

"RURAL ROAD CONNECTIVITY IN KARNATAKA – A STUDY  
OF NAMMA GRAMA NAMMA RASTE YOJANE (NGNRY)"

**Thesis Submitted to Kuvempu University**  
**in fulfilment of the requirements for the Degree of**

**DOCTOR OF PHILOSOPHY**  
in  
**ECONOMICS**

**By**

**Sunil Kumar P.**

**Research Scholar**

**Department of P.G. Studies and Research in Economics**  
**Kuvempu University**  
**Jnana Sahyadri, Shankaraghatta - 577 451**  
**Shivamogga District, Karnataka State**

**Under the Guidance of**

**Dr. B. Jayarama Bhat**

**Professor**

**Department of P.G. Studies and Research in Economics**  
**Kuvempu University**  
**Jnana Sahyadri, Shankaraghatta - 577 451**  
**Shivamogga District, Karnataka State**




# Declaration

I, **Sunil Kumar P.**, hereby declare that the Thesis entitled, “**Rural Road Connectivity in Karnataka – A Study of Namma Grama Namma Raste Yojane (NGNRY)**”, is the outcome of my own study undertaken under the Supervision and Guidance of **Dr. B. Jayarama Bhat**, Professor, Department of P.G. Studies and Research in Economics, Kuvempu University, Jnana Sahyadri, Shankaraghatta for the award of the Degree of **Doctor of Philosophy in Economics** and has not previously formed the basis for the award of any Degree/Diploma or such other similar title.

Date: 25-08-2022

Place: Shankaraghatta

  
SUNIL KUMAR P.



**Kuvempu University**

Cell : 9845990643

9449603550

E-mail : bj\_bhat1959@yahoo.co.in

**Dr. B. Jayarama Bhat**  
Professor

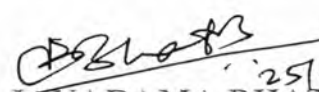
DEPARTMENT OF P.G. STUDIES  
AND RESEARCH IN ECONOMICS  
Jnana Sahyadri, Shankaraghatta - 577 451  
Shivamogga District, Karnataka, INDIA

## Certificate

This is to certify that the material presented in this Thesis entitled “**Rural Road Connectivity in Karnataka – A Study of Namma Grama Namma Raste Yojane (NGNRY)**”, is a record of bonafide research work carried out by **Mr. Sunil Kumar P.**, in this Department, under my Supervision and Guidance for the Degree of **Doctor of Philosophy in Economics** of Kuvempu University. The results presented in this Thesis are not previously formed the basis for the award of any Degree/Diploma or such other similar title.

Date: 25-08-2022

Place: Shankaraghatta

  
25/08/2022  
**B. JAYARAMA BHAT**  
**Dr. B. JAYARAMA BHAT**  
Professor M.A., Ph.D.,  
DOS. In Economics  
Kuvempu University, Jnanasanyadri  
SHANKARAGHATTA - 577 451.  
Shivamogga Dist., Karnataka.

## *Acknowledgement*

*Gratitude is stored in heart not in Mind*

First and foremost, I express my bonafide gratitude to Kuvempu University for giving me an opportunity to carry out my research programme.

The success of any student is mainly because of guidance of the research supervisor and his concern helps his students in a successful way. I was blessed to have Dr. B. Jayarama Bhat, Professor, Department of P.G. Studies and Research in Economics, Kuvempu University, Jnana Sahyadri, Shankaraghatta, as my guide to pursue my doctoral degree. Sir I take this opportunity to thank you from the depth of my heart for the valuable guidance, encouragement and constant support all through my studies.

My grateful thanks are due to Dr. S.N. Yogish, Professor and Chairman, Department of P.G. Studies and Research in Economics, Kuvempu University, Jnana Sahyadri, Shankaraghatta and I would also like to express my sincere gratitude to Dr. Narayan Rao, Professor (Retd.) and Dr. Shivappa, Assistant Professor, GFGC, Koratagere, for their help during my research work.

Without my family support, it would never happen and I would never have thought of a higher degree like this. At first, thanks are due to my parents Ms. Choudamma, Sri. Puttappa S., Smt. Renuka, brothers Mr. Prakash, Mr. Girish, Mr. Mahabhalesh, sisters Ms. Anjali, Ms. Aishwarya, Ms. Ananya, Ms. Ankita, Ms. Ammu and all my family members, who always stood beside me and supported me during the entire period of research work. I always owe my gratitude to all of them.

It is my great privilege to express my gratitude to Sri. Kotreshappa H., Principal, Sri. Nagaraj T.R., Sri. Doddappa, Sri. Yogeeshwarappa, Sri. Kuber Naik and the Staff Members of Government P.U. College, Hosuru, Shikaripura Taluk, for their support. I would like to acknowledge all my students for their support.

It is my pleasure to say thanks to Dr. Yuvaraj U., Dr. Ravikumar S., Dr. Shanmukhappa M.T., Mr. Santhosh C., Mr. Thipperudrappa E., Dr. Shashi, Dr. Nagesha, Mr. Eswara M.G., Mr. Mallikarjun Gadad, Dr. Hanumanth, Mr. Chandrashekar Aradhya, Mr. Ganesh, Mr. Mallikarjunappa M., Mr. Bhupal Balambeed, Mr. Ramachandra, Ms. Seetha, Ms. Sindhu, Mrs. Meenakshi, Mrs. Malini, Mrs. Sandhya, Dr. Late Ranjith Kumar and all my friends, who stood by my side and extended their support while conducting my research work.

I acknowledge the services rendered by all the Officers of the Rural Development and Panchayat Raj, Engineering Department, Panning Division, Hassan and Yadgir Districts, for their support during my research work.

I place my thanks on record to all the Respondents, who have helped me and provided information and support during my field survey.

I am thankful to Mr. Dinesh and Ms. Sudha, S.G.S. Computers Shankaraghatta for neat computing the Thesis and Mr. Kashinath, Ganga Book Binders, for their neat binding.

Finally, I am grateful to Kuvempu University for giving me an opportunity to carry out my research work.

Finally, I would like to thank all those who directly and indirectly helped me in completion of my research work.

*- Sunil Kumar P.*

## LIST OF ABBREVIATIONS

Abbreviations	Full form
%	Per cent
$\chi^2$	Chi-square
AWR	All Weather Roads
CAGR	Compound Annual Growth Rate
CBA	Cost-Benefit Analysis
CRF	Central Road Fund
et al.	And others (co-authors)
EU	European Union
FAO	Food and Agriculture Organization
FG	Flash Green
FY	Financial Year
GDP	Gross Domestic Product
GoI	Government of India
GoK	Government of Karnataka
JRY	Jawahar Rozgar Yojana
km	Kilometer(s)
KRRDA	Karnataka Rural Road Development Agency
KSA	Kingdom of Saudi Arabia
KSRTC	Karnataka State Road Transport Corporation
MDG	Millennium Development Goals
MDRs	Major District Roads

MT	Million Tonne(s)
MW	Mega Wats
NABARD	National Bank for Agriculture and Rural Development
NGNRY	Namma Grama Namma Raste Yojane
NHs	National Highways
ODRs	Other District Roads
OPWD	Other Public Works Department
PIUs	Programme Implementation Units
PMGSY	Pradhan Mantri Gram Sadak Yojana
PPP	Public Private Partnership
PRs	Project Roads
RSDP	Road Sector Development Programme
SDGs	Sustainable Development Goals
SHs	State Highways
SOC	Social Overheads Capital
sq.km	Square kilometer(s)
TLAs	Territorial Local Authorities
URs	Urban Roads
VANETs	Vehicular Ad Hoc Networks
VDC	Village Development Committee
VRs	Village Roads
WP	Weight Points

## LIST OF TABLES

Table No.	Title of the Table	Page No.
1.1	District-wise Physical Progress under NGNRY	08
1.2	Selection of the Taluks	09
1.3	Household Respondents of the Sample Districts	11
1.4	Sample Details of Household Respondents in Hassan District	12
1.5	Sample Details of Household Respondents in Yadgir District	13
3.1	Goals and Strategies for 2025 Infrastructure Sector in Karnataka	88
3.2	Zonal Statistics in India	92
3.3	Zonal Statistics of Karnataka	95
3.4	Road Network in India	102
3.5	Road Density in India, 2020-21	104
3.6	National Waterways in Karnataka	110
3.7	Status of Karnataka Waterways	111
3.8	Status of Communications in India	113
3.9	Number of Post Offices, Telephone Exchanges and Telephones	114
3.10	Category-wise Bank Branches Network	115
3.11	Health Oriented Programmes	118
3.12	Education Oriented Programmes	120
3.13	Major Rural Employment Generation Programmes	126
3.14	Rural Infrastructure Programmes in India	128
4.1	Status of Road Transport in Karnataka	135
4.2	National Highways in Karnataka, 1956-2021	137
4.3	State Highways in Karnataka, 1956-2021	139
4.4	Major District Roads in Karnataka, 1956-2021	141
4.5	Vision-2025 - Target for Connectivity of Villages	147



<b>Table No.</b>	<b>Title of the Table</b>	<b>Page No.</b>
4.6	Rural Roads in Karnataka, 1956-2021	148
4.7	Rural Roads in Karnataka, 2007-08 and 2020-21	149
4.8	Accessibility of Rural Road Network in Karnataka	151
4.9	Region-wise Rural Road Network Development in Karnataka	153
4.10	District-wise Road km per 100 sq.km and Per Lakh of Rural Population in Karnataka – As on March 2021	155
4.11	Rural Road Statistics (As on March 2021)	156
4.12	Physical and Financial Progress under PMGSY (2012-13 – 2020-21)	157
4.13	Physical and Financial Progress under CMGSY (2012-13 – 2020-21)	158
4.14	Physical and Financial Progress under NGNRY (2012-13 – 2020-21)	160
5.1	Financial Allocation and Utilization under the NGNRY (2013-14 to 2019-20)	163
5.2	Road Length under the NGNRY from 2013-14 to 2019-20	164
5.3	Financial Allocation and Utilization of the NGNRY in the Study Regions	166
5.4	Road Length under NGNRY in the Study Regions - 2013-14 to 2019-20	168
5.5	Construction of NGNRY Roads in the Study Regions	169
5.6	Age-wise Distribution of the Respondents	177
5.7	Gender-wise Classification of the Respondents	178
5.8	Educational Level of the Respondents	179
5.9	Occupational Details of the Respondents	181
5.10	Awareness about Rural Development Programmes	182
5.11	Travel Frequency of Users	183
5.12	Users Views on Quality of the NGNRY Roads	185

<b>Table No.</b>	<b>Title of the Table</b>	<b>Page No.</b>
5.13	Mode of Transport Used	187
5.14	Impact on Employment Generation	189
5.15	Impact on Employment Generation of the Respondents and Weight Points (WP)	190
5.16	Impact on Education	192
5.17	Impact on Education and Weight Points (WP)	193
5.18	Impact on Health Infrastructure	195
5.19	Impact on Health Infrastructure and Weight Points (WP)	196
5.20	Impact on Agricultural Infrastructure	198
5.21	Impact on Agricultural Infrastructure and Weight Points (WP)	199
5.22	NGNRY Roads Impact on Social Aspects	201
5.23	Impact on Social Aspect and Weight Points (WP)	202
5.24	Impact on Business, Culture and Modernization in Rural Areas	203
5.25	$\chi^2$ Test for the Impact of NGNRY on Road Transportation	204
5.26	Users' Overall Views on Rural Road Conditions in the Study Regions	205
5.27	Quality of the Surface	206
5.28	Overall Condition of Rural Roads of NGNRY in the Study Region	207
5.29	Quality of NGNRY Roads in the Study Regions	208
5.30	Users View on the Short Life of NGNRY Roads	209
5.31	Users Index of the Short Life of the NGNRY Roads	210
5.32	Comparison of NGNRY Roads with Other Rural Roads	212
5.33	Maintenance of NGNRY Roads	213
5.34	Adequate Construction of the NGNRY	214
5.35	Safety of NGNRY Roads to Travel	215

<b>Table No.</b>	<b>Title of the Table</b>	<b>Page No.</b>
5.36	Effective Implementation of the NGNRY Roads in the Study Regions	216
5.37	Adequate Maintenance of NGNRY Roads in the Study Regions	218
5.38	NGNRY Roads - Quality Issues	219
5.39	Own Vehicle Used	223
5.40	Type of Impact After Construction of NGNRY	224
5.41	Availability of Facilities/Provisions in Study Regions	226
5.42	Role and Impact of NGNRY in the Study Regions	229
5.43	Computed Results of $\chi^2$ Test	231
5.44	Agricultural Products (Food Grains, Vegetables, Pulses, Oilseeds, Commercial Crops and Others)	232
5.45	Pre and Post-Implementation of NGNRY and Marketing of Agricultural Products	235
5.46	Experience Details of the Contractors	236
5.47	Contractors Views on NGNRY Road Construction	237
5.48	Employment Created Under the NGNRY Road Works	239
5.49	Wage Details of Daily form Labour	240
5.50	Short Life of NGNRY Roads-Calculations using Weight Points	241
5.51	PIU Authorities Opinion about NGNRY	244
5.52	Short Life of NGNRY Roads - The Causes	248

## LIST OF GRAPHS

<b>Graph No.</b>	<b>Title of the Graph</b>	<b>Page No.</b>
5.1	Financial Allocation and Utilization under the NGNRY (2013-14 to 2019-20)	163
5.2	Road Length under the NGNRY from 2013-14 to 2019-20	165
5.3	Financial Allocation and Utilization of the NGNRY in the Study Regions	167
5.4	Construction of NGNRY Roads in the Study Regions	169
5.5	Educational Level of the Respondents	180
5.6	Travel Frequency of Users	184
5.7	Effective Implementation of the NGNRY Roads in the Study Regions	217
5.8	Adequate Maintenance of NGNRY Roads in the Study Regions	218

## SUMMARY OF CONTENTS

		Page No.
<b>Chapter-01.</b>	<b>INTRODUCTION</b>	<b>01-15</b>
	1.0. Introduction	01
	1.1. Statement of the Problem	05
	1.2. Objectives	06
	1.3. Hypotheses	06
	1.4. Scope, Relevance and Limitations of the Study	06
	1.5. Methodology	07
	1.5.1. Area of the Study	07
	1.5.2. Sources of Data	10
	1.5.3. Sampling Design	10
	1.5.3.1. Rural Road Users/Beneficiaries	10
	1.5.3.2. Builders/Contractors of NGNRY Roads	13
	1.5.3.3. PIU Authorities	14
	1.5.4. Analytical Techniques	14
	1.6. Chapter Scheme	14
<b>Chapter-02.</b>	<b>REVIEW OF LITERATURE</b>	<b>16-79</b>
	2.1. Studies made Abroad	16
	2.1.1. Studies on the Transport System	17
	2.1.2. Studies on Metropolitan Transportation Planning	21
	2.1.3. Studies on Transport Forecasting/Cost Structure	24
	2.1.4. Studies on Road Infrastructure	28
	2.1.5. Studies on Rural Transportation	32
	2.1.6. Studies on Transport Safety	35
	2.2. Studies Made in India	40
	2.2.1. Studies on the Role of Transport	40
	2.2.2. Studies on Transport Planning and Finance	48
	2.2.3. Studies on Transport Forecasting/Cost Structure	51
	2.2.4. Studies on the Transport and Development	53
	2.2.5. Studies on Rural Transportation	57
	2.2.6. Studies on Transport Infrastructure	65
	2.2.7. Studies on Transport Safety	77

**Chapter-03. ECONOMIC AND SOCIAL INFRASTRUCTURE IN INDIA - AN OVERVIEW 80-131**

3.0.	Introduction	80
3.1.	Infrastructure - The Meaning	81
3.2.	Conceptual and Theoretical Framework	82
3.3.	The Status of Infrastructure in India	86
	3.3.1. Share of Infrastructure Investment	87
	3.3.2. Vision-2025 for Infrastructure Sector	88
3.4.	Types of Infrastructure	90
3.5.	Economic Infrastructure	90
3.6.	Transport Infrastructure in India	90
3.7.	Rail Transport Infrastructure	91
	3.7.1. Beginning of Rail Transport	91
	3.7.2. Development of Railways	91
	3.7.3. Railway Zone of the Country	92
	3.7.4. Development of Railways during Five Year Plans	93
	3.7.5. Railway Infrastructure of Karnataka	95
3.8.	Road Transport Infrastructure	96
	3.8.1. Status of Roads Based of Capacity	97
	3.8.2. Road Development Plans in India	98
	3.8.3. Road Transport under Five Year Plans	99
	3.8.4. India's Road Network during 1950-51 – 2020-21	101
	3.8.5. Road Density in India	104
	3.8.6. Road Transport in Karnataka	105
3.9.	Air Transport	106
	3.9.1. Development of Air Transport in India	106
	3.9.2. Air Transport in Karnataka	107
3.10.	Water Transport Infrastructure	107
	3.10.1. Inland Water Transport (IWT)	107
	3.10.2. Ports	108
	3.10.3. Major Sea Ports of India - At a Glance	109
	3.10.4. Inland Water Transport in Karnataka	110
	3.10.5. Waterways in Karnataka	111

3.11.	Infrastructure of Communication	112
3.11.1.	Structure of Telecommunication Services	112
3.11.2.	Postal and Telecommunication in Karnataka	113
3.11.3.	Banking and Financial Infrastructure	114
3.11.4.	Banking and Finance in Karnataka	115
3.12.	Social Infrastructure	116
3.13.	Health Infrastructure	117
3.13.1.	Health Infrastructure of Karnataka	117
3.13.2.	Health Infrastructure Programmes	118
3.14.	Education	119
3.15.	Rural Housing	121
3.16.	Rural Drinking Water	121
3.16.1.	National Rural Drinking Water Programme (NRDWP)	121
3.16.2.	Rural Drinking Water of Karnataka	122
3.17.	Rural Sanitation	123
3.17.1.	Swachh Bharat Abhiyan (SBA)	123
3.17.2.	Swachh Bharat Mission (Gramin)	123
3.18.	Rural Road Connectivity	124
3.19.	Rural Electrification	124
3.19.1.	Deen Dayal Upadhyaya Gram Jyothi Yojana (DDUGJY)	124
3.19.2.	Rural Electrification in Karnataka	125
3.20.	Rural Employment	126
3.21.	Rural Infrastructure Programmes in India	128
3.22.	Conclusion	131

**Chapter-04. RURAL ROAD DEVELOPMENT IN KARNATAKA - 132-161**  
**AN ANALYSIS**

4.0.	Introduction	132
4.1.	The Road - A Brief Reference to Early History	133
4.2.	A Brief History of Road Development in India	134
4.3.	Status of Road Transport in Karnataka	135
4.4.	Road Development in Karnataka (1956-2021)	135
4.4.1.	National Highways in Karnataka (1956-2021)	136

4.4.2.	State Highways in Karnataka (1956-2021)	138
4.4.3.	District Roads in Karnataka (1956-2021)	140
4.5.	Village Roads/Rural Roads	142
4.6.	Historical Development of Rural Roads	143
4.7.	Rural Roads during Five Year Plans	144
4.8.	Target for Connectivity of Villages - Vision-2025	147
4.9.	Rural Road Development in Karnataka (1956-2021)	148
4.9.1.	Rural Road Development in Long-Run (1956-2021)	148
4.9.2.	Rural Road Development in Short-Run (2007-08 – 2020-21)	149
4.9.3.	Accessibility of Rural Road Network in Karnataka	151
4.9.4.	Region-wise Rural Road Network Development in Karnataka	152
4.9.5.	District-wise Rural Road Network Development in Karnataka	154
4.9.6.	Status of Rural Roads in Karnataka	156
4.10.	Rural Road Infrastructure Programmes in Karnataka	156
4.10.1.	Pradhanan Mantri Gram Sadak Yojane (PMGSY)	157
4.10.2.	Chief Minister Grama Sadak Yojana (CMGSY)	158
4.10.3.	Namma Grama Namma Raste Yojane (NGNRY)	159
4.11.	Conclusion	161
<b>Chapter-05.</b>	<b>RESEARCH RESULTS, DISCUSSION AND INTERPRETATION</b>	<b>162-250</b>
	<b>SECTION - A</b>	<b>162-170</b>
	<b>A Brief Account of NGNRY in the Study Regions</b>	
5.1.	Financial Allocation and Utilization under the NGNRY in the Study Divisions	162
5.2.	Physical Achievement of the NGNRY in the Study Divisions	164
5.3.	Allocation and Utilization of Funds under the NGNRY in the Study Regions	166



5.4.	Physical Achievement of the NGNRY in the Study Regions	168
5.5.	Phase-wise Road Construction in the NGNRY Roads in the Study Regions	169
<b>SECTION-B</b>		<b>171-176</b>
<b>A Brief Profile of Study Region</b>		
5.6.	Profile of Hassan District	173
5.7.	Profile of Yadgir District	175
<b>SECTION-C</b>		<b>176-250</b>
<b>Part-I</b>		<b>177-235</b>
<b>Views of NGNRY Road Users</b>		
5.8.	Age-wise Distribution	177
5.9.	Gender-wise Classification	178
5.10.	Educational Level	179
5.11.	Occupation	181
5.12.	Awareness about Programmes	182
5.13.	Travel Frequency of Users	183
5.14.	Quality of NGNRY Roads	185
5.15.	Mode of Transport	186
5.16.	Impact on Employment Generation	189
5.17.	Impact on Education	191
5.18.	Health Infrastructure	194
5.19.	Impact on Agricultural Infrastructure	197
5.20.	Impact on Social Aspects	200
5.21.	Impact on Business, Culture and Modernization in Rural Areas	203
5.22.	Users' Overall Views on Rural Road Conditions	205
5.23.	Quality of the Surface	206
5.24.	Users Overall Views on NGNRY Road Conditions	207
5.25.	Quality of NGNRY Roads	208
5.26.	Users View on the Short Life of NGNRY Roads	209
5.27.	NGNRY Roads with Other Rural Roads	212
5.28.	Proper Maintenance of NGNRY Roads	213
5.29.	Adequate Construction of the NGNRY Roads	214
5.30.	Safety of NGNRY Roads to Travel	215

5.31.	Effective Implementation of NGNRY Roads	216
5.32.	Adequate Maintenance of NGNRY Roads	217
5.33.	NGNRY Road User's Satisfaction Index	219
5.34.	Own Vehicle	223
5.35.	Availability of Facilities/Provisions in the Study Area	
5.36.	Role and Impact of NGNRY in the Study Regions	225
5.37.	Socio-Economic Factors and Level of Performance of NGNRY	229
5.38.	Issues on Marketing of Agricultural Produce	230
		231
	<b>Part-II</b>	
	<b>The Contractors Views</b>	<b>235-242</b>
5.39.	General Information about the Contractors	
5.40.	Experience in the Field	235
5.41.	Contractors Views on the Programme	236
5.42.	Creation of Employment	236
5.43.	Labour	239
5.44.	Wage	239
5.45.	Deterioration of NGNRY Roads - The Contractors' Views	240
		240
	<b>Part-III</b>	
	<b>The PIU Authorities of the NGNRY</b>	<b>242-250</b>
5.46.	The Working of PIU Authorities	
5.47.	Authorities Views on Implementation in the Study Region	242
5.48.	Reasons for the Deterioration of Roads - The Authorities Views	243
		247
<b>Chapter-06.</b>	<b>FINDINGS, SUGGESTIONS AND CONCLUSION</b>	<b>251-267</b>
<b>A.</b>	<b>Findings Based on Secondary Data</b>	<b>251-253</b>
6.1.	Road Network in India	251
6.2.	Rural Road Network in India	251
6.3.	Road Network in Karnataka	252
6.4.	Rural Road Network in Karnataka	252
6.5.	The NGNRY in the Study Regions	252

<b>B.</b>	<b>Findings Based on Primary Data</b>	<b>253-266</b>
	<b>Part-I</b>	
6.6.	Views of NGNRY Road Beneficiaries	253
6.6.1.	Educational Background of the Respondents	253
6.6.2.	Occupation	253
6.6.3.	Awareness about the Programme	253
6.6.4.	Quality of NGNRY Roads	254
6.6.5.	Impact on Employment Generation	254
6.6.6.	Impact on Education	254
6.6.7.	Health Infrastructure	254
6.6.8.	Impact on Agricultural Infrastructure	254
6.6.9.	Impact on Social Aspect	255
6.6.10.	Impact on Business, Culture and Modernization in the Rural Areas	255
6.6.11.	Overall Views of Users on Rural Road Conditions	255
6.6.12.	Users' View on the Short Life of the NGNRY Roads	256
6.6.13.	Effective Implementation of the NGNRY Roads	256
6.6.14.	Adequate Maintenance of the NGNRY Roads	256
	<b>Part-II</b>	<b>257-258</b>
6.7.	Views of NGNRY Contractors	257
6.7.1.	Approval of Works	257
6.7.2.	Allocation of Funds	257
6.7.3.	Release of Funds	257
6.7.4.	Success of the Programme in the Study Regions	258
6.7.5.	Creation of Employment	258
6.7.6.	Wage	258
	<b>Part-III</b>	<b>258-264</b>
6.8.	Authority Views	258
6.8.1.	Preparation of a Proposal	258
6.8.2.	Contractors Abiding Norms and Conditions	259
6.8.3.	Attending to the Road Contractors' Problems	259
6.8.4.	Completion of Road Works	259
6.8.5.	Maintenance of Roads	259
6.8.6.	Fund Release	259
6.8.7.	Contractors'-Authority Relation	260

6.8.8.	Quality Assessment	260
6.8.9.	Success of the Programme	260
6.9.	Problems Identified during the Study	260
6.9.1.	Regional Disparity	260
6.9.2.	Ineffective Implementation of NGNRY Roads	260
6.9.3.	Inadequate Maintenance of NGNRY Roads	261
6.9.4.	Poor Quality of NGNRY Roads	261
6.9.5.	Negligence of Remote Villages	262
6.9.6.	Overall Conditions of the NGNRY Roads	262
6.9.7.	Lack of Awareness about Rural Development Programmes	262
6.9.8.	Environmental Pollution	263
6.9.9.	Red-tapison in the Allocation of Funds	263
6.9.10.	Unscientific Road Humps	263
6.9.11.	Improper Maintenance of Water and Drainage System	264
6.10.	Suggestions	264
6.10.1.	More Emphasis on North Karnataka	264
6.10.2.	More Emphasis on Yadgir District	264
6.10.3.	Better Quality of the NGNRY Roads	265
6.10.4.	More Emphasis on Remote Areas	265
6.10.5.	Inter-Village Connectivities	265
6.10.6.	Programme Awareness	265
6.10.7.	Role of Government	265
6.10.8.	Daily Travel Needs	266
6.10.9.	Increase Enhancement in Grants and Maintenance Period	266
6.10.10.	Proper Speed Breaker	266
6.10.11.	Proper Drainage System	266
6.10.12.	Public Co-operation	266
6.11.	Conclusion	267

<b>BIBLIOGRAPHY</b>	<b>268-281</b>
---------------------	----------------

<b>INTERVIEW SCHEDULES</b>	<b>282-294</b>
----------------------------	----------------

<b>PUBLICATION DETAILS</b>	<b>295</b>
----------------------------	------------

---

## **Chapter-01**

### **INTRODUCTION**

---

#### **1.0. Introduction**

#### **1.1. Statement of the Problem**

#### **1.2. Objectives**

#### **1.3. Hypotheses**

#### **1.4. Scope, Relevance and Limitations of the Study**

#### **1.5. Methodology**

##### **1.5.1. Area of the Study**

##### **1.5.2. Sources of Data**

##### **1.5.3. Sampling Design**

###### **1.5.3.1. Rural Road Users/Beneficiaries**

###### **1.5.3.2. Builders/Contractors of NGNRY Roads**

###### **1.5.3.3. PIU Authorities**

##### **1.5.4. Analytical Techniques**

#### **1.6. Chapter Scheme**

---

## Chapter-01

### INTRODUCTION

#### 1.0. Introduction

India is a developing country with a vast rural population. The development of the rural areas is an economic priority. The planning and effective implementation of the development related to rural transport infrastructure is an essential ingredient. A key component of transport infrastructure is the creation of assets in the form of rural roads. The access to the means needed to procure the three most important requirements of human beings, namely food, clothing and shelter are depended upon the availability of the road network.

Rural road connectivity is a key component of rural development, by promoting access to socio-economic services and generating increased agricultural incomes and create productive employment opportunities in India as well as in Karnataka. It is also a result i.e. a key ingredient in ensuring sustainable poverty reduction. In spite of the efforts made over the years, at the state and central level through different programmes, about 40 per cent of the habitations in the country are still not connected by All-Weather Roads. The improved rural connectivity helps in the mobility of rural population and rural produce and also helps in improving in the rural economy and life style of rural masses and increase in their per capita income.<sup>1</sup>

---

<sup>1</sup> Ishita and Tripathy (2014). Development of Rural Roads. *Kurukshetra – A Journal of Rural Development*, Division Ministry of I&B, Government of India, New Delhi, 62(12), 61.

There is no doubt about the fact that if there is proper road connectivity to places it would enable people to have easier access to resources or means to satisfy their basic needs viz., Roti (food), Kapada (clothing) and Makaan (house). Road transport functions as a network and provides definite physical access to people, to urban amenities like power supply, potable water, better communication services and opportunities for quality education and entertainment. It provides income generation activities in such a way that people will have easy reach to income. In such a situation businessmen and traders try to make use of the opportunity and undertake business and entrepreneurial activities. This is what our past president A.P.J. Abdul Kalam introduced the concept of Providing Urban Amenities to Rural Areas (PURA), provides four important connectivity. They are:

1. Physical Connectivity (Roads and power supply) in rural areas,
2. Electronic Connectivity by providing consistent rural communication connectivity,
3. Knowledge Connectivity of providing rural education & health, and
4. Economic Connectivity that helps to realize the extreme worth for the products and services of the rural areas.

### **Classification of Roads in India**

According to the Nagpur Plan (1943)<sup>2</sup>, the roads in India have been broadly classified into five major categories, viz., National Highways (NHs), State Highways (SHs), Major District Roads (MDRs), Other District Roads (ODRs) and Village Roads (VRs). The present study is with reference to rural roads.

---

<sup>2</sup> According to Nagpur Plan (1943-61) length of DRs and VRs assessed on the basis of number of villages with below 500 population, 501-1000, 1001-2000 and 2001-5000 population.

## **Rural Road Network in India**

The rural roads in India form a substantial portion of the Indian road network. These roads are in poor shape affecting the rural population's quality of life and Indian farmer's ability to transfer produce to markets. On account of poor rural roads it is estimated that farmers lose around 30 per cent of produce after harvest. Many rural roads are of poor quality, potholed and unable to withstand the loads of heavy farm equipments. These roads are also far from quality required for all seasons.

According to the Census of India 2011, more than 83 crore people of India live in rural areas in 6.41 lakh villages. Almost 3/5<sup>th</sup> of India's road network consisting of more than 28 lakh kilometres provides connectivity to these rural units. During the 2002-12 decade, the rural road network registered a moderate rate of growth of 3.3 per cent, marginally lower than that of the total road network of the country which grew at 3.5 per cent. The Rural Roads were 2,06,408 km in length in 1950-51, which increased to the tune of 45,35,511 km of length during 2020-21, the percentage increase being 2097.35 between 1950-51 and 2020-21, grew by about 22 times.<sup>3</sup>

## **Road Development in Karnataka**

In the year 1956, the total road length remained at 43,182 km in Karnataka, of which 21,917 km length was surfaced and the remaining 21,265 km length was

---

<sup>3</sup> Annual Report 2020-21, Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi, pp. 25-26.



unsurfaced in nature. Karnataka has a total road network of 1,22,489 km in March 2016, it has increased to 3,31,099 km in March 2021. Rural road network in Karnataka was 2,373 km in length in 1956, which has increased to the tune of 1,90,501 km during the period 2021, increase being 8265 percentage points between 1956 and 2021. This implies that during the period under reference the rural road network in Karnataka rose by 84 times, which is a noticeable feature in respect of the trends in the growth of rural roads in the state.<sup>4</sup>

### **Namma Grama Namma Raste Yojane (NGNRY)**

Karnataka state cabinet on January, 2010, gave consent to NGNRY which is a state government scheme and started within the state with PMGSY guidelines in 189 Assembly constituencies. Under the scheme of NGNRY, 30 km of rural roads will be developed in each of the 189 Assembly segments at a cost of ` 42 lakh per km which includes a maintenance period of five years. Implementation of the NGNRY, novel programme started in 2010. Objectives of the Programme are

- The primary objective of the NGNRY is to provide connectivity, by way of an All-Weather Roads to the eligible unconnected habitations in the rural areas.
- The NGNRY will not permit the upgradation of the existing roads in those districts where all the eligible habitations have been provided with All Weather Road connectivity.

---

<sup>4</sup> Economic Survey of Karnataka 2020-21, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, March 2019, pp. 399-400.

### **1.1. Statement of the Problem**

Rural road connectivity is a major requirement of rural development, by promoting access to socio-economic services and generating increased agricultural incomes and productive employment opportunities in India and next to railways, road transport plays a significant role in the country's transport system, besides, the fact that social and economic progress of the country depends on the roads. Most of the earlier studies with respect to transport in Karnataka have focused on railways, road transport, the KSRTC, the PMGSY, but the present study is focusing mainly on rural transportation and purely state government sponsored scheme entitled *Namma Grama Namma Rasthe Yojane (NGNRY)*.

This study examines the problems encountered in developing rural road network to which one of the major solutions is NGNRY. The present study remains analytical in nature. The problem identified for the research has been taken up in the form of evaluative study of the implementation and performance of the NGNRY in the southern and northern parts of Karnataka currently existing in Hassan and Yadgir districts respectively. Issues related with the Target, Achievement, Finances, Problems, Impacts on Rural Transportation and the like in connection with the scheme have been taken up in the present study for analysis. Unless there is improvement in rural road connectivity there is no hope for growth of farm sector which is regarded as the backbone of our economy. It implies that development of rural roads leads to development of agriculture.

## **1.2. Objectives**

The major objective of the present study has been an analysis of the present road connectivity in Karnataka. However, the following specific objectives have been set for the present study:

1. To analyse the present rural road network in the study area.
2. To analyse region-wise development of rural road connectivity in Karnataka that is by taking up one district in each of the south and the north regions.
3. To assess the role of rural road connectivity in the development process.
4. To identify the problems associated with the implementation and maintenance of NGNRY and suggest remedial measures based on the results of the study.

## **1.3. Hypotheses**

In order to achieve the above objectives, the following hypotheses have been set for the study:

1. As compared to South Karnataka implementation of NGNRY has partially failed in North Karnataka.
2. The rural road connectivity tends to improve employment, education, health, agriculture and other facilities in the study area.
3. The implementation and maintenance of NGNRY in Hassan district has been better than that in Yadgir district.

## **1.4. Scope, Relevance and Limitations of the Study**

The present study has been, geographically, restricted to two districts in Karnataka state viz., Hassan in the southern part and Yadgir in the northern part of the State. The study under took an evaluation of the rural road connectivity under

the NGNRY scheme in the above two districts focusing on Sakaleshpur and Arsikere taluks in Hassan and Shahpur and Shorapur taluks in Yadgir district. Thus, this has been a specific study (region-specific and issue-specific), which certainly contributes to the field of Transport Economics. Viewed from this angle the study assumes relevance in its own way.

## **1.5. Methodology**

The present study has been partially descriptive and partially analytical in nature.

### **1.5.1. Area of the Study**

Considering the significance of research, the topic has been geographically restricted to Karnataka state. The researcher has decided to take two districts, one district each in the Southern and Northern parts of Karnataka, for a comparative analysis of the NGNRY. The study area focused in such a way as to represent one developed district in the south and one backward district in the northern parts of the state based on *High-Power Committee for Redressal of Regional Imbalances (HPCRR)* report headed by D.M. Nanjundappa. In each of the parts while selecting districts, the length under NGNRY roads have been given weights. Accordingly, one relatively developed district of Hassan (with the highest length of 473.51 km) in the southern part and one backward district i.e., Yadgir (with the lowest length of 279.64 km) in the northern part of Karnataka were selected for the study. The road length indicates the achievement of the programme. The details of information gathered about the physical progress under NGNRY has been provided in Table 1.1.

**Table 1.1**  
**District-wise Physical Progress under NGNRY**

(Road Length in km)

Sl. No.	Districts	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)
1	Bagalkot	126.23	27.41	63.34	96.37	70.33	88.58	472.26
2	Belgaum	205.45	200.48	156.18	258.31	157.95	225.09	1203.5
3	Ballari	70.03	126.99	106.4	77.7	58.53	92.04	531.69
4	Bidar	51.11	140.98	89.52	57.22	33.27	65.78	437.88
5	Vijayapura	176.05	48.07	109.38	61.75	102.61	67.4	565.26
6	Dharwad	46.1	77.68	44.35	56.28	85.23	20.58	330.22
7	Gadag	30.2	81.17	44.23	51.01	47.68	83.52	337.81
8	Kalaburagi	128.49	99.41	62.55	70.59	70	131.79	562.83
9	Haveri	143.47	42.05	56.2	69.47	109.02	47.47	467.68
10	Koppal	71.62	59.19	24.55	83.26	35.25	46.65	320.52
11	Raichur	28.84	65.61	105.89	89.52	24.5	63.17	377.53
12	Uttara Kannada	64.21	55.71	160.96	75.23	100.18	118.77	575.06
13	Yadgiri	63.55	14.5	77.16	27.29	69.7	27.44	279.64
<b>North Karnataka</b>		<b>1205.35</b>	<b>1039.25</b>	<b>1100.71</b>	<b>1074</b>	<b>964.25</b>	<b>1078.28</b>	<b>6461.84</b>
14	Bengaluru (R)	41.99	55.79	41.18	41.03	59.49	56.99	296.47
15	Bengaluru (U)	69.61	62.56	75.09	62.07	52.89	65.26	387.48
16	Chamarajanagar	16.96	75.96	39.35	54.42	49.56	51.32	287.57
17	Chikmagalur	69.96	91.65	50.73	55.17	42.28	85.84	395.63
18	Chikballapur	79.7	51.19	48.19	62.01	84.61	68.1	393.8
19	Chitradurga	115	65	126.36	0	119.44	110.8	536.6
20	Davanagere	136.01	97.81	96.12	43.68	157.88	36.91	568.41
21	Dakshina Kannada	153.6	48.25	69.73	64.56	106.02	56.89	499.05
22	Hassan	46.53	126.5	96.46	74.18	80.78	159.4	583.85
23	Kolar	39.58	94.96	65.08	114.05	18.86	159.25	491.78
24	Kodagu	22.34	29.62	11.49	16.78	27.14	22.43	129.8
25	Mandya	84.46	92.29	65.53	69.36	30.99	140.3	482.93
26	Mysuru	107.2	158.99	67.89	84.99	59.97	91.09	570.13
27	Ramanagar	23.44	62.86	19.88	66.39	37.37	48.41	258.35
28	Shivamogga	94.96	72.07	50.45	97.47	43.62	114.94	473.51
29	Tumakuru	49.65	149.93	56.71	190.88	52.75	72.2	572.12
30	Udupi	135.78	14.48	36.59	13.49	89.53	86.21	376.08
<b>South Karnataka</b>		<b>1286.77</b>	<b>1349.91</b>	<b>1016.83</b>	<b>1110.53</b>	<b>1113.18</b>	<b>1426.34</b>	<b>7303.56</b>
<b>Karnataka</b>		<b>2492.12</b>	<b>2389.16</b>	<b>2117.54</b>	<b>2184.53</b>	<b>2077.43</b>	<b>2504.62</b>	<b>13765.40</b>

*Source: Annual Reports - 2012-13 to 2018-19. Rural Development and Panchayat Raj Department, GoK, , Bengaluru.*

## Selection of Taluks

An attempt has been made to collect primary data by selecting two taluks in each district namely Sakaleshapur and Arsikere from Hassan and Shorapur and Shahapur from Yadgir for the purpose of the comparative study. In each of the district while selecting the taluks, the *High-Power Committee for Redressal of Regional Imbalances (HPCRR)* report has been considered. Accordingly, in Hassan district, one relatively developed taluk of Sakaleshapur (1.48 weights) and one backward taluk of Arsikere (0.91 weights) in southern parts and in Yadgir district most backward taluks of Shorapur (0.70 weights) and Shahapur taluk (0.62 weights) in northern part have been chosen for comparative study. The details of gathered information about selection of Taluks is provided in Table 1.2.

**Table 1.2**  
**Selection of the Taluks**

Taluks	No. of Villages	NGNRY villages	HPCRR (Weights)	Status
(01)	(02)	(03)	(04)	(05)
<b>Hassan District</b>				
Alur	260	19	1.15	Relatively developed
<b>Arsikere</b>	<b>393</b>	<b>71</b>	<b>0.91</b>	<b>Backward</b>
Arakalgudu	297	41	0.84	More backward
Beluru	384	31	0.94	Backward
Channarayapattana	388	69	0.92	Backward
Hassan	393	111	1.25	Relatively developed
Holenarasipura	250	28	0.97	Backward
<b>Sakaleshpur</b>	<b>228</b>	<b>33</b>	<b>1.48</b>	<b>Relatively developed</b>
<b>Yadgir District</b>				
<b>Shahpur</b>	<b>152</b>	<b>34</b>	<b>0.62</b>	<b>Most backward</b>
<b>Shorapur</b>	<b>202</b>	<b>24</b>	<b>0.70</b>	<b>Most backward</b>
Yadgir	166	44	0.67	Most backward

*Note* : In Yadgir District only three taluks have been declared as Revenue Taluks i.e., Shapur, Shorapur and Yadgir, for which data which available. The remaining three taluks are Non-Revenue Taluks i.e., Hunasagi, Wadagera and Gurmitkal on account of which data is not available.

*Source* : 1) Rural Development and Panchayat Raj, Engineering Department, Panning Division, Hassan and Yadgir Districts.

2) Census of India 2011, Register General of India, Hassan and Yadgir Districts.

### **1.5.2. Sources of Data**

The study relied on both the primary and secondary data for its analysis. Primary data were gathered through appropriately prepared open-ended interview schedules assigned to the NGNRY road Users/beneficiaries in the sample villages chosen from the taluks of Arsikere and Sakaleshpur in Hassan and Shahapur and Shorapur in Yadgir district. NGNRY road contractors in the study districts of Hassan and Yadgir and the Programme Implementation Units (PIUs) authorities have been interviewed.

The secondary data required for the study were gathered from published sources such as various titles, journals, periodicals and reports on the subject. For the purpose of gathering the latest information and data relevant to research topic, PIUs, the District Statistical Offices in the districts of Hassan and Yadgir have also been consulted for reliable sources during the course of the study in order to build the necessary theoretical framework in developing the Thesis.

### **1.5.3. Sampling Design**

#### **1.5.3.1. Rural Road Users/Beneficiaries**

The researcher has decided to select villages which have been benefited from the rural road network under the NGNRY and has used stratified random sample method based on the size of the village used in the sample taluks of Hassan and Yadgir districts. As per the above, in each sample taluk about 15 per cent of the NGNRY connected villages have been chosen for the study. Accordingly, 11 (Arsikere) and 05 (Sakaleshpur) villages have been chosen in sample taluks of *Hassan district* for the study (15% of NGNRY connected total villages). Further,

05 (Shahapur) and 04 (Shorapur) villages have been chosen in the sample taluks of *Yadgir district* for the present study and sample villages in each cluster have been selected using the lottery method. The details of gathered information about household respondents of the sample districts are provided in Table 1.3.

**Table 1.3**  
**Household Respondents of the Sample Districts**

Sl. No.	Sample Taluk	NGNRY Villages	15% of NGNRY	No. of Households	10% of Households
(01)	(02)	(03)	(04)	(05)	(06)
01	Arsikere	71	11	1840	184
02	Sakaleshpur	33	05	558	56
03	Shahapur	34	05	1052	105
04	Shorapur	24	04	730	73
<b>Total</b>		<b>162</b>	<b>25</b>	<b>4180</b>	<b>418</b>

*Source:* 1) *Rural Development and Panchayat Raj, Engineering Department, Panning Division, Hassan and Yadgir Districts.*

2) *Census of India 2011, Register General of India, Hassan and Yadgir Districts.*

Exactly 184 and 56 household respondents have been randomly chosen in the sample taluks of Arsikere and Sakaleshpur in Hassan district respectively. Similarly, a total of 105 and 73 household respondents have been randomly selected in the sample taluk of Shahapur and Shorapur of Yadgir district respectively. In total from the sample taluks of Hassan and Yadgir districts together 418 household respondents have been selected for the comparative study.

### **Selection of Villages**

Villages which have been benefited from NGNRY road connectivity based on the size of the population, Villages selected in the sample have been clustered as below 500, 500-999, 1000-1499, 1500-1999 and 2000+ population villages.



Note: In each cluster population villages 15 per cent of the villages has been chosen and in each cluster population village 10 per cent of households has been chosen for the study. The details of gathered information about samples and details of household respondents in Hassan and Yadgir districts are provided in Tables 1.4 and 1.5.

**Table 1.4**  
**Sample Details of Household Respondents in Hassan District**

Sl. No.	Population Cluster	NGNRY road connected village	Population	No. of Households	10% of Households
<b>Arsikere Taluk</b>					
01	Below 500	Chikkajjikattehalli	287	70	7
02		Hunasekatte	353	78	8
03		Devihalli	375	82	8
04		Ajjanahalli	425	97	10
05	500-999	Harlakatta	549	116	12
06		Neerajunda	588	124	12
07		Talalatore	906	225	23
08		Adihali	923	210	21
09		Pannasamudra	649	152	15
10	1000-1499	Dumanahali	1361	324	32
11	1500+	Belagumba	1621	362	36
<b>Total</b>				<b>1840</b>	<b>184</b>
<b>Sakaleshpur taluk</b>					
01	Below 500	Menasumakki	321	82	08
02		Rajendrapura	358	86	09
03		Ramenahalli	487	119	12
04	500-999	Vadur	502	121	12
05		Halasulige	886	154	15
<b>Total</b>				<b>558</b>	<b>56</b>
<b>District Total</b>				<b>2398</b>	<b>240</b>

*Source : Census of India 2011, Register General of India, Hassan and Yadgir Districts.*

**Table 1.5**  
**Sample Details of Household Respondents in Yadgir District**

Sl. No.	Population Cluster	NGNRY road connected village	Population	No. of Households	10% of Households
<b>Shahapur taluk</b>					
01	Below 500	Roza Simt Sirwal	285	49	05
02	500-999	Ingalgi	987	154	15
03	1000-1499	Tippenahalli	1122	172	17
04	1500-1999	Rajapur	1560	259	26
05	2000 +	Kakkesgera	2334	418	42
<b>Total</b>				<b>1052</b>	<b>105</b>
<b>Shorapur taluk</b>					
01	Below 500	Bailapur	486	72	07
02	500-999	Bandoli	889	158	16
03	1000-1499	Shalgi	1410	276	28
04	1500-1999	Bommanahalli	1529	224	22
<b>Total</b>				<b>730</b>	<b>73</b>
<b>District Total</b>				<b>1782</b>	<b>178</b>

*Source : Census of India 2011, Register General of India, Hassan and Yadgir Districts.*

### 1.5.3.2. Builders/Contractors of NGNRY Roads

As per the document supplied by the NGNRY office, subdivision of PMGSY, in the study districts of Hassan and Yadgir respectively, there were 34 and 20 (total 54) NGNRY road contractors as on March 2020. In each sample district about 20 per cent of the NGNRY road contractors have been chosen randomly for the study. Accordingly, 07 and 04 (total 11) NGNRY road contractors in the districts of Hassan and Yadgir respectively have been chosen for the study. These sample contractors of the two districts were interviewed and required information was gathered from them.

### **1.5.3.3. PIU Authorities**

In each PIU office in Hassan and Yadagir, 6 and 5 different cadres of PIU authorities have been chosen for the field survey respectively. Two of the PIU offices of Hassan and Yadagir districts comprised of 11 different cadres PIU authorities who were interviewed using separately prepared interview schedules and information on the authorities' opinion of the NGNRY implementation in respect of study region has been collected.

## **1.6. Analytical Techniques**

To draw the inferences and verify the hypotheses set for the study, the data were gathered from both the secondary and primary sources and are analyzed with the help of appropriate Tables, Charts, Graphs and suitable Diagrams have also been used in the interpretation. Simple statistical tools like annual growth rate method, ranking method, weight point score method, percentages, averages and statistical techniques like chi-square ( $\chi^2$ ) and 't' test have been used in the discussion and interpretation of the data gathered.

## **1.7. Chapter Scheme**

The present study has been planned in six chapters.

### **Chapter-1: Introduction**

An introduction and background of the study and all the mandatory information has been provided in this chapter.

### **Chapter-2: Review of Literature**

A fairly elaborate review of literature has been presented in this chapter. Attempt is also made here to maintain chronological order in the review of literature to throw light on the organizational link from the past to the present, covering the period between 1901 and 2020. For convenience, the reviews have

been presented in two broad parts such as Studies made Abroad and Studies made in India.

### **Chapter-3: Economic and Social Infrastructure in India - An Overview**

In the third chapter, analysis of the infrastructure in India in general and economic infrastructure and social infrastructure in particular has been made. Other relevant issues have also been dealt with in this chapter.

### **Chapter-4: Rural Road Development in Karnataka - An Analysis**

This chapter provides a brief history of road development in India in general and explains rural road development in Karnataka in particular. Briefly, 65 years of growth of National Highways (NHs), State Highways (SHs), District Roads (DRs) and Village Roads (VRs) in Karnataka has been explained with facts and figures related to the rural road development. The chapter also provides a picture of the present conditions of rural roads in Karnataka.

### **Chapter-5: Research Results, Discussion and Interpretation**

This core chapter has been presented in two sections. Section-A provides brief information based on the secondary data, Section-B is devoted to the analysis of primary investigation. The Section-B has been further classified into three parts, Part-I highlights the views of NGNRY Road users, Part-II is on the NGNRY Contractors' views and Part-III explains PIUs Authorities of NGNRY in the study region. The results are presented, discussions carried out and interpretations have been made.

### **Chapter-6: Findings, Suggestions and Conclusion**

This chapter has presented the major findings of the study. Suggestions have also been offered based on the problems identified in the study area and a formal conclusion has been arrived at the end.

## **Chapter-02**

### **REVIEW OF LITERATURE**

---

#### **2.1. Studies made Abroad**

**2.1.1. Studies on the Transport System**

**2.1.2. Studies on Metropolitan Transportation Planning**

**2.1.3. Studies on Transport Forecasting / Cost Structure**

**2.1.4. Studies on Road Infrastructure**

**2.1.5. Studies on Rural Transportation**

**2.1.6. Studies on Transport Safety**

#### **2.2. Studies Made in India**

**2.2.1. Studies on the Role of Transport**

**2.2.2. Studies on Transport Planning and Finance**

**2.2.3. Studies on Transport Forecasting/Cost Structure**

**2.2.4. Studies on the Transport and Development**

**2.2.5. Studies on Rural Transportation**

**2.2.6. Studies on Transport Infrastructure**

**2.2.7. Studies on Transport Safety**

---

## **Chapter-02**

### **REVIEW OF LITERATURE**

In the present chapter, an attempt to review the studies on rural infrastructure and road transportation in general and on rural road connectivity in particular has been made. Further, chronological order, in the review of literature to throw light on the organizational link from the past to the present, covering the period from 1901 to 2020 has been maintained. For convenience, the review has been presented in two broad parts such as:

2.1. Studies made Abroad and

2.2. Studies made in India.

Further, in both the parts, the reviews are presented issue-wise.

#### **2.1. Studies made Abroad**

Several studies conducted by experts abroad have focused on the role of particular means of transport. Inadvertently, such studies also referred reviews of some earlier studies and have been presented in the following passage;

- Studies on the Transport System
- Studies on Metropolitan Transportation Planning
- Studies on Transport Forecasting/Cost Structure
- Studies on Road Infrastructure
- Studies on Transport Safety
- Studies on Rural Transportation

### 2.1.1. Studies on the Transport System

Transport system has been a vast subject area including the role of transport, the structure and the geography of transport.

Thomas Holdich (1901), in his book titled “The Indian Borderland 1880-1900”, described the geography and border way of road disputes of the North-West Frontier. The book contains illustrations of tables, figures, charts and an appendix that provides a short history of Afghanistan. This series also include work in social, political and military history on a wide range of periods and regions. It also covers an account of historical events and movements by eye-witnesses and contemporaries, as well as landmark studies that assembled significant source materials that developed new historic-geographical methods.<sup>1</sup>

A Census Report (1908) on “Transportation by Water: 1906 United States”, represents statistics for the year 1906, for all American documented and undocumented crafts of 5 tones net register. Therefore, it includes all craft of the required ownership and tonnage operated on the required ownership and tonnage operated on the coasts and inland waters of the United States, Porto Rica and the Hawaiian Islands or between the ports of these and other countries, but does not include craft operating exclusively in the waters of the Philippine Iceland. For the purpose of census convenience the entire country was divided into districts and the Agents were instructed to make a thorough Canvas after all the names on the lists,

---

<sup>1</sup> Thomas Holdich (1901). *The Indian Borderland 1882-1900*. Published in the United States of America, Cambridge University Press, New York, pp. 1-80.

to make careful enquiry and secure reports for all other craft that should be included in the census.<sup>2</sup>

A paper entitled, “The Structure of Transportation Network” by Garrison and Marble (1962), analyzed the structure, geometry pattern and layout of transportation networks in the study area of Ireland. Further study gave more attention to motions of arrangement of routes, intersections and terminals on earth's surface and their motions provide an adequate general identification. Later researchers treat changes in the structures of networks when transportation systems are expanded and operational definitions are given at the time of consistent with the needs regarding the subject. Suitable operational definitions are given for the comparison of transportation network with each other.<sup>3</sup>

European transport system composed of infrastructure, modes and terminals that are so embedded in the socio-economic life of individuals, institutions and corporations that they are often invisible to the consumer. Rodrigue (2006), argued in his book entitled “The Geography of Transport Systems” concerned with movement of freight, people and information where he tries to link spatial constraints and attributes with the origin, the distribution, the extent, the nature and the purpose of movements. Further the study covered a

---

<sup>2</sup> S.N.D. - North Director (1908). *Transportation by Water : 1906 United States*. Department of Commerce and The Labour Bureau of the Census, Bulletin 91, Washington, Govt. Printing Office, pp. 1-20.

<sup>3</sup> Garrison, W.L. and Marble, D.F. (1962). *The Structure of Transportation Network, Transportation Forecast and Predict on Study Progress Report 62-II*. Defense Technical Information Centre for U.S. Army, Transportation Research Command Fort Eustis, Virginia, pp. 1-93.



specific conceptual dimension, including networks, modes and terminals, international transportation, urban transportation and environmental impacts.<sup>4</sup>

Dorosh et al. (2012), in their combined study on “Road Connectivity, Population and Crop Production in Sub-Saharan Africa”, pointed out that this study adopts a cross sectional spatial approach to examine the relationship between transport, infrastructure, population, location and agricultural products in Sub-Saharan Africa. There is substantial evidence that investments in roads and improved road connectivity positively affect agricultural productivity and output. Further, the authors suggested that the improvements in road infrastructure could facilitate a substantial increase in agricultural production.<sup>5</sup>

A research paper on “Impact of Road Transport on Agriculture Development: A Nigerian Example”, by Tunde and Adeniyi (2012), emphasized that road transport plays an important role in agricultural development. This is because it is the major means of transporting agriculture produce from the farms to the markets as well as to various urban communities. The study found that road transport has both positive and negative impact on agricultural development in the study area. Further, the study concludes by suggesting an improvement in road transport system will lead to increased production by farmers. Community

---

<sup>4</sup> Rodrigue, J.P. (2006). *The Geography of Transport System*. Routledge Taylor & Francis Group, London and New York, pp. 1-49.

<sup>5</sup> Dorosh, P., Wang, H.G., Liangzhi and Schmidt, E. (2012). Road Connectivity, Population and Crop Production in Sub-Saharan Africa. *Journal of International Association of Agricultural Economists-(IAAE), Agricultural Economics*, 43(1), 10-36.

participation in road transport development should also be encouraged in the study area.<sup>6</sup>

Ducruet and Lugo (2013), in their study on “Structure and Dynamics of Transportation Network Models, Methods and Applications”, viewed that the study of transport networks has long been at cross roads between various scientific disciplines. Traditionally, transport networks are studied, from a graph theory prospective, which has a branch of mathematics proposing concepts and measures about the topology of networks considered as a set of nodes (vertices) connected by links (edges). Further the author explained about the structure of transport networks in the global and local level (European examples), mechanism for changing and growing transport network. The study concluded that applying complex systems to transport networks was preferred to complement theories and applications in different scientific fields.<sup>7</sup>

In a study on “A Methodology for Definition of Road Networks in Rural Areas of Nepal”, Shrestha et al. (2013), stated that Nepal has a total population of 26.5 million with 83 per cent living in rural areas. About 77 per cent of the total area of Nepal lived in hills (52%) and mountains (25%). Construction of rural road was one of the major infrastructure development projects in Nepal in order to improve this disability in rural areas. Further, the researcher argued that planning the road network in rural area is therefore crucial, not only in terms of network

---

<sup>6</sup> Adeniyi and Tunde, A.M. (2012). Impact of Road Transport on Agriculture Development: A Nigerian Example. *Ethiopian Journal of Environmental Studies and Management (EJESM)*, 5(3), 232-238.

<sup>7</sup> Ducruet, C. and Lugo, I. (2013). *Structure and Dynamics of Transportation Networks Models Methods and Applications*. The Sage Hand Book of Transport Studies, Sage Publications Ltd., pp. 347-364.

efficiency, but also regarding construction and operation costs, as limited funding was available. The covering approach was found to be useful to identify the nodal points which cover the settlements within the Village Development Committee (VDC). The definition of linkages to the nodal points in the second phase can from a basic rural road network.<sup>8</sup>

Jones and Walsh (2016), in their study on “Public Transport and Health Outcome in Rural Sub-Saharan Africa- A Synthesis of Professional Opinion”, reported that poor mechanical conditions of vehicles and risky driving behaviours were reported to be an important source of injury from rural road crash and also found that the factors contributing to unsafe rural public transport were attributable to economic barriers to proper operation. Authors conducted field interviews as semi-structured dialogues with some 40 transportation and public health professionals in the capital cities of Ethiopia, Ghana and Kenya. Additionally, 86 responses to an internet survey were received from 38 African countries.<sup>9</sup>

### **2.1.2. Studies on Metropolitan Transportation Planning**

Garrison (1960), in a study entitled “Connectivity of the Interstate Highway System”, discussed about characteristics of the Inter-State Highway System and relevance of the research problem in the USA. Further the researcher analyzed the problems and evaluated the results and discussed an elementary and descriptive

---

<sup>8</sup> Shrestha, J.K., Shrestha, A., Bunta, R.B., Lopes and Lopes, N. (2013). A Methodology for Definition of Road Networks in Rural Areas of Nepal. *Engineering and Technology International Journal of Civil and Environmental Engineering*, 7(6), 122-426.

<sup>9</sup> Jones, S. and Walsh, J. (2016). Public Transport and Health Outcome in Rural Sub-Saharan Africa - A Synthesis of Professional Opinion. *Journal of Transport & Health*, 3(2), 211-219.

use of the theory of graphs to evaluate the effects of changes in transport networks.<sup>10</sup>

In an article on “Forecasting the Carbon Footprint of Road Freight Transport in 2020”, Piecyk and McKinnon (2010), argued that the research was undertaken to determine the baseline trends in logistics and supply chain management and associated environmental effects upto 2020. The researchers explained the factors affecting freight transport demand, truck fuel consumption and related carbon dioxide emissions are classified them into six categories in relation to different levels of logistical decision-making. Further the study projections are based on the results of seven focused group discussions and a large-scale Delphi survey.<sup>11</sup>

In an article on “Crash Index in the Arab World During the Three Decades Challenges and Opportunities”, Al-Madani (2014), explained that traffic crash deaths in 18 Arab countries were in the range of 22 thousand during the year 1980 compared to that of 27 in the European Union (EU) countries with 75 thousand deaths recorded. The death records in the Arab countries exceeded 37 thousand in 2011, it is about three and a half times that of 1980. Further he argued that the gap in the facility records and rates between the Arab countries and the EU is continuously increasing with time and it is expected to do so during the coming decade unless proper counter actions are considered. The total death record in the Arab countries is expected to exceed 52 thousand in the year 2022. Further the

---

<sup>10</sup> Garrison, W. (1960). Connectivity of The Interstate Highway System. *Regional Science Association International (RSAI)*, 6(1), 121-137.

<sup>11</sup> Piecyk, M. and McKinnon, A.C. (2010). Forecasting the Carbon Footprint of Road Freight Transport in 2020. *International Journal of Production Economics*, 128(1), 31-42.

study concluded with the urban planning though being reasonable in many countries is not forgiving one and does not support traffic safety strategies.<sup>12</sup>

A study carried out by Hassan et al. (2015), on “Comprehensive Analysis of the Severity and Nature of Traffic Crashes Occurring on Rural Road in the Kingdom of Saudi Arabia (KSA)”, examined the nature and causes of traffic crashes occurring on rural road in the KSA, so that counter measures and future studies could be suggested. Further study results indicated that sudden lane change, distraction, speeding and defects in tires what are the main reasons for involvement in traffic crashes on rural roads. Moreover, the study found that passenger cars were the most frequent vehicles involved in crashes (64%) followed by trucks at 28 per cent and findings of the ordered probity model revealed that the crash location, aggressive driving behaviour and size of crash were the significant variables that increase the severity of traffic crashes on rural roads.<sup>13</sup>

Sarhan (2015), in his paper on “Driver Behavior in Signalized Intersection and Response to End of Green Flash Intervals”, deals with the characteristics of the dilemma/option zone assumed on the Abu Dhabi roads with 60 and 80 km per hour posted speed. Data have been collected for speed perception and reaction time and declaration rate and values were substituted in formulas derived for the calculation of the mean and standard deviation dilemma/options probabilistic

---

<sup>12</sup> Al-Madani, H. (2014). Arab World during the Three Decades Challenges and Opportunities. *International Road Federation (IRF) Examiner*, USA, 4, 18-21.

<sup>13</sup> Hassan, H.M., Al-Faleh, H., Al-Rashidi, A. (2015). Comprehensive Analysis of the Severity and Nature of Traffic Crashes Occurring on Rural Road in the Kingdom of Saudi Arabia. *International Road Federation (IRF) Examiner*, USA, 5, 38-43.

analysis approach. Further the results also indicated that, the speed has the greatest impact on the standard deviation of dilemma zone. He suggested that the Flash Green (FG), interval should be deactivated during the rush hours when speed decreases to volume of 30 or 40 km (per hour).<sup>14</sup>

A Paper entitled “The Vehicle-to-Vehicle Connectivity on Parallel Roadways with Large Road Separation”, of Wang and Yan (2015) explained that the completes a full range of roadway separation in an effort to characterize information propagation vehicle connectivity in Vehicular Ad Hoc Networks (VANETs), on parallel roadways. The large road separate distance makes modelling more challenging compared to the case  $d < \sqrt{3}L/2$ . This paper also developed recursive model for expectation, variance and probability of information propagation distance on the parallel roads with a large separation distance  $d \geq \sqrt{3}/2 = L$  while explicitly considering success rate of cross road transmission.<sup>15</sup>

### 2.1.3. Studies on Transport Forecasting/Cost Structure

In a study on “Transport and Storage Phenomena in a Fracture Matrix System: Experimental Investigations and Numerical Modelling” carried out by Pfungsten and Mull (1990), explained the different fracture-matrix-models are used for experimental and theoretical investigations of transport and storage processes in these systems. A study also pointed out that the source of pollutants is assumed

---

<sup>14</sup> Sarhan, M.E. (2015). Driver Behavior in Signalized Intersection and Response to End of Green Flash Intervals. *International Road Federation (IRF) Examiner*, USA, 5, 24-29.

<sup>15</sup> Wang, X.B. and Yan, X. (2015). *Vehicle-to-Vehicle Connectivity on Parallel Roadways with Large Road Separation*. Transportation Research, Elsevier Publication Ltd., Emerging Technologies Part-C, 52, 93-100.

to be active for a certain time. Pollutants migrate through the fractures predominantly by advection. From the fracture they enter into the porous matrix by diffusion during the loading time. When the source of pollution is eliminated, clean water is assumed to enter into the fractures. The pollutants stored in the matrix return into the fracture. In spite of remedial action pollutants are found in the system for a long time. These processes are simulated and some experimental investigations were carried out on a laboratory scale. The authors also investigated that they are part of a risk analysis concerning the quality of groundwater which is pumped from similar systems as assumed in the study.<sup>16</sup>

Talvitie (2000), in his study on “Evaluation of Road Projects and Programmes in Developing Countries”, made an economic evaluation of World Bank supported road projects in developing countries using Cost-Benefit Analysis (CBA). The study found that the road transport cost comprises of five interacting sets of costs, like construction cost, rehabilitation and periodic maintenance cost, routine maintenance and system operation cost, road users cost and external cost of society<sup>17</sup>.

In a paper entitled “The Importance of Accurate Road Data for Spatial Applications in Public Health: Customizing a Road Network”, Frizzelle and others (2009), examined that the custom road network dataset was developed to associations between health behaviours and the environment among pregnant and

---

<sup>16</sup> Pfingsten, W. and Mull, R. (1990). Transport And Storage Phenomena In A Fracture Matrix System: Experimental Investigations and Numerical Modeling. In: *International Association Of Hydrological Sciences (IAHS), Proceedings of the Conference, The Hague, Calibration and Reliability in Groundwater Modeling*, 195, 261-269.

<sup>17</sup> Talvitie, A. (2000). Evaluation of Road Projects and Programmes in Developing Countries. *Journal of Transport Policy*, 7(1), 61-72.

postpartum women living in central North Carolina in the United States. Authors further developed three analytical measures to assess the comparative accuracy and utility of four publicly and commercially available road datasets and the custom dataset in relation to participants' residential locations over three time periods. The exclusion of road segments and positional errors in the four comparison road datasets resulted in between 5.9 and 64.4 per cent of respondents lying farther than 15.24 meters from their nearest road, the distance of the threshold set by the project to facilitate spatial analysis. Further researchers using a Pearson's correlation coefficient, between the customized road dataset and the four comparison road datasets ranged from 0.01 to 0.82. This study demonstrated that the importance of available road datasets and assessing their completeness, accuracy and currency for their particular study area. This paper served as an example for assessing the feasibility of readily available commercial or public road datasets, and outlines the steps by which an improved custom dataset for a study area can be developed.<sup>18</sup>

In an article entitled “Towards Optimal Lifecycle Management in a Road Maintenance Setting Using DEA” Rouse and Chiu (2009), focused on local road aspects of the highway system and assessed how efficiently, effectively and economically the 73 Territorial Local Authorities (TLAs) in New Zealand have maintained their respective local road networks from a life cycle perspective. Further, the authors also measured the quality, quantity and cost, together with

---

<sup>18</sup> Frizzelle, B.G., Evenson, K.R., Rodriguez, D.A. and Laraia, B.A. (2009). The Importance of Accurate Road Data for Spatial Applications in Public Health: Customizing A Road Network. *International Journal of Health Geographics (IJHG)*, pp. 1-11.



nondiscretionary measures of environmental factors and incorporated it in Data Envelopment Analysis to evaluate each TLA's performance in terms of efficiency, effectiveness and economy. TLAs that have high performance on all three measures provide best practice indication of the optimal maintenance activity mix to undertake. The study found that the best practice mix of expenditure is 59 per cent routine maintenance, 27 per cent resealing and 14 per cent rehabilitation.<sup>19</sup>

Shrestha and Lopes (2014) brought out a Paper titled "Multi-Objective Analysis of Rural Road Network Problem in the Hilly Regions of Nepal". This paper took up the rural road network upgradation problems, using a multi-objective optimum model, to support decision makers in the choice of road upgrade in the hilly regions of Nepal. The model was found suitable for the case under study and possibility, easily extendable and rural roads of other developing countries and also achieve minimum transportation cost by establishing a suitable road surface level in rural road networks in hilly regions of Nepal.<sup>20</sup>

In their combined research paper on "Multi-criteria Evaluation for Ranking Rural Road Projects: Case study of Nepal", Bhandari et al. (2014), viewed that about half of the world's population still lives in rural areas. In the least developed countries this figure is more than 71 per cent. About one billion or 31 per cent of the rural population still live isolated from markets and services. However, the roads are highly capital-intensive projects, they are the most vital infrastructures

---

<sup>19</sup> Rouse, P. and Chiu, T. (2009). Towards Optimal Lifecycle Management in a Road Maintenance Setting using DEA. *European Journal of Operational Research*, 196(2), 672-681.

<sup>20</sup> Shrestha, J. and Lopes, N. (2014). *A Multi-objective Analysis of Rural Road Network Problem in the Hilly Regions of Nepal*. Transportation Research Part A; Policy and Practice, 64, 43-53.

for the development of these rural areas. In order to properly utilize the scarce financial resources to develop the rural areas of the developing countries, evaluation for ranking of rural road projects is an important stage of the planning process. Evaluation of rural road projects is a systematic method for collecting, analyzing and using information to answer the questions about their effectiveness and efficiency. In the early 1960s, Cost-Benefit Analysis (CBA) methods were developed and spread across the transportation sectors in France. CBA methods are widely used in different countries such as France, UK, Japan, the USA and other developing countries. The evaluation criteria was derived from a thorough literature review and individual importance was determined via a Google Survey among different experts, who have worked on rural roads in Nepal and other 22 countries. This survey used Analytic Hierarchy Process. Thirteen sub criteria and three criteria were considered in the question on the survey and almost all the respondents responded that these criterias and sub criterias were necessary in the criteria for the ranking of rural road projects from the point of sustainability.<sup>21</sup>

#### **2.1.4. Studies on Road Infrastructure**

A Report (1996) of the Food and Agriculture Organization (FAO) stated that adequate irrigation, road network, electricity, marketing and telecommunication, power plants, fiber cables and sewer system provisions are very important for stimulating agricultural investment and growth. The report also points out better communication infrastructures will reduce transport maintenance

---

<sup>21</sup> Bhandari, S.B., Shahi, P.B. and Shrestha, R.N. (2014). Multi-Criteria Evaluation for Ranking Rural Road Projects: Case Study of Nepal. *Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 11(6), 53-65.

cost and marketing merging and improve the income and private investment opportunities in the agricultural sector.<sup>22</sup>

In a study on “Transport Infrastructure in India: Developments, Challenges and Lessons from Japan”, Sahoo (2011), argued that India is one of the fastest growing countries in the world after China and needs to maintain its growth momentum in a sustainable manner to improve its overall standard of living and reduce poverty. The study analysed the current status and issues related to India’s transport infrastructure, mainly roads, railways, airports and ports. Further, the study looks at development of transport infrastructure in Japan and draws useful policy lessons for India. The study found that the major issues in infrastructure sector in India include financing of infrastructure, land acquisition and environmental clearances, private sector participation, stable policy framework and tariff policy etc.<sup>23</sup>

A study carried out by Shiferaw et al. (2012) on “Road Infrastructure and Enterprise Development in Ethiopia”, investigates whether the improvement in road infrastructure resulting from the Road Sector Development Programme (RSDP) was implemented in Ethiopia over the period 1997-2010. And also, the Researcher investigated as whether the improvement in road infrastructure resulting from the RSDP has affected the patterns of entry of new manufacturing firm and the firm size of new entrants and concluded that the improvements in the

---

<sup>22</sup> Food and Agriculture Organization (FAO) Report (1996). United Nations, Chapter 10, p. 15.

<sup>23</sup> Sahoo, P. (2011). *Transport Infrastructure in India: Developments, Challenges and Lessons from Japan*. Institute of Developing Economics, Japan External Trade Organization, V.R.F. Series No. 465, pp. 1-72.

road infrastructure have a favourable impact on the size and structure of the manufacturing sector in Ethiopia.<sup>24</sup>

Baraloto et al. (2015), in their article entitled “Effects of Road Infrastructure on Forest Value across a Tri-National Amazonian Frontier”, argued that the construction and paving of roads represent key factors responsible for tropical deforestation. But its consequences for forest degradation remain less clear. Furthermore, they argued that the remote sensing techniques showed much stronger effect of road proximity on deforestation. The authors also found that remote sensing techniques including canopy spectral signatures might be calibrated to characterize multiple components of forest value, so the landscape impacts infrastructure development is on both deforestation and forest degradation in tropical regions.<sup>25</sup>

A study carried by Bertha and Kurantin (2017) on “The Impact of Infrastructure on Growth and Development the Case of Ghana, 1986-2016”, described how the level of infrastructure development affected economic growth in Ghana from 1986 to 2016. The study focused on road transport infrastructure and its impact on economic growth under successive Ghanaian governments. They used Cobb-Douglas production function and Vector Auto Regression (VAR), approach. The result showed a positive relationship between infrastructure development and maintenance in 2000. The government attempted to plan and

---

<sup>24</sup> Shiferaw, A., Soderboom, M., Siba, E. and Alemu, G. (2012). *Road Infrastructure and Enterprise Development in Ethiopia*. Working Paper, International Growth Centre (IGC), United Kingdom, pp. 1-40.

<sup>25</sup> Baraloto, C., Alverga, P., Castro, W. and Rockwell, C. (2015). *Effects of Road Infrastructure on Forest Value Across a Tri-National Amazonian Frontier*. Elsevier Publication Ltd., Biological Conservation 191, pp. 674-681.

prioritise development of infrastructure, road in particular and create fake culture of maintenance. It targeted at rising the countries competitiveness and attractiveness to growth factors of all sectors of the economy.<sup>26</sup>

Yilmaz and Isin (2017), in their study on “The Impact of Infrastructure on Growth in Developing Countries: Dynamic Panel Data Analysis”, held the view that Infrastructure and growth nexus has been debated in the literature since 1980s. This study is of vital importance from the point of view of developing countries. These countries need to grow faster in order to catch-up with their advanced counterparts. Thus, it is important to detect the effect of infrastructure on growth. Further the authors developed a standard growth regression in the present study and used per capita GDP growth rate as a dependent variable. Moreover, they argued that the infrastructure is added to the model as an index constructed from the indicators of infrastructure, total electric generating capacity, total telephone lines and the length of road network. The study also employed a set of instrumental variables comprising 29 developing countries between 1990 and 2014, in order to estimate dynamic panel data and prefer Generalized Methods of Moments (GMM) estimators. According to empirical analysis researcher claimed that infrastructure has a positive and significant impact on growth. He also found that this impact is smaller than what was predicted in the earlier studies.<sup>27</sup>

---

<sup>26</sup> Bertha, Z. and Kurantin, N. (2017). The Impact of Infrastructure on Growth and Development : The Case of Ghana, 1986-2016. In: *Handbook of Research on Economic, Financial and Industrial Impacts on Infrastructural Development*, pp. 84-113.

<sup>27</sup> Yilmaz, D. and Isin, C. (2017). The Impact of Infrastructure on Growth in Developing Countries: Dynamic Panel Data Analysis. In: *Handbook of Research on Economic, Financial and Industrial Impacts on Infrastructural Development*, pp. 40-68.

### 2.1.5. Studies on Rural Transportation

In an article entitled “Importance of Rural Road as Source Areas for Runoff in Mountainous Areas of Northern Thailand”, of Ziegler and Giambelluca (1997), analyzed that the hydrologic role of road and important issue in mountainous areas of the Tropic, erosion control efforts are predominantly focused on deforestation and agricultural practices. Further the study reported that investigation of soil physical properties that control excess rainfall, rural road and surrounding lands in a mountainous watershed in the Northern Thailand. The researchers found that in contrast with other areas of the watershed the road surface tends to generate excess rainfall early in a crane event and a near all of its areas. Despite the relatively small area extent of road-related surfaces (< 0.5% of basin area), they contribute a large portion of basin-wide total excess rainfall during frequently occurring, small rainfall events. However, during larger events, agricultural, secondary vegetation, and forested areas assume greater importance because of their larger extent.<sup>28</sup>

A study carried out by Ellis (1997), on “Key Issues in Rural Transport in Developing Countries”, attempts to draw together the key issues in rural transport in developing countries. It draws on the recent literature together with Thailand, Srilanka, Ghana, Zimbabwe and Pakistan. The study also addresses the balance away from a ‘roads-only’ approach to a more integrated view of rural accessibility which includes planning for the provision of vehicle services. Three key issues related to rural transport covered includes the importance of transport in satisfying basic needs and the relationship between accessibility, mobility and rural

---

<sup>28</sup> Ziegler, A.D. and Giambelluca, T. (1997). Importance of Rural Road as Source Areas for Runoff in Mountainous Areas of Northern Thailand. *Journal of Hydrology*, 196(1), 204-229.

development, the nature of rural transport and possible solution to reviving the burden of village level travels, the role of non-motorised, agricultural and conventional modes of transport are explored together with the constraints to their introduction and operations and the importance of the market in enabling the efficient and low cost operations of transport services.<sup>29</sup>

A research paper by Starkey et al. (2002) on “Improving Rural Mobility: Options for Developing Motorized and Non-motorized Transport in Rural Areas”, found that many inhabitants of rural areas in developing countries, lack of adequate and affordable access to transport infrastructure and services. The study also argued that poor access to transport constrains economic and social development and adds to poverty. Better transport services can stimulate economic activity and social improvement, leading to easier accesses and a virtuous circle that reduces poverty and improves the lives of poor rural residents. The study also focuses on improving rural mobility by facilitating the provision of affordable means of transport and transport services.<sup>30</sup>

The study on “The Promise of Rural Roads: Review of the Role of Low-Volume Roads in Rural Connectivity, Poverty Reduction, Crisis Management and Liveability” by Faiz (2012), for the Transportation Research Board (TRB), viewed that about 33.8 million km of roads girdle the earth’s land mass of 148.9 million km, about 57 per cent of it is paved and nearly all the unpaved roads and an estimated 85 per cent of paved roads are LVRs with an Average Annual Daily

---

<sup>29</sup> Ellis, S.D. (1997). *Key Issues in Rural Transport in Developing Countries*. Transport Research Laboratory, Crowthorne, Berkshire, TRL Report-260, pp. 1-27.

<sup>30</sup> Starkey, P., Simon, H., John and Ternell (2002). *Improving Rural Mobility: Options for Developing Motorized and Non-motorized Transport in Rural Areas*. World Bank Technical Paper (WTP)-525, World Bank Group, Washington DC, pp. 1-78.

Traffic (AADT) of 1,000 Vehicles Per Day (VPD) or less. Further the circulation reviewed the role of rural roads in improving rural connectivity, catalysing economic growth and reducing poverty, managing natural disasters and manmade crises, sustaining, rural livelihoods and enhancing liveability.<sup>31</sup>

Veloga et al. (2012), in their study on “Transport Poverty Meets the Digital Divide: Accessibility and Connectivity in Rural Communities”, argued that the rural communities face a range of challenges associated with accessibility and connectivity which apply to both the physical and virtual sphere. Constraints in rural transport infrastructure and services are often compounded by limitations. This paper focused specifically on two issues of current research such as the role of information and associated technologies in supporting rural passengers on public transport.<sup>32</sup>

In an article on “Overview of Rural Roads”, Bhandari (2013) reviewed the existing rural road situation worldwide. The importance and overall status of rural roads in different countries including China, India, Bangladesh, Pakistan, Bhutan, Ethiopia, Kenya, the USA, Australia and Nepal are studied. The Researcher also discussed on the issues like rural road length, policy and programmes in these countries. Further, as well the researcher provided some suggestions for the overall development of rural roads.<sup>33</sup>

---

<sup>31</sup> Faiz, A. (2012). *The Promise of Rural Roads: Review of the Role of Low-Volume Roads in Rural Connectivity, Poverty Reduction, Crisis Management and Livability*. Transportation Research Circular, Transport Research Board, Washington DC, pp. 1-40.

<sup>32</sup> Veloga, N., Croft, B., Nelson, J.D. and Corsar, D. (2012). Transport Poverty Meets the Digital Divide: Accessibility and Connectivity in Rural Communities. *Journal of Transport Geography*, 24, 530-536.

<sup>33</sup> Bandari, S.B. (2013). Overview of Rural Roads. *The Open Transportation Journal*, pp. 53-65.



### 2.1.6. Studies on Transport Safety

Neville Moray (1990), in his article on “Designing for Transportation Safety in the Light of Perception, Attention and Mental Models” showed concern with regard the errors in the occasion of information which are caused by perceptual and attentions mechanism. Further, he also noted that the failures to scheduled attention sampling of the environment will lead to accidents. Theoretical model exists for attention and for data acquisitions. Further the models suggested how designers might approach human-machine system so as to reduce errors. Further, the study includes a brief summary of the author’s feelings about probabilistic risk assessment and related attempts to predict error.<sup>34</sup>

Bangladesh has a very high road accident fatality rate with official figures indicating more than 60 deaths per 10,000 motor vehicles. Every day around eight persons die in road accidents. Actual rate of fatality is likely to be even higher, noted Maniruzzaman and Mitra (2005), in their article on “Road Accidents in Bangladesh”. Further, they explained that the number of accidents has increased by 43 per cent between 1982 and 2000, while the number of fatalities has increased by around 400 per cent in the same period. This indicates that not only the occurrence of accidents is on the rise; the severity of accidents is also increasing. Further the study concluded that the creation of National Road Safety Council (NRSC) and adoption of Road Safety Action Plan are welcome moves towards improving road safety.<sup>35</sup>

---

<sup>34</sup> Moray, N. (1990). Designing for Transportation Safety in the Light of Perception Attention and Mental Models. *Journal of Ergonomics*, 33(10-11), 1201-1213.

<sup>35</sup> Maniruzzaman, K.M. and Mitra, K. (2005). *Road Accidents in Bangladesh*. International Association of Traffic and Safety Sciences (IATSS) Research, Elsevier Publication Ltd., 29(2), 71-75.

A study carried out by Hermans and Wets (2008) on “Combining Road Safety Information in a Performance Index”, focused on the essential steps in the construction and progress of a composite road safety performance indicate and the assignment of weights to the individual indicators. They further noted that composite indicators literature subject has been discussed for a long time and no agreement has been reached so far. The aim of the research is to provide insights into the most important weighted methods like factor analysis, analytical hierarchy process, budget allocation, data envelopment analysis and equal weighted. Furthermore, the authors gave essential theoretical considerations, applied the methods on road safety data from various countries and discussed their advantages and disadvantages. The study showed that the position of the country in the ranking is influenced by the method used. The study found that of five techniques, the weights based on the data envelopment analysis resulted in the highest correlation with the road safety ranking of 21 European countries based on the number of traffic fatalities per million inhabitants.<sup>36</sup>

A report titled “Road Safety Review” (2010) measured number of deaths that occur on the roads for every million people of the population. In 2010, Ireland recorded 47 road deaths per million population. This represents an improvement of 56 per cent from 107 people killed per million inhabitants in 2001. Very significant improvements have been made in enhancing the safety of Irish roads in 2010, this report highlights that there is a considerable body of work yet to be

---

<sup>36</sup> Hermans, E. and Wets, A. (2008). *Combining Road Safety Information in a Performance Index*. Accident Analysis and Prevention, Elsevier Publication Ltd., 40(4), 37-44.

done in order to maintain the reduction of deaths and serious injuries on Irish roads and the targets were set out in the Government Road Safety Strategy (GRSS). That target is to reduce fatalities to not greater than 60 fatalities per million, 252 deaths per annum or saving 400 lives during the lifetime of the Strategy. Whilst we have exceeded the target at 47 deaths per million populations in 2010, it is important that our efforts are maintained and we do not become complacent. There are still too many people dying and seriously injured needlessly on our roads. The contributory behaviors remain the same, speeding, impaired driving, non-use of seatbelts and unsafe behavior by or towards vulnerable road users. The GRSS has targeted these behaviors through a range of interventions and initiatives. While major progress has been made in addressing Ireland's drink driving problem, speed remains the biggest contributory factor to deaths and injuries on Irish roads. The biggest challenge faced by us is to change this culture of inappropriate speeding through enforcement, awareness raising and educational campaigns.<sup>37</sup>

In their research paper entitled "The Properties of Safety Performance Indicators in Target Setting, Projections and Safety Design of the Road Transport System", Tingvall et al. (2010), analyzed that the road traffic Safety Performance Indicators (SPIs) are increasingly used as an instrument for the planning and monitoring of safety progress. Further the authors explained that the SPIs form an intermediate step between actions and final outcome in terms of casualties in road

---

<sup>37</sup> Annual Report on Road Safety Review (2010). The Road Safety Authority (RSA), Ballina, Co. Mayo, Ireland, pp. 1-66.

crashes. It is understood that SPIs are closely related to outcome; and that it is also possible to use them in calculations and predictions of both actions and final outcome. In the present study it was also found that, some of the properties assigned to SPIs could be questioned. An assumption of linearity between SPIs and final outcome was partly rejected. Furthermore, it was also found that 100 per cent fulfillment of a set of SPIs could lead to very low mortality, demonstrating the importance of handling SPIs simultaneously.<sup>38</sup>

A paper on “Effects of Single-Phase Sequences on Signalized Intersection Safety Performance Case Study from Abu Dhabi U.A.E.” by Abdullah-al-Ghafli and Mohamad (2015), argued that in Abu Dhabi as regards traffic signal, two types of signal designs are used: split facing and lead-lag protected facing sequence. Further researchers also examined the influence of signal changes on intersection safety performance and also analyzed before and after revaluation in relation to three factors including signal facing, speed limit and intersection location. Results showed that intersection approaches that have changed from split facing sequences to lead lag phasing sequence experienced a significant increase 2.13 type 1 accident compared to 0.07 for those that remained split. Approaches located within the Central Business Distributed (CBD) also experienced around 300 per cent increase in type 1 accidents. The researches were done based on the data provided by Abu Dhabi police, which indicate the intersection conflicts.

---

<sup>38</sup> Tingvall, C., Stigson, H., Eriksson, L. and Johansson, R. (2010). *The Properties of Safety Performance Indicators in Target Setting, Projections and Safety Design of the Road Transport System*. Elsevier Publication Ltd., 42(2), 372-376.

Hence, to add more value to the safety performance related to single phase sequence the researcher concluded that property damage accident data will help to study all accident patterns.<sup>39</sup>

The 2009 “Road Safety Review” report analyzed that 79 per cent of road deaths occurred on rural roads in 2019. The review shows that from January 1 to July 28, 2019; 89 people died on Irish roads in 80 collisions. This represents 3 per cent more collisions and 7 per cent more deaths compared to provisional data for the same period in 2018. The study also found that January and February were the worst months for road fatalities with 16 deaths in each month. New mandate to the council in an effort to “reinforce and strengthen” its advisory role in relation to the sustainable development of the outdoor recreation sector in Ireland. The year 2019 has clearly focused on the key lifesaver offences and to that end speeding intercept detections are upto 48 per cent, non-wearing of seatbelts upto 27 per cent, driver distraction offences (mobile phones) upto 11 per cent and driving under the influence of an intoxicant upto 8 per cent. The review showed that road deaths have increased by six times, when compared to figures for the same period, upto 28 July, 2019, 49 drivers, 10 passengers, 15 pedestrians, 09 motorcyclists and 06 pedal cyclists have been killed on Irish roads; and 70 fatalities (79% Road Safety Review) occurred on rural roads with a speed limit of 80 kph or higher.<sup>40</sup>

---

<sup>39</sup> Abdullah-al-Ghafli and Mohamad, E. (2015). Effect of Single Phase Sequences on Signalized Intersection Safety Performance - Case Study from Abu Dhabi. *International Road Federation (IRF) Examiner*, USA, 5, 12-17.

<sup>40</sup> Annual Report on Road Safety Review (2019). The Road Safety Authority (RSA), Ballina Co. Mayo, Ireland, pp. 1-50.

## 2.2. Studies Made in India

The studies made in India have focused on various aspects like international, national, regional and local level, reviews of which are presented in chronological order in the following passages:

- Studies on the Role of Transport
- Studies on Transport Planning
- Studies on Transport forecasting/cost structure
- Studies on Transport and Development
- Studies on Rural Transportation
- Studies on Transport Infrastructure
- Studies on Transport Safety

### 2.2.1. Studies on the Role of Transport

In his book entitled “Road Transport in India”, Ramanatham (1948), explained about the role of road transport system in India. He argued that road transport plays a pivotal role in the country’s transport system. Besides the fact that social and economic progress of the country depends on the development of road, it is also a significant link of bringing about the sentimental integration of the common masses. Further the author claims that road transport can be classified as National Highways, State Highways, District Roads, Village Roads and Border Roads.<sup>41</sup>

---

<sup>41</sup> Ramanatham, V.V. (1948). *Road Transport in India*. The University Publishers Ltd., Lucknow, pp. 1-148.

Guha (1991), in the book entitled “Economics of Rural Transport”, attempts to provide an analytical framework for project appraisal in the transport sector in rural areas. Transport is the life line of an economy. Hence, the demand for viable network of transport is almost universal and as a consequence, investment decisions in this sector sometimes are costly and not always cost effective. The book has four sections. In part-I, social cost benefit criterion is discussed and its application for evaluating a rural road project is demonstrated with reference to a particular road section. In part-II, the regression technique is presented in a nutshell and it is used to assess the effects of development of rural road network and its catchment area. In part-III, the weighted rating method is presented and a case study using the method shows how easily the criterion can be adopted for taking speedy decision. Finally, in part- IV, the role of water transport in an area having natural advantage is discussed and a balanced approach towards development of rural transport is advocated.<sup>42</sup>

In her unpublished Ph.D., Thesis on “Nationalized Road Transport in Karnataka - An Economic Study”, Sharada (1994) discussed about the role of public sector passenger road transport in developing economy. She also analyzed the present system of wage fixation for the traffic staff in the Karnataka State Road Transport Corporation (KSRTC) does not bring forth a commitment for higher productivity among its employees. Further, the researcher argued that passenger every fare rise on the petition that the service is unsatisfactory and inadequate. Workers keep demanding more and more without a corresponding

---

<sup>42</sup> Guha, S. (1991). *Economics of Rural Transport*. Anil Mittal for Daya Publishing House, Delhi, pp. 1-92.

increase in their efficiency. In such a case productivity gets ignored. Higher efficiency on the part of the workers will bring about an improvement in the quality of service.<sup>43</sup>

Shamasundar (2004), in his Thesis on “Passenger Road Transport System - A Case Study of Shimoga District”, discussed about the passenger road transport system in the district making fairly elaborative analysis, based on primary investigation. The researcher made use of some simple statistical tools and techniques and offered some suggestions for improving the system. Need to improve road conditions, need to open fuel stations, coordination among different departments and road safety education.<sup>44</sup>

A study on “Rural Roads” carried out by Mohapatra and Chandrashekhar (2007), argued that rural road connectivity is a key component of rural development, since it promotes access to economic and social services, thereby generating increased agricultural productivity, non-agricultural productivity, which in turn expands rural growth opportunities and real income through which poverty can be reduced. Further they explained road classification of National Highway (NHs), State Highways (SHs), Major District Roads (MDRs), Other District Roads (ODRs) and Village Roads (VRs), and road Development plans of Nagpur Plan (1943-61), Bombay Plan (1961-81) and Lucknow Plan (1981-01). The researcher further explained Pradhan Mantri Gram Sadak Yojana (PMGSY) launching, achievements and impact assessment of PMGSY on rural economy.<sup>45</sup>

---

<sup>43</sup> Sharada, N. (1994). *Nationalized Road Transport In Karnataka - An Economic Study*. Unpublished Ph.D., Thesis, Karnatak University, Dharwad, pp. 1-215.

<sup>44</sup> Shamasundar (2004). *Passenger Road Transport System - A Case Study of Shimoga District*. Unpublished Ph.D., Thesis, Kuvempu University, Shimoga, pp. 1-230.

<sup>45</sup> Mohapatra and Chandrashekhar (2007). *A Study on Rural Roads, India Infrastructure Report 2007*. Oxford University Press, New Delhi, pp. 109-137.



In his Doctoral work on “Performance of Karnataka State Road Transport Corporation - A Case Study of North-West Karnataka Road Transportation Corporation”, Uttama (2010) analyzed the strengths and weaknesses in physical, operational and financial performance. Further the study pointed out the quality of service of the corporation. The researcher offered few suggestions for improving the Karnataka State Road Transport Corporation (KSRTC) in the study area of North-West Karnataka.<sup>46</sup>

In a research article on “Urban Transport Models BRTS Ahmedabad”, Verma (2014), highlights the innovative ways in which the Ahmedabad Municipal Corporation (AMC) has engaged itself with the users and citizens to develop a people centric urban mass transport system. The study argued that Ahmedabad Bus Rapid Transit System (ABRTS) has achieved most of its stated goals, where the need for inclusive and participatory decision making and governance has been widely accepted. Study concluded that the case of Ahmedabad BRTS demonstrates that service delivery can be improved by actively engaging the users and other stakeholders at various points in development of the service.<sup>47</sup>

Fernandis and Keshava (2014), in their research paper entitled “Economic Analysis of Regional Disparities in Karnataka”, argued that the regional disparity is a global phenomenon. Regional disparities sharply exist in Karnataka. Further the study examined the performance of the sectors like education, communication, transportation, railways, health infrastructure and urbanization in the study area.

---

<sup>46</sup> Uttama, K.H. (2010). *Performance of Karnataka State Road Transport Corporation - A Case Study of North-West Karnataka Road Transportation Corporation*. Ph.D. Thesis, Kuvempu University, Shimoga.

<sup>47</sup> Verma, M. (2014). Urban Transport Models BRTS Ahmedabad. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 58, 76-78.

Karnataka state provides efficient, convenient and easy accessible public transport to people of different income groups across the state as well as in neighboring states. Further the study found that, continuous improvement in the National Highways (NHs) by 13.03 per cent from the year 2007-08 to 2011-12 could be observed. There has been a tremendous increase in the NHs in South Karnataka by 23.74 per cent but in North Karnataka only a marginal increase by 0.11 per cent between the year 2007-08 and 2011-12 was observed. A decline in the State Highways (SHs) in South Karnataka by 2.08 per cent could be observed, but there in slight increase in SHs in North Karnataka by 1.86 per cent. On an average in Karnataka, the SHs in km has marginally increased by 0.15 per cent between the year 2007-08 and 2011-12.<sup>48</sup>

A paper entitled “Managing Urban Transport Needs” of Kalra (2015), discussed that massive urbanization and the result on transport problems is at present one of the biggest challenges in the foreseeable future in India. The government has taken steps to improve and meet the challenges, through the adoption of a National Urban Transport Policy (NUTP) and launch of the National Urban Renewal Mission (NURM).<sup>49</sup>

Dev (2015), in his paper on “Travelling to the Future with Green Transport” opined that the transportation being a major contributor to Green House Gas Emissions, it is the prime target for reducing air pollution and obtaining sustainable environment. Green Transportation involves effective and

---

<sup>48</sup> Keshava and Fernandis (2014). Economic Analysis of Regional Disparities in Karnataka. *Southern Economist - A Journal*, 53(8), 39-48.

<sup>49</sup> Kalra, K. (2015). Managing Urban Transport Needs. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 59, 11-16.

efficient resource utilization, changes in transport structure and making healthier travel choices. This demand enhanced public awareness and participation, control of private vehicles and development of vehicles powered by renewable energy sources like solar, wind, electricity and biofuels.<sup>50</sup>

Ganguli (2016), in his article on “Rural Roads: The Artery of Indian Economy” describes that rural connectivity is the nerve centre of our economy. The linkage between urban and rural areas is possible through rural roads. The relationship between agricultural growth and rural roads is intertwined and also increasing the agricultural contribution to GDP and provision of proper marketing for agricultural produce. There is no doubt that rural roads are vital for agro-based industry and rural development.<sup>51</sup>

In his research paper on “Building Connections : Political Corruption and Road Construction in India”, Lahne (2016), analyzed corruption as a pervasive challenge for the development. The study provides empirical evidence that of its welfare effect is scare using data from the bidding process for a major rural construction programme in India. He has documented political interference in a setting where politicians have no official role in constructing decisions. He concluded that setting up of the PMGSY is conceptually a pro founding inclusive programme, facilitating the integration of over 100 million people into the Indian economy.<sup>52</sup>

---

<sup>50</sup> Dev, K. (2015). Travelling to The Future with Green Transport. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 59, 23-27.

<sup>51</sup> Ganguli, B. (2016). Rural Roads: The Artery of Indian Economy. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 46(4), 5-8.

<sup>52</sup> Lahne, J. (2016). *Building Connections: Political Corruption and Road Construction in India*. International Growth Centre (IGC), (JEL Codes: D72.L14.018), pp. 1-50.

A textbook on “Transportation Engineering” of Chandoola (2016), explained the role of transport engineering in developing efficient transportation systems that fulfills the need of rapidly growing infrastructure of the country. This book has been divided into five sections they are Railways, Docks and Harbors, Road transport, Air transport and Tunneling.<sup>53</sup>

In his article on “Connecting India, Building Roads for the Poor”, Aklekar (2016), opined that rural roads are key components of rural development and they provide access to economic and social infrastructure and services. Further, the author argued that the rural roads have been a state subject; the PMGSY is a one-time special intervention of the government to provide rural connectivity, by way of single all-weather road to the eligible un-connected habitations in the core network. The study also found that after construction of rural roads, there is an influence in agricultural, health, education, and impact on social aspects, employment generation and its impact on urbanization.<sup>54</sup>

Sahu (2017), in her work on “Trend, Growth and Problems of Road Transport in India”, argued that India has one of the largest road networks in the world length of 33.14 lakh km. The growth rate of road was 12.50 per cent in 2017 due to significant increase in urban roads. The road density per 100 sq. km of land area is 142.68 in India. The road density has increased from 3.28 km in 2001 to 3.96 km in 2014, registering a CAGR of 3.9 per cent. Further, researcher explains that inter-state analysis of road transport reveals that Andhra Pradesh has highest

---

<sup>53</sup> Chandola, S.P. (2016). *A Text Book of Transportation Engineering*. S. Chand Publishing Co., New Delhi, pp. 1-544.

<sup>54</sup> Aklekar, R. (2016). Connecting India, Building Roads for the Poor. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 64(11), 5-9.

road length followed by Uttar Pradesh and Karnataka. Finally, the study found that Government of India has earmarked 20 per cent of the investment of US\$1 trillion reserved for infrastructure during the Twelfth Five Year Plan (2012-17) to develop the country's roads.<sup>55</sup>

Jayarama Bhat (2018), in his book on "Road Transport in India", explained that transport is one of the important forms of economic activity consisting of movement of people and materials from one place to another for different purposes and it is an essential infrastructure which helps and encourages all types of productive activities across the regions. Further he argued that road transport is a basic and fundamental step of any society because nothing can exist without road transport in place. All other modes of transport can complete their services only with the help of road transport, such is its significance. Road transport plays all time significant role in every country particularly in the case of short and medium distance transports. In the analysis, the author dealt with Transport and Economic Development, Transport Ownership, Transport Pricing and Competition, as well provided an overview of Road Transport in India.<sup>56</sup>

In an article entitled "Transport Infrastructure in India", Raghuram (2020), argued that over the years there has been a thrust on improving technology and capacity in the sectors like railways, roadways, airways and waterways. The outcome of these projects is Dedicated Freight Corridor (DFC), High-Speed

---

<sup>55</sup> Sahu, K.K. (2017). *Trend, Growth and Problems of Road Transport in India, Handbook of Research on Economic. Financial and Industrial Impacts on Infrastructure Development*, pp. 1-23.

<sup>56</sup> Jayarama Bhat, B. (2018). *Road Transport in India*. Shreyas Publications, Shivamogga, Karnataka, pp. 1-150.

Railway, Expressways, Electronic Vehicles and PPPs in airports. While the budget has appropriate allocation announcements, execution needs attention. He further argued that among the roads, railways, airports and ports, the share of investment is 36 per cent. If we include the other investment, it is likely to exceed 40 per cent. In an overall sense, the transport infrastructure is the most significant investment in the National Infrastructure Pipeline (NIP).<sup>57</sup>

### 2.2.2. Studies on Transport Planning and Finance

Nanjundappa (1973), in his book entitled “Transport Planning and Finance”, analyzed the importance of road transportation in changing socio-economic status of rural people. He also suggested that improvement of rural transportation facilities should be recognized by all modern governments as a part and parcel of national development and provision of adequate road network facilities were essential requirements for economic development of any country or region.<sup>58</sup>

In their research paper on “Jawahar Rozgar Yojana - An Assessment” by Chathurkulam and Kurien (1995) observed that there were a number of reasons because of which though different types of community assists were created under JRY scheme, more attention was bestowed upon the construction of rural roads. The study also found that, the response of the rural poor road network is relatively more and this is largely exploited by the panchayat members trying to get popular

---

<sup>57</sup> Raghuram, G. (2020). Transport Infrastructure in India. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 66(3), 17-22.

<sup>58</sup> Nanjundappa, D.M. (1973). *Transport Planning and Finance*. Prasaranga, Karnatak University, Dharwad, pp. 8-9.

support by keeping eye on the coming election. The authors attributed as to why the panchayat members gave more link roads under the JRY Schemes.<sup>59</sup>

Shankaran (2010), in his study on “Rebuilding Rural India: A Review of Bharath Nirman”, explained that the Bharath Nirman is a four-year (2005-09) business plan for strengthening six areas of rural infrastructure: electrification, roads, water supply, telephone, irrigation and housing. The study found that achievement of Bharath Nirman was moderate 65.74 per cent new connectivity, commendable 87.04 per cent in the task of the up-gradation programmes, but least satisfactory 52.05 per cent in the case of habituating proposed to be covered. However, the evaluation of the study by the Planning Commission (2010) found 66.4 per cent achievement in the coverage of habituating for the first half Bharath Nirman.<sup>60</sup>

A study on “Government Programmes for Rural Infrastructure” carried out by Sharma (2013), argued that the last six decades of planning period, the country’s economists and planners have identified the potential of a vibrant rural India to resolve issue of poverty and advocated for improvement and explanation of rural social infrastructure. Further the study explains that while the Eleventh Five Year Plan (2007-2012) noted direct and significant causal relationship between the infrastructure and incidence of poverty in states, the approach to Twelfth Five Year Plan (2012-17) laid renewed emphasis on creation of physical infrastructure like roads, railways, ports, power and telecommunications. Further

---

<sup>59</sup> Kurien, V.K. and Chathurkulam (1995). Jawahar Rozgar Yojana - An Assessment. *Political Weekly*, XX(6), 343-345.

<sup>60</sup> Shankaran, P.N. (2010). Rebuilding Rural India: A Review of Bharath Nirman. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, 58(12), 55-59.

the study evaluated the Government rural infrastructure programmes like irrigation, rural electrification, rural road connectivity and rural drinking water supply.<sup>61</sup>

In their article on “Transportation Planning, Principles, Practices and Policies”, Sarkar et al. (2014), dealt with the basic principles and fundamentals of transportation planning and keep abreast of the current practices and policies in transport plan. The book explores the fundamental techniques of transportation planning and travel demand modeling, urban form and urban structure, land use, transport model, accessibility and mobility consideration in transport modeling, graph theory and road networking planning, cost benefit analysis, mass transport planning, applications of intelligent transport system, applications of software in transport planning and policies.<sup>62</sup>

A study carried out by Mahipal (2016), on “Pradhan Mantri Gram Sadak Yojana - Rural Upliftment Connectivity” dealt with the road connectivity taken-up under the PMGSY in the country and based on the findings of some studies showing the betterment in the lives of villagers. The study found that more than 90 per cent of the sample habitations were covered in the states of Bihar, Chattisgarh, Jharkhand and Uttar Pradesh. They have reported improvement in terms of all season motorized access after the PMGSY road was constructed.<sup>63</sup>

---

<sup>61</sup> Sharma, A. (2013). Government Programmes for Rural Infrastructure. *Kurukshetra - A Journal of Rural Development*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, 61(12), 36-41.

<sup>62</sup> Sarkar, P.K., Maitri, V. and Joshi, G.J. (2014). *Transportation Planning Principles, Practices and Policies*. Prentice Hall India Learning Pvt. Ltd., pp. 1-480.

<sup>63</sup> Mahipal (2016). Rural Roads: Pradhan Mantri Gram Sadak Yojana - Rural Upliftment Connectivity. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 64(4), 9-12.



In an article on “Road Connectivity through PMGSY: Achievements, Initiatives and Challenges”, Mahipal (2016) opines that the PMGSY aims at providing all-weather road connectivity to all the eligible unconnected habitations, existing in the core network in the rural areas. The study throws light on the achievements, new initiatives taken and challenges faced by the programme in meeting out the expectations of rural people in the country. Further the study concludes that the PMGSY has not only provided both direct and indirect benefits to village community but also greatly benefited women in terms of more informed choices at their levels and easier access to the outer world. Hence, the PMGSY roads have, to a large extent, assisted in contributing towards the Millennium Development Goals (MDG) related to poverty reduction and removal of hunger by way of increasing agricultural production and creating job opportunities not only in construction sector but also in primary and secondary sectors of the rural economy.<sup>64</sup>

### **2.2.3. Studies on Transport Forecasting/Cost Structure**

Apparao et al. (2009) in their combined research paper on “A Case Study of RIDF Road Project in Srikakulam District of Andhra Pradesh” reported that the increase in awareness through greater mobility after the road project coupled with the changes in the marketing practices, had its impact on the changes in use of farm inputs of the sample households. Further, the study analyzed the socio-economic characteristics of the sample respondents as well as assessed the impact

---

<sup>64</sup> Mahipal (2016). “Road Connectivity Through PMGSY: Achievements, Initiatives and Challenges”, *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 65(2), 15-18.

of road project on agricultural economy in the study area. Finally, the researchers concluded that policy implications and interventions are needed to enhance the impact of rural economy.<sup>65</sup>

Kumar et al. (2014), in a paper entitled “Cell-Filled Concrete Roads: An Alternative to Rural Roads - A Case Study in Karnataka”, argued that providing good road network is very essential for the development of any country. Construction of cell fill concrete pavements is advantageous compared to conventional concrete and as asphalt pavement. Further the study argued that since cell filled roads are economical compared to conventional concrete roads and they need less annual maintenance compared to flexible roads, it is a road solution for the rural roads.<sup>66</sup>

Jagdish et al. (2015), discussed that in India the rural roads play a vital role in the development of a country. In India there are more than six lakh villages and large number of villages is still not connected with all-weather roads. A good road network is also a necessity for the employment opportunities, basic necessities like health, education etc, explained in their research paper on “Pavement Evaluation Study of Road Stretches constructed using Nanotechnology Adopted by Zydex Industries”. Further, the authors evaluated use of nanotechnology using Terraprime, Nanotac and Zycosoil constructed under the technology demonstration stretches of Namma Grama Namma Raste Yojane (NGNRY) under

---

<sup>65</sup> Apparao, C.R. and Rao, S.P. (2009). A Case Study of RIDF Road Project in Srikakulam District of Andhra Pradesh. *Kurukshetra - A Journal of Rural Development*, Publication Davison, Ministry of I&B, GoI, New Delhi, 52(6), 14-16.

<sup>66</sup> Kumar, H., Das, P. and Kumar, B. (2014). Cell-Filled Concrete Roads: An Alternative to Rural Roads - A Case Study in Karnataka. *International Journal of Emerging Technology and Advanced Engineering*, 4(10), 465-472.

Karnataka Rural Road Development Agency (KRRDA) of the Government of Karnataka. The study also includes structural and functional evaluation and geotechnical investigation of the mentioned road stretches evaluation.<sup>67</sup>

#### **2.2.4. Studies on the Transport and Development**

Rao (1986), in his study on “Rural Bus Transport Operations of the Andhra Pradesh State Road Corporation”, opined that rural bus transport operation has been highly encouraged by the rural people of Andhra Pradesh but the cost of operation has gone up. The study suggested points for improving rural transportation in the rural regions of Andhra Pradesh, such as, Government should prepare master plan for rural road construction; Financial allocation for the maintenance of rural roads should be increased; Separate department of rural transportation should be established at the head and regional offices of the APSRTC and Political interference and bureaucratic bias should be avoided in deciding the question of adequacy or inadequacy of rural roads.<sup>68</sup>

Singh (1988), in his study on “Road Transport and Economic Development, with reference to Bihar State Road Transport Corporation (BSRTC)”, from 1959-60 to 1974-75 evaluated the physical and financial performance of BSRTC. Further, the study advocated for nationalization of a greater number of bus routes in Bihar to reach maximum number of public.<sup>69</sup>

---

<sup>67</sup> Jagdish, S.B., Kumar, P. and Kumar, K. (2015). Pavement Evaluation Study of Road Stretches Constructed using Nanotechnology adopted by Zydex Industries. *International Journal for Scientific Research and Development*, 3(7), 152-157.

<sup>68</sup> Rao, K.R. (1986). Rural Bus Transport Operations of the Andhra Pradesh State Road Corporation. *Journal of Finance India*, X(2), 397-403.

<sup>69</sup> Singh, R.K. (1988). *Road Transport and Economic Development*. Deep and Deep Publication, New Delhi, pp. 1-291.

In his book on “Management of State Road Transport in India”, Kulshreshta (1989), examined the managerial problems of road transport undertakings in the country. The study concluded with suggestions to adopt various measures to control the cost of bus operation, while improving revenue.<sup>70</sup>

Jayarama Bhat (1989), in his doctoral work on “Road Transport and Rural Development - A Case Study of Dakshina Kannada District”, analysed the role of transport in economic development, transport ownership and also discussed about the role of transport in rural development in the study area of Dakshina Kannada district. The researcher offered a few suggestions for improving road transport and rural development.<sup>71</sup>

Vaidya (2003), in his book on “Geography of Transport Development in India”, explains that transport network and transport geography plays a pivotal role in reducing the special disparities and bringing about a balanced and integrated development. This could help in proper exploitation of the regional resources of the region. Transport network is thus, a necessary element of special expression. The linkage and flow between centers, their nature and size, function and accessibility are major consideration in structural aspects in transport geography. The present study includes three major sections, viz., Indian transport system, Metropolitan transport system and Regional transport system.<sup>72</sup>

---

<sup>70</sup> Kulshreshta, D.K. (1989). *Management of State Road Transport in India*. Mittal Publications, New Delhi, pp. 1-182.

<sup>71</sup> Jayarama Bhat, B. (1989). *Road Transport and Rural Development - A Case Study of Dakshina Kannada District*. Unpublished Ph.D., Thesis, Mangalore University, Mangalore, Karnataka.

<sup>72</sup> Vaidya, B.C. (2003). *Geography of Transport Development in India*. Concept Publishing Company, New Delhi, XXVI, 401-466.

In his Thesis on “Problems and Prospects of Goods Transport - A Case of Shimoga District”, Tyagaraja (2006), discussed about the problems and prospects of goods transport. The researcher has proposed certain policy recommendations for improving the road transport system in general and goods transport in particular in the study area of Shimoga district. Further, the researcher gives following suggestions that the industry should focus on. The Four tenants for optimum functioning are Samanvaya (equal incidence and applicability), Avirodha (Non-Contradictory), Sadhana (Proactive Acting) and Phala (Results as planned).<sup>73</sup>

Vadivelu (2008) in his Thesis on “Performance of State-owned Road Transport Corporation - A Case Study of Davangere Division”, analyzed the trends in road transport, physical and financial performance of KSRTC in Karnataka. Further he found from his study that, the bifurcation of KSRTC into four corporations and division of administrative and financial responsibilities among them resulted in full autonomy. The KSRTC has and marked itself to provide the services being provided to the commuters in general by adopting new technologies and various cost control exercises to improve its financial position. The corporation introduced the concept of business plan emphasizing more on the ten-point programme in the beginning of the budget years. Further the author explained the performance of KSRTC during the pre-bifurcation and post bifurcation periods.<sup>74</sup>

---

<sup>73</sup> Tyagaraja, C.M. (2006). *Problems and Prospects of Goods Transport - A Case of Shimoga District*. Unpublished Ph.D., Thesis, Kuvempu University, Shankaraghatta, Shimoga, Karnataka, pp. 1-80.

<sup>74</sup> Vadivelu, A. (2008). *Performance of State Owned Road Transport Corporation - A Case Study of Davangere Division*. Unpublished Ph.D., Thesis, Kuvempu University, Jnana Sahyadri, Shankarghatta, Shimoga, pp. 1-204.

A paper entitled “Rural Infrastructure and Economic Development” carried out by Tarique (2009), described that the deficiencies in transportation, energy, telecommunication and related infrastructure will transform into poorly functioning domestic markets with little spatial and temporal integration, low price transmission and weak international competitiveness and failure to accelerate investments in rural infrastructure which will make a mockery of efforts to achieve the MDGs in the poor Developing Countries.<sup>75</sup>

Senagupta and Pal (2015), in their paper entitled “Urban Sustainable Transportation Development: A Case of West Bengal”, viewed that urbanization is a fact of life in developing countries with development taking place. The study meets three criteria like the system must be ecologically sustainable, maintaining transport related pollution levels below those that environmental carrying capacity can allow; the system must be financially sustainable so that it does not require significantly higher expenditure for operation, maintenance are carrying charges higher than what its users can pay and the system should be socially sustainable providing each members of society with the means for attaining fundamental, social, cultural, educational and economic essentials. Further the study concluded with certain interesting policy suggestions that may be important to mitigate the problem and bring in sustainable urbanization.<sup>76</sup>

---

<sup>75</sup> Tarique (2009). Rural Infrastructure and Economic Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(12), 12-13.

<sup>76</sup> Senagupta, A. and Pal, A.K. (2015). Urban Sustainable Transportation Development: A Case of West Bengal. *Indian Journal of Economics*, XCVI(381), 239-251.

### 2.2.5. Studies on Rural Transportation

Ramanujam (1993), in his book entitled “Rural Transportation in India”, explained the significance of rural transport, needs of transport in rural areas and their comparative study of bullock cart transport, cost of investment and modernization. Further the author gives suggestions and recommendations for improving the rural transport.<sup>77</sup>

A Research paper on “Rural Transport in India”, of Ramaswami (1993), emphasizes the role of rural roads and rural transport in the country’s development. Further, the study draws on the experience of Kerala, it explains as how to improve economic conditions in rural India and reduce migration to cities.<sup>78</sup>

A paper entitled “Rural Road System and its impact on Rural Development” carried out by Kantharajappa (1998), found that road communication plays a crucial role in promoting economic, social and cultural development of a region. Further, the author argued that their importance has always been recognized and found from history that once road connectivity is given, it is followed by the development of civilization, their quality improves significantly. The study concluded that road is one of the greatest fundamental institutions of mankind.<sup>79</sup>

---

<sup>77</sup> Ramaninujam, K. N. (1993). *Rural Transportation in India*. Mittal Publications, New Delhi, pp. 1-188.

<sup>78</sup> Ramaswami (1993). *Rural Transport India*. Mittal Publications, New Delhi, pp. 1-115.

<sup>79</sup> Kantharajappa, H.C. (1998). *Rural Road System and its Impact on Rural Development (Special Reference to Agriculture)*. Unpublished Ph.D., Thesis, Bangalore University, Jnana Bharathi, Bangalore, pp. 1-122.

In his study on “Rural Roads - A Path to Rural Development” by Amit Sharma (2009), argued that the World Bank has been funding to build roads in India’s villages to raise rural incomes and improve people’s access to health and education services. The researcher also found that rural road projects are ongoing in six states like Himachala Pradesh, Jharkhand, Rajasthan, Uttar Pradesh, Andhra Pradesh and Assam. The state of Rajasthan was one of the very few which could reach the target in time and it has been widely acknowledged that these roads have improved social, physical, financial and human capital of the population of the connected villages. The study presented a note on Rural Road Development Plan Vision-2025, its future and the major recommendations of the vision. Further the study concluded saying that rural roads had positive impact on the rural economy.<sup>80</sup>

Yadav (2009), in the article on “Rural Road connectivity: A Growth Narrative”, opined that rural economic development is influenced by road connectivity in many ways and in poverty reduction, productivity enhancement, improvement in quality of life; improvement is inevitable in mobility and accessibility, agricultural development and rural industrialization. The study also found that there is an inverse relationship between connectivity level, better the connectivity; lower poverty level and vice-versa. Further the researcher as well evaluated the major rural road programmes of PMGSY and Bharat Nirman.<sup>81</sup>

---

<sup>80</sup> Sharma, A. (2009). Rural Roads - A Path to Rural Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(6), 8-11.

<sup>81</sup> Yadav, K. (2009). Rural Road Connectivity : A Growth Narrative. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(6), 3-7.



Devaraja (2009), in his Thesis on “Rural Transport Services : A Case Study in Chikmagalur District”, analysed the issue of rural transportation system at the district level, where the researcher points out certain practical suggestions for improving the rural transport services in Chikmagalur district. They are scientific enforcement system, strengthening enforcement system, road safety education and adherence to traffic rules.<sup>82</sup>

Shrinivasan (2010), in his work on “Need for Rural Infrastructure Development” viewed that infrastructure consists of both physical and social components with the latter such as basic education, primary health and a pollution free ambience always taking precedence over the physical infrastructure. He also argued that the social infrastructure such as a sound road, sanitation, employment for people seeking out existence on the margins and habitations remained small amount at a low level.<sup>83</sup>

In an article on “Rural Infrastructure - A Vital Ingredient for Double Digit Growth”, by Rao and Shekhar (2010), argued that the inadequate infrastructures in rural areas remain a major constraint to progress in numerous villages and their habitations in India. The study found that to sustain 9 per cent GDP growth, investment in infrastructure will need to increase from 4.6 per cent of GDP to around 8 per cent of GDP over the period 2007-12. Further, they also argued that infrastructure investment is irregular and inadequate to support 6 lakh villages and

---

<sup>82</sup> Devaraja, P. (2009). *Rural Transport Services - A Case Study in Chikmagalur District*. Unpublished Ph.D. Thesis, Kuvempu University, Shankaraghatta, Shivamogga, pp. 1-230.

<sup>83</sup> Shrinivasan, G. (2010). Need for Rural Infrastructure Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 58(10), 9-11.

the average cost of providing infrastructure has inversely related to the scale of the operation.<sup>84</sup>

Yadav (2010), in his study on “Road Connectivity as a Stimulate for Rural Poverty Reduction” found that economic development of rural areas has a definite link with poverty reduction. Enough evidence of theoretical and empirical nature can be sighted in support of the argument. Further, the study reported that investment in rural transport infrastructure stimulates the rural economy and hence acts as a tool for poverty reduction. The study concluded that road connectivity to rural poor is important for poverty reduction. The said connectivity ends isolation, creates opportunities and that in turn helps people to realize their potential as useful workers.<sup>85</sup>

In a research paper on “Rural Infrastructure: An Engine for Poverty Mitigation”, of Malydri (2010), argued that rural infrastructure assumes great importance in India because of the country’s predominantly rural nature, the crucial linkages of infrastructure to economic growth. Poverty alleviation and human development cannot be achieved with poor availability of rural infrastructure. The Researcher also pointed out that the rural country side is dotted with decaying bridges, potholed roads, crumbling buildings, electricity lines that carry no power and dry water supply schemes obviously, something has gone

---

<sup>84</sup> Rao, S. and Shekhar, C. (2010). Rural Infrastructure - A Vital Ingredient for Double Digit Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 58(10), 3-8.

<sup>85</sup> Yadav, K. (2010). Road Connectivity as a Stimulate for Rural Poverty Reduction. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 58(10), 12-15.

wrong somewhere. Therefore, the issue of the sustainability of the infrastructure created gaining visibility both in policy as well as media space.<sup>86</sup>

In his Thesis on “Rural Road Connectivity in Karnataka - A Study of PMGSY”, Yuvaraj (2013), has discussed on the pertinent issue between the period 2000-01 and 2010-11. He pointed out that the rural road network in North Karnataka registered about 70.88 per cent growth, higher than the South Karnataka’s 62.23 per cent growth, as well the researcher offered a few suggestions for the improvement of rural road network. The study found that, the PMGSY by providing physical connectivity to rural regions has helped improve the health, education, marketing, transport, dairy and other activities in the rural areas in Gulbarga and Mysore districts. The study concluded that the program should be implemented with all seriousness as regards provision of rural connectivity in the study region in particular and in Karnataka in general. Further, upgradation of already existing roads should also be attended to and proper attention should be given towards regular maintenance of the newly constructed as well as upgraded rural roads.<sup>87</sup>

A paper entitled “Development of Rural Roads - Are We on the Right Track?” carried out by Tripathy (2014) explains that according to sources of 2011, more than 83 crore people of India live in rural India. Almost 3/5<sup>th</sup> of India’s road network, consisting of more than 28 lakh km, provides connectivity to these rural

---

<sup>86</sup> Malydri, P. (2010). Rural Infrastructure: An Engine For Poverty Mitigation. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 58(10), 16-19.

<sup>87</sup> Yuvaraj, U. (2013). “Rural Road Connectivity in Karnataka - A Study of PMGSY”, Unpublished Ph.D., Thesis, Kuvempu University, Shankaraghatta, Shimoga, pp. 47-236.

areas. Further, the researcher argued that during the 2002-12 decade, the rural road network registered a moderate rate of growth of 3.3 per cent marginally lower than that of the total road network of the country, which grew at 3.6 per cent. The study also found that out of the entire 28 lakh km of rural road length in the country, only around 11 lakh km has been surfaced. Uttar Pradesh has the highest proportion of surfaced rural roads (61%) as compared to the other two states which have a large rural population, Bihar (39.3%) and West Bengal (15.4%). Although Assam and Odisha have a large rural road network, the proportion of their surfaced roads is very low, ranging between a mere 10-12 per cent of their rural road networks.<sup>88</sup>

A World Bank Report (2015), on “Rural Roads - A Lifeline for Villages in India” stresses that the rural roads sector, which was a state subject, also lacked adequate planning and management due to poor coordination between contractors, officers, agencies and village people. Investing in rural roads was given low priority and viewed in isolation from the need for State and National Highways.<sup>89</sup>

Alam (2015), a study on “Rural Connectivity” argued that in India 2.7 million km of rural road network was in poor condition until 2001 and 30 per cent of the country’s population lacked access to all-weather roads. He further evaluated the performance of programmes of rural road connectivity such as PMGSY, Bharat Nirman and Minimum Needs Programme. The study concluded that construction of roads is not the only solution for rural connectivity, rural roads

---

<sup>88</sup> Tripathy, I.G. (2014). Development of Rural Roads - Are We on The Right Track?. *Kurukshetra - A Journal of Rural Development*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, 62(12), 61-64.

<sup>89</sup> A Report of World Bank (2015). *Rural Roads - A Lifeline for Villages in India*. The World Bank Report, South Asia sustainable Development Unit (Transport)-70, New Delhi, pp. 1-28.

also need a clear framework for maintenance and asset management which also requires clear financing mechanism.<sup>90</sup>

Balappa (2016), in his study on “Impact of Rural Roads on Rural Economy: A Case Study of Kolar District”, viewed that the need for rural roads for the rural economy in the third world, particularly in India, tends to have a crucial place in the process of socio-economic cultural transformation for the rural masses. In the emerging scenario, the need for rural roads get prioritized due to the availability of very limited resources. Further the study found that the better rural roads together with well knitted transportation system both public and private transport facility for marketing agricultural products related to non-land-based activity across the social groups. Moreover, the study clearly proved that the overall economic activities of the people in regard and allied activities have taken positive upward mobility even at the micro level activities when the economic activities are compared with pre and post construction of rural roads.<sup>91</sup>

Yuvaraj and Jayarama Bhat (2016), in their research paper on “Regional Disparities of Rural Road Connectivity in Karnataka: An Analysis” found that the economy of Karnataka has been considered to be one of the fastest growing economies in the country based on macro-economic variables. As on 2015-16, the state has registered about 6.2 per cent growth rate of Gross State Domestic Product (GSDP) and the state’s per capita income at current price has also shown

---

<sup>90</sup> Alam, A. (2015). Rural Connectivity, National Stakeholder Consultation and Capacity Building. In: *Workshop on Development of Sustainable and Inclusive Transport Policy (AITD)*, @ Thimpu Bhutan, pp. 1-19.

<sup>91</sup> Balappa (2016). Impact of Rural Roads on Rural Economy: A Case Study of Kolar District. *Journal of Development and Social Change*, XII(1-2), 134-155.

increasing trend, as compared to previous year of 11 per cent in 2015-16. Further the study also concentrates on the division-wise and region-wise and population-wise physical performance of PMGSY. At the end, the study concluded saying that the Governments should have to rethink about the pattern of already existing rural road development programmes in respect of resolving the problem of regional imbalances among the divisions.<sup>92</sup>

Dev (2017), in his article entitled “Transforming Rural India: The Story of Triumph” pointed out that according to the census 2011 data, 69 per cent of India’s population or around 833 million people, live in rural areas, against 31 per cent or 377.1 million people, in urban areas. It also projected that by 2050, the urban population figure would jump to 50 per cent. Further, study argued that laying emphasis on roads, came in the greater push for the PMGSY with a firm strategy to establish a comprehensive rural transport system. Further study also noted that a new scheme also crafted under the name and style of PMGPY seeks to improve and regulate transportation facilities in villages.<sup>93</sup>

A study carried out by Saikia (2019), on “Connectivity: Transforming Rural India”, explained that infrastructure is the backbone of any nation's development and quality of life. Whether it is a Highway or Railways or Airways or even dig ways, the Government has gone beyond incremental growth to attain transformative achievements. He further pointed out that under the PMGSY, constructions of rural roads have tripled. The PMGSY is being allocated ` 19

---

<sup>92</sup> Yuvaraja, U. and Jayarama Bhat, B. (2016). Regional Disparities of Rural Road Connectivity in Karnataka: An Analysis. *Global Journal for Research Analysis*, 5(12), 215-219.

<sup>93</sup> Dev, N. (2017). Transforming India: The Story of Triumph Rural. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 65(7), 12-15.

thousand crore in the Budget Estimation 2019-20 as against ` 15,500 crores in revised estimation 2018-19. Further, he argued that the Balance of Payments (BOPs) movement is slowly making in roads to smaller towns to create employment opportunities and promote IT industries and aims to secure a balanced regional growth.<sup>94</sup>

### 2.2.6. Studies on Transport Infrastructure

India, “Rural Infrastructure Report of 2007”, explained the rural infrastructure concepts of financing of rural infrastructure, rural telecommunication, rural roads, rural electronics, irrigation and water resources, rural drinking water, sanitation, rural environment, rural housing, rural health infrastructure and rural education.<sup>95</sup>

Rastogi (2007), in his study on “Infrastructure Sector in India” argued that India has witnessed a robust economic growth of over 8 per cent in the period 2004-06. The higher growth rate expectations are pegged on the hope of better performances from the farming and service sectors. Further researcher explains different sectors of roads, ports, railways, airports, power, telecommunication, rural and urban infrastructure. Further the study concluded that India’s dream of replicating the success of the telecom sector, in other infrastructure sectors is tough due to the inherent nature of the other sector. Nevertheless, lessons learnt from the accomplishments of the telecom sector are not lost. The Government

---

<sup>94</sup> Saikia, S.P. (2019). Connectivity: Transforming Rural India. *Kurukshetra - A Journal of Rural Development* (Perspective in Rural Development), Publication Division, Ministry of I&B, GoI, New Delhi, 67(5), 29-32.

<sup>95</sup> India Infrastructure Report (2007). *Rural Infrastructure*. Oxford University Press, New Delhi, pp. 1-317.

intends to harness allocated and financial efficiency by using PPPs to build new ports, roads, railways, power and Universal Mobile Telecommunications System (UMTS).<sup>96</sup>

Satish (2007), in his work on “Rural Infrastructure and Growth: An Overview”, argued that rural infrastructure is crucial for agriculture, agro industries and overall economic development of rural areas. It also incidentally provides basic amenities that improve the quality of life. Further the study discussed that the infrastructure services, the world over, are largely provided by the public sector. Thus, there are often good reasons for public sector involvement in the provision of rural infrastructure services. However, in the production of such services there exists a role for other than public entities also.<sup>97</sup>

In an article entitled “Infrastructure Development Some Issues”, Renukarya (2008), argued that the access to adequate and feasible infrastructure brings progress and prosperity to both the individual and the economy. The low level of human development is both a cause and a consequence of inadequate and inefficient infrastructure. This lack of access to positive infrastructure is a crucial obstacle to the economic development of an economy. The study concluded with the greater equity in policy and proactive effects by government to create the conditions necessary to attract the private investment in infrastructure which will result in successful implementation of more and more projects. If care is taken to

---

<sup>96</sup> Rastogi, A. (2007). *Infrastructure Sector in India*. Oxford University Press, New Delhi, pp. 1-27.

<sup>97</sup> Satish, P. (2007). Rural Infrastructure and Growth: An Overview. *Indian Journal of Agricultural Economics*, 62(1), 32-51.



develop infrastructural needs of a country, India's economic annual growth of 9-10 per cent can easily be ensured.<sup>98</sup>

Jayarama Bhat (2008), his article, published in his edited volume, on “Infrastructure and Development Link”, discussed the issues related to infrastructure and development link in India forecasting and transport sector in general and road transport in particular based on secondary information. The author broadly categorized infrastructure into three types, economic infrastructure, social infrastructure and financial infrastructure. Further he argued that transport is a basic pre-requisite for sustainable economic development of a country. Transport is basically a key infrastructure input to accelerate the growth process. More than that, transport plays a significant role in promoting national integration and in maintaining it as well. From the economic point of view transport network contributes significantly to increase in productivity and enhances the comparative efficiency of the economies in the world. Not only backward regions are developed because of adequate transport network they are interlinked with the mainstream economy by opening themselves to trade and investment. Further the study concluded that to promote development transport is to be nurtured, encouraged and promoted. Otherwise, transport-economy and development link will be weakened or even broken. Missed link is uncalled for. Hence, we should hope and strive for a transport and economic development linked to the society's economy and the nation for the present as well as the days to come.<sup>99</sup>

---

<sup>98</sup> Renukarya, C.K. (2008). Infrastructure Development Some Issues. In: *Infrastructure Development in India* (Jayarama Bhat, B. ed.), Kuvempu University, Shankaraghata, Shivamogga, pp. 21-29.

<sup>99</sup> Jayarama Bhat, B. (ed.) (2008). Infrastructure and Development Link. In: *Infrastructure Development in India*, Kuvempu University, Shankaraghata, Shivamogga, pp. 46-51.

A paper entitled “Rural Infrastructure An Impetus to Economic Growth”, of Rao (2009), held that infrastructure could serve as true engine of growth and pointed out that the fast growth of the economy in recent years has placed increasing stress on physical infrastructure such as rural electricity, roads, irrigation, health, rural water supply and sanitation, all of which already suffer from a substantial deficit from the past in terms of capacities as well as efficiencies in the delivery of critical infrastructure services.<sup>100</sup>

In an article on “Developing Rural Roads: Some Policy Issues”, Singh (2009), describes that rural roads are an important factor in rural development, including agriculture, health, education, forestry, fisheries, small scale industries, trade and commerce. Rural roads provide vital links that have quicker access to and utilization of important social and physical infrastructure. Further, the study found that the CAGR of road length per annum in village and urban areas increased by 4 per cent compared to 2.24 per cent and 1.5 per cent respectively of National Highways and State Highways. The study concluded that the most advanced computer based information technology for special planning, the Geographical Information System (GIS) can be used as an effective tool for village and road information system which will help the planners and administrators to identify the problems associated with the rural road development activities, location and provision of appropriate facilities, monitoring, maintenance and management of the assets created in rural areas.<sup>101</sup>

---

<sup>100</sup> Rao, S. (2009). Rural Infrastructure an Impetus to Economic Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(12), 3-7.

<sup>101</sup> Singh (2009). Developing Rural Roads: Some Policy Issues. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(6), 16-19.

In a study on “Managing Rural Development: Rural Roads are a Catalyst of Development”, Kar (2009), argued that the Indian roads network provides the country with great economic benefits if appropriately and quickly developed. It also discussed that use of the road network has increased dramatically throughout India’s history with about 87 per cent of all passengers’ traffic and 65 per cent of all freight traffic currently on roads in India, problems have plagued its infrastructure including poor maintenance and inaccessibility to many villages. Further the study concluded that the creation of more roads in the country side would prove to be a very big catalytic factor for India to become one of the leaders of development in the global scenario.<sup>102</sup>

A study on “Transport Infrastructure in India: Developments, Challenges and Lessons from Japan” carried by Sahoo (2011), argued that India is one of the fastest growing countries in the world, after China and needs to maintain its growth momentum in a sustainable manner to improve its overall standard of living and reduce poverty. The study analyzed that the current status and issues related to India’s transport infrastructure, mainly roads, railways, airports and ports. Further the study looks at development and draws useful policy lessons from Japan.<sup>103</sup>

In a Research work on “Rural Infrastructure; Road to Progress” carried out by Patel (2012), pointed out that 15 per cent of the agricultural produce is lost

---

<sup>102</sup> Kar, S. (2009). “Development Managing Rural: Rural Roads are a Catalyst of Development”, *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 57(12), 50-53.

<sup>103</sup> Sahoo, P. (2011). *Transport Infrastructure in India: Developments, Challenges and Lessons from Japan*. Institute of Developing Economics, Japan External Trade Organization, V.R.F Series No. 465, pp. 1-72.

between the farm gate and the consumer because of poor roads and inappropriate storage facilities alone, adversely affecting the income of farmers. The study also presented the planned efforts of the Government in recent years with thousands of kilometers of highways between major cities across India. However, over 40 per cent of country's inhabitants still remain unconnected with rural roads.<sup>104</sup>

In an article on “Strengthening Infrastructural - Base of Rural India: Realities and Constraints”, Hazra (2012), states that rural infrastructure is defined as those wide ranges of public facilities or infrastructural arrangements designed exclusively for the betterment of rural life and initiated mostly by the Government and made available within rural areas. Provisioning of all-weather road connectivity to rural areas, electricity distribution facilities and telecommunication network will act as a catalytic intervention for the rural population. Further the study argued that a concerted effort towards building rural infrastructure, to great extent can bridge the rural-urban development gap by accelerating the growth of rural economy.<sup>105</sup>

In an article on “Rural Roads: Faster Connectivity for Growth” by Mukherjee (2012), pointed out that India has a road network of over 4.42 million km (2059 miles) of roadways, making it the second largest road network in the world. The author also stated that at 0.66 km of highway of India's highways network was slightly higher than that of the United States (0.65) and is higher than

---

<sup>104</sup> Patel, A. (2012). Rural Infrastructure: Road to Progress. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, 60(12), 21-24.

<sup>105</sup> Hazra, A. (2012). Strengthening Infrastructural - Base of Rural India : Realities and Constraints. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, 60(12), 14-17.

that of China's (0.16) or Brazils (0.20). The study concluded with the opinion that increase of rural roads is imperative for the growth and development of the country and its people.<sup>106</sup>

Kaushik (2012), in her article on "Boosting Rural Development through Road- Connectivity: The Orissa Experience", came out of an evaluated research, appraises implementation of PMGSY in five districts of Odissa where naxal activities have mounted sharply. The study found that the extent of rural road connectivity in Orissa was far less than the requirements. Only 40 per cent of all villages have all weather road connectivity as compared to the national average of 60 per cent. Further, the researcher gave a few suggestions for improvement of road connectivity.<sup>107</sup>

Desai (2013), in his book entitled "Rural Development in India (Past, Present and Future) Challenges in the Crisis", explained the concepts of Rural India, Rural development aspects, present Rural Development programme, approaches, financing, rural management and future of rural development and case studies.<sup>108</sup>

Tripathy (2014), in his study on "Review of Rural Infrastructure under Bharat Nirman" argued that around 83.5 crore (70%) of India's population lives in rural areas. The large magnitude of the rural population, their prevailing socio-

---

<sup>106</sup> Mukherjee, D. (2012). Rural Roads : Faster Connectivity for Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, 60(12), 25-27.

<sup>107</sup> Kaushik, A. (2012). Boosting Rural Development through Road-Connectivity: The Orissa Experience. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, 60(12), 32-33.

<sup>108</sup> Desai, V. (2013). *Rural Development in India (Past, Present and Future) Challenge in the Crisis*. Published by Mrs. Meena Pandey for Himalaya Publishing House Pvt. Ltd., Mumbai, pp. 1-252.

economic conditions and the quality of life calls for all round development in rural infrastructure, the basic framework for economic and social progress of a country. The initiatives of Bharat Nirman (2005-12) schemes envisage enhancement of socio-economic status of our rural people with the help of its six components such as irrigation, drinking water, electrification, roads, housing and rural telephony.<sup>109</sup>

A research paper on “Rural Infrastructure Key to Inclusive Growth” contributed by Rajamani (2014), opined that the development of infrastructure envisages creation of values through engineering consultancy. The rural construction sector has reached a certain level of maturity. But it faces challenges not envisaged earlier, including financial stress, enhanced construction risk and construct management issues that is best addressed by an independent authority. In that way, the Government has decided to constitute a regulatory authority for the road sector.<sup>110</sup>

Raghuram (2015), in his research paper on “Transport Infrastructure: Way Forward” expressed the view that directions for transport include five ‘S’s such as *Speed, Safety, Sustainability, Stresslessness* and *Security*. The study also argued that the transport infrastructure development needs a good regulatory framework. Such regulation must address licensing environmental impact, safety, security, pricing, service levels and dispute resolution.<sup>111</sup>

---

<sup>109</sup> Tripathy (2014). Review of Rural Infrastructure under Bharat Nirman. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 58, 76-84.

<sup>110</sup> Rajamani (2014). Rural Infrastructure Key to Inclusive Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 62(5), 11-14.

<sup>111</sup> Raghuram (2015). Transport Infrastructure: Way Forward. *Yojana - A Development Monthly*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, 59, 7-9.

In an article on “Issues and Challenges of Rural Roadways in India”, Sarkar (2015), opined that transportation is a vital component of economic development, social progress and quality of rural population. India is a vast country with 0.6 million villages. Construction of new roads and maintenance is an urgent need to be addressed by encouraging the use of locally available materials for road construction and development of an asset management system.<sup>112</sup>

Samanta (2015) in an article entitled “Development of Rural Road Infrastructure in India”, found that as per the 2011 census, rural areas account for 69 per cent of India’s total population. Therefore, improved rural infrastructure in general and rural-transport infrastructure in particular is very crucial in India. The study found that rural roads account for 60 per cent of the total road length in India, while the total rural road length was only about 3,54,530 km in 1970-71, it has increased to about 24,50,559 km in recent times. Further, researcher suggested that public investment in infrastructure, especially in the rehabilitation of rural roads, improves local community and market development. In addition, the study investigated the impact of rural road infrastructure development on socio-economic conditions of the rural population including the overall contribution to the nation.<sup>113</sup>

In a study on “Infrastructure Development and Literacy Nexus in Rural India: A District Level Analysis”, Beero (2016) made an attempt to study the link between rural infrastructural development and literacy rate in rural India.

---

<sup>112</sup> Sarkar, A. (2015). Issues and Challenges of Rural Roadways in India. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, 59, 46-50.

<sup>113</sup> Samanta, P.K. (2015). *Development of Rural Road Infrastructure in India*. Pacific Business International Volume, 7(11), 88-93.

Researcher used both descriptive and regression analysis to assess the relationship. The result of descriptive analysis showed that the districts with better rural infrastructure development were better placed in terms of rural literacy rate than the other districts. Further the study argued that the electricity enhanced production and productivity, in turn increased the rural household's literacy rate. Finally the study concludes with a note that infrastructure facilities are the right pathway for the development of education in India.<sup>114</sup>

Varghese (2016), in his paper on “Building Roads for Rural Prosperity (Budget 2016-17)” viewed that the rural road connectivity is a key component of rural development and a holistic approach of promoting access to economic and social services and thereby generating increased agricultural incomes and productive employment opportunities. Further the study argued that in the absence of road connectivity, schools have local children but were beyond the reach of the appointed teachers, at Primary Health Centers (PHC) patients wait for the arrival of the doctors and medical staff. Ambulance cannot make it to the ailing and needy, farmers have bumper crop production but fail to reach it to the demanding parts of the country. The study concluded that rural connectivity will improve indicators of education, health, rural income etc.<sup>115</sup>

---

<sup>114</sup> Beero, S.K. (2016). *Infrastructure Development and Literacy Nexus in Rural India: A District Level Analysis*. Center for Research in Rural and Industrial Development, Chandigarh, XXXVIII(3), 125-130.

<sup>115</sup> Varghese, M. (2016). Building Roads for Rural Prosperity (Budget 2016-17). *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 64(6), 23-25.



A paper entitled “Union Budget 2017-18: A Take-off for Infrastructure”, of Dev (2017), argued that an increased focus is required in provision of services roads along with high capacity corridor to cater to local motorized and non-motorized traffic and social requirements of pedestrian/cattle under passes. The study also focused at the other end of the spectrum, rural areas have benefited enormously from the PMGSY which emphasized new connectivity and upgradation of rural roads to meet the growth in traffic demand. Further the study also pointed out that in the Budget 2017-18, the transportation sector as a whole, including rail, roads, shipping and airports. A provision of ` 2,41,387 crore has been made in 2017-18 which is 61 per cent of total infrastructure sector budget. Further he pointed out that the road budget allocation increased to ` 64,900 crore in 2017-18 which is 27 per cent of total allocation of transport sector.<sup>116</sup>

In his research paper on “Moving Towards Integration”, Chiru (2018), argued that the current focus of the government to upgrade infrastructure in the region through various projects for improvement of roads, railways, inland waterways, air connectivity and communication network is a welcome change. Besides, Government has implemented various schemes for development, upgradation and promotion of micro, small and medium enterprises in the region.<sup>117</sup>

---

<sup>116</sup> Dev, K. (2017). Union Budget 2017-18: A Take-off for Infrastructure. *Yojana - A Development Monthly*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, 61, 47-52.

<sup>117</sup> Chiru, S.J. (2018). Moving Towards Integration. *Yojana - A Development Monthly* (Special Issue), Publication Division, Ministry of I&B, GoI, New Delhi, 62, 62-64.

Raghuram (2018) in his study on “Infrastructure Creation: Integration the Nation” analysed the 2018-19 Union Budget, found a total allocation of about ₹ 5.97 trillion in infrastructure. This is compared with an expected expenditure of about ₹ 4.94 trillion in 2017-18. Further the study argued that the infrastructure allocations have not only been increasing in absolute terms, but also as a share of total budgetary allocation. The allocation has been going up in all sub-sectors of infrastructure including railways, roads, aviation, ports and inland waterways and provide good quality service.<sup>118</sup>

In their research paper on “Rural Infrastructure”, Juyal and Priyadarshini (2018), argued that India still lives in rural areas, as per 2011 census, rural areas of the country accommodated 68 per cent of the population. There are 6.41 lakh villages in India and rural area account for a larger portion of the population and it still will be same even in 2050. Rural economy constitutes 46 per cent of national income and 70 per cent of workforce residing in India. Hence development of these rural areas is necessary for achieving overall and inclusive development of the country. Further researchers discussed Budget allocation and its impacts on rural economy.<sup>119</sup>

Tripathy (2019), in an article on “Infrastructure for Rural Transformation” noted that India lives in villages. Around 69 per cent of India’s population live in

---

<sup>118</sup> Raghuram, G. (2018). Infrastructure Creation: Integration the Nation. *Yojana - A Development Monthly* (Special Issue- Union Budget 2018-19), Publication Division, Ministry of I&B, GoI, New Delhi, 62, 56-60.

<sup>119</sup> Jaya, P. and Juyal, S. (2018). Rural Infrastructure. *Kurukshetra - A Journal of Rural Development* (Special Issue-Union Budget 2018-19), Publication Division, Ministry of I&B, GoI, New Delhi, 66(5), 47-51.

rural areas. The large magnitude of the rural population, their prevailing socio-economic condition and the quality of life calls for an all-round development in rural infrastructure to achieve the objectives of equitable and inclusive growth with social justice. The country, during decades of planning and democracy, has witnessed a series of strategy approaches to economic growth. The economists, planners and policy makers of the country have always visualized a vibrant rural India and advocated improvement and expansion of rural socio-economic infrastructure. Further the author explained that the components of 'Bharat Nirman' programme. He further argued that the infrastructure provides the basic framework for economic and social progress of a country. The initiatives for building rural infrastructure and the related schemes envisage enhancement of socio-economic status of rural people.<sup>120</sup>

### 2.2.7. Studies on Transport Safety

Kleefeld and Baidy (2009), in their study on "Atmospheric Emissions from Road Transport in India" stated that India has become one of the biggest emitters of atmospheric pollutants from the road transportation sector globally. The study also presented that up to date inventory of the exhaust emissions of ten species. This inventory has been calculated bottom-up from the vehicle categories, four technology layers and three fuel types each, for the seven biggest cities as well as for the whole nation.<sup>121</sup>

---

<sup>120</sup> Tripathy, K.K. (2019). Infrastructure for Rural Transformation. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, 67(5), 15-18.

<sup>121</sup> Kleefeld, B. and Baidy (2009). *Atmospheric Emissions from Road Transport in India*. Published in Energy Policy, pp. 1-11.

In a research article “Road Safety in Improvement: A Challenging Issue on Indian Roads”, Singh et al. (2011), argued that the road traffic accidents are the most inflammable topic in today’s scenario on the Indian road network. A number of people are losing their lives in road accidents. The study also focused on some very important and inflammable issue like road accidents, their trends, factors responsible for road accidents, adverse effects of road accidents, prevention and control. Further the study also discussed some recent approaches to improve the safety on roads and counter measures that promise to address the specific road accident problems.<sup>122</sup>

In their combined research paper on “Burden, Pattern and Outcomes of Road Traffic Injuries in a Rural District of India”, Gururaj et al. (2014), viewed that Road Traffic Injuries (RTI’s) are a leading public health problem and the understanding of RTI’s in rural India is limited. The RTI’s contributed to 38 per cent of fatal and 39 per cent of non-fatal injuries with an annual mortality rate of 18.1/1 thousand population per year. The study also found that young males were affected most of the two-wheeler users and pedestrians were involved in 45 per cent and 205 of fatal crashes, respectively. The researchers concluded that road safety should be given high importance in rural India with focus on safe roads, safe vehicles and safe people along with trauma care.<sup>123</sup>

---

<sup>122</sup> Singh, A.P., Sarji, P., Rao, G.N., Jayaram, A.N. and Venkatesh, P. (2011). Road Safety in Improvement : A Challenging Issue on Indian Roads. *International Journal of Advanced Engineering Technology (IJAET)*, II(2), 1-7.

<sup>123</sup> Gururaj, G.K., Rao, U.N., Jayarama and Venkatesh (2014). Burden, Pattern and Outcomes of Road Traffic Injuries in a Rural District of India. *International Journal of Injury Control and Safety Promotion*, 23(1), 64-68.

From the above review, it can be viewed that, studies conducted earlier spread across issues related to rural infrastructure and rural road connectivity in general. In this chapter, an ardent attempt has been made to cover studies conducted abroad and in India during the period between 1901 and 2020. Yet, micro level studies of this nature attempt at filling the gap prevailing in the field of rural road network connectivity in particular. Substantial research work, published books, articles, journals, periodicals and reports under the related topic have been reviewed from the point of view of creating a base for the present study. However, there is hardly any reference for the analysis of NGNRY in the study area. Thus, the present study assumes relevance in its own way and may be argued contextual in terms of adding to the existing literature in Transport Economics in particular.

## **Chapter-03**

# **ECONOMIC AND SOCIAL INFRASTRUCTURE IN INDIA - AN OVERVIEW**

---

- 3.0. Introduction**
  - 3.1. Infrastructure - The Meaning**
  - 3.2. Conceptual and Theoretical Framework**
  - 3.3. The Status of Infrastructure in India**
    - 3.3.1. Share of Infrastructure Investment**
    - 3.3.2. Vision-2025 for Infrastructure Sector**
  - 3.4. Types of Infrastructure**
  - 3.5. Economic Infrastructure**
  - 3.6. Transport Infrastructure in India**
  - 3.7. Rail Transport Infrastructure**
    - 3.7.1. Beginning of Rail Transport**
    - 3.7.2. Development of Railways**
    - 3.7.3. Railway Zone of the Country**
    - 3.7.4. Development of Railways during Five Year Plans**
    - 3.7.5. Railway Infrastructure of Karnataka**
  - 3.8. Road Transport Infrastructure**
    - 3.8.1. Status of Roads Based of Capacity**
    - 3.8.2. Road Development Plans in India**
    - 3.8.3. Road Transport under Five Year Plans**
    - 3.8.4. India's Road Network during 1950-51 – 2020-21**
    - 3.8.5. Road Density in India**
    - 3.8.6. Road Transport in Karnataka**
  - 3.9. Air Transport**
    - 3.9.1. Development of Air Transport in India**
    - 3.9.2. Air Transport in Karnataka**
-

- 
- 3.10. Water Transport Infrastructure**
    - 3.10.1. Inland Water Transport (IWT)**
    - 3.10.2. Ports**
    - 3.10.3. Major Sea Ports of India - At a Glance**
    - 3.10.4. Inland Water Transport in Karnataka**
    - 3.10.5. Waterways in Karnataka**
  - 3.11. Infrastructure of Communication**
    - 3.11.1. Structure of Telecommunication Services**
    - 3.11.2. Postal and Telecommunication in Karnataka**
    - 3.11.3. Banking and Financial Infrastructure**
    - 3.11.4. Banking and Finance in Karnataka**
  - 3.12. Social Infrastructure**
  - 3.13. Health Infrastructure**
    - 3.13.1. Health Infrastructure of Karnataka**
    - 3.13.2. Health Infrastructure Programmes**
  - 3.14. Education**
  - 3.15. Rural Housing**
  - 3.16. Rural Drinking Water**
    - 3.16.1. National Rural Drinking Water Programme (NRDWP)**
    - 3.16.2. Rural Drinking Water of Karnataka**
  - 3.17. Rural Sanitation**
    - 3.17.1. Swachh Bharat Abhiyan (SBA)**
    - 3.17.2. Swachh Bharat Mission (Gramin)**
  - 3.18. Rural Road Connectivity**
  - 3.19. Rural Electrification**
    - 3.19.1. Deen Dayal Upadhyaya Gram Jyothi Yojana (DDUGJY)**
    - 3.19.2. Rural Electrification in Karnataka**
  - 3.20. Rural Employment**
  - 3.21. Rural Infrastructure Programmes in India**
  - 3.22. Conclusion**
-

## **Chapter-03**

### **ECONOMIC AND SOCIAL INFRASTRUCTURE IN INDIA - AN OVERVIEW**

#### **3.0. Introduction**

This chapter is an analysis of the infrastructure in India in general and explanation of the economic and social infrastructure in particular. Economic infrastructure includes transport system like railways, roadways, airways, waterways and communication like telecommunication, postal and monetary system including banks and other financial institutions. Further, social infrastructure also explains health system including public and private hospitals, education system, sanitary system and rural drinking water facilities. Rural infrastructure facilities include rural housing, rural road connectivity, electricity and rural employment. Still further, briefly explaining rural infrastructure programmes of India as well as in Karnataka.

Rural infrastructure assumes greater importance in India. Since our country is predominantly rural in nature, the critical linkage of infrastructure to economic growth, poverty alleviation and human development assume a greater significance in the country. Poor availability of rural infrastructure, inadequate access of potable water supply, energy, land, health services and markets are also causes of concern.

In Indian economy service sector contributes 60 per cent to the country's Gross Domestic Product (GDP) and manufacturing sector contributes about 15 per cent to GDP, but the reality as borne out in the Census of 2011 reveals that 68.2 per cent of our population or 83 crore people lives in rural India spreading in 6.41 lakh villages. Almost 2/3<sup>rd</sup> of the workforce derives its livelihood from agriculture.



Thus, infrastructure assumes crucial importance in the country. A key component of development of rural areas is the creation of assets in the form of rural infrastructure.<sup>1</sup> However, one of the basic limitations to create adequate infrastructure is lack of resources both physical and human. Inadequate financial position of the state governments is mainly responsible for the poor development and maintenance of infrastructure, which has been a cause of concern. Many of the well international infrastructure projects are found languishing for want of resources. India being the 7<sup>th</sup> largest country in the world has maintained and infrastructure management has enabled India to reach its new heights of basic physical system of a country's or communities' populations, including roads, utilities, water, sewages, etc.<sup>2</sup>

### **3.1. Infrastructure - The Meaning**

Infrastructure refers to the facilities, activities and services which support the operation and development of the economy. It is also termed as Social Overheads Capital (SOC). It is the supporting pillar of the economy that provides different types of services and also facilitates the flow of goods and services between buyers and sellers. Lack of infrastructure in any economy will definitely reduce the growth rate of that economy.

Infrastructure includes roadways, railways, waterways, airways, dams, power stations, oil and gas pipelines, telecommunication facilities. The country's educational system including schools and colleges, health system including hospitals, sanitary system, clean drinking water facilities and the monetary system

---

<sup>1</sup> Tripathy, I.G. (2014). Development of Rural Roads. *Kurukshetra – A Journal of Rural Development*, Ministry of I&B, Government of India, New Delhi, pp. 61-64.

<sup>2</sup> Infrastructure, The Indian Economy Compendium, 3<sup>rd</sup> Edition, Disha Publications, New Delhi, November 2018, p. 2.

including bank, insurance and other financial institutions. Some of these facilities have a direct impact on the working of the system of on production of goods and services, while others give an indirect support on building the socio-economic sector of the economy. Infrastructure provides supporting services in the main areas of industrial and agricultural production, domestic and foreign trade and commerce<sup>3</sup>.

### **3.2. Conceptual and Theoretical Framework**

The process of economic development needs to be accelerated to fulfill or realize pre-determined goals. While development process is indicated in all sectors, it requires proper connectivity to enable movement of men and material. Timely supply of inputs leads to un-interpreted activity. Keeping this in view, economic thinker over the years has laid great emphasis on development of infrastructure to proceed the real development process in the sectors. Adequate investment has to be made in transport sector which could nourish and nurture, the process of development in all the other sectors.

Gandhian approach to rural development attaches to the generation of maximum possible employment opportunities in rural areas, especially for the weaker sections of the society so as to enable them to improve their standard of living. Provision of certain basic amenities like potable drinking water, electricity, especially for the productive purpose, link roads connecting villages to market centers and facilities for health and education etc. figure prominently in the scheme of rural development.

---

<sup>3</sup> Infrastructure, The Indian Economy Compendium, 3<sup>rd</sup> Edition, Disha Publications, New Delhi, November 2018, p. 244.

Myrdal's theory of Backwash and Spread effects quoted that the stronger spread effects will attain a higher level of economic development because the development is accompanied by improved transportation and communication, higher levels of education and a more dynamic communion of ideas and value of all of which tend to strengthen the forces for the centrifugal spread of economic expansion. Further he highlighted the fact that regional disparities are more prominent in under developed countries, than in developed ones, which according to him are due to insufficient infrastructure facilities.

Ragnar Nurkse and Paul Rosentien Rodan asserted that the process of development requires a great momentum in the form of big push. In this context, according to him, creation of infrastructure facility particularly, in transport sector is a prime necessity for accomplishing sustainable economic development.

Hirshman looks infrastructure as initiator of investment and to him when these sector expands the other sectors respond by making the demand for it and vice versa.

Rostow in his 'stages of economic growth' includes social overhead capital as one of the pre conditions for accelerated growth of the economy. The problem of regional disparity in relation to economic development is the result of resource imbalances.

V.K.R.V. Rao is of the opinion that, "The link between infrastructure and development is not once for all affairs. It is a continuous progress in development has to be preceded, accompanied and followed by progress in infrastructure, if we are to fulfill our declared objectives of a self-accelerating process of economic development".

Vivekananda also rightly said that, “The real India lives in the villages. Unless we are able to uplift the tribal and the backward classes, India faces a dark future”.

“If the village perishes, India will perish too, it will be no more India. Her own mission in the world will get lost. The revival of the village is possible only when it is no more exploited”.<sup>4</sup>

Hansen (1965) divides public infrastructure into two categories Economic Overhead Capital including the public works projects in circling roads, bridges, waterways irrigation and water treatment and distribution system. Social Overhead Capital includes investment on public health, education, fire and police protection.

Williamson (1965), who in his article on ‘relationship between economic growth and regional disparity’ argued that increase in regional inequality occurs during the early stages of development, while mature growth producers regional convergence or a reduction in differentials.

The World Development Report (1994) stressing the significance of infrastructure facilities in the overall development of an economy. The relationship between infrastructure facilities and economic development has been recognized, which effects the production and consumption directly and creates many positive and negative externalities. Moreover, infrastructure development involves large flow of expenditure which has direct impact on the budget and

---

<sup>4</sup> Mahatma Gandhi’s Views on Infrastructure stated in his book of Vasant Desai (2013). *Rural Development in India (Past, Present and Future) Challenge in the Crisis*, Himalaya Publishing House Pvt. Ltd., Mumbai, p. 142.

balance of payments. Infrastructure provision must be fashioned as per the needs and circumstances of the country, which carry widely.<sup>5</sup>

Rakesh Mohan Committee Report (1997) emphasized infrastructure led-growth and growth led infrastructure development in India. This report presents a well planned strategy needed for the sectoral infrastructure development in the country. Evidences ranging over a decade of reforms starting from 1991, clarifies the fact that infrastructure which is a pre-requisite for overall development has to be revised further for regional development and there is need for the development of a comparative static framework in order to verify the infrastructure trajectory at the district level, with the lack drop of national and state level infrastructure planning, so that the regional imbalance can be erased off.<sup>6</sup>

Sahoo and Sexena (1999) explained regional disparities of economic growth in the case of infrastructure development has a sum of the states could not took advantage of Central fund provided for the purpose. Gujarat is a leading state at all India level for optimum utilization of funds with proving results about PPPs. However, reality backward states should come forward with economically viable and technically feasible projects reports.<sup>7</sup>

Ghosh and Prabir De (2005) have picture is it the role played by different categories of infrastructure and the efforts of the sectors and development through the evidence of Indian states.

---

<sup>5</sup> World Development Report (1994). *Infrastructure for Development*. Oxford University Press, New York.

<sup>6</sup> Rakesh Mohan Committee Report on Infrastructure Development in India. Ministry of Finance, GoI, New Delhi (1997).

<sup>7</sup> Sahoo and Sexena (1999). Infrastructure and Economic Development: Some Empirical Evidence. *The Indian Economic Journal*, 47(2), 110-124.

Our former Prime Minister Manmohan Singh (2006) explained that the planning commission has estimated that investment in infrastructure including roadways, railways, water ways, electronic power, telecommunication, potable water supply and irrigation estimated about US dollar 320 billion during the 11th five year plan period and the government is going to have investment in infrastructure through a combination of public investment, PPP and occasionally, exclusive private investments wherever feasible.<sup>8</sup>

Deepak Parekh Committee Report (2007) has shown ways and means for sustainable growth of infrastructure development in India with Public Private Partnership (PPP). Speedy transportation and communication, enough power supply and other public utilities help manufacturers to reduce cost of production in area of global competition.<sup>9</sup>

An attempt is here to examine and analyse the views expressed by development economist as to how creation of sustainable infrastructure in transport sector is a necessary pre-requisite for overall development of the economy.

### **3.3. The Status of Infrastructure in India**

Traditionally, the government has been solely responsible for developing the country's infrastructure. But it is found that the government's investment in infrastructure is inadequate. Today, the private sector by itself and also in joint collaboration with the public sector has started playing a very important role in infrastructure development.

---

<sup>8</sup> Manmohan Singh (2006). *Development Infrastructure*. Ministry of Information, GoI, New Delhi.

<sup>9</sup> Deepak Parekh Committee Report on Public Private Partnerships in Infrastructure Projects. GoI, New Delhi (2007).

Some economists have projected that India will become the third largest economy next only to the USA and China in the world, a few decades from now. For that to happen, India will have to boost its infrastructure investment. In any country, as income rises, the composition of infrastructure requirements changes significantly in a positive direction. For low income countries basic infrastructure services like irrigation, transport and power are more important.

As economies mature and most of their basic consumption demands are met, the share of agriculture in the economy shrinks for which more service-related infrastructure is required and share of power and telecommunication infrastructure is greater in high income countries such as the USA, the UK, Belgium, France, etc.<sup>10</sup>

### **3.3.1. Share of Infrastructure Investment**

Infrastructure development has lagged behind to greater extent in the economy. The India's overall infrastructure ranked 81<sup>st</sup> among 140 economies in the world.<sup>11</sup> India lags from its BRICS countries<sup>12</sup> in overall infrastructure. Russian Federation ranked 35<sup>th</sup>, China ranked 39<sup>th</sup>, South Africa ranked 68<sup>th</sup> and Brazil ranked 74<sup>th</sup>. The neighboring country Srilanka also is able to capture the 64<sup>th</sup> rank. The top three ranking in terms of infrastructure went to Hongkong SAR, Singapore and Netherlands.<sup>13</sup>

---

<sup>10</sup> Indian Economic Development, Publication Division, New Delhi, January 2017, pp. 142-143.

<sup>11</sup> As per World Economic Forum's Global Competitiveness Report 2015-16, India ranked 81<sup>st</sup> Place out of 140 Countries.

<sup>12</sup> BRICS includes Brazil, Russian Federation, India, China and South Africa.

<sup>13</sup> ASSOCHAM Study on Analysis of Infrastructure Investment in India, The Associated Chambers of Commerce and Industry of India, New Delhi, May 2016, p. 1.

### 3.3.2. Vision-2025 for Infrastructure Sector

Vision 2025 for Infrastructure Sector in Karnataka is to ensure safe, reliable and environmentally sustainable last mile connectivity across Karnataka in order to achieve increased socio-economic development of the state. Table 3.1 shows the Vision 2025-List of Goals and Strategies for Infrastructure Sector in Karnataka.

**Table 3.1**  
**Goals and Strategies for 2025 Infrastructure Sector in Karnataka**

<b>Goals</b>	<b>Targets</b>	<b>Strategy</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
Enhancing regional connectivity of roads ensuring first and last mile connectivity to all villages	<ul style="list-style-type: none"> <li>• At least 50 per cent of SH roads are upgraded to Two Lane Roads.</li> <li>• At least 50 per cent of MDRs are upgraded to Intermediate Lane Roads.</li> <li>• 100 per cent conversion of metal/earthen MDR to All-Weather Roads.</li> <li>• Ensuring quality road infrastructure across coastal belt.</li> <li>• Ensuring All-Weather Roads connectivity to all habitations.</li> <li>• 50 per cent of all arterial road connectivity to all habitations.</li> </ul>	<ul style="list-style-type: none"> <li>• All-Weather Roads connectivity to all habitations.</li> <li>• Upgradation of intermediate and Major District Roads.</li> <li>• Fast track implementation of State-Wide Road infrastructure maintenance.</li> <li>• Road grid connecting Bus-Rail-Air-modes of transport.</li> </ul>
Developing robust airport and airstrip infrastructure in the state	<ul style="list-style-type: none"> <li>• Increasing passenger capacity of airports in the state to 45 million.</li> <li>• Enhancing district-wise helicopter service network in the state.</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable regional/minor airport.</li> <li>• Air infrastructure development and upgradation – Airports and Helipads.</li> </ul>
Augmenting rail connectivity across the state to deliver a seamless, accessible, multimodal and secure transport offering	<ul style="list-style-type: none"> <li>• Increasing passenger capacity of airports in the state to 45 million.</li> <li>• 100 per cent upgradation of all A1 category railway stationary to international standards.</li> <li>• Increasing rail electrification in the state to 22 per cent.</li> </ul>	<ul style="list-style-type: none"> <li>• Fast-track development of railways, tracks.</li> <li>• Smart infrastructure upgradation of railway stations.</li> <li>• Dedicated Freight Corridors connecting to BMEC.</li> </ul>

Contd...



<p>Developing quality port infrastructure and promote coastal shipping</p>	<ul style="list-style-type: none"> <li>• Formulating a maritime board for the state and enhance port-led development in the state.</li> <li>• Implementing latest technologies in upgradation of ports and waterways in order to increase current utilization percent of ports.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor port development programme.</li> <li>• Getting Maritime Board into action.</li> </ul>
<p>Developing corridor infrastructure to augment cross-sector potential of the state</p>	<ul style="list-style-type: none"> <li>• At least 2 state waterways are equipped with tourism support infrastructure.</li> <li>• Initiate corridor development activities under proposed BMEC and CBIC.</li> </ul>	<ul style="list-style-type: none"> <li>• Inter-State Corridor.</li> <li>• Intra-State Corridor.</li> <li>• Tourism Corridor.</li> <li>• Innovation and Technology Corridor.</li> </ul>
<p>Attracting large investments in infrastructure sector</p>	<ul style="list-style-type: none"> <li>• At least 50 per cent of PPP ready projects are implemented.</li> <li>• Explore innovative means of financing for large infrastructure projects.</li> <li>• 3-level capacity enhancement programme for department staff dealing with infrastructure assets.</li> <li>• Achieving 80 per cent response rate under grievance redressed portal for public infrastructure assets.</li> </ul>	<ul style="list-style-type: none"> <li>• Database of PPP- ready projects.</li> <li>• Effective management of PPP infrastructure projects.</li> <li>• Capacity building of people, technology and governance.</li> <li>• Stakeholder engagement portal- stakeholder queries and grievance redressal portal.</li> </ul>
<p>Improving accessibility and efficiency of bus public transportation system</p>	<ul style="list-style-type: none"> <li>• Increasing capacity and quality of services of bus public transport system in the state.</li> <li>• Increasing bus public transport coverage to all villages.</li> <li>• Reducing congestion due to bus traffic in urban centers.</li> </ul>	<ul style="list-style-type: none"> <li>• Bus Public Transport Service Enhancement Plan.</li> <li>• Introducing shorter distance in city peak hour bus services.</li> </ul>

**Note :** SHs - State Highways, MDRs - Major District Roads, PPP - Public Private Partnership, BMEC - Bengaluru Mumbai Economic Corridor, CBIC - Chennai-Bengaluru Industrial Corridor.

**Source :** Nava Karnataka Vision 2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, pp. 69-71.

### **3.4. Types of Infrastructure**

Infrastructure has been broadly categorized into two types, viz., Economic infrastructure and Social infrastructure.

### **3.5. Economic Infrastructure**

Economic infrastructure refers to all such elements of economic changes which serve as a base for the process of economic growth. In the absence of economic infrastructure, any efficient system of economic growth would remain a far-off possibility. Economic infrastructure includes the following segment of the economy:

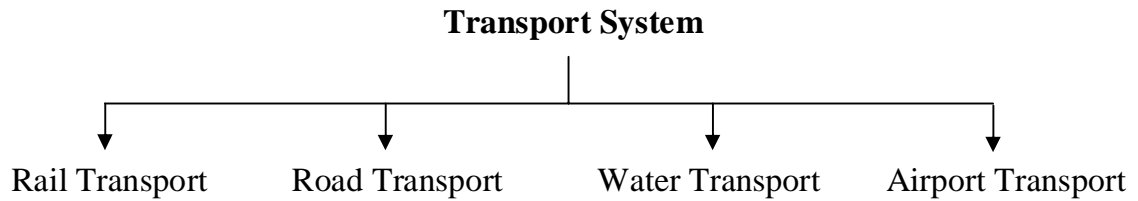
- i. Transport Infrastructure
- ii. Communication Infrastructure
- iii. Postal Infrastructure
- iv. Banking and Financial Infrastructure

### **3.6. Transport Infrastructure in India**

In modern era, transport is the basic infrastructure and is fundamental to the economic growth of the country. Most effective economic fact of our times are not the development of manufacturing industries but that of the transport system in any country serves as a nerve system of the human body.<sup>14</sup> It is evident that the prosperity of a country does not depend on the development of agriculture, industry and mines alone but also on the development of means of transport. The transport system consists of the following distinct services:

---

<sup>14</sup> Marshall aptly remarked as a role of Transport Infrastructure.



### **3.7. Rail Transport Infrastructure**

The development and expansion of railways transport has brought about a revolution in the transport system throughout the world.

#### **3.7.1. Beginning of Rail Transport**

The history of rail transport began as early as in 1844. The first train in India covered a distance of 34 km (21.6 miles) between Mumbai and Thane on 16<sup>th</sup> April 1853. In the beginning, rail transport was under in private ownership. Nationalization of railways was undertaken stage by stage between 1924 and 1950. Now railway transport is under the complete authority of the Union Government.<sup>15</sup> Indian Railways have grown into a vast network of 7,216 stations spread over a route length of about 66,687 km. Indian railways is the biggest in Asia and world's third largest rail network under a single management and a very big public sector undertaking.<sup>16</sup>

#### **3.7.2. Development of Railways**

Construction of railways in India started in 1844. The first train had run between Mumbai and Thane in 1853 covering a distance of 34 km (21.6 miles). By the year 1900, railways track covered a total length of 40,000 km.

<sup>15</sup> Awasthi, A. (1994). *History and Development of Railways in India*. Deep and Deep Publication, New Delhi, pp. 1-32.

<sup>16</sup> *Indian Economy*, Pratiyogita Darpan, Upkar Stationary Pvt. Ltd., 2018, p. 247.

### 3.7.3. Railway Zone of the Country

We have 18 railway zones in the country as on March 2021. The information about railway zones is given in Table 3.2.

**Table 3.2**  
**Zonal Statistics in India**

Sl. No.	Railway Zones	Zone Headquarters	Route Length (km)	No. of Stations
(01)	(02)	(03)	(04)	(05)
1.	Northern Railway (NR)	Delhi	6,968	1142
2.	North-Eastern Railway (NER)	Gorakhpur	3,667	537
3.	Northeast Frontier Railway (NFR)	Guwahati	5483	743
4.	Eastern-Railway (ER)	Kolkata	2414	576
5.	South-Eastern Railway (SER)	Kolkata	2631	353
6.	South-Central Railway (SCR)	Secunderabad	6137	883
7.	Southern Railway (SR)	Chennai	6844	890
8.	Central Railway (CR)	Mumbai	3905	612
9.	Western Railway (WR)	Mumbai	6182	1042
10.	South-Western Railway (SWR)	Hubballi	3177	456
11.	North-Western Railway (NWR)	Daipur	5459	663
12.	West-Central Railway (WCR)	Jabalpur	2965	372
13.	North-Central Railway (NCR)	Allahabad	3151	435
14.	South East Central Railway (SECR)	Bilaspur	2447	358
15.	East-Coast Railway (ECOR)	Bhubaneswar	2572	342
16.	East-Central Railway (ECR)	Hajipur	3628	800
17.	Kolkata Metro Railway (KMR)	Kolkata	-	-
18.	North-Coast Railway (SCR)	Vishakhapatnam	-	-

*Source : www.railwayzone.en.in.wikipedia.org. Information Downloaded 2 July 2021.*

### **3.7.4. Development of Railways during Five Year Plans**

Five Year Plans have given specific importance to the development of railway transport. Development of railways during Five Year Plans is as follows:

- **First Plan (1951-56):** During this Plan ` 217 crore was earmarked for the development of railways and 115 million tonne of goods carrying capacity was added to the railways.
- **Second Plan (1956-61):** During second five-year Plan ` 723 crore was allocated for the development of railway transport, 1500 km of railway routes were converted to double routes.
- **Third Plan (1961-66):** During this period, ` 1326 crore was spent on the development of railways and 203 million tonne of new goods carrying capacity was undertaken during this plan period.
- **Fourth Plan (1969-74):** Expenditure of ` 934 crore was incurred on the development of railways and 499 million tonne of new goods carrying capacity was added to the railways.
- **Fifth Plan (1974-79):** ` 2063 crore was spent on the development of transport during this Plan and 596 million tonne of new goods carrying capacity was added.
- **Sixth Plan (1980-85) :** During sixth five-year Plan ` 6,587 crore was spent in this plan and 833 million tonne of new goods carrying capacity was enhanced to the railways.

- **Seventh Plan (1985-90)** : An investment of ` 16,549 crore was made during this plan for the development of railways and 960 million tonne of new goods carrying capacity was added during this period.
- **Eighth Plan (1992-97)** : During this period ` 27,202 crores were allocated and it was proposed to convert 6,000 km of meter gauge to broad gauge.
- **Ninth Plan (1997-2002)** : During this plan ` 45,725 crore was spent on the development of railways.
- **Tenth Plan (2002-07)** : ` 37,917 crore was spent on the development of railway transport during tenth plan period.
- **Eleventh Plan (2007-12)** : During this period ` 1,94,263 crore was allocated for the development of railway.<sup>17</sup>
- **Twelfth Plan (2012-17)** : ` 5 lakh crore was allocated for the development of railways during this plan, capacity additional for the development of Indian railway<sup>18</sup>. Twelfth Plan has envisaged on integrated approach for the transport sector as a whole. The vision for transport is to be guided by a model mix that will be led to an efficient, sustainable, economically safe, reliable, eco-friendly and regionally balanced transport system, in live with the objectives of the twelfth five-year Plan.<sup>19</sup>

---

<sup>17</sup> Development of Railways in Five-Year Plans, (First Five-Year Plan to Eleventh Five-Year Plan), Planning Commission Government of India, New Delhi (Retrieved on 21-03-2018, 11.00 am).

<sup>18</sup> Economic Times Newspaper by Shraya Jai, E.T. Bureau, December 25<sup>th</sup> 2012 (05.35 A.M. [www.economictimes.com](http://www.economictimes.com).)

<sup>19</sup> Indian Economy (MAG Book), Arihant Publications (India) Ltd., New Delhi, 2017, p. 127.

### 3.7.5. Railway Infrastructure of Karnataka

Karnataka is well connected to other parts of the country through a railway with network of 3,281 km. The Headquarter of The South-Western Zone of the Indian Railways is situated at Hubballi, Bengaluru is extensively connected through railways with interstate destinations. However, there is scope for improvement in the interstate railways connectivity with Karnataka having the lowest rail route and broad density when compared to other southern states. Out of Karnataka's 176 taluks, 81 taluks account for 46 per cent of the land area, which does not have rail network.<sup>20</sup> The details of zones of railways in Karnataka are presented in Table 3.3.

**Table 3.3**  
**Zonal Statistics of Karnataka**

Type of Railways	Broad Gauge (km)	Metre Gauge (km)	Narrow Gauge (km)	Total (km)
(01)	(02)	(03)	(04)	(05)
South-Central Railways	268	0	0	268
South-Western Railways	2516	97	84	2637
Southern Railways	37	0	0	37
Konkan Railways	248	0	0	248
<b>Total</b>	<b>3069</b>	<b>97</b>	<b>84</b>	<b>3250</b>

*Source : 1) Economic Survey of Karnataka 2020-21, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, March 2021.*

*2) Nava Karnataka Vision 2025, Report of Infrastructure Sector, Government of Karnataka, December 2017, p. 11.*

<sup>20</sup> Economic Survey of Karnataka 2017-18, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, March 2019, p. 23.

Table 3.3 shows zones of railways in Karnataka. It includes 4 zones, viz., Southern-Central Railways (248 km), South-Western Railways (highest km length 2,697 km), Southern Railways (37 km) and Konkan Railways (248 km). Karnataka Railway Network has total 3250 km in 2020-21 and it also includes Broad Gauge (3069 km), Metre Gauge (97 km) and Narrow Gauge (84 km).

### **3.8. Road Transport Infrastructure**

Next to railways, road transport plays a significant role in the country's transport system, besides the fact that social and economic progress of the country depends on the roads. In the words of Bentham "Roads are the veins and arteries of a country through whose channels every improvement takes circulation".

Road transport has emerged as the predominant segment in India's transportation sector with a share of 4.8 per cent on India's Gross Domestic Product (GDP) in 2011-12. Although National Highway accounted 1.58 per cent of the total road network in 2012. They carried 40 per cent of the total road traffic.<sup>21</sup> Union Budget includes a total outlay of ` 1.21 trillion on the road infrastructure. ` 5.35 trillion is spent on Bharatwala project which includes development of economic corridors, efficiency, improvement on key national corridors and border, coastal and port connectivity roads.<sup>22</sup>

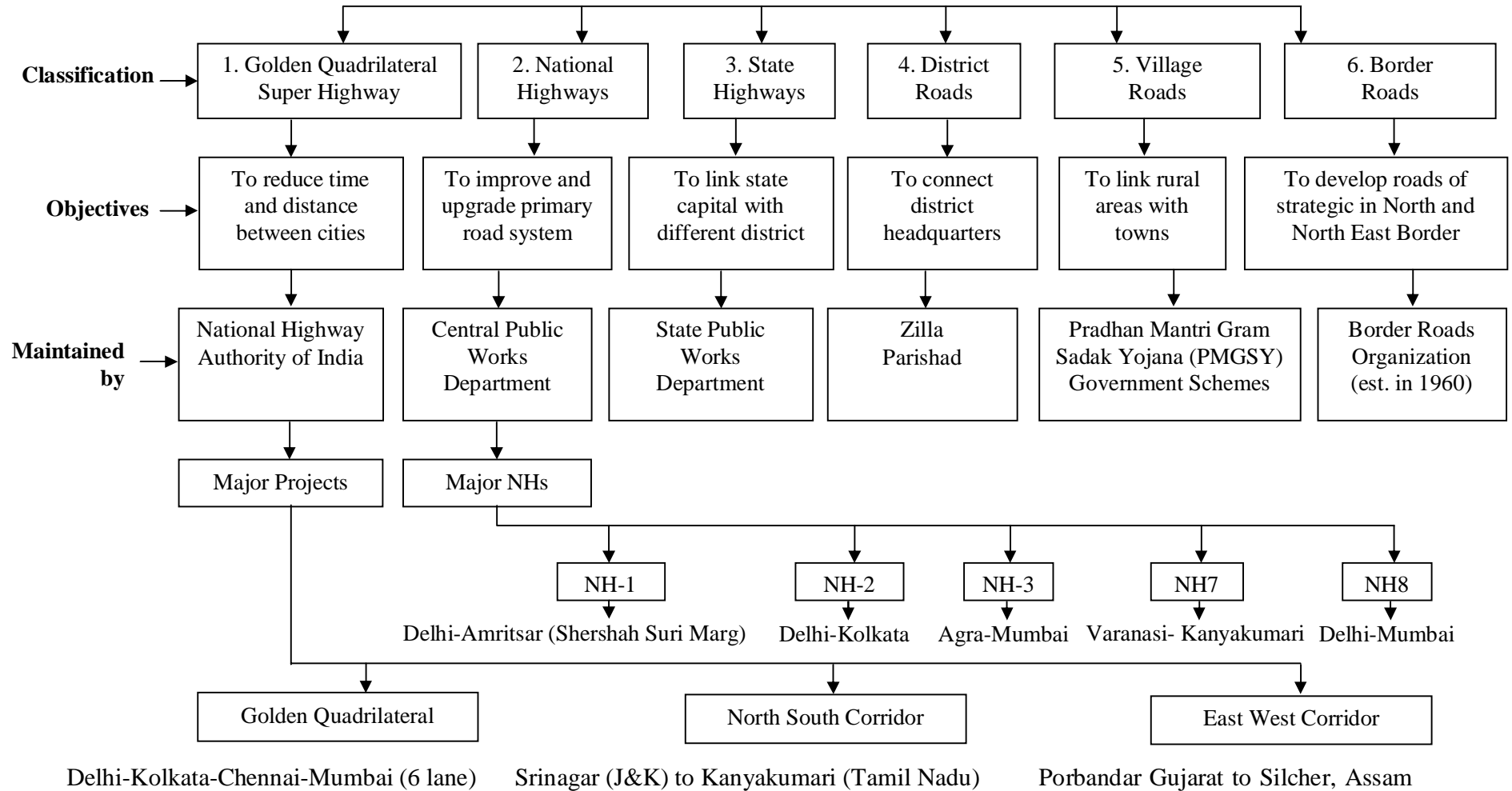
---

<sup>21</sup> A Reference Annual, New Media Wing, Publication Division, Ministry of I&B, Government of India, New Delhi, March 2018, p. 726.

<sup>22</sup> Raghuram, G. (2018). Infrastructure Creation: Integrating the Nation. *Yojana – A Development Monthly (Union Budget 2018-19, Special Issue)*, Publication Division, Government of India, New Delhi, pp. 56-60.



### 3.8.1. Status of Road on the Basis of Capacity



### 3.8.2. Road Development Plans in India

The history of development of road transport in India started from 1929 with the formation of *Jayakar Committee* by the British government. This committee had realized the key role of the Central Government in the development of roads. Details of the development plans for roads are as follows:

- **Nagpur Plan (1943-61)**

In 1943, the Chief Engineers of all the states met in Nagpur and prepared a 10-year development plan for road transport. This is popularly known as ‘Nagpur Plan’. This plan aimed at increasing the surfaced roads from 88,000 to 1,23,000 km and unsurfaced roads from 1,32,000 to 2,08,000 km. This plan was renewed in 1948.

This plan has classified Indian roads into five groups. They are as follows:

National Highways (NHs)<sup>23</sup>, State Highways (SHs)<sup>24</sup>, Major District Roads (MDRs)<sup>25</sup>, Other District Roads (ODRs) and Village Roads (VRs)<sup>26</sup>.

---

<sup>23</sup> The arterial roads of the country for inter-state movements of goods and passengers. They traverse the length and width of the country connecting the National and State capitals, major ports and rail junctions and link up with border roads and foreign highways.

<sup>24</sup> The arterial roads in a state for inter-district movements. They traverse the length and width of the state connecting the state capital, district headquarters and important towns and cities and link up with the National Highways and adjacent State Highways.

<sup>25</sup> District roads comprising of Major District Roads (MDRs), Other District Roads (ODRs) provide connection between district and taluk headquarters with the State Highways and National Highways. These roads which run within the district.

<sup>26</sup> These roads serve as the feeder roads as well as the roads for inter-village movements. They pass through rural areas connecting the village to one another and to the nearest road of higher category viz., District Roads, State Highways and National Highways etc.

- **Hyderabad Plan (1959-61)**

In 1959, the Chief Engineers of five states and the Chief Engineers of the centre met at Hyderabad and prepared 20-year plan for the development of roads. This is called Hyderabad Plan. This plan aimed at increasing roads between 1961 and 1981 by 3,79,000 km.

- **Bombay Plan (1961-81)**

The Chief Engineers of the Central and State Governments, who were looking after the administration of roads and bridges met in Bombay in 1957 and prepared a 20-year road development plan (1961-81). This plan aimed at increasing the length of roads from 6.69 lakh km in 1961 to 10.51 lakh km by 1981.

- **Lucknow Plan (1981-2001)**

Perspective plan was made by the Central Government for 20 years of the long-term development of roads and it is known as Lucknow Plan. The purpose of this plan had proposed to spend ` 64,250 crores and to provide employment opportunities to 50 lakh people.<sup>27</sup>

### **3.8.3. Road Transport under Five Year Plans**

The Nagpur Plan laid the foundation for the development of roads in India. Special interest was given to the development of roads under Five Year Plans. A brief note on Five Year Plans is given below:

---

<sup>27</sup> Jayarama Bhat, B. (2018). *Road Transport in India*. Shreyas Publication, Shivamogga, Karnataka, pp. 69-70.

- **First Five-Year Plan (1951-56):** During this period, ₹ 147 crore was spent on the development of roads and road transport. Under the same plan 2,09,000 km of surfaced roads were constructed.
- **Second Five-Year Plan (1956-61):** During this period, ₹ 242 crore was earmarked for the development of roads and road transport and during the same period ₹ 2.63 lakh km of surfaced roads were constructed against the target of 2.29 lakh km.
- **Third Five-Year Plan (1961-66):** During this plan period, ₹ 467 crore was allocated for the development of roads and road transport. 3.43 lakh km of surfaced roads were constructed against the target of 2.76 lakh km.
- **Fourth Five-Year Plan (1969-74):** A total of ₹ 990 crore was allocated for the development of roads and road transport during fourth five year plan 4.99 lakh km of surfaced roads were constructed against the target of 84.50 lakh km.
- **Fifth Five-Year Plan (1974-79):** During this plan period, ₹ 2,204 crore was incurred upon the development of road transport. About 5.96 lakh km of surfaced roads were constructed.
- **Sixth Five-Year Plan (1980-85):** A total of ₹ 5082 crore was earmarked on the development of road transport during this period, 8.33 lakh km of surfaced roads were constructed during the same period and the total length of roads was 14.91 lakh km in 1984-85.

- **Seventh Five-Year Plan (1985-90):** During this plan period, ` 8,486 crore was incurred on the development of road transport. About 9.60 lakh km of surfaced roads were constructed.
- **Eighth Five-Year Plan (1992-97):** It was proposed to spend ` 17,060 crore on the development of road transport during this plan period.
- **Ninth Five-Year Plan (1997-2002):** During this plan period, ` 1,21,324 crore was incurred on the development of total transport.
- **Tenth Five-Year Plan (2002-07):** The Tenth Plan outlay for the central sector roads programme was ` 59,480 crore.
- **Eleventh Five-Year Plan (2007-12):** For the roads and bridges sector, the Eleventh Plan envisages a total investment of ` 3,14,152 crore.
- **Twelfth Five-Year Plan (2012-17):** The Twelfth Plan outlay for the central sector roads (including private sector investment) is ` 4,21,789 crore.<sup>28</sup>

#### **3.8.4. India's Road Network during 1950-51 – 2020-21**

The road network of the country consists of National Highways (NHs), State Highways (SHs), Other Public Works Department (OPWD) Roads, Rural Roads (RRs), Urban Roads (URs)<sup>29</sup> and Project Roads (PRs).<sup>30</sup>

Table 3.4 given the data on trends in India's Road Network from 1950-51 to 2020-21.

---

<sup>28</sup> Basic Road Statistics in India 2015-16, Ministry of Road Transport and Highways, Transport Research Wing, Government of India, New Delhi, pp. 25.

<sup>29</sup> A road within the limits of the area of a development project of a public authority for the exploitation of resources such as forest, irrigation, electricity, coal, sugarcane and steel.

<sup>30</sup> A road within the limits of the area of Municipality, Military Cantonment, Port or Railway Authority.

**Table 3.4**  
**Road Network in India**

(Length in km)

Years → Category of Roads ↓	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11	2020-21	% increase over 1950-51 to 2020-21	CAGR (%)
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(12)	(13)	(14)
National Highways	19,811 (-)	23,798 (20.12)	23,838 (0.16)	31,371 (32.85)	33,650 (06.24)	57,737 (71.58)	70,934 (22.85)	1,35,440 (13.01)	476.23	<b>2.79</b>
% to total	04.95	4.53	2.60	2.13	1.14	1.71	1.51	1.94		
State Highways	-	-	56,763 (-)	94,359 (66.22)	1,27,311 (34.92)	1,32,100 (3.76)	1,63,898 (24.07)	1,76,818 (-0.64)	208.36*	<b>2.3</b>
% to total	-	-	6.20	6.35	5.47	3.91	3.50	2.97		
Other PWD Roads	1,73,723 (-)	2,57,125 (48.00)	2,76,833 (7.66)	4,21,895 (52.40)	5,09,435 (20.74)	7,36,001 (44.47)	9,98,895 (35.71)	5,90,259 (4.31)	237.42	<b>1.76</b>
% to total	43.43	49.05	30.25	28.40	21.88	21.81	21.35	9.94		
Rural Roads	2,06,408 (-)	1,97,194 (-4.46)	3,54,530 (79.79)	6,28,865 (77.38)	12,60,430 (100.43)	19,72,016 (56.46)	27,49,804 (39.44)	45,35,511 (5.88)	1918.77	<b>4.51</b>
% to total	51.62	37.59	38.77	42.36	54.18	58.45	58.82	70.65		
Urban Roads	-	46,361 (-)	72,120 (55.69)	1,23,120 (70.71)	1,86,799 (51.72)	2,52,001 (34.90)	4,11,679 (63.36)	5,44,683 (3.28)	1035.61 ⊕	<b>4.19</b>
% to total	-	8.83	7.88	8.28	8.02	7.46	8.80	8.93		
Project Roads	-	-	1,30,893 (-)	1,85,511 (41.72)	2,09,737 (13.05)	2,23,665 (6.64)	2,81,628 (25.91)	3,54,921 (3.06)	151.27*	<b>2.02</b>
% to total	-	-	14.30	12.48	9.01	6.63	6.02	5.58		
<b>Total</b>	<b>3,99,942</b> (-)	<b>5,24,478</b> (31.13)	<b>9,14,979</b> (74.45)	<b>14,85,421</b> (62.34)	<b>23,27,362</b> (56.68)	<b>33,73,520</b> (44.95)	<b>46,76,838</b> (38.63)	<b>63,86,297</b> (2.39)	<b>1374.63</b>	<b>4.04</b>
	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>		

Note : 1) Figures in brackets show percentage change over the previous period, 2) \* over the period 1970-71 and 3) ⊕ over the period 1960-61

Source : 1) Basic Road Statistics of India, 2015-16 and 2016-17 Government of India, Ministry of Road Transport and Highways, Transport Research Wing, New Delhi, pp.2-7, <http://www.basicroadstatisticsindia.com> Retrieved on 20-02-2020, 11.00 am.

2) Annual Report 2020-21, Ministry of Road Transport and Highways, Transport Research Wing, Govt. of India, New Delhi.

From the statistics provided in Table 3.4, it can be viewed that India's total Road length was 3,99,942 km in 1950-51 which has increased to 63,86,297 km during 2020-21. In the case of NH, the length was 19,811 km in 1950-51, which has increased to 1,35,440 km during 2020-21, secretarial to an increase to the tune of 583.66 percentage points between 1950-51 and 2020-21.

The total length of SH was 56,763 km in 1970-71, which has increased to 1,76,818 km during 2020-21, amounting to 211.50 percentage points increase between 1970-71 and 2020-21.

The length of Other PWD Roads was 1,73,723 km in 1950-51, which has also increased to 5,90,259 km during 2020-21, which was 339.77 percentage points increase between 1950-51 and 2020-21.

The Rural Roads was 2,06,408 km in length in 1950-51, which has increased to the tune of 45,35,511 km during the period 2020-21, the percentage increase being 2097.35 between 1950-51 and 2020-21, which is a noticeable feature in respect of the trends in the growth of rural roads in the country.

The length of Urban Roads was 46,361 km in 1960-61, which has increased to 5,44,683 km during 2020-21, amounting to 1074.87 percentage points increase between 1960-61 and 2020-21, which is also noticeable because the trend in increase has been higher than that of all other categories of roads, except that of the rural roads.

The Project Roads were 1,30,893 km in length in 1970-71, which has increased to 3,54,921 km during 2020-21, amounting to 171.15 percentage points increase between 1970-71 and 2020-21.

In India's total Road connectivity between 1950-51 and 2020-21, the rise in Rural Road length has been the uppermost amounting to 2097.35 percentage

points. But during the period of 66 years, the annual growth of Rural Roads has been 0.15 percentage points. This lends evidence to the fact that importance towards the development of Rural Roads needs to be continuously given in the interest providing rural infrastructure in the country as a whole. This is all the more essential in these days of globalized environment.

### 3.8.5. Road Density in India

Road density is another important indicator of the development of roads in any country. This explains the share of road length of each category in total length as well as the road length per unit of land area and per unit size of population. The relevant statistics is provided in Table 3.5 and briefly analyses the issue of road density in India with respect to the different categories of roads.

**Table 3.5**  
**Road Density in India, 2020-21**

Category	Road Length (km)	Share of Road Length (%)	Length of Road per Lakh Population* (km)	Length of Road Per 100 Sq.km. (km)
(01)	(02)	(03)	(04)	(05)
National Highways	1,36,440	2.13	10.18	4.15
State Highways	1,76,818	2.76	13.19	5.37
Other PWD Roads	5,90,259	9.42	44.05	17.95
Rural Roads	45,35,511	71.62	544.00 <sup>#</sup>	138.00
Urban Roads	5,44,683	8.52	144.43 <sup>#</sup>	16.56
Project Roads	3,54,921	5.55	26.50	10.79
<b>Total</b>	<b>63,86,297</b>	<b>100.00</b>	<b>476.68</b>	<b>194.27</b>

*Note :* 1) Total Geographical Area of the Country 32,87,263 sq.km.

2) Total Population of country in 2015 stood at 1254019 thousand.

3) According to the Census of India 2011, Rural Population was 83,37,48,852 and Urban Population was 37,71,06,125.

*Source :* Annual Report, 2020-21, Ministry of Road Transport and Highways, Transport Research Wing, Govt. of India, New Delhi.



Statistical information provided in the Table 3.5 reveals that the total road length in India stood at 63,86,297 km in 2020-21. National Highways length per lakh population stands at 10.18 km, of the Rural Roads in length stands a high of 544 km. The position of Urban Roads is the third in order being 144.43 km. In this respect, 138 km rural road length was found available per 100 sq.km and urban road length of 16.56 km was found available per 100 sq.km. in India in the year 2020-21. Overall, 476.68 km and 194.28 km of road length was available respectively, per lakh population and per 100 sq.km in the country in the year 2020-21.

### **3.8.6. Road Transport in Karnataka**

Karnataka state has well connected to its six neighbouring states<sup>31</sup> and other parts of India through 25 National Highways and 161 State Highways that run through the State. The state's road density is third amongst the ten largest states and 13<sup>th</sup> overall in India. In recent years, the focus has been on upgrading the roads making them durable, all weather and wider-rather than building new roads.<sup>32</sup> Karnataka road network consists of National Highways, State Highways, Major District Roads, Urban Roads and Rural Roads.

Details of this concept will be explained in Chapter 4.

---

<sup>31</sup>. Karnataka is the 7<sup>th</sup> largest state in India in area and 8th-largest by population. Karnataka is shared bordered with six states by, Maharashtra in the north, Goa in the north-west, Tamil Nadu in the south-east, Kerala in the south-west, Andhra Pradesh in the east and Telangana in the north-east.

<sup>32</sup>. Nava Karnataka Vision-2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, p. 9.

### **3.9. Air Transport**

Air Transport is the means of carries of goods and passengers by airplanes and helicopters. It is the fastest and costly means of transport and it has shrunk world and has the top role to place in the share of defense of the nation.

#### **3.9.1. Development of Air Transport in India**

The capacity of air transport in India was tested in 1911 by the flight of an aircraft for a distance of 10 km between Allahabad and Naini by transporting mail. In the year 1929, the Government of India decided to connect Bombay, Calcutta and Rangoon through airways. In 1927, Civil Aviation Department was established. In 1929 air transport contacts were set-up between Britain and India. And in 1932 airport service was provided between Karachi and Lahore to Madras. In 1946, Air Transport Licensing Board was set-up. In 1950, Air Transport Enquiry Commission was constituted under the Chairmanship of G.S. Rajadhyaksha. Government of India nationalized air transport in 1953.

By 2021, there are 486 airports, out of which the Airports Authority of India (AAI) runs 123 domestic airports and 35 international airports in India. There are also four joint venture airports in Delhi, Mumbai, Bengaluru and Hyderabad, which were developed under the PPP mode in collaboration with private sector companies.<sup>33</sup>

---

<sup>33</sup> [https://en.wikipedia.org/wiki/List\\_of\\_airports\\_in\\_India](https://en.wikipedia.org/wiki/List_of_airports_in_India), Data downloaded on 2<sup>nd</sup> July 2021.

### **3.9.2. Air Transport in Karnataka**

Major Airports of Karnataka are Kempegowda International Airport (KIA)<sup>34</sup>, Kalaburagi, Shivamogga, Mysuru, Hubballi, Belagavi, Mangaluru, Bidar and Jindal Vijayanagar Airport.

### **3.10. Water Transport Infrastructure**

Water transport refers to the transportation of goods and passengers through canals, rivers, seas and oceans. Boats and ships are the main modes of water transport. As waterways are the free gift of nature, there is no need to bear expenditure on the construction and maintenance. Therefore, water transport is the cheapest means of transport and suitable for transporting heavy goods in large quantities.

#### **3.10.1. Inland Water Transport (IWT)**

Transporting of goods and passengers through rivers and canals by means of small boats and steamers is called Inland Water Transport. It is a traditional means of transport. India has 12 Major ports and about 200 non major ports. Indian Shipping Industry has over the years played a crucial role in the transport sector of India's economy. About 95 per cent of the country's trade by volume and 68 per cent by value are moved through Marine Transport. Therefore, shipping

---

<sup>34</sup> Kempegowda International Airport (KIA) has won several awards and accolades including the 'Best Airport India' award by Skytrax World Airport Awards in 2011. 'Best Emerging Airport - Indian Subcontinent' award in 2010 and 2011, the 'Best Managed Airport' in CNBC Award Travel Award 2010. "Best Regional Airport in Central Asia" award at the Skytrax World Airport Awards in 2015, in Paris on March 11, 2015.

and ocean resources, ship design and construction, ports and harbours, issues relating to human resource development, finance, ancillaries and new technologies need to be developed in the light of the emerging scenario.<sup>35</sup>

### **3.10.2. Ports**

The Indian coastline comprises of 12 major ports. India ranks 16<sup>th</sup> among the maritime countries and has one of the largest merchant shipping fleet Kandla, Mumbai, Jawaharlal Nehru, Marma-Gao, New Mangalore, Cochin and Kolkata. The all-India capacity of 13 major ports was 871.52 Million Tonnes Per Annum (MTPA) at the end of March 2014, which increased by 79 percent to 1,560.61 MTPA by the end of March 2021.

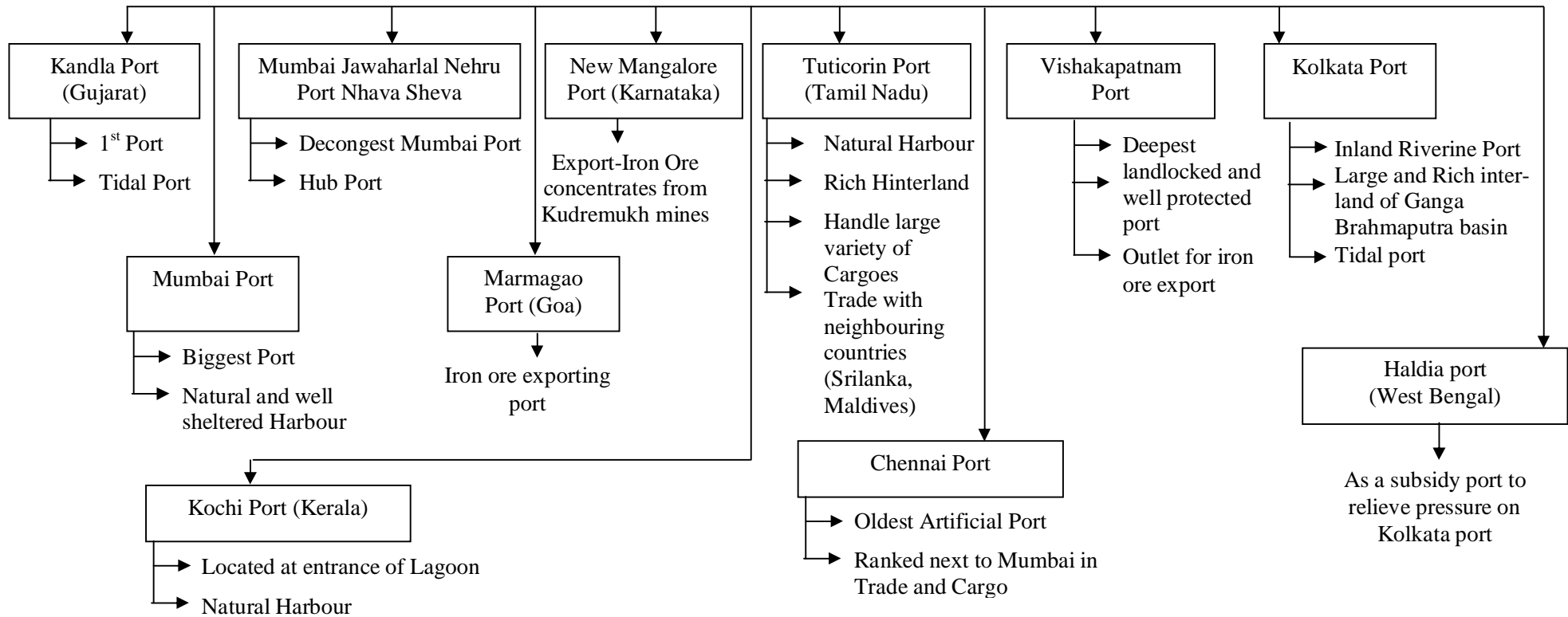
Karnataka has a coastline of 309.59 km with one major port and 12 minor ports. Among these 12 minor ports, Karwar and Old Mangalore ports have handled significant volumes of cargo. It has increased from 675.10 MT in FY 2017-18 to 785.494 MT for the Financial Year 2020-21 and 332.9 MT for FY 2021-22. While the impact of the pandemic is evident, the trend indicates the growing significance of ports for the state, and the country.<sup>36</sup>

---

<sup>35</sup> Annual Report 2020-21, Ministry of Ports, Shipping & Waterways, Government Of India, New Delhi , March, p. 6.

<sup>36</sup> Economic Survey of Karnataka 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2022, p. 347.

### 3.10.3. Major Sea Ports of India - At a Glance



### 3.10.4. Inland Water Transport in Karnataka

Under the National Waterways Act, 2016, 111 inland waterways have been declared as National Waterways (NWs) in addition to the five existing National Waterways (NWs), across 24 states for utilizing them as an eco-friendly and sustainable mode of transport. Out of 111 NWs, 106 were created in 2016. Out of these, Karnataka has seven waterways, which are likely to offer potential public and freight transport options for the state.<sup>37</sup> Information provided in Table 3.6 shows National Waterways in Karnataka.

**Table 3.6**  
**National Waterways in Karnataka**

Sl. No. (01)	National Waterways (02)	Description (03)
1	Ghataprabha River	Barrage near Malali to confluence with river Krishna at Chicksangam
2	Kabini River	Kabini Dam to Beeramballi
3	Kali River	Kodasalli dam to confluence of Kali river with Arabian sea near Sadashivagad bridge
4	Malaprabha River	Jakanuru to confluence with river Krishna at Kudalasangama
5	Manjara River	Singur Dam to confluence with river Godavari at Kandakurthi
6	Netravathi River	Netravathi Dam, Dharmastala to confluence with Arabian sea at Bengre
7	Sharavathi River	Honnavar Port Sea Mouth to link to highway at Gerusoppa
8	Tungabhadra River	Bridge on State Highway 29 near Chikkajantakal village to confluence with river Krishna near village Murva Kinda

**Source :** 1) *Economic Survey of Karnataka 2020-21, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021,*  
2) *Nava Karnataka Vision 2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, pp. 15-16.*

<sup>37</sup> Nava Karnataka Vision-2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, p. 15.

### 3.10.5. Waterways in Karnataka

The waterways are poised to spur the tourism potential of the state and aid industrial growth. Seasonality of most of the rivers has posed feasible challenges for the development of inland water transport as round-the-clock Waterways are essential to develop a seamless water transport system in Karnataka. Table 3.7 provides information about the status of Karnataka Waterways.

**Table 3.7**  
**Status of Karnataka Waterways**

<b>River/ Waterways</b>	<b>Total Length (km)</b>	<b>Navigable Length (km)</b>	<b>Proposed Reach for IWT</b>	<b>Hinterland (Taluk)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>	<b>(05)</b>
Kali	184	29	Kodibagh to Kadra	Karwar
Sharavati	80	27	Honnavara to Gerusoppa	Honnavara
Gangolli	48	20	Kundapur Port to other places situated on the banks of the group of five rivers	Kundapur
Udayavara	37	14	Malpe Port to other places situated on the banks of the Udayavara river	Udupi
Gurupur	80	20	Mangaluru Port to other places situated on the banks of the river Gurupur	Mangaluru
Netravathi	96	26	Mangaluru Port to other places situated on the banks of the river Netravathi	Mangaluru
Kabini	-	30	Bidarahalli Hobli Anandagiri to Beeramballi	Mysuru
Krishna	-	25	Backwater of Alamatti Dam	Bagalkot
<b>Total</b>	<b>525</b>	<b>191</b>		

**Source :** 1) *Economic Survey of Karnataka 2020-21, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021,*  
2) *Nava Karnataka Vision 2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, p. 16.*

### **3.11. Infrastructure of Communication**

The telecom sector plays an important role in implementation of JAM-trinity (Jandhan Aadhar Mobile) based social sector schemes and other pro-development initiative of the Government of India. The sector has been recognized all over the world as a powerful tool for development and poverty reduction. The government has laid considerable emphasis on broadband for all as a part of its Digital India Campaign. Efforts are being made to address the digital divide by extending inclusive internet access to every Indian citizen. The wireless telephony constitutes 98.3 per cent of all subscriptions whereas the share of landline telephones now stand at only 1.7 per cent. The overall tele-density in India stands at 86.6 per cent in the FY 2020-21, whereas tele-density in rural and urban areas was 59.1 per cent and 139.0 per cent respectively.

#### **3.11.1. Structure of Telecommunication Services**

There are many ways in which there can be communication between different individuals. But the use of particular means of communication may depend upon the distance involved and speed desired. The most important means of communications are post and telegraphs (now telegraphs is no more in existence), telephone, fax, pager, internet, teleprinters, radio and television etc. Following Table 3.8 shows the status of communications in India.



**Table 3.8**  
**Status of Communications in India**

(As on March 2021)

Gross Adjusted Revenue	₹ 1,60,814 crore (US \$ 22 billion)
Total Telephone Subscribers	1,179 billion
Mobile Subscribers	1,157 billion
Fixed Line Subscribers	22.27 million
Telephone Additions (Net)	10.43 million
Teledensity	90.44 per cent
Urban Teledensity	159.38 per cent
Rural Teledensity	58.45 per cent

*Source : www.communications.wikipedia.com. Information Downloaded 2 July 2021.*

### **3.11.2. Postal and Telecommunication in Karnataka**

Postal service is the cheapest mode of the communication and constitutes an important mechanism of achieving transportation and communication. The overall telecommunications system in the state is operated by both private and public sector undertakings. Apart from BSNL, private companies like Vodafone, Reliance, Airtel, Aircel, Bharati Airtel, Idea, TATA, MNTL, JIO, etc., are providing the wireless and wireline phones. The details of number of post offices, telephone exchanges and number of telephones are presented in Table 3.9.

**Table 3.9**  
**Number of Post Offices, Telephone Exchanges and Telephones**

<b>Year</b>	<b>Post Offices</b>	<b>Telephone Exchanges</b>	<b>Telephones</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
2008-09	9862	2651	2326532
2009-10	9820	2654	2187802
2010-11	9772	2789	2040456
2011-12	9703	2884	1951878
2012-13	9686	2802	1670378
2013-14	9681	2806	1535931
2014-15	9340	2844	1389192
2015-16	9661	2793	1294726
2016-17	9662	2793	1229813
2017-18	9663	2787	1147420
2018-19	9620	2760	1010759
2019-20	9618	3012	754544

*Source : 1) General Manager Telecom Office, Karnataka Circle, Bengaluru and GoK, March 2016, pp. 12-19.*

*2) Economic Survey of Karnataka 2020-21, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, Bengaluru, March 2021.*

### **3.11.3. Banking and Financial Infrastructure**

The financial sector plays a major role in the development process of our country. This system consists of 12 Public Sector Banks, 22 Private Sector Banks, 46 Foreign Banks, 56 Regional Rural Banks, 1485 Urban Cooperative Banks and

96,000 Rural Co-operative Banks in addition to cooperative credit institutions as of September 2021, the total number of ATMs in India reached 213,145 out of which 47.5 per cent are in rural and semi urban areas.<sup>38</sup>

### 3.11.4. Banking and Finance in Karnataka

Karnataka State has a fairly well developed financial infrastructure. Currently, 12 Public Sector Banks, 21 Private Commercial Banks, 2 Regional Rural Banks, 3 Co-operative Banks, 5 Small Finance Banks and 2 Payment's Banks are operating in the State. Disbursement of credit in rural areas takes place through Co-Operative Banks, Commercial Banks and Regional Rural Banks. Category-wise bank branch network is represented in Table 3.10.

**Table 3.10**  
**Category-wise Bank Branches Network**

<b>Banks</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2020</b>	<b>2021</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>	<b>(05)</b>	<b>(07)</b>	<b>(08)</b>
Commercial Banks	6052	6876	7440	7826	8373	8414
RRBs	1460	1547	1671	1743	1775	1763
KASCARD	178	201	201	203	203	203
DCC Bank	630	672	692	698	858	866
Karnataka Industrial Co-operative Bank	38	38	38	38	38	38
KSFC	32	32	32	32	32	32
<b>Total</b>	<b>8390</b>	<b>9366</b>	<b>10074</b>	<b>10540</b>	<b>11279</b>	<b>11316</b>

*Source : Economic Survey of Karnataka 2015-16 to 2021-22, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, Bengaluru, March 2022, p. 134.*

<sup>38</sup> <https://www.ibef.org/industry/banking-india>.

Only 10.2 per cent of Karnataka's rural villages had bank branches, which is lower than all southern states of India by FY 2020-21. Only Maharashtra is behind Karnataka on the share of rural villages with bank branches. Around 95 per cent of villages and towns have bank branches in Karnataka in semi-urban areas. Total bank branches consist of 11316 in March 2021. Category-wise Bank Branch Network is represented in Table 3.10.

### **3.12. Social Infrastructure**

Social infrastructure refers to the core elements of social changes, which serve as a base of the process of social development of a country. It focuses on human resources development implying the development of skilled personnel as well as healthy and efficient beings.

In India, the expenditure on social infrastructure by the Centre and the States combined as a proportion of GDP increased from 6.2 to 8.8 per cent between 2014-15 and 2020-21. During the same period, expenditure on education increased from 2.8 per cent to 3.5 per cent and expenditure on health increased from 1.2 per cent to 1.5 per cent. The total budgetary expenditure on social services increased to 23.4 per cent to 26.5 per cent.<sup>39</sup>

Social infrastructure includes the following segments in India as well as in Karnataka. Health Infrastructure, Education, Rural Housing, Rural Drinking Water, Rural Sanitation, Rural Road Connectivity, Rural Electricity, Rural Employment and Rural Infrastructure Programmes.

---

<sup>39</sup> Economic Survey of India - 2020-21, Volume 2, Ministry of Finance Department of Economic Affairs, Economic Division North Block, Government of India, January 2021, pp. 326-327.

### **3.13. Health Infrastructure**

Improvement in the standard of living and health status of the population has remained one of the important objectives for policy making in India. In line with the National Health Policy 2002, the National Rural Health Mission (NRHM) was launched on 12<sup>th</sup> April 2005 with the objective of providing accessible, affordable and quality health care to rural population.

COVID-19 demonstrated the importance of investing and strengthening public health system. India has made significant progress in improving its health outcomes over the last two decades by eliminating Polio, Guinea worm disease, Yaws and maternal and neo-natal Tetanus. Public health measures were taken in pre-emptive, pro-active and graded manner based on the evolving scenario. Government has taken several measures including world's largest vaccination drive to prevent, control and mitigate the impact of COVID-19.<sup>40</sup>

#### **3.13.1. Health Infrastructure of Karnataka**

Karnataka has made remarkable progress improving its health infrastructure at different levels in both rural and urban areas, resulting in a significant positive impact on demographic and health indicators in the State.

The first tier of the public healthcare system is called Primary Healthcare which includes Sub-Centers (SCs) and Primary Health Centers (PHCs). 8871 Health Sub Centers and 2359 PHCs are operational in the State. The Second Tier of the healthcare system is called Secondary Healthcare which includes 207 Community Health Centers and 146 Taluk/General Hospitals. The third tier of the

---

<sup>40</sup> Economic Survey of India - 2020-21, Volume 2, Ministry of Finance Department of Economic Affairs, Economic Division North Block, Government of India, January 2021, pp. 352-353.

healthcare system includes 15 District Hospitals, 11 Other Hospitals and 36 Autonomous and Teaching Hospitals in the State. Apart from this, the State also has around 2600 Hospitals providing health services based on Indian System of Medicine.<sup>41</sup>

### 3.13.2. Health Infrastructure Programmes

Now-a-days government has been providing importance to health care facilities through different programmes. The following Table 3.11 shows health oriented programmes in India.

**Table 3.11**  
**Health Oriented Programmes**

<b>Name of the Programme</b>	<b>Year of its Beginning</b>	<b>Objectives / Descriptions</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
National Rural Health Mission (NRHM)	12 <sup>th</sup> April 2005	To provide effective health care to rural population with special focus on 18 states with weak health indices or infrastructure; to rise public spending on health from 0.9 per cent of GDP to 2.3 per cent of GDP reduction of IMR and MMR
Janani Suraksha Yojana (JSY) a core component of NRHM	April 2005	To Focus on demand promotion for institutional deliveries in states and regions and targets lowering of MMR, it is a conditional cash transfer porogramme to increase births in health facilities
Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)	2010	To correct regional imbalances in tertiary health care and augmenting facilities for quality medical education in the country and setting up 6 AIIMS like institutions Phase-1 and in phase-2, 2 more AIIMS like institutions
Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY).	September 2018	To People using the program access their own primary care services from a family doctor. When anyone needs additional care, then PM-JAY provides free secondary health care for those needing specialist treatment and tertiary health care for those requiring hospitalization

<sup>41</sup> Economic Survey of Karnataka 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021, pp. 388-389.

### **3.14. Education**

India which has bottom heavy population is now graduating to an economy with middle heavy population. To reap the benefits of the demographic dividend to the fullest extent, India has to provide education to its population and that too quality education. The government also gives support through various educational programmes.

Karnataka's overall literacy rate was 66.64 per cent in 2001, rose to 75.60 per cent in 2011 with the State's overall literacy rate, male and female literacy rates being higher than those at the national level. In 2011, urban male literacy rate in Karnataka exceeded 90 per cent although rural female literacy rate was marginally lower than 60 per cent. Education-related services are provided through a wide network of state-wide institutions which also implement targeted programs to address the needs of distinct segments.<sup>42</sup>

Following Table 3.12 includes Education Oriented Porogrmames in India and Karnataka.

---

<sup>42</sup> Economic Survey of Karnataka 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2022, p. 387.

**Table 3.12**  
**Education Oriented Programmes**

<b>Name of the Programme</b>	<b>Year of its Beginning</b>	<b>Objectives/Descriptions</b>
(01)	(02)	(03)
Mid-Day Meal Scheme (largest feeding school programme in the world)	1995	To improve the nutritional status of children in Classes I-VII in government, local body and government aided schools and EGS and AIE centres with the end objective of enabling disadvantaged and poor children to attend school regularly
Sarva Shiksha Abhiyan (SSA)	2001	To ensure that all children (6-14) complete 5 years of primary schooling by 2007; all children complete 8 years of elementary schooling by 2010; bridge all gender and social category gaps at primary stage by 2007 and at elementary education level by 2010; universal retention by 2010
National programme for Education of Girls at Elementary Level (NPEGEL)-important component of SSA	2003	To Focus on intervention to reach the 'Hardest to Reach' girls and provides for 'Model School' in every cluster with more intense community mobilization and supervision of girl's enrollment in schools
Kasturaba Gandhi Balika 4. Vidyalayas (KGBVs) (with effect from 1 <sup>st</sup> April 2007, merged with SSA)	2004	To set up residential schools at all primary level for girls belonging to SC, ST, OBC or Minority communities. The scheme is being implemented both in rural and urban areas with female literacy rate of below 30 per cent and national average respectively
Rashtriya Madhyamik Shiksha Abhiyan (RMSA) or scheme for universalization of access for secondary education (SDCESS)	March 2009	To raise the enrolment rate at secondary stage from 52.26 per cent in 2005-06 to 75 per cent in next 5 years by providing a secondary school within a reasonable distance of 5 km of any habitation to ensure universal access by 2017 and universal retention by 2020
Saakshar Bharat	3 <sup>rd</sup> September 2009	To cover all adults in the age groups of 15 and above, with its primary focus on women
Inclusive Education for the Disabled at Secondary Stage (IEDSS) replaced Integrated Education for Disabled Children (IEDC)	2009-10	To Provide 100 per cent central assistance for inclusive education of disabled children studying in class IX-XII in government, local body and government aided schools
New Educational Policy (NEP)	2020	To produce productive and contributing citizens for building and equitable inclusive and plural society as envisaged by our constitution



### **3.15. Rural Housing**

Rural housing is a significant part of the progress of rural economy. There were 40.62 lakh of houseless households in rural areas of Karnataka, which varies across the district.<sup>43</sup> Government has brought into force various housing schemes both at the state and national level. Some of them are given below:

- Pradhan Mantri (Indira) Awas Yojana (Gramin)
- Rajiv Gandhi Housing Scheme
- Suvarna Karnataka Housing Scheme
- Basava Vasati Yojane
- Dr. B.R. Ambedkar Nivas Yojane
- Devaraj Urs Housing Scheme

### **3.16. Rural Drinking Water**

The Department of Drinking Water Supply (DDWS) was created under the Ministry of Rural Development in 1999, which subsequently was renamed as the Department of Drinking Water and Sanitation in 2010.

#### **3.16.1. National Rural Drinking Water Programme (NRDWP)**

National Rural Drinking Water Programme (NRDWP) is a centrally sponsored scheme aimed at providing adequate and safe drinking water to the rural population of the country. National Rural Drinking Water Programme (NRDWP) is a component of Bharat Nirman which focuses on the creation of the

---

<sup>43</sup> Economic Survey of Karnataka - 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021, pp. 392-393.

infrastructure. This has resulted in the provision of major additional resources to the sector and for creating an environment for the development of infrastructure and capacities for the successful operation of drinking water supply schemes in rural areas.<sup>44</sup>

### **3.16.2. Rural Drinking Water of Karnataka**

Karnataka has been at the forefront of adopting Sustainable Development Goals (SDG) targets in providing basic infrastructure relating to water and sanitation to its citizens. The SDG Index 3.0 (2020-21) of NITI Aayog observes that 59.47 per cent of Karnataka's rural population received safe and adequate drinking water within the premises through Piped Water Supply (PWS) and that cent per cent of the State's rural population had access to an improved source of drinking water. Besides providing PWS, efforts are being made to ensure full coverage of the households and on 1<sup>st</sup> April 2021, 47.06 per cent of the State's population and 38.22 per cent of the State's habitations were fully covered and with PWS.

Since 2020, Karnataka has been implementing the 'Mane Manege Gange' (Ganga to every household) programme to provide safe and pure drinking water through Functional Household Tap Connections (FHTC) by ensuring access to sustainable water sources and supplying at least 55 litres per person per day. As a part of the Jalamrutha programme, rejuvenation of 14000 traditional water bodies, 37000 lakes, 12000 multi-arched check Dams and about 20000 water conservation

---

<sup>44</sup> India-2018, A Reference Manual, New Media Wing, Publications Division, Ministry of I&B, GoI, New Delhi, March 2017, pp. 669-670.

works under NRMS (Natural Resource Management Systems) have been taken up.<sup>45</sup>

### **3.17. Rural Sanitation**

Rural sanitation programmes in India are as follows:

#### **3.17.1. Swachh Bharat Abhiyan (SBA)**

Swachh Bharat Abhiyan (SBA) was launched on the 145<sup>th</sup> birth anniversary of Mahatma Gandhi the Father of the nation, on 2<sup>nd</sup> October 2014. The concept of Swachh Bharat Abhiyan is to pave access for every person to sanitation facilities including toilets, solid and liquid waste disposal systems, village cleanliness and safe and adequate drinking water supply.

#### **3.17.2. Swachh Bharat Mission (Gramin)**

Intervention in the rural sanitation sector in the country was initially started in 1954. The baseline survey conducted in 2012 reported that of 70.26 lakh households in Karnataka, 24.84 lakhs households had toilets and 45.42 lakh households were deprived of the same. Individual Household Latrines (IHHLs) were constructed for all the households that were reported to be without toilets by 19th November 2018. The biggest challenge is to sustain the Open Defecation Free Status. In order to sustain the Open Defecation Free Status and to work on ODF-Plus activities, the Ministry of Jal Shakti, Department of Drinking Water and Sanitation has obtained approval from the Union Cabinet for implementation of

---

<sup>45</sup> Economic Survey of Karnataka - 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021, pp. 390-391.

Swachh Bharat Mission-Gramin (SBM-G) Phase II from 2020-21 to 2024-25. The project outlay is ₹ 416 crores for the year 2021-22.<sup>46</sup>

### **3.18. Rural Road Connectivity**

The government in a bid to give better rural connectivity launched PMGSY with an objective to provide rural connectivity by way of all weather roads to eligible habitations having a population of 500 and above.<sup>47</sup>

In Karnataka Under this programme, Rs.80 crore was allocated, of which Rs. 40 crore was spent for maintenance of 1392.71 km of road length by November 2021 and the total length of rural roads is 1,98,501 km in the same year.<sup>48</sup> Improvement of roads and their maintenance being taken up under PMGSY, CMGSY, NGNRY and Rural Infrastructure Development Fund (RIDF) schemes (Details of this concept will be explained in Chapter 4).

### **3.19. Rural Electrification**

Rural electricity programmes in India are as follows;

#### **3.19.1. Deen Dayal Upadhyaya Gram Jyothi Yojana (DDUGJY)**

This scheme is implemented by the Ministry of Power in collaboration with REL Limited.

---

<sup>46</sup> Economic Survey of Karnataka - 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2022, pp. 534-535.

<sup>47</sup> India-2018, A Reference Manual, Ministry of I and B, New Media Wing, Publications Division, Government of India, New Delhi, March 2018, p. 659.

<sup>48</sup> Economic Survey of Karnataka - 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2021, p. 535.

This scheme would help in

1. Increasing hours of power supply in rural areas.
2. Reduction of peak load.
3. Improvement in billed energy based on metered consumption.
4. Providing access to electricity to rural households.<sup>49</sup>

Indian power sector is undergoing a significant change that has redefined the industrial out lock. Electricity demand in the country has increased rapidly and is expected to rise further in future. India has moved up to 73 spots to rank twenty sixth<sup>50</sup>.

### **3.19.2. Rural Electrification in Karnataka**

Karnataka state has been experiencing acute shortage of power because of the ever-growing demand for power being influenced by the rapid economic progress. The anticipated capacity in the state addition during 2021-22 is 31249.85 Mega Wats (MW). The power generation capacity is 3522.6 MW and import of power is 7433.41 MW. For FY 2020-21, all India per capita availability of power was 1031.4 kilo Watt hours (kWh), the Karnataka per capita availability of power was 1125.9 kWh<sup>51</sup>.

---

<sup>49</sup> A Complete Resource Manual Economics, Unique Publishers (I) Pvt., Ltd., New Delhi, 2016, pp. 62-63(III).

<sup>50</sup> India got 26<sup>th</sup> rank in the world bank's list of electricity accessibility in 2017.

<sup>51</sup> Economic Survey of Karnataka 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March 2022, pp. 341-342.

### 3.20. Rural Employment

Some of the major rural employment generation programmes were launched during five-year plans and they are as given in Table 3.13.

**Table 3.13**  
**Major Rural Employment Generation Programmes**

Sl. No.	Programmes Implemented during Five Year Plans	Year of Launching	Main Objectives
(01)	(02)	(03)	(04)
<b>4<sup>th</sup> Five Year Plan</b>			
1	Crash Scheme for Rural Employment (CSRE)	1971-72	To develop rural areas through the generation of new employment
2	Pilot Intensive Rural Employment Programme	1972-73	To Construction work in villages
3	Drought Prone Area Programme (DPAP)	1973-74	To develop natural resources in drought prone rural areas
<b>5<sup>th</sup> Five Year Plan</b>			
1	Food for Work Programme (FWP)	1977-78	To provide food for work in development process
2	Antyodaya Yojana	1977-78	To give economic assistance to families living Below Poverty Line (BPL)
<b>6<sup>th</sup> Five Year Plan</b>			
1	National Rural Employment Programme (NREP)	1980-81	To Help that segment of population which depend largely on wage employment by providing gainful employment
2	Rural Landless Employment Guarantee Programme (RLEGP)	1983-84	To extend the employment opportunities for rural landless
3	Training of Youth for Self-Employment (TRYSEM)	1979-80	To generate self employment of the poor households through the transfer for productive assets
4	Integrated Rural Development Programme (IRDP)	1980-81	To promote self employment of the poor households through the transfer for productive assets
<b>7<sup>th</sup> Five Year Plan</b>			
1	Million Wells Scheme (MWS)	1980-89	To provide open irrigation wells, free of cost to poor and marginal farmers belonging to SC/STs and bonded labourers
2	Jawahar Rojgar Yojana (JRY)	1989-90	To generate of gainful employment for the unemployed and underemployed men and women in rural areas

Contd...

<b>8<sup>th</sup> Five Year Plan</b>			
1	Development of women and child in rural areas (DWCRA)	1992-93	To make rural women self reliant by organizing them in groups
2	Employment Assurance Scheme (EAS)	1993-94	To provide assured employment of 100 mandays of unskilled manual work to the rural poor
3	Prime Minister's Rojgar Yojana (PMRY)	1994-95	To provide self employment to educated unemployed by setting up of seven lakh micro enterprises.
<b>9<sup>th</sup> Five Year Plan</b>			
1	Jawahar Gram Samrudhi Yojana (JGSY)	1999-2000	To create employment and durable assets in rural areas
2	Swarnajayanthi Gram Swarozgar Yojana (SGSY)	1999-2000	To promote micro-enterprises and helping the rural poor into self help groups
3	Pradhan Mantri Gramodaya Yojana (PMGY)	2000	To improve the quality of life of people in the rural areas
4	Sampoorna Grameena Rojgar Yojana (SGSY)	2001-02	To generate employment opportunities by emphasizing the growth of drought proofing watershed development, afforestation and construction of school buildings
<b>10<sup>th</sup> Five Year Plan</b>			
1	Jai Prakash Rojgar Guarantee Yojana (JPRGY)	2002-03	To provide employment guarantee to the unemployed in the most distressed districts of the country
2	National Food for Work Programme (NFWP)	2004-05	To intensify the generation of supplementary wage employment
<b>11<sup>th</sup> Five Year Plan</b>			
1	National rural Employment Guarantee Act (NREGA)	2006	To entitle the rural poor to guaranteed employment for 100 days. It extended from 200 districts to all 614 district, 100 days
2	Swavalamban Scheme	2010	To ensure new pension scheme for poorer sections of the society in which the government will contribute a sum of ` 1000 provided the subscriber contributes any amount between ` 1000 to ` 12,000/annum.

### 3.21. Rural Infrastructure Programmes in India

Rural infrastructure development is a complex phenomenon due to many attributes of infrastructure that make it difficult for individuals to design, construct, operate and maintain these services as effectively and efficiently as possible. During the last six and a half decades of planning period, the country's economists and planners have identified the potential of a vibrant rural India to resolve the issues of poverty and advocated for improvement and expansion of rural socio-economic infrastructure. Table 3.14 represents the rural infrastructure programmes in India.

**Table 3.14**  
**Rural Infrastructure Programmes in India**

Sl. No.	Name of the programme	Year of beginning	Objectives / Descriptions
(01)	(02)	(03)	(04)
1	Community Development Programme (CDP)	1952	To ensure overall development of rural areas with people's participation
2	Drought Prone Area Programmes (DPAP)	1973-74	To minimize the adverse effects of drought on production of crops and lives-stock and productivity of land, water and human resources ultimately leading to drought proofing of the affected areas
3	20 Points Programme	1975	To eradicate poverty and to raise the standard of living
4	Desert Development Programme (DDP)	1977-78	To mitigate the adverse effects of desertification
5	National Fund for Rural Development (NFRD)	1984	To grant 100 per cent tax rebate to donors and also to provide financial assistance for rural development projects

Contd...



6	Council for Advancement of People's Action and Rural Technology (CAPART)	1986	To aid with rural prosperity
7	Integrated Wasteland Development Programmes (IWDP)	1989-90	To develop wasteland and degraded land
8	District Rural Development Agency (IRDA)	1993	To provide financial assistance for rural development
9	Member of Parliament Local Area Development Programme (MPLAD)	1993	To provide ` 2 crore to each MP to undertake developmental activities in his/her constituency. The amount has been raised to ` 5 crore from 2011
10	Indira Awas Yojana (IAY)	1999	To help construction of new dwelling units as well as conversion of unserviceable Kutcha houses into Pucca or Semi-Pucca by members of SC or STs, rural poor below the poverty line by extending them grant-in-aid
11	Total Sanitation Campaign (TSC)	1 <sup>st</sup> April 1999	To focus on community led and people centered approach and places emphasis on information, communication and education (ICE) for demand generation of sanitation facilities
12	Pradhan Mantri Gram Sadak Yojana (PMGSY)	December 2000	To line all villages with Pukka road
13	Annapoorna Scheme	2000	To ensure food security for all, create a hunger free India in the next five years and to reform and improve the public distribution system
14	Valmiki Ambedkar Awas Yojana (VAAY)	December 2001	To provide facilitates for the construction and upgradation of dwelling units for slum dwellers
15	Nirmal Gram Puraskar (NGP)	October 2003	To give incentive scheme to encourage PRIs to take up sanitation promotion

Contd...

16	Bharat Nirman Programme	2005	To develop rural infrastructure including 6 components: irrigation, water supply, housing, road, telephone and electricity
17	Jawaharlal Nehru National Urban Renewal Mission (JNNURM)	3 <sup>rd</sup> December 2005	To assist cities and towns in taking up housing and infrastructural facilities for the urban poor in 63 cities (now 65 cities) in the country
18	National Rural Drinking Water Programme (NRDWP)	1 <sup>st</sup> April 2009	To move forward from achieving habitation level coverage towards household level drinking water through resorting to multiple sources like groundwater and surface water etc.
19	Affordable Housing in Partnership (AHIP)	2009	To construct one million houses for the EWS or LIG or MIG with at least 25 per cent for EWS category seeks to operationalize National Habitat Policy, 2007
20	Shyama Prasad Mukherjee Rural Mission	2015	To deliver integrated project-based infrastructure in the rural areas
21	Pradhan Mantri Aawas Yojana –Garmin (PMAY-G)	1 <sup>st</sup> April 2017	To provide ‘Housing for All by 2022’ with improved scheme architecture and robust delivery and monitoring mechanism
22	Jal Jeevan Mission (JJM)	August 2019	To enable every rural household get assured supply of potable piped water at a service level of 55 Liters Per Capita Per Day (LPCD) regularly on long-term basis by ensuring functionality of the tap water connections
23	Garib Kalyan Rojgar Abhiyan (GKRA)	20 <sup>th</sup> June 2020	To make provision for the livelihood opportunities to returning migrants and similarly affected rural citizens, saturate villages with public infrastructure viz. roads, housing, Anganwadis, Panchayat Bhavans, various livelihood assets and community complexes, among others and a basket of a wide variety of works

**Source :** Indian Economy, Magbook, Government Schemes and Programmes, Arihant Publications India Limited, 2021.

### **3.22. Conclusion**

Investment in socio-economic infrastructure in rural areas improves rural economy and quality of life and also ensured to rural health, housing, drinking water supply, sanitation, road connectivity, electricity etc., in order to bring overall improvement in socio-economic indicators and achieving Sustainable Development Goals (SDGs). Thus, rural infrastructure plays a vital role in promoting all economic activities throughout the country. Since India is predominantly agrarian and rural in nature. It is inevitable to focus much on the development of rural infrastructure. This in turn will lead to the growth and development of all the sectors of the Indian economy. Policy makers need to focus more in this regard.

Rural road development in Karnataka has been discussed in the ensuing chapter.

## **Chapter-04**

# **RURAL ROAD DEVELOPMENT IN KARNATAKA - AN ANALYSIS**

---

- 4.0. Introduction**
  - 4.1. The Road - A Brief Reference to Early History**
  - 4.2. A Brief History of Road Development in India**
  - 4.3. Status of Road Transport in Karnataka**
  - 4.4. Road Development in Karnataka (1956-2021)**
    - 4.4.1. National Highways in Karnataka (1956-2021)**
    - 4.4.2. State Highways in Karnataka (1956-2021)**
    - 4.4.3. District Roads in Karnataka (1956-2021)**
  - 4.5. Village Roads/Rural Roads**
  - 4.6. Historical Development of Rural Roads**
  - 4.7. Rural Roads during Five Year Plans**
  - 4.8. Target for Connectivity of Villages - Vision-2025**
  - 4.9. Rural Road Development in Karnataka (1956-2021)**
    - 4.9.1. Rural Road Development in Long-Run (1956-2021)**
    - 4.9.2. Rural Road Development in Short-Run (2007-08 – 2020-21)**
    - 4.9.3. Accessibility of Rural Road Network in Karnataka**
    - 4.9.4. Region-wise Rural Road Network Development in Karnataka**
    - 4.9.5. District-wise Rural Road Network Development in Karnataka**
    - 4.9.6. Status of Rural Roads in Karnataka**
  - 4.10. Rural Road Infrastructure Programmes in Karnataka**
    - 4.10.1. Pradhanan Mantri Gram Sadak Yojane (PMGSY)**
    - 4.10.2. Chief Minister Grama Sadak Yojana (CMGSY)**
    - 4.10.3. Namma Grama Namma Raste Yojane (NGNRY)**
  - 4.11. Conclusion**
-

## **Chapter-04**

### **RURAL ROAD DEVELOPMENT IN KARNATAKA - AN ANALYSIS**

#### **4.0. Introduction**

In the previous chapter, information about Economic and Social Infrastructure in India - An Overview was discussed. In the present chapter an attempt is made to briefly explain the history of road development in India in general and to explain rural road development in Karnataka in particular. It further explains 65 years of growth of National Highways (NHs), State Highways (SHs), and District Roads (DRs) and region-wise NHs, SHs and DRs Development in Karnataka. The growth of rural road in Karnataka in short-run (2007-08 to 2019-2021) and long run (1956 and 2021) has also been explained. Required data has been used and present status of road transport is highlighted.

The total length of rural road in India was of the order of 2.06 lakh km in 1951 and was 1.9 million km in 2001,<sup>1</sup> which increased to 2.7 million km and 4.5 million km in 2011 and 2021 respectively.<sup>2</sup> The total length of rural road in Karnataka was of the order of 2,373 km in 1956 and was 1,15,840 km in 2006 and it increased to 1,77,542 km and 1,98,501 km in 2016 and 2021 respectively.<sup>3</sup> This amounted to 8265 percentage point's increase between 1956 and 2021, which is a noticeable feature.

---

<sup>1</sup> Basic Road Statistics in India – 2015-16. Ministry of Road Transport and Highways, Transport Research Wing, Government of India, New Delhi, pp. 29-30.

<sup>2</sup> Annual Report – 2020-21. Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi, pp. 25-26.

<sup>3</sup> Economic Survey of Karnataka – 2020-21. Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.

In Karnataka huge amount is being spent for the improvement of rural road infrastructure through various programmes with special focus on All Weather Roads. It is heartening to note that 77.51 per cent of villages in Karnataka have an access to all weather roads. In the case of 178 out of 227 taluks, the percentage of villages having access to all weather roads was higher than the state average of 50 per cent. Only about 9 per cent of taluks i.e., 21 out of 227 taluks was the proportion of villages having access to all weather roads which is less than 50 per cent. The poor access to All Weather Roads (AWR) was primarily noticed in the Raichur and Belagavi and hilly districts of Dakshina Kannada, Uttara Kannada, Chikkamagaluru and Hassan.<sup>4</sup>

#### **4.1. The Road - A Brief Reference to Early History**

The earliest roads developed from the paths and trails of pre-historic people. Their construction was concurrent with the appearance of wheeled vehicles, which was probably in the area between the Caucasus Mountains and the Persian Gulf sometime before 3000 B.C. Road systems were developed that connected the civilization of Mesopotamia and Egypt and facilitated trade. The first major road was the Persian Royal Road, which extended from the Persian Gulf to the Aegean Sea covering a distance of 1,775 miles (2,857 km) and was used since 3500 to 300 B.C.<sup>5</sup>

---

<sup>4</sup> Economic Survey of Karnataka – 2021-22. Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2022, p. 543.

<sup>5</sup> Benson, F.J. and Lay, M.G. (2010). *The New Encyclopedia of Britannica*, Inc., 15<sup>th</sup> Edition, Vol. 28, p. 98.

The “Amber Routes” were the earliest European roads and extended from Greece and Tuscany to the Baltic Sea. In East Asia, the Chinese built a road system that linked for about 2,000 miles (3,200 km). The techniques used to build these early roads varied. Civilizations around the Indus Valley built roads of brick cemented together with bitumen and provided drains for water run-off. The Mouryan Empire created a “Ministry of Public Works” to keep road system in good condition.<sup>6</sup>

#### **4.2. A Brief History of Road Development in India**

There are innumerable references to the Road Policy and Road Construction in vogue in different periods in India. The excavations at Mohenjo-Daro in Sindh and Harappa in Punjab have related that in these cities which existed between 3,500 and 2,500 B.C. There were broad streets with proper drainage system. Emperor Ashoka - recognized the importance of highways in the fourth century B.C. For the first time the British Government in 1943 convinced a Conference of Road Engineers at Nagpur which gave out a Blue Print for the Road Development in the country popularly known as ‘*Nagpur Plan*’. The Plan clearly classified the roads in country and assessed the needs of roads for 20 years and laid down ambitious construction targets for ten years. The responsibilities of central provincial and local bodies were also clearly indicated.<sup>7</sup>

---

<sup>6</sup> Ibid., p. 99.

<sup>7</sup> Balappa (2016). Impact of Rural Roads on Rural Economy: A Case Study of Kolar District. *Journal of Development and Social Change*, Vol. XII, No. 1 & 2, p. 135.

### 4.3. Status of Road Transport in Karnataka

The total length of roads in Karnataka is 3,29,926 km as on March 2022.

Details of rural connectivity are shown below in Table 4.1.

**Table 4.1**  
**Status of Road Transport in Karnataka**

(km)

Category	2020-21	2021-22
(01)	(02)	(03)
National Highways	7652 (02.30)	7589 (2.30)
State Highways	28985 (08.75)	27811 (8.40)
Major District Roads	55474 (16.75)	56131 (17.00)
Other Roads (Including Municipal Roads)	40487 (12.20)	43957 (13.30)
Rural Roads	198501 (60.00)	194438 (59.00)
<b>Total Roads</b>	<b>331099 (100.00)</b>	<b>329926 (100.00)</b>

*Note : Figures in brackets show percentage to total.*

*Source : Economic Survey of Karnataka - 2020-21, 2021-22. Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2022, p. 344.*

### 4.4. Road Development in Karnataka (1956-2021)

In Karnataka, the development of rural roads and their monitoring activities had been under the jurisdiction of Public Works Department till the end of 1999. From 1<sup>st</sup> January 2000 onwards, the development of rural roads, technical supervision and monitoring functional responsibilities were transferred to Rural Development and Panchayat Raj Department.



In the year 1956, the total road length remained at 43,182 km including 2373 km village roads in Karnataka. It has increased to 3,31,099 km as on 31<sup>st</sup> March 2021, spreading over an area of 1,91,791 sq.km. The average road length per 100 sq. km of areas amounts to 173 km and road length per lakh population is 542 km as per the 2011 census.<sup>8</sup>

According to the Nagpur Plan (1943), the total road network has been classified into four major types, viz., National Highways (NHs), State Highways (SHs), District Roads (DRs) and Village Roads (VRs).

#### **4.4.1. National Highways in Karnataka (1956-2021)**

The NHs connects inter-states, metropolitan cities, state capitals and other centers of the country. The NHs would be obviously surfaced with block top and concrete. Karnataka state has 7652 km length of NHs in the year 2021, which is about 2.30 per cent share in the total road length of all categories. Of the total NHs in India, the State's share is about 5.75 per cent ranking 5<sup>th</sup> place in the same year.<sup>9</sup>

Statistical information pertaining to six and half decades from 1956-2021, as regards to the decadal growth of NHs in the state is presented in Table 4.2.

---

<sup>8</sup> Economic Survey of Karnataka – 2020-21. Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.

<sup>9</sup> Annual Report – 2020-21. Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi.

**Table 4.2**  
**National Highways in Karnataka, 1956-2021**

(Road Length in km)

Year	Category of Roads			
	NHs	Decadal Growth Rate of NHs (%)	Length of Road per lakh Population*	Per 100 sq.m.
(01)	(02)	(03)	(04)	(05)
1956	864	-	04.45	00.45
1966	1269	46.87	05.38	00.66
1976	1968	55.39	06.72	01.02
1986	1968	-	05.30	01.02
1996	1997	01.47	04.44	01.04
2006	3973	98.94	07.52	02.07
2016	6572	65.42	10.75	03.42
2017	6572	-	10.75	03.42
2018	6572	-	10.75	03.42
2019	6066	(-) 7.69	9.92	3.16
2020	6612	09.00	10.81	3.44
2021	7652	5.42	12.51	3.98
<b>% increase over 1956</b>		<b>785.64</b>		
<b>CAGR</b>		<b>3.41</b>		

*Note :* Total Geographical Area of the State 1,91,791 sq.km.

\* Distributed based on the Respective period of total population of the country Census Report 1951 to 2011.

CAGR- Compound Annual Growth Rate.

*Source :* 1) Management Information System, Public Works, Ports and Land Water Transport Department, Government of Karnataka, March 2016, pp. 31-46.

2) Directorate of Economics and Statistics, Rural Development and Panchayat Raj Department and Karnataka Rural Road Development Agency, Government of Karnataka, Bengaluru, March 2016-2020.

3) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, Government of Karnataka, Bengaluru, March 2021, p. 399.

It can be inferred from the Table 4.2 that over 65 years (1956-2021) period, the length of NHs in Karnataka has increased substantially. In the year 1956, there was 864 km length of NHs in Karnataka. This has increased to 7652 by 2021. In the year 2006, registering as high as 98.94 percentage points growth compared to about 65.42 percentage points growth compared to 65.42 percentage between the decadal periods of 2006-2016 and for about 55.39 percentage points between 1966 and 1976. It could also be viewed from the above Table that the NHs in Karnataka had not been developed between 1976 and 1986.

This was found about 3.98 km of roads length per 100 sq.km and 12.51 km per lakh population in 2021. Thus, the road length of NHs per unit sq.km increased from 0.45 to 3.98 km between 1956 and 2021 and per lakh population had increased from 4.45 to 12.51 km during the same period of time.

#### **4.4.2. State Highways in Karnataka (1956-2021)**

The SHs connect NHs, district headquarters and other important centres within the state boundary. These roads have been of bituminous or cemented, designed to cater huge vehicle traffic. Construction and maintenance of the SHs is the responsibility of the concerned State Governments. However, the funds are also being provided from the Central Road Fund (CRF) by the Union Government. In Karnataka, of the total SHs in India, the state's share was about 10.44 per cent<sup>10</sup>. Statistical information pertaining to the road network of SHs in the State between 1956 and 2021 is presented in Table 4.3.

---

<sup>10</sup> Annual Report – 2020-21. Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi, p. 40.

**Table 4.3**  
**State Highways in Karnataka, 1956-2021**

(Road Length in km)

Year	Category of Roads			
	SHs	Decadal Growth Rate of SHs (%)	Length of Road per lakh Population*	Per 100 sq.m.
(01)	(02)	(03)	(04)	(05)
1956	5983	-	30.84	03.11
1966	6640	10.98	28.15	03.46
1976	7554	13.76	25.78	03.93
1986	7912	04.73	21.31	04.12
1996	11395	44.02	25.34	05.94
2006	17405	52.74	32.93	09.07
2016	19578	12.48	32.04	10.20
2017	19578	-	32.04	10.20
2018	19578	-	32.04	10.20
2019	19570	(-) 0.04	32.01	10.19
2020	19934	1.85	32.60	10.39
2021	28985	45.40	47.41	15.11
<b>% increase over 1956</b>	<b>384.45</b>			
<b>CAGR</b>		<b>2.46</b>		

*Note :* Total Geographical Area of the State 1,91,791 sq.km.

\* Distributed based on the Respective period of total population of the country Census Report 1951 to 2011.

CAGR- Compound Annual Growth Rate.

- Source :** 1) Management Information System, Public Works, Ports and Land Water Transport Department, Government of Karnataka, March 2016, pp. 31-46.  
2) Directorate of Economics and Statistics, Rural Development and Panchayat Raj Department and Karnataka Rural Road Development Agency, Government of Karnataka, Bengaluru, March 2016-2020.  
3) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, Government of Karnataka, Bengaluru, March 2021, p. 399.

The statistical data provided in Table 4.3 reveals that between the years 1956 and 2021, the NHs recorded about 384.45 per cent of growth and nearly 3.84 times expansion in Karnataka between 1956 and 2021. It can also be observed that the highest rate of growth, in respect of the State Highways in the state was recorded at 52.74 per cent between 1996 and 2006. Further, it is also found that during 65 years period, in 1956 the road length of SHs per lakh population has 30.84 and per 100 sq.km has 3.11 km. It has increased 47.41 and 15.11 km in 2021 respectively.

#### **4.4.3. District Roads in Karnataka (1956-2021)**

The district road network refers to MDRs and ODRs. MDRs significantly connect NHs, SHs, market centers, railways and other important regional activities. MDRs and ODRs connect the district headquarters, taluk headquarters and rural areas. The State Government is the responsible authority for construction and maintenance of such roads. Of the total MDRs in India, the state's share was about 8.17 per cent.<sup>11</sup> Data presenting to 65 years period to the growth of MDRs in Karnataka are provided in Table 4.4.

---

<sup>11</sup> Annual Report – 2020-21. Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi, p. 43.

**Table 4.4**  
**Major District Roads in Karnataka, 1956-2021**

(Road Length in km)

Years	Category of Roads			
	MDRs	Decadal Growth Rate of MDRs (%)	Length of Road per lakh Population*	Per 100 sq.m.
(01)	(02)	(03)	(04)	(05)
1956	7006	-	36.11	03.65
1966	13180	88.12	55.88	06.87
1976	12980	(-) 1.51	44.30	06.76
1986	15999	23.25	43.08	08.34
1996	28311	76.95	62.95	14.76
2006	32572	15.05	61.63	16.98
2016	49909	53.22	81.69	26.02
2017	49909	-	81.69	26.02
2018	49909	-	81.69	26.02
2019	50087	0.35	81.93	26.11
2020	50006	(-) 0.16	81.80	26.07
2021	55474	10.93	90.74	28.92
<b>% increase over 1956</b>		<b>691.80</b>		
<b>CAGR</b>		<b>3.23</b>		

*Note :* Total Geographical Area of the State 1,91,791 sq.km.

\* Distributed based on the Respective period of total population of the country Census Report 1951 to 2011.

CAGR- Compound Annual Growth Rate.

*Source :* 1) Management Information System, Public Works, Ports and Land Water Transport Department, Government of Karnataka, March 2016, p. 103.

2) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, Government of Karnataka, Bengaluru, March 2021, p. 399.

It can be presented from Table 4.4 that the network of MDRs in Karnataka, over a 65 years period has registered as high as 691.80 percentage point's growth and nearly 7 times of expansion. During the decadal period of 1956-1966, the

length of MDRs in Karnataka increased drastically from 7006 to 13180 km registering 88.12 percentage changes. Also, it is witnessed that due to the upgradation of MDRs as SHs, the length of MDRs in Karnataka had fallen by -1.51 per cent between the years 1966 and 1976. Further, in a decade of 2006 to 2016, about 17,337 km length of more road network has been added to the MDRs category in Karnataka, and by this the total length of MDRs stood at 55,474 km in 2021.

The data also proves that the road length of MDRs per lakh population and per 100 sq.km in Karnataka has increased from 36.11 and 3.65 km respectively in 1956 to 90.74 km and 28.92 km in 2021, explaining increased accessibilities of roads of different categories in the state over 1956.

#### **4.5. Village Roads/Rural Roads**

Village roads serve as the feeder roads as well as the roads for inter village movements. They pass through rural areas connecting the village to one another and to the nearest road of higher category; viz., DRs, SHs and NHs. The rural road network in India remained at 45,35,511 km of length in the year 2021 and it has been 64.93 per cent of the total road network.<sup>12</sup>

The term rural road has a very wide implication. Any stretch of land joining two terminals is a road. Rural roads provide connectivity in rural areas for the transportation of goods for production, consumption, investment transportation of people in pursuit of education and employment besides transporting them for the purpose of travel and tourism.

---

<sup>12</sup> Annual Report – 2020-21. Ministry of Road Transport and Highways, Transport Research Wing, GoI, New Delhi, pp. 25-26.

The rural road connectivity consists of Zilla Panchayat roads, Gram Panchayat roads and community roads, following the 73<sup>rd</sup> Constitutional Amendment in 1992, State Governments are assigned with the responsibility for management of rural roads to Panchayat Raj Institutions (PRIs) and to remit necessary financial resources for this purpose.<sup>13</sup> In India entire rural road network is spread overall the states and the two Union Territories of Daman & Diu and Puducherry.<sup>14</sup>

In a Report, the Economist (2011) it is noted that the rural road scheme and Mahatma Gandhi Rural Employment Guarantee to be India's biggest single welfare project, costing over \$ 8 billion a year. Further noted that, it eats up over 3 per cent of all public spending in India.<sup>15</sup>

#### **4.6. Historical Development of Rural Roads**

Since 1940, the Government of India and State Government have implemented several policies, programmes and have conceived various schemes for the development of rural roads in India. The policies framed and targets were set-up under the long-term road development plans and accordingly funds were allocated in various rural development programme schemes under the Five-Year Plans.

*The Sinha Committee* has defined rural roads as those roads which serve predominantly the need of village and provide communication not only between

---

<sup>13</sup> Sector Assessment: Road Transport, Rural Connectivity Investment Programme (RRP IND 40423), Government of India (www.adb.org).

<sup>14</sup> Ishita and Tripathy (2014). Development of Rural Roads. *Kurukshetra – A Journal of Rural Development*, Division Ministry of I&B, GoI, New Delhi, Vol. 62, No. 12, p. 61.

<sup>15</sup> Indian Rural Welfare: Digging Holes, A Report. *The Economist*, 5<sup>th</sup> November 2011.



one village and another but also from one village manday i.e., Market place and to the main road.<sup>16</sup>

The first of its kind was Minimum Needs Programme (MNP) was introduced during fifth Five Year Plans. Rural roads were considered as one of the basic needs of the rural community in addition to other basic needs such as education, health, electrification and housing in rural areas. The programme envisaged connectivity of all villages with population of 1500 and above as per 1971 census, with an all-weather road by the end of the Fifth Five Year Plan. It also proposed a cluster approach for connectivity in respect of hilly, coastal, tribal and desert areas where the villages are smaller in population size.<sup>17</sup>

A Working Group on Rural Roads set up by the Planning Commission of India in 1978 to formulate connectivity criteria and make projects of road length and estimate requirement of funds for development of funds for the development of rural roads. This committee estimated that an amount around ` 11,000 crores (at 1978 prices) would be required to connect all villages with All-Weather Road.

#### **4.7. Rural Roads during Five Year Plans**

India has witnessed a gradual and phenomenal increase in rural road connectivity during the past 65 years under various Five Year Plans.

---

<sup>16</sup> The Government of India appointed a One-Man Commission, under the Chairmanship of Shri H.P. Sinha to make recommendations regarding developing rural roads in the country in the year 1967.

See, Working Group on Rural Roads (Final Report) in the 11<sup>th</sup> Five Year Plan, Ministry of Rural Development, GoI, Planning Commission, November 2006, p. 16.

<sup>17</sup> Balappa (2016). *Op. Cit.*, p. 136.

- Since *Fifth Five Year Plan (1974-79)*, funds are allocated under various rural development programmes such as Minimum Needs Programme (MNP), National Rural Employment Programme (NREP), Rural Landless Employment Guarantee Programme (RLEGP) and Jawahar Rozgar Yojana (JRY) for the development of rural roads.
- In the *Sixth Five Year Plan (1980-85)*, about 30 per cent of the total road outlay was allocated for rural road sector from some of the recommendations of the working group were taken into consideration while formulating budget for road development.
- The plan outlay under the *Seventh Five Year Plan (1985-90)* was ₹ 1729.40 crore for providing rural connectivity.
- The criteria for connectivity under MNP were periodically revised. During *Eight Five Year Plan (1992-97)*, the criteria for linkage of villages to a road were modified. Priorities were accorded to link all villages population with the population of 1000 and above on the basis of 1981 census and special efforts to accelerate village connectivity in respect of backward regions and tribal areas.
- The connectivity criteria under MNP were once again revised for the *Ninth Five Year Plan (1997-2002)*. The revised norms for connectivity of villages adopted the 1991 population census as the base and the criteria were as follows:

#### **Plain Areas**

- 100 per cent of all villages with above 1000 population and
- 75 per cent of all villages between 500 and 1000 population

### **Hilly Areas**

- 100 per cent of all villages with 500 population
- 75 per cent of all villages with 200-500 population

### **Tribal, Coastal, Riverine and Desert Areas**

- 100 per cent of all villages with above 500 population
- 75 per cent of all villages between 200 and 500 population

#### **• Physical Targets of Tenth Five Year Plan (2002-07)**

The PMGSY envisages providing connectivity to all habitation of 500 and above in all states and 250 and above in hill states, tribal and desert areas. Based on the projects already approved under PMGSY, a further 2,39,000 km of new roads will have to be built to provide connectivity to the remaining eligible habitations under PMGSY.

#### **• Physical Targets of Eleventh Five Year Plan (2007-12)**

It is proposed to connect about qualifying 78,000 habitations with 1.65 lakh km of new roads. Nearly, 1.15 lakh km length of rural roads needs upgradation during Eleventh Five Year Plan under PMGSY. According to PMGSY guidelines, the construction contractors are obligated to provide routine maintenance for the five year.<sup>18</sup>

#### **• Physical Targets of Twelfth Five Year Plan (2012-17)**

The balance work which will not be possible to be completed during the Eleventh Plan. It carried during the Twelfth Five Year Plan in order to achieve the

---

<sup>18</sup> Working Group on Rural Roads (Final Report), *Op. Cit.*, p. 16-17, 29-30.

PMGSY targets of providing 100 per cent connectivity to all eligible habitations. Twelfth Plan estimated that the habitations to be covered would be around 60,000 requiring about 1.05 lakh km road lengths.

#### 4.8. Target for Connectivity of Villages - Vision-2025

The Rural Development Plan Vision-2025 has been brought out to guide the Central and State Governments in developing the rural road infrastructure of adequate standards in the country. Table 4.5 presents the prioritized targets for the provision of All-Weather Roads.

**Table 4.5**  
**Vision-2025 - Target for Connectivity of Villages**

<b>Villages to be Connected by All-Weather Roads (Population Category)</b>	<b>Target Year</b>
<b>(01)</b>	<b>(02)</b>
Villages with above 1000 population	2009-10
Villages with 500-1000 population	2014-15
Villages with below 500 population	2021-22

*Source : Rural Development Plan: Vision-2025, Ministry of Rural Development, GoI, New Delhi, 2007, p. 3.*

The data presented in Table 4.5 shows target for connectivity of villages, Vision-2025. The vision also gives priority by way of special attention to the coastal regions, tribal areas, desert and hilly areas for rural road development in general.<sup>19</sup>

<sup>19</sup> The Vision also recommended for consideration to improve the existing fair-weather roads to All-Weather Standards, by providing adequate cross drainage structure wherever they are missing and also for completion of works in progress.

#### 4.9. Rural Road Development in Karnataka (1956-2021)

A better picture of rural road network in Karnataka is to be explained in two parts i.e., in long run (1956 and 2021) and in short run (2007-08 to 2019-2021) as follows:

##### 4.9.1. Rural Road Development in Long-Run (1956-2021)

The progress of rural road network in Karnataka between the year 1956 and 2021 of statistical information is provided in Table 4.6.

**Table 4.6**  
**Rural Roads in Karnataka, 1956-2021**

(Road Length in km)

<b>Years</b>	<b>Rural Roads</b>	<b>Decadal Growth of Rural Roads (%)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
1956	2373	-
1966	11532	385.96
1976	62602	442.85
1986	85335	36.31
1996	85361	00.03
2006	115840	35.70
2016	177542	53.26
2017	177542	-
2018	190862	7.50
2019	191791	00.48
2020	196119	02.25
2021	1,98,501	1.21
<b>% increase over 1956</b>		<b>8265.00</b>
<b>CAGR</b>	<b>7.05%</b>	

*Note : CAGR- Compound Annual Growth Rate.*

*Source : 1) Hand Book of Karnataka-2010, Karnataka State Gazetteer, GoK.*

*2) Annual Report 2016-17, Rural Development and Panchayat Raj Department, Bengaluru, GoK, March 2016.*

*3) Directorate of Economics and Statistics, Bengaluru, GoK, Rural Development and Panchayat Raj Department, March 2016, p. 83.*

*4) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.*

From the figures presented in the Table 4.6, it can be observed that between the years 1956 and 2021, rural road network in Karnataka has grown by 83 times. In the year 1956, the rural road length was only about 2373 km in the state which was substantially increased to 11532 in 1966 (386 percentage points increase), the road length in the year 2016 had 177542 km registering 53.26 per cent growth rate over 2006. The growth of rural road was lowest registering 0.03 per cent between a decade 1986 and 1996. In the year 2021, the rural road length was only about 198501 km in the state, which was registered highest km of length.

#### 4.9.2. Rural Road Development in Short-Run (2007-08 – 2020-21)

Year-wise data between 2007-08 and 2020-21, including that of quality and type of rural roads in the state is presented in Table 4.7.

**Table 4.7**  
**Rural Roads in Karnataka, 2007-08 and 2020-21**

(Road Length in km)

Year	Rural Roads	% Growth	Surface Type of Rural Roads			Total No. of Habitation	No. of Habitations access to all Weather Roads
			BT	WBM	Un-surfaced*		
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
2007-08	1,47,212	00.00	39394 (26.76)	24730 (16.79)	83088 (56.45)	-	-
2008-09	1,47,212	00.00	39394 (26.76)	24730 (16.79)	83088 (56.45)	1718	-
2009-10	1,47,212	00.00	43845 (29.78)	22059 (14.98)	81308 (55.24)	2235	-
2010-11	1,47,212	00.00	45393 (30.83)	22359 (15.17)	79460 (54.00)	57,417	36,720
2011-12	1,47,212	00.00	47744 (32.43)	25771 (17.50)	73697 (50.07)	57,417	38,057

Contd....

2012-13	1,55,546	05.77	58184 (37.40)	21495 (13.81)	75867 (48.79)	57,417	39,376
2013-14	1,55,546	00.00	58184 (37.40)	21495 (13.81)	75867 (48.79)	68,431	47,043
2014-15	1,55,546	00.00	58184 (37.40)	21495 (13.81)	75867 (48.79)	68,431	47,043
2015-16	1,76,565	13.51	63103 (35.73)	23150 (13.11)	90312 (51.16)	68,431	36,760
2016-17	1,77,542	0.55	63374 (35.70)	23059 (13.00)	91109 (51.30)	64,049	41,631
2017-18	1,90,862	7.50	52521 (27.51)	26026 (13.63)	112315 (58.86)	-	-
2018-19	191791	0.48	57459 (29.95)	24722 (12.90)	109610 (57.15)	64576	47744
2019-20	196119	2.25	66416 (33.72)	26132 (13.32)	109571 (52.96)	64592	50067
2020-21	198501	1.21	-	-	--	-	-
<b>% increase over 2007-08</b>		<b>34.84</b>					

*Note : BT = Black Tap (Asphated Roads), WBM = Water Bound Macadam*

*\* Unsurfaced Roads includes Earthen, Gravel, Track.*

*Source : 1) Annual Reports, 2007-08, 2020-21, Rural Development and Panchayat Raj Department, Bengaluru.*

*2) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.*

The data presented in Table 4.7 reveals that the rural road length remained at 198501 km in Karnataka in the year 2020-21 as against 1,47,212 km in the year 2007-08. This evidenced the fact that the rural road network in Karnataka has increased by 34.84 per cent over 2007-08. In the year 2019-20, there were 64,592 total numbers of habitations in the state and 50,067 numbers of habitations have access to all weather roads.

Further, the Water Bound Macadam Roads have been converted into Block Top Roads over a decade in Karnataka. As on 2019-20, of the total rural road network, about 52.96 per cent was unsurfaced in the state, which registered an increase of 31.87 per cent over 2007-08 and it is really a matter of concern.

#### 4.9.3. Accessibility of Rural Road Network in Karnataka

Data represent to rural road length per lakh of population and per 100 sq.km in the state between 2007-08 and 2020-21 are presented in Table 4.8.

**Table 4.8**  
**Accessibility of Rural Road Network in Karnataka**

(Road Length in km)

<b>Year</b>	<b>Rural Roads</b>	<b>Road Length per lakh Rural Population*</b>	<b>Road per 100 sq.km</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
2007-08	1,47,212	421.94	76.75
2008-09	1,47,212	421.94	76.75
2009-10	1,47,212	421.94	76.75
2010-11	1,47,212	392.01	76.75
2011-12	1,47,212	392.01	76.75
2012-13	1,55,546	414.20	81.10
2013-14	1,55,546	414.20	81.10
2014-15	1,55,546	414.20	81.10
2015-16	1,76,565	470.18	92.06
2016-17	1,77,542	472.78	92.57
2017-18	1,90,862	508.25	99.51
2018-19	191791	510.72	100.00
2019-20	196119	522.25	102.25
2020-21	198501	528.59	103.50

**Note :** \*As on 2011 Census, Karnataka have 3,75,52,529 rural population and 1,91,791 geographical area.

CAGR- Compound Annual Growth Rate.

**Source :** 1) Karnataka at a Glance, 2010, Government of Karnataka.

2) Annual Reports, 2007-08, 2019-20, Rural Development and Panchayat Raj Department, Bengaluru.

3) Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.



The data represented in Table 4.8 reveals that in 2020-21, the rural road network in Karnataka remained at 198501kms, working out to a length of 528.59 km per lakh of population (2011 census) and 103.50 km per 100 sq.km as against of the 421.94 km length per lakh population and 76.75 km per 100 sq.km in the year 2007-08. Thus, it can be argued that during a decade, availability of rural road network per unit of geographical area has been continuously increased in the state of Karnataka.

#### **4.9.4. Region-wise Rural Road Network Development in Karnataka**

The HPCRRI Report stated that of the 50 more backward taluks and 40 less backward taluks in the state of Karnataka, about 37 and 24 taluks were respectively in the North Karnataka and 13 and 16 taluks were in the South Karnataka in the year 2000.<sup>20</sup> This report recommended Eight-Year special development plan to be implemented from 2002-03 to 2009-10, with an outlay of ` 1500 crores. The shares of different divisions, based on the committee estimated Comprehensive Composite Development Index (CCDI) is Gulbarga 40 per cent, Belgaum 20 per cent, Bengaluru 25 per cent and Mysuru 15 per cent.<sup>21</sup> In this respect, improvements made in such regions as regards the accessibility of the rural road network during 2001-2021 are provided in Table 4.9 in the form of statistical information.

---

<sup>20</sup> 90 out of 175 taluks had road lengths less than state average of 68 km per 100 sq.km in 2000. Consequent upon finding the severance of backwardness, it would be classified 90 backward taluks into 'more backward taluks' (50) and 'less backward taluks' (40) based on the deprived nature of roads. Backwardness of the taluks could be scaled based on the roads per lakh population and 100 sq.km per road.

See, HPCRRI Report (High-Power Committee for Redressal of Regional Imbalances Report of Nanjundappa Committee), Planning, Programme, Monitoring and Statistics Department, Government of Karnataka ([www.planning.kar.nic.in](http://www.planning.kar.nic.in)).

<sup>21</sup> Economic Survey of Karnataka – 2018-19. Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2019, p. 28.

**Table 4.9**  
**Region-wise Rural Road Network Development in Karnataka**

(Road Length in km)

Regions*	Rural Road Network (km)			% of Growth Over 2001	Rural Road Length per lakh Rural Population* (km)			Road Length per 100 sq.km		
	2001*	2011**	2021**		2001	2011	2021	2001	2011	2021
(01)	(02)	(03)	(03)	(04)	(05)	(06)	(03)	(04)	(08)	(05)
North Karnataka	36629	62592	74249	103	225	385	402.5	37	63.44	77
South Karnataka	52160	84620	103293	98	280	454	540.6	53	90.85	108
<b>Karnataka</b>	<b>88789</b>	<b>147212</b>	<b>177542</b>	<b>100</b>	<b>254</b>	<b>392</b>	<b>472.8</b>	<b>46</b>	<b>77</b>	<b>93</b>

**Note :** \* As on 2001 Census, 16246641 Rural Population, 98652 sq.km area in North Karnataka & 18642392 Rural Population, 93139 sq.km area in South Karnataka.

\*\* As on 2011 Census, 18447107 Rural Population, 96534 sq.km area in North Karnataka and 19105422 Rural Population, 95257 sq.km area in South Karnataka.

**Source :** 1) Economic Survey of Karnataka 2020-21, Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021, p. 399.

2) Karnataka Annual Growth Report-2010, GoK, Bengaluru, March 2011.

3) Karnataka at a Glance 2020-21, GoK, Bengaluru, March 2021.

From the statistics provided in Table 4.9, it can be viewed that the rural road length in 2001 in North Karnataka and South Karnataka was 36629 km and 52160 km respectively. The same went up to 62592 km and 84620 km in 2011. Further, it increased to 74249 km and 103293 km in 2021. The study reveals that, the rural road network has increased by 103 and 98 percentage points by 2021 in comparison to 2001 in the North Karnataka and South Karnataka respectively.

It can be understood from the above table that the rural road length per lakh population and per 100 sq. km was 225 km and 37 km in 2001, 280 km and 53 km in 2001 respectively in North Karnataka and South Karnataka. It shot upto 385 km & 63.44 km and 454 km & 90.85 km in 2011 and further to increased to 402.5 km & 77 km and 540.6 & 108 km in 2021 respectively in North Karnataka and South Karnataka.

The study found that percentage of growth rate is higher in North Karnataka whereas increase in rural road length is comparatively higher in South Karnataka. However, efforts must be made increase rural road length per lakh persons and per 100 sq.km in Karnataka state in order to provide greater access to rural people.

#### **4.9.5. District-wise Rural Road Network Development in Karnataka**

Table 4.10 gives information as regards district-wise figures of road km with respect to geographical area and population.

**Table 4.10**  
**District-wise Road km per 100 sq.km and Per Lakh of Rural Population in**  
**Karnataka – As on March 2021**

(Rural Road Length in km)

Sl. No.	Districts	Rural Road Length	Road Length per lakh Rural Population (As on 2011 Census) *	Rural Road per 100 sq.km**
1.	Bagalkot	5972.84	462.28	90.58
2.	Belagavi	11290.44	316.46	84.16
3.	Bellary	5295.00	328.26	62.89
4.	Bidar	3560.7	278.91	65.36
5.	Bijapur	8552.15	510.79	81.64
6.	Dharwad	3748.69	470.10	88.62
7.	Gadag	4328.84	631.53	92.95
8.	Gulbarga	6503.29	375.41	59.12
9.	Koppal	3847.93	332.39	45.49
10.	Haveri	3669.39	295.34	75.64
11.	Raichur	4678.59	325.50	84.16
12.	Uttara Kannada	11429.65	1122.52	111.06
13.	Yadgir	2372.01	249.03	45.41
14.	Bengaluru (R)	2872.98	399.27	125.73
15.	Bengaluru (U)	2041.30	234.91	93.21
16.	Chamarajanagara	3039.15	359.38	53.46
17.	Chikkamagaluru	6739.98	750.49	93.60
18.	Chikkaballapura	3600.51	369.21	85.52
19.	Chitradurga	6673.94	501.04	79.57
20.	Davanagere	5372.69	407.70	89.28
21.	Dakshina Kannada	9157.75	838.71	189.09
22.	Hassan	8475.55	605.74	124.38
23.	Kolar	4213.16	398.61	105.75
24.	Kodagu	4039.85	852.90	98.48
25.	Mandya	7050.48	470.08	142.12
26.	Mysuru	6738.73	383.66	107.49
27.	Ramanagara	2460.74	301.79	68.81
28.	Shivamogga	11613.64	1025.68	137.21
29.	Tumakuru	11786.92	567.04	111.22
30.	Udupi	6415.42	760.27	178.31
	<b>Karnataka</b>	<b>177542.31</b>	<b>472.78</b>	<b>103.23</b>
	<b>No. of Districts listed in Below State Average</b>		<b>18</b>	<b>16</b>

*Note* : \*Districted based on the respective period or rural population of the respective district (as on 2011 Census).

\*\* Distributed based on the geographical area of respective district (as on 2011 Census).

*Source* : Directorate of Economics and Statistics, Rural Development and Panchayat Raj Department, GoK, Bengaluru, March 2021.

When one compares the actual road length per lakh population and km per 100 sq.km with the state average one of the states lags, of 18 and 16 out of 30 districts respectively. Rural road length has been the state average of 522.25 km per lakh population and 102.25 km per 100 sq.km as on March 2021. It is presented in the Table 4.10.

#### 4.9.6. Status of Rural Roads in Karnataka

The total length of rural roads in Karnataka in March 2021 was 1,98,501 km as per District Rural Road Map. Details of rural connectivity are shown in Table 4.11.

**Table 4.11**  
**Rural Road Statistics (As on March 2021)**

(Road Length in km)

Category of Road	Length (km)	% of Length
(01)	(02)	(03)
Bituminous Surface	61,778	31.12
Metal Surface	21,925	11.04
Earthen/Gravel Roads	1,14,798	57.84
<b>Total</b>	<b>1,98,501</b>	<b>100.00</b>

*Source : Economic Survey of Karnataka 2018-19, 2020-21, Planning, Programme, Monitoring and Statistics Department, GoK, Bengaluru, March 2021.*

#### 4.10. Rural Road Infrastructure Programmes in Karnataka

Karnataka state being predominantly maintenance rural road infrastructure through various programmes or schemes like PMGSY, NABARD, Mukhya Mantri Grameena Rasthe Abivruddi Yojane (CMGSY) and Namma Grama Namma Raste Yojane (NGNRY).

#### 4.10.1. Pradhanan Mantri Gram Sadak Yojane (PMGSY)

PMGSY was launched during December 2000 with an objective to provide rural connectivity by way of All-Weather Roads to eligible habitations having a population of 500 and above. In order to implement the scheme more effectively, Karnataka Rural Road Development Agency has been formed during October 2005. Statistical data shows in Table 4.12, physical and financial progress under PMGSY during the year 2012-13 – 2020-21.

**Table 4.12**  
**Physical and Financial Progress under PMGSY (2012-13 – 2020-21)**

Year	Physical Achievement (Length km)	Financial Achievement (` lakh)
(01)	(02)	(03)
2012-13	356.88	12,836.74
2013-14	211.43	5,598.42
2014-15	628.28	43,320.00
2015-16	830.98	27,784.40
2016-17	921.97	34,311.12
2017-18	58.98	4,861.27
2018-19	6.63	1,113.15
2019-20	00	149.36*
2020-21	495.08	71,329.96
<b>Total</b>	<b>3510.23</b>	<b>2,01,304.42</b>

*Note : \*since the government of India has not approved any new construction work, physical target is not taken into consideration. Further ` 149.36 lakh has been spent from initial amount.*

*Source : Annual Reports 2012-13 to 2020-21, Rural Development and Panchayat Raj Department, GoK, Bengaluru.*

The above statistical data presented in Table 4.12 a glance at physical and financial achievement made in Karnataka under PMGSY for the period from 2012-13 to 2020-21. Overall achievement during period under reference in terms

of investment is ` 2,01,304.42 lakhs and physical achievement over nine years is to the sum of about 3510 km of road length.

The study revealed that, while the highest physical and financial achievement was in different periods. Highest physical achievement was made in the year 2016-17 and highest financial achievement was made in the year 2020-21. In the year 2019-20, witnessed lowest performance in both physical and financial achievement.

#### **4.10.2. Chief Minister Grama Sadak Yojana (CMGSY)**

Under Mukhya Mantri Grameena Rasthe Abivruddi Yojane, the funds so provided have been allocated to Zilla Panchayats as per the HPCRRI report headed by Dr. D.M. Nanjundappa for maintenance of rural roads. The statistical data provided in Table 4.13, physical and financial progress under CMGSY between 2012-13 and 2020-21.

**Table 4.13**  
**Physical and Financial Progress under CMGSY (2012-13 – 2020-21)**

<b>Year</b>	<b>Physical Achievement (Length km)</b>	<b>Financial Achievement (` lakh)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
2012-13	7,295.40	14,590.98
2013-14	7,318.62	14,637.24
2014-15	6,126.67	12,253.18
2015-16	2,169.67	12,874.72
2016-17	2,270.49	11,352.44
2017-18	5,006.75	47,888.20
2018-19	2,850.99	14,647.51
2019-20	3,500.00	2,990.66
2020-21	5,189.00	14,396.62
<b>Total</b>	<b>41,727.59</b>	<b>1,45,631.55</b>

*Source* : Annual Reports 2012-13 to 2020-21, Rural Development and Panchayat Raj Department,, GoK, Bengaluru.

Data in Table 4.13 gives information with regard to nine-years of physical and financial achievement made in Karnataka under CMGSY. Overall physical achievement between 2012-13 and 2020-21 covers a length of about 41,728 km of physical achievement and the study reveals that financial achievement over nine years is to the investment is ` 41,728 lakh.

The researcher found from the study that, while the highest physical and financial achievement was in different periods. Highest physical achievement was made in the year 2012-13 and highest financial achievement was made in the year 2017-18. In the year 2015-16 and 2016-17 lowest performance in physical and financial achievement respectively was witnessed.

#### **4.10.3. Namma Grama Namma Raste Yojane (NGNRY)**

The Government of Karnataka has launched the Namma Grama Namma Raste Yojana in January 2010 to provide all weather access to unconnected habitations. This scheme is a 100 per cent state sponsored scheme. Statistical information presented in Table 4.14, shows Physical and Financial Progress under NGNRY during the year 2012-13 – 2020-21.



**Table 4.14**  
**Physical and Financial Progress under NGNRY (2012-13 – 2020-21)**

<b>Year</b>	<b>Physical Achievement (Length km)</b>	<b>Financial Achievement (` lakh)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
2012-13	1,715.30	48,541.48
2013-14	2,492.09	1,14,394.88
2014-15	2,389.16	47,516.18
2015-16	2,117.50	1,41,084.63
2016-17	2,184.62	1,01,373.65
2017-18	2,077.43	1,31,609.05
2018-19	2,504.62	1,75,664.71
2019-20	940.23	77,492.84
2020-21	620.79	45,285.04
<b>Total</b>	<b>17,041.74</b>	<b>2,18,835.54</b>

*Source: Annual Reports 2012-13 to 2020-21, Rural Development and Panchayat Raj Department, GoK, Bengaluru.*

Statistical data presented in Table 4.14 reveals that about physical and financial achievement recorded under the NGNRY in Karnataka for the period from 2012-13 to 2020-21. The study reveals that physical achievement over nine years is to the extent length of 17,042 km of length. Highest amount was made in the year 2018-19. It can also be observed that the lowest achievement was made in 2020-21.

We will have a glance at financial achievement made in Karnataka under NGNRY for the period of nine-years. Overall achievement during period under

reference in terms of investment is ` 2,18,836 lakh. It can also be seen that while the highest achievement was made in the year 2018-19. The lowest achievement was made in the year 2020-21.

It is evident from the study that, highest physical and financial achievement was in same time periods. In the year 2020-21 witnessed lowest performance in both physical and financial achievement. The reason for poor performance is obvious. The economy was reeling under negative impact of pandemic during the last year under consideration.

#### **4.11. Conclusion**

Rural roads connectivity leads to socio-economic development of rural people. Improvement of rural road will have direct bearing in improving the conditions of rural people. It has not been possible to improve rural roads for the last many years. In the state of Karnataka still 61.43 per cent people live in rural areas. Hence, there is an urgent need of considerable amount of funds for improvement under various programmes. This will have a major impact on the development of secondary and tertiary sectors of the rural economy.

## **Chapter-05**

# **RESEARCH RESULTS, DISCUSSION AND INTERPRETATION**

---

### **SECTION - A**

#### **A Brief Account of NGNRY in the Study Regions**

- 5.1. Financial Allocation and Utilization under the NGNRY in the Study Divisions**
- 5.2. Physical Achievement of the NGNRY in the Study Divisions**
- 5.3. Allocation and Utilization of Funds under the NGNRY in the Study Regions**
- 5.4. Physical Achievement of the NGNRY in the Study Regions**
- 5.5. Phase-wise Road Construction in the NGNRY Roads in the Study Regions**

### **SECTION-B**

#### **A Brief Profile of Study Region**

- 5.6. Profile of Hassan District**
- 5.7. Profile of Yadgir District**

### **SECTION-C**

#### **Part-I**

#### **Views of NGNRY Road Users**

- 5.8. Age-wise Distribution**
  - 5.9. Gender-wise Classification**
  - 5.10. Educational Level**
  - 5.11. Occupation**
  - 5.12. Awareness about Programmes**
-

- 
- 5.13. Travel Frequency of Users**
  - 5.14. Quality of NGNRY Roads**
  - 5.15. Mode of Transport**
  - 5.16. Impact on Employment Generation**
  - 5.17. Impact on Education**
  - 5.18. Health Infrastructure**
  - 5.19. Impact on Agricultural Infrastructure**
  - 5.20. Impact on Social Aspects**
  - 5.21. Impact on Business, Culture and Modernization in Rural Areas**
  - 5.22. Users' Overall Views on Rural Road Conditions**
  - 5.23. Quality of the Surface**
  - 5.24. Users Overall Views on NGNRY Road Conditions**
  - 5.25. Quality of NGNRY Roads**
  - 5.26. Users View on the Short Life of NGNRY Roads**
  - 5.27. NGNRY Roads with Other Rural Roads**
  - 5.28. Proper Maintenance of NGNRY Roads**
  - 5.29. Adequate Construction of the NGNRY Roads**
  - 5.30. Safety of NGNRY Roads to Travel**
  - 5.31. Effective Implementation of NGNRY Roads**
  - 5.32. Adequate Maintenance of NGNRY Roads**
  - 5.33. NGNRY Road User's Satisfaction Index**
  - 5.34. Own Vehicle**
  - 5.35. Availability of Facilities/Provisions in the Study Area**
  - 5.36. Role and Impact of NGNRY in the Study Regions**
  - 5.37. Socio-Economic Factors and Level of Performance of NGNRY**
  - 5.38. Issues on Marketing of Agricultural Produce**
-

---

**Part-II**

**The Contractors Views**

- 5.39. General Information about the Contractors**
- 5.40. Experience in the Field**
- 5.41. Contractors Views on the Programme**
- 5.42. Creation of Employment**
- 5.43. Labour**
- 5.44. Wage**
- 5.45. Deterioration of NGNRY Roads - The Contractors' Views**

**Part-III**

**The PIU Authorities of the NGNRY**

- 5.46. The Working of PIU Authorities**
  - 5.47. Authorities Views on Implementation in the Study Region**
  - 5.48. Reasons for the Deterioration of Roads - The Authorities Views**
-

## **Chapter-05**

### **RESEARCH RESULTS, DISCUSSION AND INTERPRETATION**

This chapter is on presentation of research results along with discussion and interpretation of field survey data. Prior to such an analysis, it would be contextual to provide a brief account of physical and financial status of the NGNRY in the study region. This chapter is presented in three sections. Section-A provides brief information, based on the secondary data, about the implementation status of the NGNRY in the study area; Section-B has been earmarked for a brief narration of profile of districts which have been chosen for the present study and Section-C is devoted to an analysis of research results along with discussion and interpretation of the data gathered through primary investigation between October and November 2020.

#### **SECTION - A**

##### **A Brief Account of NGNRY in the Study Regions**

This part contains brief information as regards the connectivity status of the NGNRY programme in the study region, including; the number of habitations connected, length of roads constructed, financial expenditure and cost per km. incurred under the programmes.

##### **5.1. Financial Allocation and Utilization under the NGNRY in the Study Divisions**

Statistical information as regards the year-wise and region-wise (2013-14 to 2019-20), financial allocation and utilization of funds under the NGNRY in the study division is presented in Table 5.1.

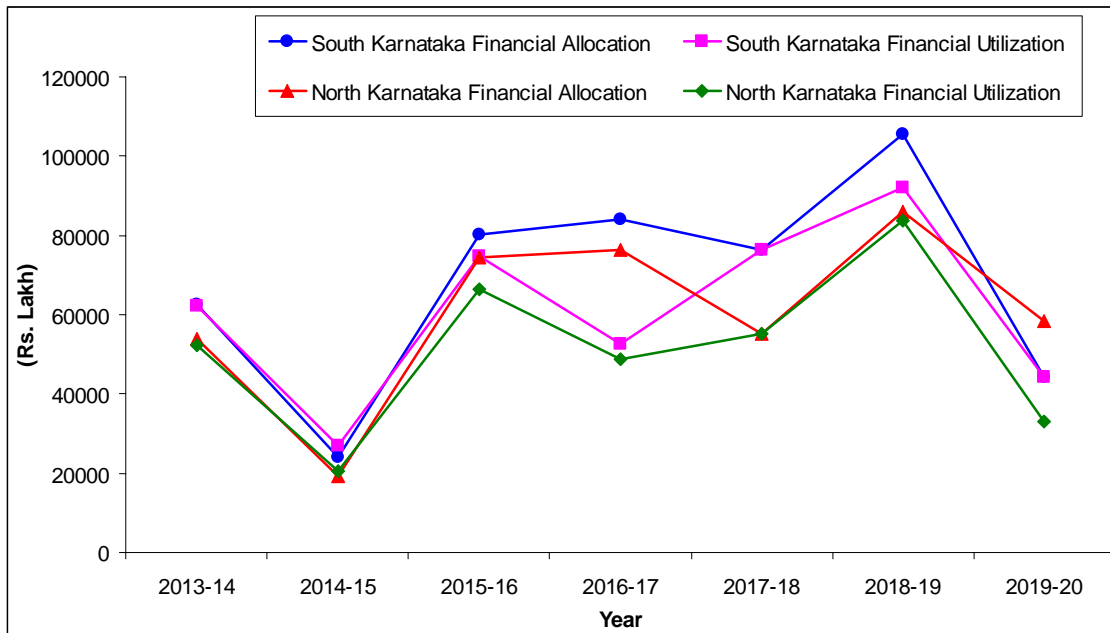
**Table 5.1**  
**Financial Allocation and Utilization under the NGNRY (2013-14 to 2019-20)**

( ₹ Lakh)

Year	South Karnataka			North Karnataka		
	Financial Allocation	Financial Utilization	% of Utilization of Funds	Financial Allocation	Financial Utilization	% of Utilization of Funds
(01)	(02)	(03)	(04)	(05)	(06)	(07)
2013-14	62560.92	62208.78	99.43	53790.55	52186.12	97.01
2014-15	24060.82	26952.10	112.01	19259.18	20564.08	106.77
2015-16	80167.97	74751.66	93.24	74592.11	66332.98	88.92
2016-17	84035.64	52623.24	62.62	76383.76	48750.41	63.82
2017-18	76321.01	76321.01	100.00	55288.05	55288.05	100.00
2018-19	105471.98	92061.62	87.28	86137.25	83603.09	97.05
2019-20	44392.77	44307.84	99.80	58277.25	33184.99	56.94
<b>Total</b>	<b>477011.11</b>	<b>429226.25</b>	<b>89.98</b>	<b>423728.15</b>	<b>359909.72</b>	<b>84.93</b>

*Source : Annual Report, Rural Development and Panchayat Raj Development, Government of Karnataka, 2013-14 to 2019-20.*

**Graph 5.1. Financial Allocation and Utilization under the NGNRY (2013-14 to 2019-20)**



Statistical data provided in Table 5.1 gives information about financial allocation and utilisation under the NGNRY during the study period from 2013-14 to 2019-20. It indicates inconsistent trend in both the regions. During this period in South Karnataka allocation received was a total of about ` 4,77,011.11 lakh as against the utilization of ` 4,29,226.25 lakh (89.98%). In North Karnataka allocation received was about ` 4,23,728.15 lakh and utilization was about ` 3,59,909.72 lakh (84.93%). It is clear that as compared to South Karnataka both allocation and utilization of funds are lower in North Karnataka. It is also clear that, for reasons unknown to us the ability to use the allocated funds in North Karnataka is definitely lower.

### 5.2. Physical Achievement of the NGNRY in the Study Divisions

Statistical information as regards year-wise and region-wise (2013-14 to 2019-20) length of roads in Karnataka under the NGNRY is presented in Table 5.2.

**Table 5.2**  
**Road Length under the NGNRY from 2013-14 to 2019-20**

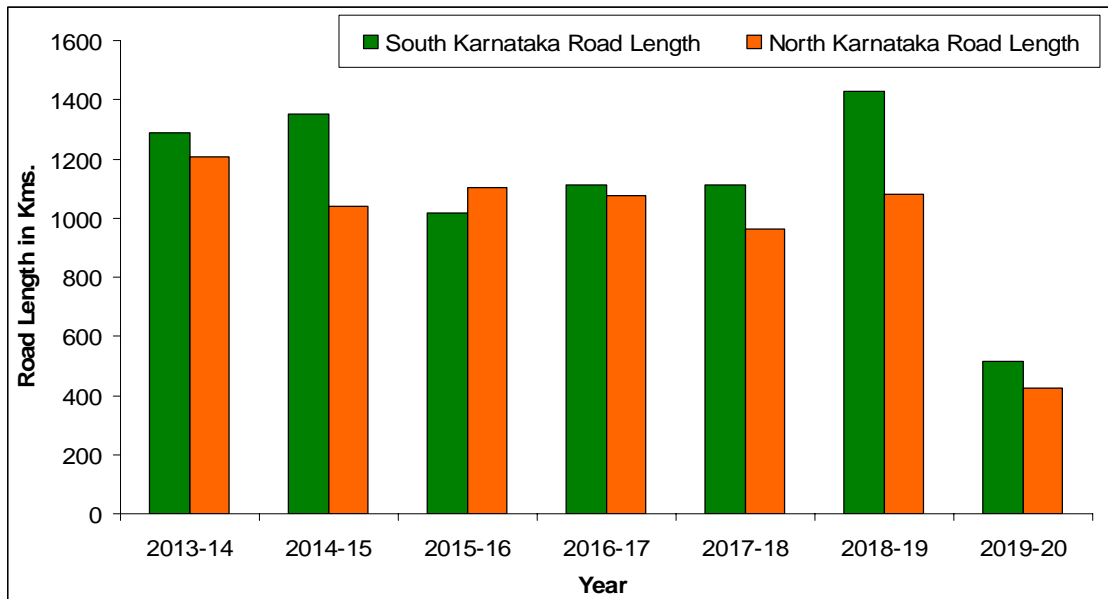
(Road Length in Kms.)

Year	South Karnataka		North Karnataka		Karnataka	
	Road Length	% Change Over the Previous Period	Road Length	% Change Over the Previous Period	Road Length	% Change Over the Previous Period
(01)	(02)	(03)	(04)	(05)	(06)	(07)
2013-14	1286.77	-	1205.35	-	2492.12	-
2014-15	1349.91	04.90	1039.25	(-) 13.78	2389.16	(-) 04.13
2015-16	1016.83	(-) 24.67	1100.71	5.91	2117.54	(-) 11.36
2016-17	1110.53	09.21	1074.00	(-) 2.42	2184.53	03.16
2017-18	1113.18	02.38	964.25	(-) 10.21	2077.43	(-) 04.90
2018-19	1426.34	28.13	1078.28	11.82	2504.62	20.56
2019-20	516.52	(-) 63.08	423.72	(-) 60.70	940.24	(-) 62.45
<b>Total</b>	<b>7820.08</b> <b>(53.14)</b>		<b>6885.56</b> <b>(46.86)</b>		<b>14705.64</b> <b>(100.00)</b>	
<b>% change over 2013-14</b>		<b>(-) 59.85</b>		<b>(-) 64.84</b>		<b>(-) 62.27</b>

*Note : Figures in bracket are percentage to total.*

*Source : Annual Report, Rural Development and Panchayat Raj Development, Government of Karnataka, 2013-14 to 2019-20.*



**Graph 5.2. Road Length under the NGRY from 2013-14 to 2019-20**

From the statistical data provided in Table 5.2, it can be understood that the road length constructed during the study period of 2013-14 to 2019-20 indicates inconsistent trend in both parts of Karnataka state. In South Karnataka, the annual growth rate which stood at 4.9 per cent in 2014-15. The annual growth rate of road construction was less by -24.67 over the period 2014-15 figures. It became 9 per cent in 2016-17 but annual growth rate in 2017-18 was only 2.38 per cent. It suddenly shot upto 28.13 per cent in 2018-19 and suddenly dipped to -63.08 per cent in 2019-20.

In North Karnataka annual growth rate became negative (-13.78%) in 2014-15 but it increased to 5.91 per cent in 2015-16, in the succeeding two years negative trend can be noticed which is evident from the Table which indicates -2 per cent and -10 per cent in 2016-17 and 2017-18 respectively. There was positive growth rate of 11.82 per cent in 2018-19 and growth rate dipped to -60.70 per cent in 2019-20. It shows that there is inconsistency in annual growth rate in both the regions of the state. The compound effect of this is reflected in physical

achievement in road construction in Karnataka state as whole. *Here, the hypothesis, as compared to the South Karnataka, implementation of NGNRY has partially failed in North Karnataka, has been verified and proved in the study and is accepted.*

From 2019-20 onwards, under the NGNRY, there was a fall in sanctioned funds for rural road network in the study districts due to COVID-19.

### 5.3. Allocation and Utilization of Funds under the NGNRY in the Study Regions

The financial sanction for the programme is being made based on the preparation of appropriate proposal. According to the NGNRY guidelines, cost estimation is the responsibility of the PIUs in respective districts. Statistical information pertaining to year-wise amount released under the NGNRY by the state government during the period 2013-14 to 2019-20 in the study districts of Hassan and Yadgir is provided in Table 5.3.

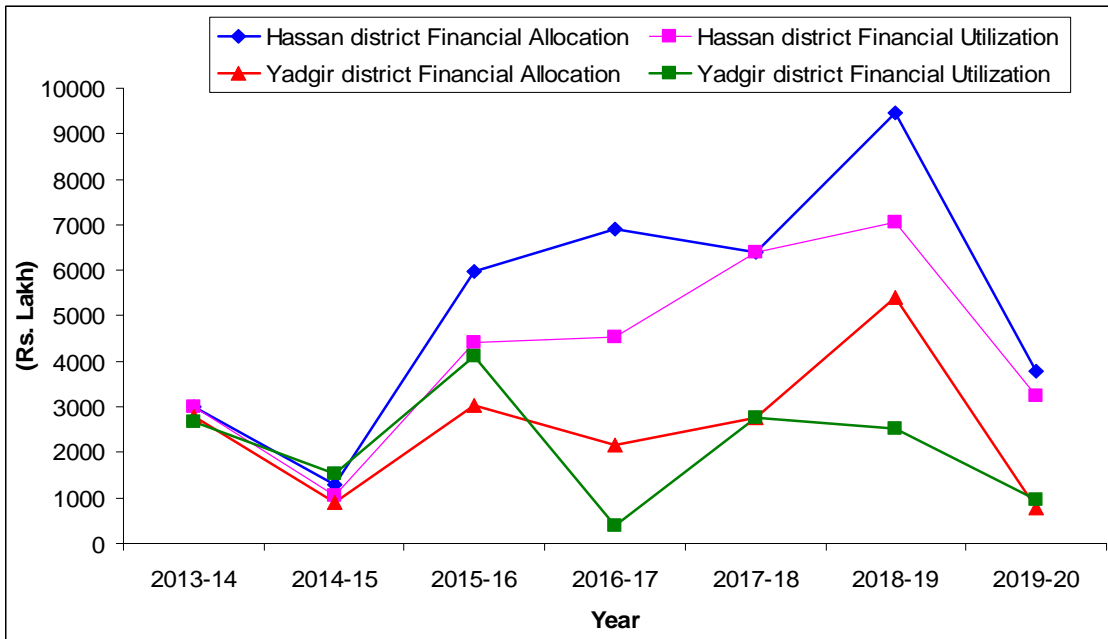
**Table 5.3**  
**Financial Allocation and Utilization of the NGNRY in the Study Regions**

(₹ lakh)

Year	Hassan			Yadgir		
	Financial Allocation	Financial Utilization	% of Utilization of Funds	Financial Allocation	Financial Utilization	% of Utilization of Funds
(01)	(02)	(03)	(04)	(05)	(06)	(07)
2013-14	3011.50	3014.35	100.09	2781.22	2670.84	96.03
2014-15	1304.58	1064.59	81.60	905.41	1521.19	186.01
2015-16	5970.81	4415.87	73.96	3022.88	4108.52	135.91
2016-17	6903.78	4524.62	65.54	2153.58	401.03	18.62
2017-18	6384.97	6384.97	100.00	2775.07	2775.07	100.00
2018-19	9471.98	7048.97	74.42	5397.71	2526.87	46.82
2019-20	3793.36	3257.37	85.87	790.78	957.55	121.09
<b>Total</b>	<b>36840.98</b>	<b>29710.74</b>	<b>80.64</b>	<b>17826.25</b>	<b>14961.07</b>	<b>83.92</b>

*Source : Annual Report, Rural Development and Panchayat Raj Development, Government of Karnataka, 2013-14 to 2019-20.*

**Graph 5.3. Financial Allocation and Utilization of the NGNRY in the Study Regions**



Data presented in Table 5.3 gives information about the financial allocation and its utilization during the period 2013-14 to 2019-20. It was noticed that, there is a lack of consistency in allocation and utilization of funds in both the districts. During this period, in Hassan district allocation of funds was ` 36840.98 lakh and the utilization figured at about ` 29710.74 lakh (80.64%). In Yadgir district allocation of funds was to the tune of ` 17826.25 lakh and the utilization was about ` 14961.07 lakh (83.92%).

In Hassan district during 2013-14, utilization was higher than allocation of funds, whereas in Yadgir district so tookplace in 2014-15, 2015-16 and in 2019-20. This is due to few factors such as expansion of road along sides, increase in cost of raw materials, change in planning in due course of construction, uncertain weather etc.

It is also found in the study that allocation and utilization of funds in Hassan district is higher than that of Yadgir district. But paradoxically utilization of funds is higher in Yadgir district than in Hassan district.

#### 5.4. Physical Achievement of the NGNRY in the Study Regions

Statistical information pertaining to year-wise (2013-14 to 2019-20) length of roads constructed in the study districts under the NGNRY is presented in Table 5.4.

**Table 5.4**  
**Road Length under NGNRY in the Study Regions - 2013-14 to 2019-20**

(Road Length in Km.)

Year	Hassan		Yadgir	
	Road Length	% Change Over the Previous Period	Road Length	% Change Over the Previous Period
(01)	(02)	(03)	(04)	(05)
2013-14	46.53	-	63.55	-
2014-15	126.50	56.64	14.50	(-) 77.18
2015-16	96.46	(-) 93.45	77.16	432.17
2016-17	74.18	(-) 70.63	27.29	(-) 64.63
2017-18	80.78	(-) 30.58	69.70	60.84
2018-19	159.40	35.12	27.44	(-) 99.64
2019-20	29.98	(-) 06.61	6.61	(-) 75.91
<b>Total</b>	<b>613.83</b>		<b>286.25</b>	
<b>% change over 2013-14</b>		<b>(-) 55.00</b>		<b>(-) 89.58</b>

*Source : Annual Report, Rural Development and Panchayat Raj Development, Government of Karnataka, 2013-14 to 2019-20.*

It can be viewed from Table 5.4 that during the period 2013-14 to 2019-20 indicates lack of consistency in trend in both parts of Karnataka state. In Hassan district during this period the road length constructed was about 613.83 km and in Yadgir district road length constructed was about 286.25 km. The Researcher clearly a lead to conclude that road construction in Hassan district was much higher than that in Yadgir district. During the year 2019-20 road construction in the both districts was considerably less due to COVID-19. On observation, it is found that, length of road construction in Hassan district was considerably higher than in Yadgir district.

### 5.5. Phase-wise Road Construction in the NGRY Roads in the Study Regions

The Phase-wise road construction under the NGRY data is presented in Table 5.5.

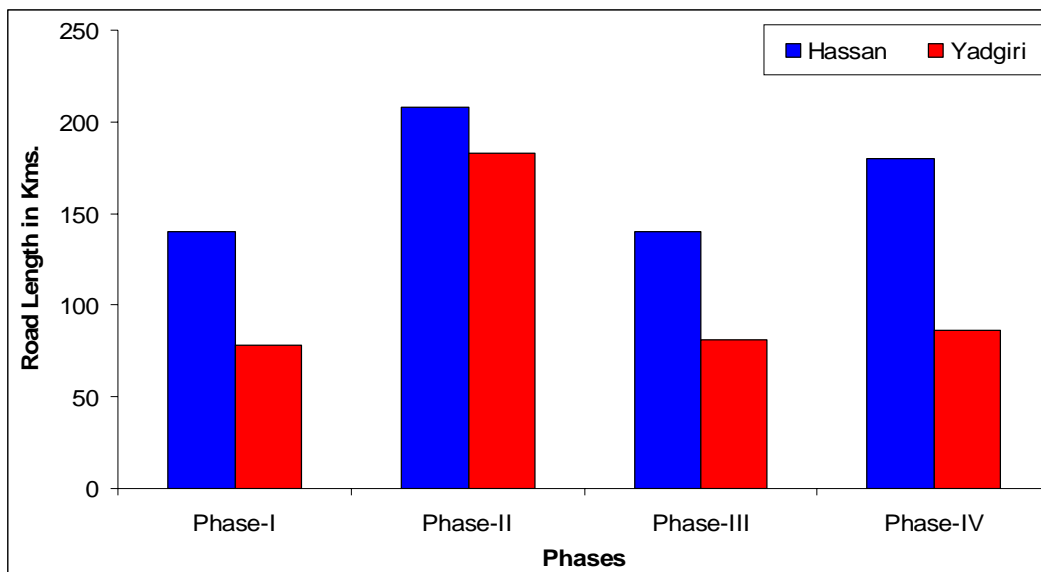
**Table 5.5**  
**Construction of NGRY Roads in the Study Regions**

(Road Length in Km.)

Phases	Hassan	Yadgir	Karnataka
(01)	(02)	(03)	(04)
Phase-I (2012-13)	140.21	77.84	3032.00
Phase-II (2014-15)	208.14	182.67	5505.57
Phase-III (2016-17)	139.92	81.42	3461.08
Phase-IV (2018-19)	180.27	86.54	3413.61

*Source : Annual Report, Rural Development and Panchayat Raj Development, Government of Karnataka, 2013-14 to 2019-20.*

**Graph 5.4. Construction of NGRY Roads in the Study Regions**



Statistical data in Table 5.5 reveals the kilometers of road length construction under the NGNRY from Phase I to IV in the study region of Hassan and Yadgir districts. The NGNRY road in Phase-I in Karnataka was about 3032.00 km of road length constructed. Out of this, the construction of the NGNRY roads was off the order of 140.21 km in Hassan district, whereas during the same period the construction of the NGNRY roads was 77.84 km in Yadgir district. In the Phase-II, road length construction in Karnataka increased from 3032.00 km in Phase-I to 5505.57 km and it was about 208.14 and 182.67 km respectively in Hassan and Yadgir districts. In Phase-III, in Karnataka, NGNRY road construction decreased to about 3468.08 km from 5505.57 km during Phase-II. The construction of NGNRY roads in Hassan and Yadgir districts was 139.92 and 81.42 km respectively. In Phase-IV, in Karnataka NGNRY road construction decreased to about 3413.61 km from 3468.08 km during Phase-III. The construction of NGNRY roads in Hassan and Yadgir districts was 180.27 km and 86.54 km respectively.

It is clear that during Phase-II, length of the NGNRY road construction was highest in Karnataka, similarly length of the NGNRY road construction in Hassan and Yadgir districts was highest in II phase.

## **SECTION-B**

### **A Brief Profile of Study Regions**

A brief profile of the study area i.e., Hassan and Yadgir districts, is presented in this part.



**Map showing the Study Areas**

Karnataka is one of the major states in the southern part of the Indian sub-continent and ranks 7<sup>th</sup> in India with its geographical area of 191791 sq.km (74,051 sq. miles). It accounts for 5.83 percent of the total area of the country (32.88 lakh sq.km). It has 31 districts<sup>1</sup> grouped into 4 administrative divisions viz., Bengaluru, Mysuru, Belagavi and Kalaburagi. Karnataka is well connected with 6 neighbouring states<sup>2</sup> and other parts of India through 25 NHs and 161 SHs that run through the state. The state's road density is third amongst the ten largest states and 13<sup>th</sup> overall in India<sup>3</sup>. Karnataka is bounded by the Arabian Sea and the Laccadive Sea in the West, Goa in the North-West, Maharashtra in the North, Telangana in the North-East, Andhra Pradesh in the East, Tamil Nadu in the South-East and Kerala in the South-West.

Karnataka is one among five states in India ranking third with INR 17.31 lakh crore economy contributing 8.8 per cent to National Gross Domestic Product (NGDP) of INR 197.5 lakh crore in Financial Year (FY) 2020-21. Maharashtra at an estimated INR 26.62 lakh crore in FY 2020-21 leads the country contributing 13.5 per cent to NGDP, with Tamil Nadu at INR 19.02 lakh crore contributing 9.6 per cent. Uttar Pradesh with an estimated INR 17.06 lakh crore contributing 8.6 per cent is fourth with Gujarat at an estimated INR 16.58 lakh crore comes fifth contributing 8.4 per cent to NGDP. These five states together make up a significant 48.9 per cent of NGDP to Indian economy and are crucial growth

---

<sup>1</sup> On November 18, 2020, the Karnataka Cabinet approved the formation of Vijayanagara District.

<sup>2</sup> Karnataka is bordered by 6 states by Maharashtra in the North, Goa in the North West, Tamil Nadu in the South East, Kerala in the South West, Andhra Pradesh in the East and Telangana in the North East.

<sup>3</sup> Nava Karnataka Vision 2025, Report on Infrastructure Sector, Government of Karnataka, December 2017, p. 9.



drivers for the USD 5 trillion and USD 10 trillion national targets over the next decade.<sup>4</sup>

Karnataka ranks eighth in terms of population in India. The population density of the state is 319 per sq. km. The decadal growth rate of Karnataka's population is 15.7 per cent. Karnataka's population was recorded as 6,11,34,704 persons as per the 2011 Census of India. Out of the total population, 61.43 per cent lives in rural areas. The sex ratio in the state is 973 which is higher than the all-India average of 940. The sex ratio for rural Karnataka is 979 while for urban Karnataka it is 963. The child sex ratio for Karnataka stood at 948. This figure is again higher than the national average of 914. The overall literacy rate for the state of Karnataka is 75.4 per cent. The male literacy rate is 82.47 per cent. The female literacy rate stood at 68.08 per cent.

### **5.6. Profile of Hassan District**

Hassan District is one of the 31 districts of Karnataka state located in the south-western part in Karnataka. The district has an eventful and rich history. It reached the height of its glory during the rule of the Hoysalas who had their capital at Dwarasamudra, the modern Halebeed in Belur taluk. The district, noted for its enchanting natural scenic beauty is also a veritable treasure-house of Hoysala architecture and sculpture, the best specimens of which are at Belur and Halebeed. Shravanabelagola, in Channarayapatna taluk, which is studded with Jain monuments, is a renowned centre of pilgrimage for the Jains.

---

<sup>4</sup> Economic Survey of Karnataka 2021-22, Department of Planning, Programme, Monitoring and Statistics, Government of Karnataka, Bengaluru, March, p. 8.

## **Location**

Geographically Hassan district lies in 13° 0' 11" 3' North Latitudes and 76° 6' 9" East Longitude with an Elevation of 3,084 feet (940 M) above Mean Sea Level. The greatest length of the district, from South to North, is about 129 kilometers, and its greatest breadth, from East to West, is about 116 kilometers. The geographic area of the district of Hassan is 6845 Square Kilometers.

According to 2011 Census data, district has a total of 38 hoblies, 2369 inhabited villages and 183 uninhabited villages.<sup>5</sup> Hassan district comprises eight taluks *viz.*, Alur (432 sq.km), Holenarasipura (602 sq.km), Arakalagud (675 sq.km), Belur (845 sq.km), Hassan (942 sq.km), Sakaleshapura (1034 sq.km), Channarayapatna (1044 sq.km) and Arasikere taluk (1271 sq.km). The population of the district is 17,76,421. Physiographically, Hassan district is divided into three regions from East to West as medium, semi-malnad and malnad region. The malnad region forms a part of Western Ghats and the Maidan region is characterized by rolling plain. The Hemavathi and the Yagachi are the main rivers and the major part of the district is irrigated by Hemavathi river.

## **Agriculture**

Coffee, Black Pepper, Potato, Paddy and Sugarcane are the major agricultural crops grown in this district. The normal annual rainfall of this district is 1030.8 mm with 75 rainy days. The total irrigated land of the district is 92,976 hectares, which accounts to 14.03 per cent of the land. Out of which, 34.39 per cent is irrigated by canal, 23.81 per cent by tank, 33.36 per cent by borewells and 2.42 per cent by other sources.

---

<sup>5</sup> District Disaster Management Plan 2019-20, District Disaster Management Authority of Hassan District, pp.14-18.

## **5.7. Profile of Yadgir District**

Yadgir District was carved out from the erstwhile Kalaburagi district as the 30<sup>th</sup> district of Karnataka on 31<sup>st</sup> December 2009, located in the North-East part of the state surrounded by Kalaburagi in the North, Raichur in the South, Vijayapura in the West and the state of Telengana in the East. Yadgir district is the 2<sup>nd</sup> smallest district<sup>6</sup> (after Bengaluru Urban) in the state, spread across 6 taluks viz., Shorapur, Hunasagi, Shahpur, Wadagera, Yadgir and Gurmitkal, with Yadgir as district headquarter. The vast stretch of fertile black soil of the district is known for bumper red gram and jowar crops. The district is also referred to as the Daal bowl of the state and is spread over an area of 5234 sq.km. constituting 8.46 per cent area of Karnataka state.

### **Location**

Geographical location of Yadgir is 16° 20' to 17° 45' North latitude and 76° 4' to 77° 42' East Longitude. The region is generally hot and temperature of this region is approximately 45°C (max) and 22°C (min). Yadgir is blessed with incessant flow of two main rivers, Krishna and Bhima. In addition to these two, a few tributaries flow in this region. Jowar and Paddy are the major crops grown in this district. Major commercial crops grown are cotton and Sugarcane.

### **Agriculture**

It is predominantly an agricultural district divided into two agro climatic zones viz., Eastern transition and North-Eastern dry zone. The zones indicate the

---

<sup>6</sup> In terms of Geographical Area, Belagavi is the largest district of the state. It spreads over 13,415 sq. km (5,180 sq. miles). Bengaluru Urban is the smallest district of Karnataka. It covers an area of just 2,190 sq. km<sup>2</sup> (850 sq. miles) in Karnataka.

predominance of rain dependent dry land agricultural area. The normal rainfall of the district is 636 mm.

Agriculture in the district mainly depends upon the rainfall and the net area irrigated to net area sown is 14 per cent, which is below the state average of 24 per cent. Krishna, Bhima rivers flow in the district. The medium irrigation projects in the district are Hattikuni and Soudha Ghar. There are 36 lift irrigation schemes and 445 minor irrigation tanks in the district. Shahapur and Shorapur both taluks have been fully irrigation Yadagiri taluk having 65 per cent irrigated area.

The major crops grown in the district are jowar, red gram, sunflower and groundnut. In terms of productivity the yields of principal crops is lesser than the state average. The variation in rainfall and endemic pest attack has affected productivity of tur (red gram). The production and productivity of jowar has been improving because of better use of fertilizer and plant protection measures. In case of oil seeds the area and production has been decreased. Cattle, Poultry, Sheep, Goats and Buffaloes constitute the major livestock of the district.<sup>7</sup>

### **SECTION-C**

This Section has been classified into three parts, Part-I highlights views of NGNRY road users, Part-II reveals views of NGNRY contractors and Part-III explains PIUs Authorities of NGNRY.

---

<sup>7</sup> District Administration of Yadgir District, National Informatics Centre, Ministry Of Electronics and Information Technology, Government of India.

## PART-I

### Views of NGNRY Road Users

Analysis and interpretation of the users' views of the NGNRY roads in particular and on the programme in general is one of the prime objectives of the present study. Such respondents' views have been gathered through primary investigation on the performance of the NGNRY programme in the study region. These have been presented and analyzed in the following passages.

#### 5.8. Age-wise Distribution

Age is one of the most important demographic features of any country. The detailed information about age-wise distribution of the respondents is shown in Table 5.6.

**Table 5.6**  
**Age-wise Distribution of the Respondents**

Age (Year)	Hassan			Yadgir			Grand Total
	Sakleshpura	Arsikere	Total	Shahpur	Shorapura	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
< 30	11 (19.64)	58 (31.52)	69 (28.77)	23 (21.90)	18 (24.65)	41 (23.03)	<b>110</b> <b>(26.31)</b>
31-40	10 (17.86)	30 (16.30)	40 (16.66)	21 (20.00)	12 (16.44)	33 (18.54)	<b>73</b> <b>(17.46)</b>
41-50	13 (23.21)	51 (27.72)	64 (26.66)	32 (30.48)	15 (20.55)	47 (26.40)	<b>111</b> <b>(26.57)</b>
51-60	15 (26.79)	27 (14.67)	42 (17.50)	18 (17.14)	19 (26.03)	37 (20.79)	<b>79</b> <b>(18.90)</b>
> 60	7 (12.50)	18 (9.78)	25 (10.41)	11 (10.48)	9 (12.33)	20 (11.24)	<b>45</b> <b>(10.76)</b>
<b>Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Data presented in Table 5.6 show that, out of 418 respondents interviewed in Hassan and Yadgir districts, about 28.77 per cent and 23.03 per cent are below the age of 30 years. Further, 16.66 per cent and 18.54 per cent in the age group of 31-40 years and 26.66 per cent and 20.55 per cent are to the age group of 41-50 years and 17.50 per cent and 20.79 per cent belong to the age group of 51-60 years and 10.41 and 11.24 per cent are above 60 years. It clearly shows that the large number of respondents are in the age group of below 30 years in Hassan district. The large number of respondents are in the age group of 41-50 years in Yadgir district.

### 5.9. Gender-wise Classification

The information about gender-wise classification of the respondents is presented in Table 5.7.

**Table 5.7**  
**Gender-wise Classification of the Respondents**

Gender	Hassan			Yadgir			Grand Total
	Sakleshpura	Arsikere	Total	Shahpur	Shorapura	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
Male	38 (67.86)	117 (63.58)	155 (64.58)	77 (73.34)	51 (69.86)	128 (71.92)	<b>283</b> <b>(67.71)</b>
Female	18 (32.14)	67 (36.42)	85 (35.42)	28 (26.66)	22 (30.14)	50 (28.08)	<b>135</b> <b>(32.29)</b>
<b>Grand Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

In Hassan district about 64.58 per cent of the total respondents were male and remaining 35.42 per cent were female. In Yadgir district about 71.92 per cent of the respondents were male and remaining 28.08 per cent were female. Thus, majority of the respondents were male (Table 5.7).

### 5.10. Educational Level

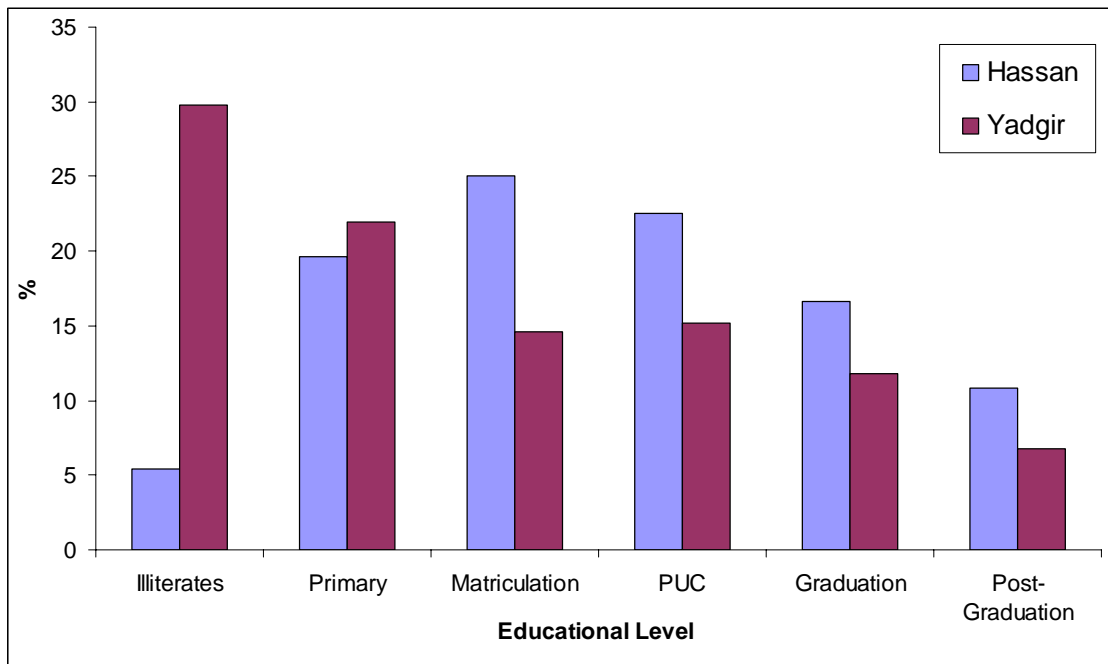
Education is not only a tool of enhancing efficiency of people but also an effective instrument of widening democratic participation in the overall development. The data pertaining to the literacy level of the respondents in study area are presented in Table 5.8.

**Table 5.8**  
**Educational Level of the Respondents**

Educational Level	Hassan			Yadgir			Grand Total
	Saklesh-pura	Arsikere	Total	Shahpur	Shora-pura	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
Illiterates	3 (5.36)	10 (5.43)	13 (5.42)	32 (30.48)	21 (28.77)	53 (29.78)	<b>66</b> <b>(15.78)</b>
Primary	8 (14.29)	39 (21.20)	47 (19.58)	23 (21.90)	16 (21.92)	39 (21.91)	<b>86</b> <b>(20.58)</b>
Matriculation	15 (26.79)	45 (24.46)	60 (25.00)	12 (11.43)	14 (19.18)	26 (14.61)	<b>86</b> <b>(20.58)</b>
PUC	13 (23.21)	41 (22.28)	54 (22.50)	17 (16.19)	10 (13.70)	27 (15.17)	<b>81</b> <b>(19.37)</b>
Graduation	11 (19.64)	29 (15.76)	40 (16.67)	12 (11.43)	9 (12.33)	21 (11.80)	<b>61</b> <b>(14.60)</b>
Post-Graduation	6 (10.71)	20 (10.87)	26 (10.83)	9 (8.57)	3 (4.11)	12 (6.74)	<b>38</b> <b>(09.09)</b>
<b>Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

**Graph 5.5. Educational Level of the Respondents**

It can be understood from the figures presented in Table 5.8 that the respondents in the sample taluks of Hassan district illiterates are 5.42 per cent, 25 per cent have studied upto matriculation and 22.50 per cent completed PUC, 16.67 per cent of the respondents have Graduation and 10.83 per cent are Post Graduates.

In the sample taluks of Yadgir district illiterates are 29.78 per cent of the respondents, 14.61 per cent have studied upto matriculation, 15.17 per cent completed PUC, 11.80 per cent have Graduation and 6.74 per cent are Post Graduates. The Researcher found from the study that, the respondents in the sample taluks of Hassan are relatively more literate than those found in the sample taluks of Yadgir district. It is further found that the percentage of Graduates and Postgraduates is quite less in both the districts.



### 5.11. Occupation

Occupational details of the respondents in the study region are presented in Table 5.9.

**Table 5.9**  
**Occupational Details of the Respondents**

Occupation	Hassan			Yadgir			Grand Total
	Saklesh-pura	Arsikere	Total	Shahpur	Shora-pura	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
Agriculture	17 (30.35)	78 (42.39)	95 (39.58)	53 (50.48)	37 (50.73)	90 (50.48)	<b>185</b> <b>(44.02)</b>
Employees	06 (10.71)	13 (07.06)	19 (07.91)	02 (01.90)	03 (04.10)	05 (2.81)	<b>24</b> <b>(05.74)</b>
Business	10 (17.85)	26 (14.13)	36 (15.00)	16 (15.24)	12 (16.43)	28 (15.73)	<b>64</b> <b>(15.31)</b>
Self-Employment	07 (12.50)	32 (17.39)	39 (16.25)	20 (19.05)	11 (15.06)	31 (17.42)	<b>70</b> <b>(17.00)</b>
Student	11 (19.64)	24 (13.04)	35 (14.58)	11 (10.48)	09 (12.32)	20 (11.24)	<b>55</b> <b>(13.15)</b>
House wife	05 (08.92)	11 (05.97)	16 (06.66)	03 (02.86)	01 (01.36)	04 (2.25)	<b>20</b> <b>(04.78)</b>
<b>Grand Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

The data in Table 5.9 reveals that, total 240 road beneficiaries interviewed in Hassan district about 39.58 per cent of respondents are depending on agricultural sector, employees are about 7.91 per cent and 15 per cent are business men, while self employee's amount to about 16.25 per cent, student constitute 14.58 per cent and the remaining 6.66 per cent are house wife. Out of total 178 road beneficiaries interviewed in Yadgir district about 50.48 per cent are depending on agricultural

sector, employees are 2.81 per cent, whereas 15.73 per cent are businessmen, self employees amount to about 17.42 per cent, student constitute about 11.24 per cent and the remaining 2.25 per cent of respondents are house wife.

It is found from the primary survey that, among the beneficiary number of agriculturist is larger share in Yadgir district than in Hassan district.

### 5.12. Awareness about Programmes

The success of rural development programme depends on the level of awareness among the people in that area. Due to lack of awareness of the programmes, people fail to reap the maximum benefit. Data provided in Table 5.10 shows respondents awareness about the rural development programmes in study region.

**Table 5.10**  
**Awareness about Rural Development Programmes**

Awareness	Hassan	Yadgir	Grand Total
(01)	(02)	(03)	(04)
Yes	94 (39.16)	47 (26.40)	<b>141 (33.73)</b>
No	146 (60.84)	131 (73.60)	<b>277 (66.27)</b>
<b>Total</b>	<b>240 (100.00)</b>	<b>178 (100.00)</b>	<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is astonishing to note from the figures presented in Table 5.10 that a large percentage of people in the sample taluks of Hassan and Yadgir districts do not have awareness about the rural development programmes. A very low proportion of 39.16 per cent and 26.40 per cent of respondents are aware of rural development programmes like MGNREGA, PMGSY, Bharath Nirman, NGNRY, CMGSY, SGY and Community Development Programmes respectively. This

necessarily calls for more programmes, in rural areas, on creating awareness amongst the people.

### 5.13. Travel Frequency of Users

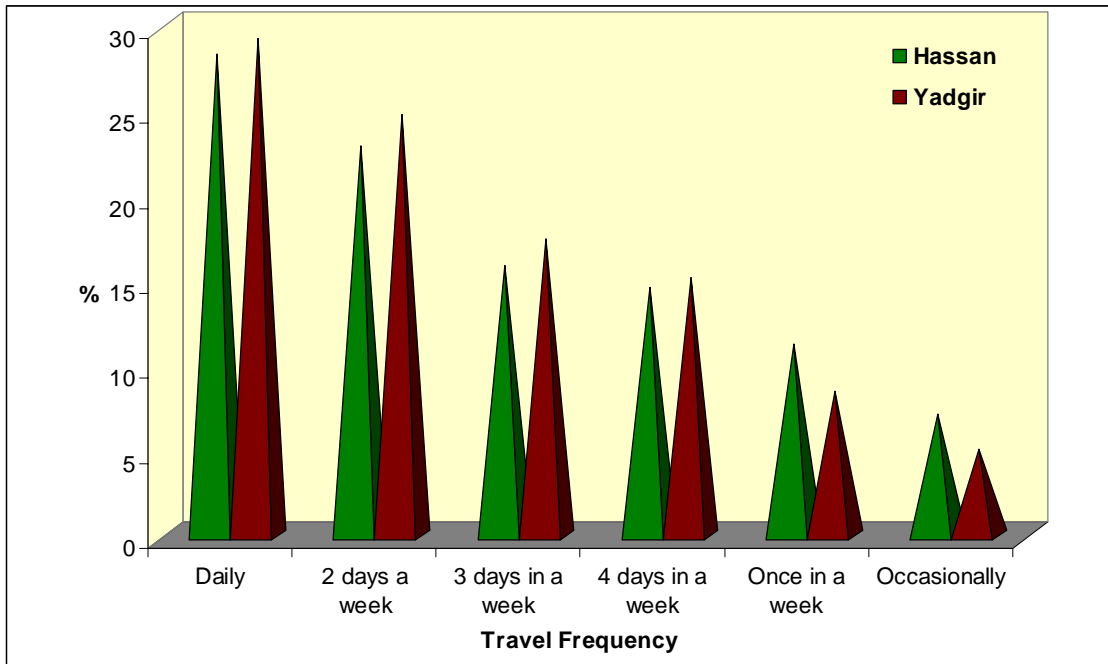
The benefits of NGNRY roads have made it easier for the users to handle with the difficult topography. Beneficiaries in the study area mentioned that there has been an increase in ownership of bicycles and two wheelers and Beneficiaries also mentioned that there has been an improvement in the public as well as the private transport system in the study area. The respondents' travel frequency details in the study region are provided in Table 5.11.

**Table 5.11**  
**Travel Frequency of Users**

Travel Frequency	Hassan			Yadgir			Grand Total
	Saklesh-pura	Arsikere	Total	Shahpur	Shora-pura	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)
Daily	17 (30.35)	51 (27.71)	68 (28.33)	31 (29.58)	21 (28.81)	52 (29.21)	<b>120</b> <b>(28.73)</b>
2 days a week	11 (19.64)	44 (23.91)	55 (22.91)	25 (23.81)	19 (26.02)	44 (24.72)	<b>99</b> <b>(23.68)</b>
3 days in a week	10 (17.85)	28 (15.21)	38 (15.83)	14 (13.33)	17 (23.28)	31 (17.42)	<b>69</b> <b>(16.50)</b>
4 days in a week	8 (14.28)	27 (14.67)	35 (14.58)	20 (19.05)	7 (09.58)	27 (15.17)	<b>62</b> <b>(14.83)</b>
Once in a week	6 (10.71)	21 (11.41)	27 (11.25)	10 (09.52)	5 (06.84)	15 (8.43)	<b>42</b> <b>(10.04)</b>
Occasionally	4 (07.14)	13 (07.06)	17 (07.08)	5 (04.76)	4 (05.47)	9 (5.06)	<b>26</b> <b>(06.22)</b>
<b>Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

**Graph 5.6. Travel Frequency of Users**

It is found from the information in Table 5.11 that, out of 240 road beneficiaries in Hassan district, the number of daily commuters' is 68 (28.33%), about 22.91 per cent of respondents use road two times in a week, about 15.83 per cent travel 3 days a week, about 14.58 per cent use the roads 4 days in a week, the number of once in a week users are 27 (11.25%) and only 07.08 per cent of respondents use road occasionally.

Out of total 178 road beneficiaries in Yadgir district the number of daily commuters' is 52 (29.21%), about 24.72 per cent of respondents use road two times in a week, about 17.42 per cent travel 3 days a week, about 15.17 per cent use the roads 4 days in a week, the number of once in a week users is 15 (8.43%) and only 05.06 per cent of respondents use road occasionally.

Larger proportion is found to be travelling daily and two days in a week in these two districts. In comparison with Hassan district the road users of all categories are in large number in Yadgir district excepting once in a week users and occasionally users. Thus, it can be inferred that mobility of people in North Karnataka is relatively higher compared to the southern part of the state.

#### 5.14. Quality of NGNRY Roads

Since its inception, the NGNRY announced that providing connectivity with the construction of a qualitative road network in rural region will be the one of the prime objectives the programme. Data pertaining to this, from the field survey in the study region, are provided in Table 5.12.

**Table 5.12**  
**Users Views on Quality of the NGNRY Roads**

Quality of the NGNRY Roads	Hassan			Yadgir		
	Sakleshpura	Arasikere	Total	Shahapur	Shorapur	Total
(01)	(02)	(03)	(04)	(05)	(06)	(07)
Good	22 (39.29)	104 (56.52)	126 (52.50)	28 (34.25)	25 (34.25)	<b>53</b> <b>(29.77)</b>
Fairly Good	13 (23.21)	25 (13.59)	38 (15.83)	11 (10.47)	16 (21.91)	<b>27</b> <b>(15.16)</b>
Poor	21 (37.50)	55 (29.89)	76 (31.67)	66 (62.86)	32 (43.84)	<b>98</b> <b>(55.07)</b>
<b>Total</b>	<b>56</b> <b>(100.00)</b>	<b>184</b> <b>(100.00)</b>	<b>240</b> <b>(100.00)</b>	<b>105</b> <b>(100.00)</b>	<b>73</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

The researcher interviewed 240 road users of NGNRY roads in Hassan district (Table 5.12). About 52.50 per cent opined that the quality of roads is good, 13.59 per cent opined NGNRY roads are fairly good and the remaining 29.89 per cent opined quality of roads is poor. In Yadgir district, out of 178 beneficiaries, 29.77 per cent opined that the quality of roads is good, 15.16 per cent opined NGNRY roads are fairly good and the remaining 55.07 per cent of the respondents stated that quality of roads is poor.

#### **5.15. Mode of Transport**

Mode and means of transport are interdependent in transport sector in any region for that matter. Development of roads receives the increasing volume of traffic and also provides for smooth operation of vehicles. Keeping this in mind, the data gathered as regards the accessibility of means of passenger road transport in study region are provided in Table 5.13.

**Table 5.13**  
**Mode of Transport Used**

Mode of Transport	Hassan			Yadgiri			Grand Total		
	Yes	No	Total	Yes	No	Total	Yes	No	Total
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)
Bullock carts	19 (7.92)	221 (92.08)	240 (100.00)	32 (17.98)	146 (82.02)	178 (100.00)	51 (12.20)	367 (87.80)	<b>418</b> <b>(100.00)</b>
Two wheelers	184 (76.67)	56 (23.33)	240 (100.00)	108 (60.67)	70 (39.33)	178 (100.00)	292 (69.86)	126 (30.14)	<b>418</b> <b>(100.00)</b>
Public transport	124 (51.66)	116 (48.34)	240 (100.00)	87 (48.87)	91 (51.13)	178 (100.00)	360 (86.12)	58 (13.88)	<b>418</b> <b>(100.00)</b>
Auto rickshaws	42 (17.50)	198 (82.50)	240 (100.00)	63 (35.39)	115 (64.61)	178 (100.00)	105 (25.12)	313 (74.88)	<b>418</b> <b>(100.00)</b>
Own Four-wheeler	35 (14.58)	205 (85.42)	240 (100.00)	12 (6.74)	166 (93.26)	178 (100.00)	47 (11.24)	371 (88.76)	<b>418</b> <b>(100.00)</b>
Tractor	144 (60.00)	96 (40.00)	240 (100.00)	125 (70.72)	53 (29.28)	178 (100.00)	221 (52.88)	197 (47.12)	<b>418</b> <b>(100.00)</b>
Trucks	28 (11.67)	212 (88.33)	240 (100.00)	11 (6.18)	167 (93.82)	178 (100.00)	39 (9.33)	379 (90.67)	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Based on the field survey data, it can be stated in Table 5.13, out of 240 beneficiaries in Hassan district about 7.92 per cent used Bullock carts, 76.67 per cent used two wheelers and 51.66 per cent used Public transport. About 17.5 per cent, 14.58 per cent and 60 per cent used Auto Rickshaws, Own Four-wheeler and Tractors, respectively and the remaining 11.67 per cent of respondents used Trucks.

Of the total (178) road beneficiaries interviewed in Yadgir district about 17.98 per cent are found using Bullock carts, about 60.67 per cent used two wheelers, 48.87 per cent used Public transport and about 35.39 per cent, 6.74 per cent and 70.72 per cent of respondents used Auto Rickshaws, Own Four-wheeler and Tractors respectively and remaining 6.18 per cent of the respondents used Trucks. The respondents in large number the sample taluks of Hassan and Yadgir districts depend both on the Light Passenger Vehicles (LPVs)<sup>8</sup> and Heavy Passenger Vehicles (HPVs)<sup>9</sup> to meet their road transport needs.

It is also found in the study that due to inconvenient bus services, the users in the taluks of Yadgir district were found to be depending only on LPV service. From the point of view of benefit accruing to the transport users, the role of LPVs is justified; but the cost of such means of transport, being relatively higher, pinches the users, particularly the lower income group in the study region. From the above, it can be strongly argued that the department concerned should pay attention towards providing public transport services though the HPVs in these two districts, particularly in Yadgir district.

---

<sup>8</sup> Light Passenger vehicles (LPVs) includes Auto rickshaws, Jeeps, automobile, van, motorcycle, motor-driven cycle and truck having a manufacturer's rated capacity of 1 ton or less.

<sup>9</sup> Heavy Passenger Vehicles (HPVs) means any public service vehicle or private service vehicle or educational institution bus or omnibus the gross vehicle weight of any of which, or a motor car the unlined weight of which, exceeds 12 tonne.



### 5.16. Impact on Employment Generation

After the construction of NGNRY roads, an improvement in the employment situation in terms of more job opportunities, more paths for self-employment, etc. were observed in the study area. A lot of housewives mentioned that they have started small scale industries like selling wood, vegetable, dairy products and locally made items like pickles, papad etc. Data provided in Table 5.14 are specifically about the NGNRY in the region under study area.

**Table 5.14**  
**Impact on Employment Generation**

Impact (01)	Hassan (02)	Yadgir (03)	Total (04)
Yes	212 (88.34)	136 (76.41)	348 (83.26)
No	28 (11.66)	42 (29.59)	70 (16.74)
<b>Grand Total</b>	<b>240 (100.00)</b>	<b>178 (100.00)</b>	<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

As high as 88.34 per cent and 76.41 per cent of respondents have opined that there is positive impact on employment generation because of NGNRY road construction respectively in the sample taluks of Hassan and Yadgir districts. This is provided by data in the Table 5.14. Further the researcher used **Weight Point Method<sup>10</sup>** to find out impact of NGNRY roads on employment generation in the study region. The weight points are accorded to the priorities in descending order of 5, 4, 3, 2, and 1 for the views of 384 (out of 418) respondents. The output is expressed with the help of data provided in the Table 5.15.

---

<sup>10</sup> Likert (1932) proposed a simple and straight forward method for scaling attitudes that is most frequently used today. This scale is also known as summated rating scale. It consists of a number of statements which express either a favourable or unfavourable attitude towards the given object to which the respondent is asked to respond to each of the statements in terms of several degrees of agreement or disagreement.

**Table 5.15**  
**Impact on Employment Generation of the Respondents and Weight Points (WP)**

Impact	Scores Assigned					Total	Rank
	5	4	3	2	1		
Improving farm and non-farming employment	120x5= 600	108x4=432	71x3=213	32x2=64	17x1=17	1326	<b>II</b>
Reduce gender wage inequality	126x5= 630	69x4=276	110x3=330	22x2=44	21x1=21	1301	<b>III</b>
Increasing rate of wages	92x5= 460	106x4=424	82x3=246	32x2=64	30x1=30	1224	<b>V</b>
Help to reaching work place at on-time	90x5= 450	112x4=448	80x3=240	42x2=84	24x1=24	1246	<b>IV</b>
Improve the informal jobs like selling wood, vegetable, dairy products and locally made items like pickles, papad etc.	130x5= 650	102x4=408	72x3=216	60x2=120	12x1=12	1406	<b>I</b>
Helpful to job opportunity	108x5= 540	56x4=224	92x3=276	46x2=92	42x1=42	1174	<b>VI</b>

*Note : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

From the Table 5.15 the researcher has used the Weight Point to identify the impact of the NGNRY road transport on Employment generation. It can be observed that the greatest impact of 1406 weight points (I rank) is on the informal jobs like selling wood, vegetable, dairy products and locally made items like pickles, papad, whereas II rank with 1326 weight points is held by farm and non-farming employment.

Further gender wage inequality impact of 1301 weight points, it has secured III rank and IV rank goes to reaching work place at on-time weight points of 1246, V rank with 1224 weight points is held by rate of wages and VI rank of helpful to job opportunity got the VI Rank with 1174 weight points.

### **5.17. Impact on Education**

With the construction of NGNRY roads, there has been an improvement in the accessibility to education facilities. This has resulted in increased school enrolment and school attendance. The NGNRY road connectivity had led to an increase in the number of girls going to schools in the study area. Another noteworthy impact has been in terms of regular attendance of the teachers throughout the year and greater inclination of parents to send their children for higher studies and college education in the study area. Data provided in Table 5.16 are specifically about the NGNRY under study area.

**Table 5.16**

**Impact on Education**

Impact	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Yes	211 (87.92)	153 (86.00)	364 (87.10)
No	29 (12.08)	25 (14.00)	54 (12.90)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Table 5.16 represents the data about 87.92 per cent and 86 per cent of respondents have opined positive impact on education after construction of NGNRY roads respectively in the sample taluks of Hassan and Yadgir districts. Further the researcher used Weight Point Method to find out impact of NGNRY roads on education sector in the study region. The weight points are accorded to the priorities in descending order of 5, 4, 3, 2, and 1 for the views of 364 (out of 418) respondents and then by calculations. The result is expressed with the help of statistical data in Table 5.17.

**Table 5.17**  
**Impact on Education and Weight Points (WP)**

Impact	Scores Assigned					Total	Rank
	5	4	3	2	1		
Priority of best school	99x5=495	77x4=308	97x3=291	59x2=118	32x1=32	1244	<b>III</b>
Reach exact time on institution	90x5=450	80x4=320	108x3=324	46x2=92	40x1=40	1226	<b>VI</b>
Help to higher education	102x5=510	86x4=344	106x3=318	70x2=140	-	1312	<b>II</b>
Reduce dropouts	120x5=600	90x4=360	102x3=306	52x2=104	-	1370	<b>I</b>
Led to increase in the No. of girls going to school	80x5=400	92x4=368	84x3=252	108x2=216	-	1236	<b>V</b>
Regular attendance of teachers and students	70x5=350	109x4=436	92x3=276	83x2=166	10x1=10	1238	<b>IV</b>

*Note* : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.

*Source* : Data gathered through Primary Investigation, October and November 2020.

In Table 5.17, the calculations made have presented. It is found from the calculations that as per identify the impact of the NGNRY road transport on Education, Reduce dropouts has scored highest 1370 weight point score and remained at I rank among the six impact identified in the study region. Added to this, with 1312 weight point score, Help to higher education has stayed at II rank in this respect. Thus, it can be inferred that having 1244 and 1238 weight points, Priority of best school and Regular attendance of teachers and students have stayed at III and IV rank respectively. Further, based on the calculations it has been proved from the field study that the impact like increase in the No. of girls going to school stayed in fifth Place (1236 WP) and Reach exact time on institution stayed in at VI rank (1226 WP) among the six impacts identified in the study region.

### **5.18. Health Infrastructure**

There has been overall improvement in access to the health facilities like PHCs, Sub Centres and District Hospitals. Impact was observed with regard to increase in accessibility to preventive and curative health care facilities, better management of infectious diseases and attending emergencies due to faster access to health facilities and increase in frequency of visits by health workers. Information pertaining to this from the field survey in the study region is provided in Table 5.18.

**Table 5.18**  
**Impact on Health Infrastructure**

Impact	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Yes	194 (80.84)	108 (60.68)	302 (72.25)
No	46 (19.16)	70 (39.32)	116 (27.75)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

As high as 80.84 per cent and 60.68 per cent respondents respectively have opined that there is positive impact on health facility after construction of NGNRY roads, in the sample taluks of Hassan and Yadgir districts (Table 5.18). Further, the researcher used Weight Point Method to measure the impact of NGNRY roads on health facility in the study region. The weight points are accorded to the priorities in descending order of 5, 4, 3, 2 and 1 for the views of 302 (out of 418) respondents. The outcome is expressed with the help of data in Table 5.19.

**Table 5.19**  
**Impact on Health Infrastructure and Weight Points (WP)**

Impact	Scores Assigned					Total	Rank
	5	4	3	2	1		
Priority of best hospital	30x5=150	47x4=188	105x3=115	72x2=144	48x1=48	645	V
Increase ambulance facility and reaching exact on time	88x5=440	42x4=168	38x3=114	75x2=150	59x1=59	941	IV
Helps to pregnant women for pre-natal and post-natal care	45x5=225	108x4=432	99x3=297	50x2=100	-	1054	III
Helps to children, women and old-age people for quick health facility	65x5=325	88x4=352	97x3=291	52x2=104	-	1072	II
Increase in medical facilities	110x5=550	36x4=144	108x3=324	36x2=72	12x1=12	1102	I

*Note : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.*

*Source: Data gathered through Primary Investigation, October and November 2020.*



In Table 5.19, the calculations made have been presented. It is found from the calculations that as per identify the impact of the NGNRY road transport on health, medical facilities has scored highest of 1102 weight point and remained at I rank among the five impacts identified in the study region. Added to this, with 1072 weight point score, helps to children, women and old-age people for quick health facility has stayed at II rank in this respect. Thus, it can be inferred that having 1054 and 941 weight points, helps to pregnant women for pre-natal and post-natal care and Increase ambulance facility and reaching exact on time have stayed at III and IV rank respectively. Priority of best hospital got the fifth place with 645 weight points.

### **5.19. Impact on Agricultural Infrastructure**

The construction of the NGNRY roads has greatly benefited the farmers, prior to the construction of the NGNRY roads. Farmers found it difficult to sell agricultural goods in the bigger markets that are located at a distance from their villages. Due to lack of transport, the farmers had to often physically carry the baskets of agricultural goods on their heads and could thus transport only a small amount of agricultural produce to the market. Also, a lot of travel time was lost. Thus, the whole process was not profitable. Impact on agricultural infrastructure about the NGNRY in the study area is presented in Table 5.20.

**Table 5.20**

**Impact on Agricultural Infrastructure**

<b>Impact</b>	<b>Hassan</b>	<b>Yadgir</b>	<b>Total</b>
(01)	(02)	(03)	(04)
Yes	203 (84.59)	158 (88.77)	361 (86.36)
No	37 (15.41)	20 (11.23)	57 (13.64)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

NGNRY road connectivity has led to a better transport system during all seasons. Farmers mentioned that the problem of not being able to access the markets during monsoon has been solved by the after construction of the NGNRY roads about 84.59 per cent and 88.77 per cent of respondents have respectively opined that there is positive impact on agricultural facility after construction of NGNRY roads in Hassan and Yadgir districts, proves the data found in Table 5.20. Further the researcher used Weight Point Method to measure impact on NGNRY roads in agricultural facility in the study region. The weight points are accorded to the priorities in descending order of 5, 4, 3, 2 and 1 for the views of 361 (out of 418) respondents. The outcome is expressed with the help of data in Table 5.21.

Table 5.21

## Impact on Agricultural Infrastructure and Weight Points (WP)

Impact	Scores Assigned					Total	Rank
	5	4	3	2	1		
Made it easier to transport chemical fertilizers, seeds and pesticides	118x5=590	99x4=396	72x3=216	46x2=92	26x1=26	1270	VI
Brought change in cropping pattern and cropping	120x5=600	90x4=360	81x3=243	70x2=140	-	1343	V
Increases the allied activities like dairy, fishery, poultry, forestry, animal husbandry in the rural areas	130x5=650	92x4=368	78x3=234	61x2=122	-	1374	III
Increases the cottage and village industry in the rural areas	135x5=675	98x4=392	70x3=210	58x2=116	-	1393	II
Increases the marketing facility and minimum support price	130x5=650	95x4=480	76x3=228	60x2=120	-	1478	I
Increases the machinery and equipment	128x5=640	96x4=384	74x3=222	61x2=122	-	1368	IV

*Note* : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.

*Source*: Data gathered through Primary Investigation, October and November 2020.

In Table 5.21 the researcher has used the Weight Point to identify the impact of the NGNRY road transport on agriculture. It can be observed that the greatest impact of 1478 weight points (I rank) is on the increases the marketing facility and minimum support price, whereas II rank with 1393 weight points is held by Increases the cottage and village industry in the rural areas. Further Increases in the allied activities like dairy, fishery, poultry, forestry, animal husbandry in the rural areas, impact with 1374 weight points securely III rank. IV rank goes to increase in the use of machinery and equipment and it secured weight points of 1368. V rank with 1334 weight points is held by change in cropping pattern and cropping. Easier to transport chemical fertilizers, seeds and pesticides got the VI rank with 1270 weight points.

### **5.20. Impact on Social Aspects**

The construction of the NGNRY road has led to an increase in frequency of visits by government officials. This is likely to result in better implementation of various government schemes and programs. Data provided in Table 5.22 are specifically about impact on social aspect in the study region.

**Table 5.22**  
**NGNRY Roads Impact on Social Aspects**

Impact	Hassan	Yadgir	Total
Yes	202 (84.17)	162 (91.00)	364 (87.08)
No	38 (15.83)	16 (09.00)	54 (12.92)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

As high as 84.17 per cent and 91 per cent of respondents have opined positive impact on social aspects after construction of NGNRY roads in the sample taluks of Hassan and Yadgir districts, which is proved by the data in Table 5.22. Further the researcher used Weight Point Method to measure impact on NGNRY roads in health facility in the study region. The weight points are accorded to the priorities in descending order of 5, 4, 3, 2 and 1 for the views of 364 (out of 418) respondents. The output is expressed with the help of data in Table 5.23.

**Table 5.23**  
**Impact on Social Aspect and Weight Points (WP)**

Impact	Scores Assigned					Total	Rank
	5	4	3	2	1		
Increasing of the housing facilities	123x5=615	104x4=416	89x3=267	48x2=96	-	1394	IV
Increasing of the drinking water and sanitation facility	128x5=640	136x4=544	94x3=282	36x2=72	-	1538	I
Increasing of the electricity and gas connectivity	112x5=560	114x4=456	96x3=288	42x2=84	-	1388	V
Increasing proper implication of the Govt schemes and programme	116x5=580	119x4=476	85x3=256	44x2=88	-	1400	III
Increasing of the banking and postal services	132x5=660	120x4=480	70x3=210	42x2=84	-	1434	II

*Note : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.*

*Source: Data gathered through Primary Investigation, October and November 2020.*

In Table 5.23, the calculations made have been presented. Drinking water and sanitation facility has scored highest with 1538 weight point and got I rank. With 1434 weight points II rank was assured by banking and postal services. proper implication of the government schemes and programme and housing facilities have stood at III and IV rank with the weight points of 1400 and 1394 respectively. The last position, i.e., V rank was held by electricity and gas connectivity with 1388 weight points.

### 5.21. Impact on Business, Culture and Modernization in Rural Areas

Trends towards business, culture and modernization of an area has an immediate and direct impact of providing rural road connectivity was observed in course of the study. Data provided in Table 5.24 are specifically about the NGNRY in the region under study area.

**Table 5.24**  
**Impact on Business, Culture and Modernization in Rural Areas**

Impact	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Yes	168 (70.00)	116 (65.17)	284 (67.95)
No	72 (30.00)	62 (34.83)	134 (30.05)
<b>Grand Total</b>	<b>240 (100.00)</b>	<b>178 (100.00)</b>	<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

About 70 per cent and 65.17 per cent of respondents have opined positive impact on business, cultural, modernization after construction of NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively, proves the data found in Table 5.24. The study areas have seen some rapid changes from

traditional and cultural to modern ways of life. Beneficiaries in the study area mentioned that the most visible change was in term of sudden escalation of prices of land adjacent to the NGNRY roads. This had led to an increase in the sale of land for commercial purposes.

The researcher has used the Chi-square ( $\chi^2$ ) test to trace or identify the impact of the NGNRY road transport on Employment, Education, Health and other aspects. The outcome of the test has been presented in Table 5.25.

**Table 5.25**  
 **$\chi^2$  Test for the Impact of NGNRY on Road Transportation**

<b>Rural Road Impact</b>	<b><math>\chi^2</math> Value</b>	<b>Degree of Freedom</b>
(01)	(02)	(03)
Impact on Employment Generation	10.293	4
Impact on Education	8.946	
Impact on Health infrastructure	14.917	
Impact on Agricultural Infrastructure	17.146	
Impact on Social aspect	7.794	
Impact on Business, Culture, Modernization in the rural areas	18.423	
<b>Average <math>\chi^2</math> Value</b>	<b>12.919</b>	

*Source: Tables 5.16, 5.18, 5.20, 5.22 and 5.24.*

It can be observed from the Table 5.25 that the  $\chi^2$  test for the impact of NGNRY on employment, education, health and other aspects is tested. It is observed in the table that calculated average value of Pearson Chi-square ( $\chi^2$ ) is 12.919 and the table value at 0.05 level of significance,  $df = 4$  is 9.49. Hence, the



calculated average value is more than the table value. Therefore, it can be concluded that the NGNRY road connectivity tends to improve employment, education, health and other facilities in the study area. ***Hence, the hypothesis set for the study that, the rural road connectivity tends to improve employment, education, health and other facilities in the study area has been verified in the field, approved and is accepted.***

### 5.22. Users' Overall Views on Rural Road Conditions

Table 5.26 finds data on the respondents overall views on rural road conditions of road users.

**Table 5.26**  
**Users' Overall Views on Rural Road Conditions in the Study Regions**

Users' View	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Surfaced	43 (17.92)	41 (23.03)	84 (20.10)
Unsurfaced	70 (29.17)	72 (40.45)	142 (33.97)
Partially surfaced	76 (31.67)	23 (12.92)	99 (23.68)
Partially un-surfaced	51 (21.25)	42 (23.60)	93 (22.25)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Table 5.26 reveals 17.92 per cent of the respondents observed rural roads are in the form of surfaced, while 29 per cent are expressed that rural roads are in unsurface form. Further 31.67 per cent opined rural roads are partially surfaced and remaining 21.25 per cent opined that they are partially unsurfaced.

Out of total 178 road beneficiaries were interviewed in Yadgir district views expressed by 178 respondents about the nature of roads in Yadgir district. According to 23.03 per cent respondents agreed road is surfaced. It is opined that 40.45 per cent agreed road is unsurfaced in nature. Further, while 12.92 per cent of road partially surfaced, remaining 23.60 per cent is partially un-surfaced.

It is also found from the table that while Hassan district possess larger proportion of partially surfaced whereas, in Yadgir district proportion of un-surfaced is largest.

### 5.23. Quality of the Surface

The quality of the road network is an important factor facilitating smooth operation of transport thereby in reducing the cost and time of users. The rural people mainly depend on road transport, the latter being pathetically poor, causes concern of all the users in the region. The users' opinion about the quality of the rural roads in their region is provided in Table 5.27.

**Table 5.27**  
**Quality of the Surface**

<b>Quality of the Surface</b>	<b>Very Good</b>	<b>Good</b>	<b>Fair</b>	<b>Poor</b>	<b>Very Poor</b>	<b>Total</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>	<b>(05)</b>	<b>(06)</b>	<b>(07)</b>
Bituminous surface	20	30	41	30	33	154 (36.85)
Metal surface	6	16	55	32	30	139 (33.25)
Earthen/Gravel Roads	19	33	17	38	18	125 (29.90)
<b>Grand Total</b>						<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Based on the field study, data provided in Table 5.27, it is found that about 28.33 per cent of the respondents opined NGNRY road is in the forms of bituminous surface and 33.25 per cent opined NGNRY roads is in the forms of metal surface. Remaining 29.90 per cent opined NGNRY roads are in the forms of Earthen/Gravel Road in the study area.

#### 5.24. Users Overall Views on NGNRY Road Conditions

Table 5.28 represents about the users opinion about the rural road conditions in the study region.

**Table 5.28**  
**Overall Condition of Rural Roads of NGNRY in the Study Region**

<b>Overall Condition</b>	<b>Hassan</b>	<b>Yadgir</b>	<b>Total</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Highly Satisfied	57 (23.75)	20 (11.24)	77 (18.42)
Fairly Satisfied	131 (54.58)	69 (38.76)	200 (47.85)
Highly Dissatisfied	52 (21.67)	89 (50.00)	141 (33.73)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is revealed from Table 5.28, out of 240 road beneficiaries interviewed in Hassan district. About 23.75 per cent of respondents indicated that overall road condition is highly satisfactory, whereas 54.58 per cent of respondents expressed their views that the overall road condition is fairly satisfactory. Remaining 21.67 per cent of respondents replied that road construction is highly dissatisfactory.

Out of total 178 road beneficiaries interviewed in Yadgir district about 11.24 per cent of respondents indicated that overall road condition is highly satisfactory. While 38.76 and 50 per cent opined that road condition is satisfactory and highly dissatisfactory respectively.

From the data provided here it becomes clear that about 54.58 per cent of respondents in Hassan district opined that there are fairly satisfied with condition of road, whereas in Yadgir district about 50 per cent of respondents are highly dissatisfied with the road condition.

### 5.25. Quality of NGNRY Roads

Statistical information pertaining to the quality of NGNRY in the study regions are provided in Table 5.29.

**Table 5.29**  
**Quality of NGNRY Roads in the Study Regions**

Quality of NGNRY Roads	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Good	172 (71.67)	58 (32.58)	230 (55.02)
Poor	68 (28.33)	120 (67.42)	188 (44.98)
<b>Grand Total</b>	<b>240 (100.00)</b>	<b>178 (100.00)</b>	<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

The NGNRY roads constructed are of poor quality in the Hassan region as opined by about 28.33 per cent of the respondents. In Yadgir region as opined by about 67.42 per cent of the respondents; whereas about 71.67 per cent in Hassan region and about 32.58 per cent in Yadgir region viewed that good quality roads

are being constructed under the NGNRY. This information has been provided in the Table 5.29.

It is found from the study that while in Hassan district majority of the respondents have expressed that the quality of NGNRY is good. In Yadgir district majority of the respondents have stated that quality of NGNRY is poor.

### 5.26. Users View on the Short Life of NGNRY Roads

Out of a total 418 respondents, the opinion of 310 is that the NGNRY roads do not last long in the study regions. The Weight Point Score has been accorded in descending order of 5, 4, 3, 2 and 1 for the views of 310 respondents. The calculations made are presented in Table 5.30.

**Table 5.30**  
**Users View on the Short Life of NGNRY Roads**

Users View	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Yes	199 (82.92)	111 (62.36)	310 (74.17)
No	41 (17.08)	67 (37.64)	108 (25.83)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

From the calculations (Table 5.30), it is found that, about 83 per cent of Hassan and 63 per cent of Yadgir respondents strongly agreed (total being 74%) that the total life of NGNRY roads is short. Table 5.31 represents user's index of the short life of the NGNRY roads.

**Table 5.31****Users Index of the Short Life of the NGNRY Roads**

<b>Causes of Short life</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>Total</b>	<b>Rank</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>	<b>(05)</b>	<b>(06)</b>	<b>(07)</b>	<b>(08)</b>
Poor Design	42x5=210	30x4=120	12x3=36	24x2=48	-	414	<b>IV</b>
Heavy Rains	38x5=190	18x4=72	27x3=81	25x2=50	-	393	<b>V</b>
Heavy laden vehicles on Road	36x5=189	30x4=120	25x3=75	17x2=36	-	420	<b>II</b>
Improper Use	44x5=220	19x4=76	32x3=96	13x2=26	-	418	<b>III</b>
Improper Maintenance	46x5=230	28x4=112	22x3=66	12x2=24	-	432	<b>I</b>

*Note : 5 = Strongly Agree, 4 = Agree, 3 = Undecided, 2 = Disagree and 1 = Strongly Disagree.*

*Source: Data gathered through Primary Investigation, October and November 2020.*

**i. Poor Design of Road**

Certainly, poorly designed road network will cause rapid deterioration. This scored 414 weight points and is positioned IV rank among the five identified causes of road deterioration. Necessarily, this should be a cause of concern to the concerned (Table 5.31).

**ii. Heavy Rainfall**

Heavy rainfall also causes early deterioration of roads specifically, with a total Weight Point Score of 393. This cause is placed at V rank among the five causes identified in the study region. It can be argued here that careful design and construction of a road can reduce any negative environmental impact.

**iii. Traffic Volume of HGVs**

The present study found that plying of heavy-laden vehicles on the low bearing capacity of rural road network is also found causing for the short life of NGNRY roads in the region. With the II highest Weight Point Score of 420 this is found to be one of the second major causes of early deterioration as viewed by the respondents in the study region. Added to this, consequent upon the inadequate construction of SHs and MDRs in the study region, traffic volume of such roads is being shifted to other roads where roads including village roads.

**iv. Improper Using of Roads**

It is the general responsibility of every one to help keep the roads in good form in their region. Certainly, improper using of road network results in short life of roads. This cause secured a low of 418 weight point score and ranked III in the order.

## V. Maintenance of Roads

Road maintenance is the routine work performed to upkeep pavement, shoulders and other facilities provided for road users for ensuring an adequate level of serviceability. It is found in a study that improper maintenance of road network is one the major causes of the short life of NGNRY road network anywhere for that matter. Specifically, here, with a total weight point score of 432 this cause placed I among the five causes identified in the study region.

### 5.27. NGNRY Roads with Other Rural Roads

Statistical information pertaining to the NGNRY roads with the other rural roads in the study region is provided in Table 5.32.

**Table 5.32**  
**Comparison of NGNRY Roads with Other Rural Roads**

Comparison	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Much better	90 (37.51)	62 (34.84)	152 (36.36)
Better	104 (43.33)	81 (45.50)	185 (44.27)
poor	46 (19.16)	35 (19.66)	81 (19.37)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is found from Table 5.32 that, out of 240 road beneficiaries interviewed in Hassan district, about 37.51 and 43.33 per cent of respondents opined that NGNRY road is much better and better respectively. Remaining about 19.16 per cent of respondents opined NGNRY roads are poor.



Out of total 178 road beneficiaries were interviewed in Yadgir district. About 34.84 and 45.50 per cent of respondents opined that NGNRY roads are much better and better respectively. Remaining about 19.66 per cent of respondents opined NGNRY road is unsafe.

It is found from the study that in Hassan and Yadgir districts majority of the respondents opined that the NGNRY roads are better and much better compared with the other rural roads.

### 5.28. Proper Maintenance of NGNRY Roads

The pertaining information from the respondents' opinion about proper maintenance of NGNRY roads presented in the Table 5.33.

**Table 5.33**  
**Maintenance of NGNRY Roads**

Roads maintenance	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Very good	29 (12.08)	21 (11.80)	50 (11.96)
Good	41 (17.08)	30 (16.85)	71 (16.98)
Fair	58 (24.17)	36 (20.22)	94 (22.48)
Poor	74 (30.84)	63 (35.40)	137 (32.80)
Very poor	38 (15.83)	28 (15.73)	66 (15.78)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is found from Table 5.33 that out of 240 road beneficiaries interviewed in Hassan district. About 12.08 and 17.08 per cent opined that road maintenance was very good and good respectively. Further, 24.17 per cent opined that road maintenance was fair. Remaining about 30.84 and 15.83 per cent opined that road maintenance is poor and very poor respectively.

Out of total 178 road beneficiaries were interviewed in Yadgir district about 11.80 and 16.85 per cent of respondents opined that road maintenance was very good and good respectively. About 20.22 per cent of respondents opined that road maintenance was fair. Remaining about 35.40 and 15.73 per cent of respondents opined that road maintenance is poor and very poor respectively.

It is found from the study that in Hassan and Yadgir districts larger respondents are found to be stating that NGNRY road maintenance is poor.

### 5.29. Adequate Construction of the NGNRY Roads

Statistical information pertaining to the adequate construction of NGNRY in the study region is provided in table 5.34.

**Table 5.34**  
**Adequate Construction of the NGNRY Roads**

<b>Adequate construction</b>	<b>Hassan</b>	<b>Yadgir</b>	<b>Total</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Yes	108 (45.00)	57 (32.00)	165 (39.47)
No	132 (55.00)	121 (68.00)	253 (60.53)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

As regards the construction of the NGNRY roads there is considerable difference in the opinion expressed by region-wise respondents about adequate construction. In Hassan district the NGNRY have been adequately constructed according to 45 per cent of the respondents, but only about 32 per cent are in Yadgir district replied in favour of adequate construction of NGNRY roads. Further, 55 and 68 per cent stated that there is inadequate construction of the NGNRY roads in Hassan and Yadgir districts respectively. This is provided in the Table 5.34.

It is evident from the primary investigation that, majority of the respondents stated that there is inadequate construction of the NGNRY roads in Hassan and Yadgir districts respectively.

### 5.30. Safety of NGNRY Roads to Travel

Users' opinion about the NGNRY roads is safe for travel in their region is provided in Table 5.35.

**Table 5.35**  
**Safety of NGNRY Roads to Travel**

<b>Safety of NGNRY Roads</b>	<b>Hassan</b>	<b>Yadgir</b>	<b>Total</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Absolute safe	67 (27.91)	36 (20.22)	103 (24.64)
Fairly safe	101 (42.09)	80 (46.08)	181 (43.31)
Unsafe	72 (30.00)	62 (33.70)	134 (32.05)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is found from Table 5.35 that, 240 road beneficiaries interviewed in Hassan district. About 27.91 and 42.09 per cent opined that NGNRY roads are absolute safe and fairly safe respectively. Remaining about 30 per cent of respondents opined NGNRY roads are unsafe.

Out of total 178 road beneficiaries were interviewed in Yadgir district 20.22 and 46.08 per cent of respondents opined that NGNRY roads are absolutely safe and fairly safe respectively. Remaining about 33.70 per cent opined NGNRY roads are not safe. It is found from the study that in Hassan and Yadgir districts majority of the respondents opined that the NGNRY roads are fairly safe for travel.

### 5.31. Effective Implementation of NGNRY Roads

Since its inception, NGNRY announced that providing connectivity with the construction of a qualitative road network in rural region will be the one of the prime objective the programme. Data pertaining to this, from the field survey in the study regions are provided in Table 5.36.

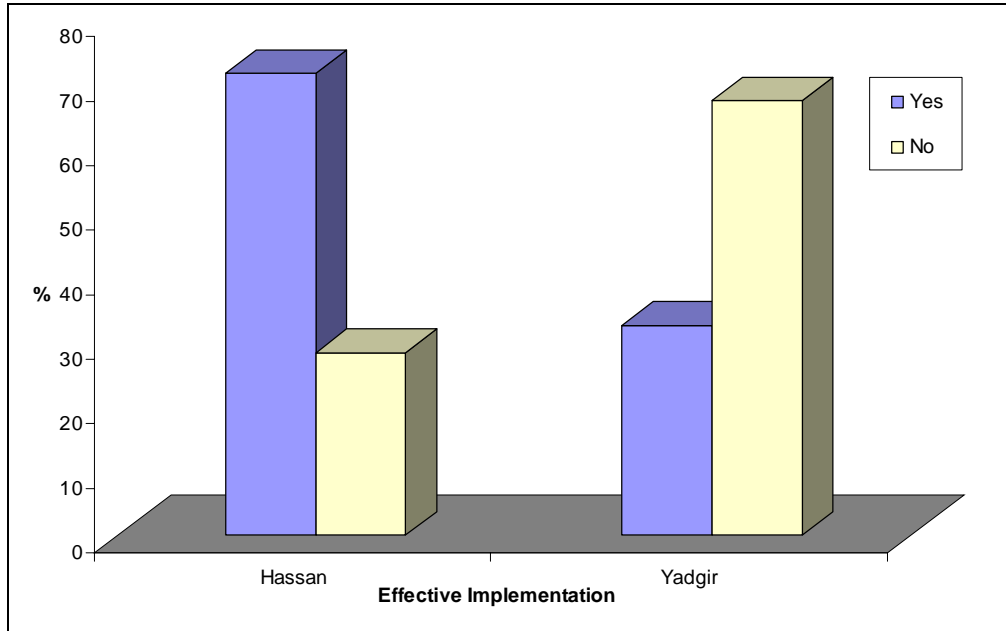
**Table 5.36**  
**Effective Implementation of the NGNRY Roads in the Study Regions**

<b>Effective Implementation</b>	<b>Hassan</b>	<b>Yadgir</b>	<b>Total</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Yes	172 (71.67)	58 (32.58)	230 (55.02)
No	68 (28.33)	120 (67.42)	188 (44.98)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

**Graph 5.7. Effective Implementation of the NGNRY Roads in the Study Regions**



It is evident from the primary investigation that as regards implementation of the NGNRY programme there is considerable difference in the views expressed by region-wise respondents about effectiveness of implementation. In Hassan district the NGNRY have been effectively implemented according to 72 per cent of the respondents, but only about 33 per cent in Yadgir district replied in favour of effective implementation of the NGNRY. Remaining 28.33 per cent and 67.42 per cent opined that there is an ineffective implementation of the NGNRY road is found in Hassan and Yadgir districts respectively, this is provided in Table 5.36.

### **5.32. Adequate Maintenance of NGNRY Roads**

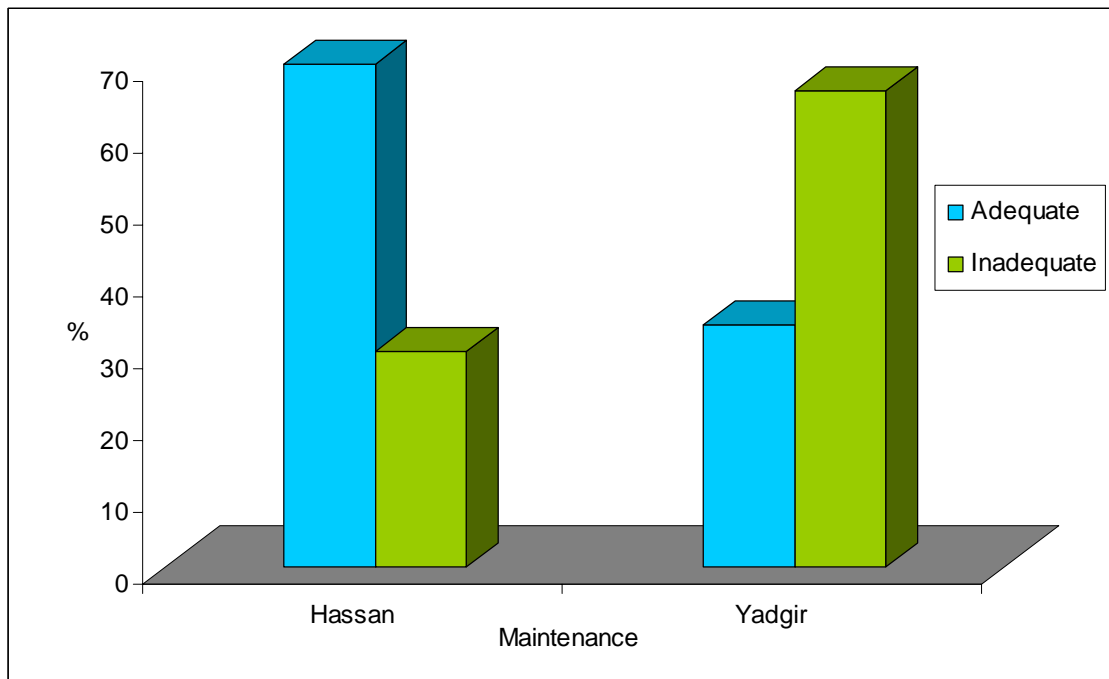
Road maintenance is the routine work performed to upkeep pavement, shoulders and other facilities provided for road users for ensuring an adequate level of serviceability. Users' opinion about the adequate maintained of NGNRY Roads in their region are provided in Table 5.37.

**Table 5.37****Adequate Maintenance of NGNRY Roads in the Study Regions**

Maintenance	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Adequate	168 (70.00)	60 (33.71)	228 (54.55)
Inadequate	72 (30.00)	118 (66.29)	190 (45.45)
<b>Grand Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

**Graph 5.8. Adequate Maintenance of NGNRY Roads in the Study Regions**

In addition, while about 70 per cent of the respondents in Hassan district admitted that NGNRY roads maintenance has been adequate. In Yadgir district, only about 34 per cent opined that there is adequate maintenance of the NGNRY roads. Remaining 33.71 per cent and 66.29 per cent opined that there is inadequate

maintenance of the NGNRY roads are found in Hassan and Yadgir districts respectively, this is provided in the Table 5.38. *Here, the hypothesis set for the study that, the implementation and maintenance of NGNRY in Hassan district has been better than that in Yadgir district has been verified in the field and it is proved and accepted.*

### 5.33. NGNRY Road User’s Satisfaction Index

The purpose of the researcher here is to measure the efficiency of NGNRY roads in the sample taluks of Hassan and Yadgir districts in general based on certain important indicators. To do so views of the users on road condition, width, markings, shoulders, smoothness, drainage provision and levelling the surface of NGNRY roads were collected. The information pooled and is presented in Table 5.38.

**Table 5.38**  
**NGNRY Roads - Quality Issues**

Quality Issues	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
<b>Pavement Condition</b>			
Good	138 (57.50)	51 (28.65)	189 (45.21)
Poor	102 (42.50)	127 (71.35)	229 (54.79)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>
<b>Road Width</b>			
Adequate	87 (36.25)	55 (30.89)	<b>142</b> (33.97)
Inadequate	153 (63.75)	123 (69.11)	<b>276</b> (66.03)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

Contd...

<b>Road Marking</b>			
Proper	103 (42.91)	85 (47.75)	<b>188</b> (44.97)
Not Proper	137 (57.09)	93 (52.25)	<b>230</b> (55.03)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>
<b>Shoulders</b>			
Adequate	161 (67.09)	20 (11.23)	<b>181</b> (43.30)
Inadequate	79 (32.91)	158 (88.77)	<b>237</b> (56.70)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>
<b>Drainage Provision</b>			
Good	72 (30.00)	39 (21.91)	<b>111</b> (26.55)
Poor	168 (70.00)	139 (70.09)	<b>307</b> (73.45)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>
<b>Levelling Surface</b>			
Satisfactory	132 (55.00)	92 (51.69)	<b>224</b> (53.59)
Not satisfactory	108 (45.00)	86 (48.31)	<b>194</b> (46.41)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

In Table 5.38, it can be viewed that very important and highly relevant as it provides data as regards a few pertinent indicators based on which users' views in the sample taluks of Hassan and Yadgir districts have been analysed.



**i. Pavement Condition**

On the basis of the test with reference to pavement condition data, the following results has been arrived at. As per the information, reveals in 42.5 per cent of the road users in Hassan district stated that the pavement condition of NGNRY roads is poor. As against this pavement condition of NGNRY roads is poor to about 71.35 per cent in Yadgir district.

**ii. Road Width**

Free spaced/ long width roads would facilitate easy movement of vehicles and restrain the accidents in any region for that matter. As above set, massive of 64 and 69 per cent of the users of Hassan and Yadgir districts respectively are not satisfied with road width.

**iii. Shoulders**

Properly built-up and well-maintained shoulders provide lateral support to the pavement. Due to the slow-moving vehicles like bullock carts or hand driven carts tend to ply over the shoulders and shoulders would abruptly get deteriorated in any region. Under the NGNRY, as per the approved design a one-meter length of shoulder should be provided on either side of rural roads during the maintenance period. Contractors should provide shoulders once in six month/year on either side of the road. As per the users view, as above set of 67 per cent and 11 per cent of the users are satisfied with the NGNRY roads in Hassan and Yadgir districts respectively.

#### **iv. Drainage Provision**

One of the important reasons for rapid loss in the level of serviceability of most of the rural road network in the country is lack of attention to appropriate drainage. As expected, large numbers of users, come heavily, complaining against providing of inadequate drainages on the NGNRY roads in the study region at the time of road works. Statistically, it is proved by the data provided in Table 5.38. About 70.00 per cent and 70.09 per cent of users respectively in the sample taluks of Hassan and Yadgir are worried about the inadequate provision of drainages under the NGNRY. Here, it can be argued that adequately maintained drainages should be considered more of an investment than expenditure. Only then, it yields benefits by the way of more economical designs and much reduced subsequent maintenance costs of roads.

#### **iv. Road Signs**

Surely, proper road signs make the riders/drivers to be more conscious about the upcoming pathway of the road and facilitate safe journey. Keeping this in mind, NGNRY intends to provide road signs where ever necessary. As regards this, about 42.79 per cent and 42.75 per cent of users respectively in the sample taluks of Hassan and Yadgir opined that under the NGNRY, the road signs/markings are not properly provided where ever found necessary. As per the researcher's observation between the two regions under the study, attention is to be given more in road signs in the regions.

**v. Leveling of Surface**

Comparatively, surface levelling is found more unsatisfactory in Yadgir (52%) than in Hassan (55%) provided in Table 5.38. For this, it can be viewed that the NGNRY has to give much attention to improve levelling of the surface in general and particularly in Yadgir region.

**5.34. Own Vehicle**

The rural people mainly depend on rural road transport, high movement of vehicle depend upon good roads. Users’ opinion about the own vehicle for travel after construction of NGNRY in their region is provided in Table 5.39.

**Table 5.39  
Own Vehicle Used**

Response	Hassan	Yadgir	Total
(01)	(02)	(03)	(04)
Yes	183 (76.25)	74 (41.57)	257 (61.49)
No	57 (23.75)	104 (58.43)	161 (38.51)
<b>Total</b>	<b>240</b> <b>(100.00)</b>	<b>178</b> <b>(100.00)</b>	<b>418</b> <b>(100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

Table 5.39 it can be viewed that about 76.25 per cent and 41.57 per cent of respondents using own vehicle respectively, in the sample taluks of Hassan and Yadgir districts. Further, the researcher used Weight Point Method to find out own vehicle after construction of NGNRY in the study region. The weight points are accorded to the priorities made are presented in following Table 5.40 and passages-wise.

**Table 5.40**  
**Type of Impact After Construction of NGRY**

Type of Impact		Hassan	Yadgir	Total	Rank
(01)		(02)	(03)	(04)	(05)
Travel Time	Saved	190	137	<b>327</b>	<b>II</b>
	Remained as earlier	50	41	91	
	<b>Total</b>	<b>240</b>	<b>178</b>	<b>418</b>	
Fuel efficiency of the vehicle	Saved	190	106	<b>296</b>	<b>IV</b>
	Remained as earlier	50	72	146	
	<b>Total</b>	<b>240</b>	<b>178</b>	<b>418</b>	
Maintenance cost of the vehicle	Reduced to some extent	176	126	<b>302</b>	<b>III</b>
	Remained as earlier	64	52	116	
	<b>Total</b>	<b>240</b>	<b>178</b>	<b>418</b>	
Smooth Travel	Facilitated	208	135	<b>343</b>	<b>I</b>
	Not Offered	32	43	75	
	<b>Total</b>	<b>240</b>	<b>178</b>	<b>418</b>	
Road Accident	Reduced	168	124	<b>292</b>	<b>V</b>
	Increased	72	54	126	
	<b>Total</b>	<b>240</b>	<b>178</b>	<b>418</b>	

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

In Table 5.40, the calculations are presented. It is found from the calculations that as per identify the impact of the NGNRY road transport on own vehicle, Smooth Travel has scored highest of 343 weight point score and remained at I rank among the five impact identified in the study region. Added to this, with 327 weight point score, Travel Time saved has stayed at II rank in this respect. Thus, it can be inferred that having 302 and 296 weight points, reduced maintenance cost of the vehicle and Fuel efficiency of the vehicle have stayed at III and IV rank respectively. Further, based on the calculations it has proved from the field study that the impact like reduced Road Accident stayed in fifth Place with weight point of 292.

### **5.35. Availability of Facilities/Provisions in the Study Area**

Primary data gathered, between the two periods of 2009-10 and 2019-20, impact of the NGNRY road network on provision of other infrastructures like Anganawadis/Convents, Primary Schools, High Schools, Primary Health Centers and Veterinary Hospitals in the study region are presented in Table 5.41.

**Table 5.41**  
**Availability of Facilities/Provisions in Study Regions**

Facilities	Hassan						Yadgiri					
	2009-10		2019-20			% Variation Over 10 years	2009-10		2019-20			% Variation Over 10 years
	Yes	No	Yes	No	Total		Yes	No	Yes	No	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)
Anganawadis/ Convents	132 (55.00)	108 (45.00)	188 (78.33)	52 (21.67)	240 (100.00)	176 (42.42)	78 (43.82)	100 (56.18)	127 (71.35)	51 (28.65)	178 (100.00)	49 (62.82)
Primary Schools	77 (32.08)	163 (67.92)	197 (82.08)	43 (17.92)	240 (100.00)	120 (155.84)	65 (36.52)	113 (63.48)	132 (74.16)	46 (25.84)	178 (100.00)	67 (103.07)
High Schools	63 (26.25)	177 (73.75)	168 (70.00)	72 (30.00)	240 (100.00)	105 (166.66)	62 (34.83)	116 (65.17)	99 (55.62)	79 (44.38)	178 (100.00)	37 (59.67)
Primary Health Centers	39 (16.25)	201 (83.75)	122 (50.83)	118 (49.17)	240 (100.00)	83 (212.82)	54 (30.34)	124 (69.66)	87 (48.88)	91 (51.12)	178 (100.00)	33 (61.11)
Veterinary Hospitals	22 (09.17)	218 (90.83)	108 (45.00)	132 (55.00)	240 (100.00)	86 (390.90)	41 (23.03)	137 (76.97)	102 (57.30)	76 (42.70)	178 (100.00)	61 (148.78)

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

The researcher wanted to know as to what extent development of rural roads has benefited the respondent as regards wanted to know to what extent development of rural roads has benefited the respondents as regards Anaganawadis/Convents, Primary Schools, High Schools, Primary Health Centres and Veterinary Hospitals are explained in the following passages.

**A) Anaganawadi/Convents**

In Hassan district in 2009, 132 respondents (55%) stated that they received assistance from Anganawadi. In Yadgir district 78 respondents (43.82%) admitted that Anganawadi was helpful to them. They replied in the affirmative indicating ‘Yes’. This number rose to 188 (78.33%) and 127 respondents (71.35%) in Hassan and Yadgir districts respectively in 2019-20. The percentage variation in ‘Yes’ amounts to 42.42 per cent and 62.82 per cent over a period of 10 years in the study regions (Table 5.41).

**B) Primary Schools**

In 2009, 32.08 per cent stated that they received assistance from Primary School in Hassan district. In Yadgir district 36.52 per cent admitted that Primary School was helpful to them. They replied in the affirmative indicating ‘Yes’. This number increased to 82.08 per cent and 74.16 per cent respondents in Hassan and Yadgir districts respectively in 2019-20. The percentage variation in ‘Yes’ amounts to 155.84 and 103.07 over a period of 10 years in the study regions (Table 5.41).

### **C) High Schools**

In Hassan district in 2009, 63 respondents stated that they received assistance from High Schools and in Yadgir district 62 respondents admitted that High School was helpful to them. They replied in the affirmative indicating 'Yes'. This number moved upward to 168 respondents and 99 respondents in Hassan and Yadgir districts respectively in 2019-20. The percentage variation in 'Yes' amounts to 166.66 and 59.67 over a period of 10 years in the study regions (Table 5.41).

### **D) Primary Health Centres**

In 2009, 16.25 per cent of the respondents stated that they received assistance from Primary Health Centre in Hassan district. In Yadgir district 30.34 per cent of the respondents admitted that primary health centre was helpful to them. They replied in the affirmative indicating 'Yes'. This number jumped upto 50.83 per cent and 48.88 per cent respondents in Hassan and Yadgir districts respectively in 2019-20. The percentage variation in 'Yes' amounts to 212.82 and 61.11 over a period of 10 years in the study regions (Table 5.41).

### **E) Veterinary Hospitals**

In Hassan district in 2009, 22 respondents (09.17%) stated that they received assistance from veterinary hospital. In Yadgir district 41 respondents (23.03%) admitted that veterinary hospital was helpful to them. They replied in the affirmative indicating 'Yes'. This number rose to 108 respondents (45%) and 102 respondents (57.30%) in Hassan and Yadgir districts respectively in 2019-20. The



percentage variation in ‘Yes’ amounts to 390.90 and 148.78 over a period of 10 years in the study regions (Table 5.41).

### 5.36. Role and Impact of NGNRY in the Study Regions

The selected responses observed for each scheduled statement have been scored to secure the total opinion score for the respondents 5 points are given for “Highly satisfied”, 4 points for “Satisfied”, 3 points are given for “Fair”, 2 points for “Dissatisfied”, and 1 point for “Highly Dissatisfied”, responses. The level of opinion has been classified into three categories namely High level, Medium level and Low level opinion for analytical purpose of the study. The classification is followed by the basic statistical parameter such as Mean and Standard deviation. The Arithmetic mean and standard deviation are approximately 72 and 9 respectively. Level of opinion of the respondents about the NGNRY is presented in Table 5.42.

$(X-SD)$  to  $(X+SD) = 72$  to  $9 =$  Medium Level

$(X-SD) = 72 - 9 = 63$  and below = Low level

$(X+SD) = 72+9 = 81$  and above = High level

**Table 5.42**  
**Role and Impact of NGNRY in the Study Regions**

Opinion	Male		Female		Total
	Hassan	Yadgir	Hassan	Yadgir	
(01)	(02)	(03)	(04)	(05)	(06)
High	38	18	13	7	<b>76 (18.18)</b>
Medium	77	48	42	19	<b>186 (44.50)</b>
Low	40	62	30	24	<b>156 (37.32)</b>
<b>Total</b>	<b>155</b>	<b>128</b>	<b>85</b>	<b>50</b>	<b>418 (100.00)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

The data provided in Table 5.42 shows that only 18.18 per cent of respondents agreed that it is of high level, about 44.5 per cent of the respondents stated that it is of medium level and remaining 37.32 per cent of the respondents opined that it is of low level.

### **5.37. Socio-Economic Factors and Level of Performance of NGNRY**

For testing the association between socio-economic variables of respondents and level of opinion about the performance of NGNRY programme in the study area,  $\chi^2$  test has been used for the study purpose.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

With (r-1) (c-1) degree of freedom

where, 
$$E = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}}$$

where, O = Observed frequency

E = Expected frequency

R = Number of rows on a contingency table

C = Number of columns in a contingency table

The Calculated Value (CV) of chi-square is tested with the Table Value (TV), if  $\chi^2$  for given level of significance is usually at 5 per cent. It is presented in Table 5.43.

**Table 5.43**  
**Computed Results of  $\chi^2$  Test**

Variables	Type	Calculated value	Degree of Freedom	Table Value	Result
(01)	(02)	(03)	(04)	(05)	(06)
Gender	The role and impact of NGNRY	4.23	2	5.99	Not Significant
Age	The role and impact of NGNRY	13.18	6	12.6	Significant
Educational Status	The role and impact of NGNRY	12.89	8	15.5	Not Significant
Area	The role and impact of NGNRY	16.73	8	15.5	Significant
Occupation	The role and impact of NGNRY	8.04	4	9.49	Not Significant

*Source: Calculated Data by using SPSS.*

The above Table 5.43 shows that there is no association between socio-economic variables, such as gender, educational status, occupation and their level of opinion about the performance of NGNRY scheme and there is an association between socio-economic variables such as age, area and their level of opinion about the performance of NGNRY programme in the study area.

### **5.38. Issues on Marketing of Agricultural Produce**

Now a day, the farmers have extensive opportunities to market their surplus agricultural marketing produce through various marketing hubs where they get more remunerative prices for their produce. Extensive/convenient transportation provisions give way for more opened rural marketing activities even for long distance. The researcher gathered primary information, again, for two different periods of 2009-10 and 2019-20, as regards to the nature of agricultural marketing operation in these study regions. The relevant data is presented in Table 5.44.

**Table 5.44**  
**Agricultural Products (Food Grains, Vegetables, Pulses, Oilseeds, Commercial Crops and Others)**

Options	Hassan						Yadgiri					
	2009-10		2019-20			% variation over 10 years	2009-10		2019-20			% variation over 10 years
	Yes	No	Yes	No	Total		Yes	No	Yes	No	Total	
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)
Middlemen	186 (77.50)	54 (22.50)	113 (47.08)	127 (52.92)	240 (100.00)	<b>(-) 73</b> <b>(-39.24)</b>	137 (76.97)	41 (23.03)	84 (47.19)	94 (52.81)	178 (100.00)	<b>(-) 53</b> <b>(-38.68)</b>
Mandies	52 (78.34)	188 (21.66)	79 (32.91)	161 (67.09)	240 (100.00)	<b>27</b> <b>(51.92)</b>	34 (19.10)	144 (80.90)	72 (40.44)	106 (59.56)	178 (100.00)	<b>38</b> <b>(111.76)</b>
Primary Market Centers	79 (32.91)	161 (67.09)	142 (59.17)	98 (40.83)	240 (100.00)	<b>63</b> <b>(79.74)</b>	27 (15.16)	151 (84.84)	99 (55.62)	79 (44.38)	178 (100.00)	<b>72</b> <b>(266.66)</b>
Regulated Markets	72 (30.00)	168 (70.00)	99 (41.25)	141 (58.75)	240 (100.00)	<b>27</b> <b>(37.50)</b>	32 (17.97)	146 (82.03)	83 (46.62)	95 (53.38)	178 (100.00)	<b>51</b> <b>(159.37)</b>
Co-operative Societies	48 (20.00)	192 (80.00)	87 (36.25)	153 (63.75)	240 (100.00)	<b>39</b> <b>(81.25)</b>	68 (38.20)	110 (61.80)	112 (62.93)	66 (37.07)	178 (100.00)	<b>44</b> <b>(64.70)</b>

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

### **a) Middlemen**

As it is the case elsewhere, the middlemen do play an essence role in the districts under study. The primary study mode found that, for the period of 2019-20, of the total 418 respondents interviewed, about 47.08 per cent and 47.19 per cent in Hassan and Yadgir districts respectively, do carry out their agricultural marketing activities through middlemen, as against 77.50 per cent and 76.97 per cent respectively during 2009-10. Thus, over a period of 10 year, the framers dependence on middlemen for agriculture marketing has decreased marginally in Hassan district by -30.41 per cent and in Yadgir district by -29.77 per cent (Table 5.44).

### **b) Mandies**

The Mandies serve as entrepreneur markets i.e., collection and distribution centres of agricultural produce marketed by farmers in the hinterland. As related to this, data gathered from the field prove that the farmer's dependence, compared 10 year figures, about 111.76 per cent and 51.92 per cent of the respondents preferred the Mandies for their agri-marketing activities in that order in Hassan and Yadgir districts respectively.

### **c) Primary Market Centres**

In the primary investigation it is found that, for the period of 2019-20, of the total 418 respondents interviewed, about 59.17 per cent and 55.62 per cent do carry out their agricultural marketing activities through Primary Market Centres in Hassan and Yadgir districts respectively, as against 32.91 per cent and 15.16 per cent respectively during 2009-10. Thus, over 10 year period, the respondents

depend on Primary Market Centres for agriculture marketing has increased marginally in Hassan by 79.74 per cent and in Yadgir district by 266.66 percentage point.

#### **d) Regulated Markets**

It can be observed from the above figures (Table 5.44) that in the year 2019-20 about 41.25 per cent and 46.62 per cent of the respondents are found marketing their goods through regulated markets in Hassan and Yadgir districts respectively. In that order which has been higher than the corresponding figures during 2009-10 explaining the farmers' awareness has increased about marketing facilities.

#### **e) Co-operative Societies**

During the year 2019-20, among the respondents of the study regions, about 36.25 per cent and 62.93 per cent of the respondents are found marketing their surplus produce through co-operative societies in Hassan and Yadgir districts respectively, where proportion was a low of 20 per cent and 38.20 per cent in 2009-10 (Table 5.44).

Thus, the importance of an efficient and competitive marketing system has been stressed as a compliment to Rural Transport Services (RTS) and infrastructure in promoting development. However, the presence of marketing hubs also constitutes a means by which the effective demand for transport can be increased. Though the efforts made through the NGNRY for rural road development, the role of middlemen in the rural marketing still continues causing concern of many. Dependence on regulated markets and co-operative societies by farmers in the study region has improved. A comprehensive rural transportation

planning is a pre-requisite to achieve this goal. Data provided in Table 5.45 about the application of ‘t’ test to assess pre and post implementation of NGNRY and marketing of agricultural products.

**Table 5.45**

**Pre and Post-Implementation of NGNRY and Marketing of Agricultural Products**

<b>Implementation of NGNRY</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Standard Error Mean</b>	<b>Mean Deviation</b>	<b>‘t’ ratio</b>
Pre-implementation	41.84	4.30	0.75	2.09	3.80
Post-implementation	67.50	5.41			

*Source : Table 5.44.*

The above Table 5.45 demonstrates the ‘t’ proportions for pre and post implementation of NGNRY and marketing of agricultural products is 3.80. The acquired ‘t’ proportion was greater than the table estimation of 2.09 at 5 per cent of significant level. Therefore, there is a significant difference between pre and post implication of NGNRY and Marketing of agricultural products in the study area.

**PART-II**

**The Contractors Views**

Generally, contractors do play a vital role in the implementation of the NGNRY programme in any region for that matter. A total of 11 contractors, 07 from Hassan and 04 from Yadgir districts have been interviewed. Their responses have been elicited with the help of structured interview schedule.

**5.39. General Information about the Contractors**

The road contractors interviewed were fairly educated. About 67 per cent of the contractors are found aged between 25 and 35 years, followed by 19 per

cent in the age group of 35 to 45 years and the remaining 14 per cent being aged above 45 years.

#### **5.40. Experience in the Field**

Table 5.46 gives the relevant information as regards the contractors' experience in their field of job.

**Table 5.46  
Experience Details of the Contractors**

<b>Experience (Years)</b>	<b>No. of Contractors</b>	<b>Percentage</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>
0-5	01	09.09
6-10	01	09.09
11-15	03	27.27
15 above	06	54.55
<b>Total</b>	<b>11</b>	<b>100.00</b>

*Source : Data gathered through Primary Investigation, October and November 2020.*

It is found that of the total contractors interviewed, about 54.55 per cent had above 15 years of experience in road construction work. About 27.27 per cent had 11-15 years of experience and 9.09 per cent of each had 0-5 and 6-10 years of experience. This is the welcome feature of the programme that fairly experienced ones have been engaged in the construction of the NGNRY roads in the study area.

#### **5.41. Contractors Views on the Programme**

Closely related with the above issue, based on the indicators like, approval of work, competition, allocation, administrative issues, completion of work, employment creation, cost of inputs, labour availability, labour wage, causes of road deterioration, performance of the NGNRY programme, development aspects



and so forth, it is found to analyse the contractors' views are presented in Table 5.47.

**Table 5.47**  
**Contractors Views on NGNRY Road Construction**

Contractors Views (01)	Number of Contractors opining		
	(02)	(03)	(04)
Approved process	<b>Easy</b>	<b>Difficulty</b>	<b>Total</b>
	08 (73.00)	03 (27.00)	11 (100.00)
Competition in the field	<b>Yes</b>	<b>No</b>	<b>Total</b>
	11 (100.00)	00 (00.00)	11 (100.00)
Allocation of Fund	<b>Adequate</b>	<b>Inadequate</b>	<b>Total</b>
	06 (55.00)	05 (45.00)	11 (100.00)
Release of the Fund	<b>Delay free</b>	<b>Delayed</b>	<b>Total</b>
	11 (100.00)	00 (00.00)	11 (100.00)
Authorities Attending to Contractors Problem	<b>Yes</b>	<b>No</b>	<b>Total</b>
	09 (82.00)	02 (28.00)	11 (100.00)
Time taken for completion of works	<b>Within 9 months</b>	<b>9 months and above</b>	<b>Total</b>
	07 (64.00)	04 (36.00)	11 (100.00)
Success of the programme	<b>Highly successful</b>	<b>Moderately Successful</b>	<b>Total</b>
	07 (64.00)	04 (36.00)	11 (100.00)

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*

#### **a) Approving of Works**

Contractors are worried about approval process<sup>11</sup> of road works under the NGNRY in the study region. Of the total contractors interviewed, about 73 per

<sup>11</sup> For approval of road works under the Programme, Contractors must accomplish the two bidding process i.e., technical bids and financial bids process.

cent opined that the sanctioning of road works under the programme was not difficult, statistical data provided in Table 5.47.

**b) Competition**

The contractors in the study districts have faced cent per cent competition in the field under the programme.

**c) Allocation of Funds**

According to a 55 per cent of contractors, allocation of funds per km of road construction is found adequate in the study districts of Hassan and Yadgir.

**d) Release of Funds**

Releasing of funds under the programme has not been delayed, as opined by all the contractors interviewed in these regions. Under the programme, fund has been released by the means of online monitoring system operated by the NRRDA at State level and PIU at District level. The fund has been released to contractors, through using of the separate account of online banking, based on the physical progress of the work.

**e) Authorities Attending to Contractors' Problems**

Cent per cent of the contractors had the same opinion in the study region that administrative and technical problems of contractors have been regularly attended to by the authorities.

**f) Success of the Programme in the Study Regions**

It can be inferred from the contractors' views presented in Table 5.47 that 65 per cent contractors have frankly agreed that the programme has been highly successful in the study region. In spite of this, the researcher, being impartial, found certain noticeable flaws in the implementation of the programme in general.

### 5.42. Creation of Employment

Elimination of poverty, inequality, unemployment, providing higher quality of life and so forth are the basic objectives of the rural development programmes in any region for that matter. As related to the above thought, Table 5.48 provides the information, gathered through field survey, on creation of employment per km of road constructed under the NGNRY in the study region.

**Table 5.48**  
**Employment Created Under the NGNRY Road Works**

(per km)

<b>Employment Created for</b>	<b>Total Mandays of Employment Created</b>	<b>No. of Respondent Contractors</b>	<b>Average Number of Days Employed Created (col. 02 ÷ col.03)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Male	780	11	70.90
Female	425		38.63
<b>Total</b>	<b>1205</b>	<b>11</b>	<b>109.54</b>

*Source : Data gathered through Primary Investigation, October and November 2020.*

From data provided in Table 5.48, it is clear that an average of about 109.54-mandays of employment has been created per km of road work under the NGNRY in the study region. Of which the share of male was 70.90 days and female was 38.63 days. Thereby, programme helped the rural people to earn their income.

### 5.43. Labour

Eventhough the programme generates employment, supply of labour (availability of workers) is found a problem in the study districts of Hassan and Yadgir. The contractors were found hiring the labour force both through contract and daily wage basis. The contractors also opined that arrangement for/

management of unskilled human resources on daily wage basis form is rather complicated, as such they preferred hiring labour force on contract basis.

#### 5.44. Wage

Data presented in Table 5.49 give the wage paid details.

**Table 5.49**  
**Wage Details of Daily form Labour**

<b>Gender</b>	<b>Total wages of labour ( ` )</b>	<b>No. of Respondent Contractors</b>	<b>Average of Wage per Person per day ( ` ) (col. 02 ÷ col.03)</b>
<b>(01)</b>	<b>(02)</b>	<b>(03)</b>	<b>(04)</b>
Male	5050	11	<b>450.10</b>
Female	3900		<b>354.54</b>

*Source : Data gathered through Primary Investigation, October and November 2020.*

Table 5.49 shows the calculation of average wage paid to unskilled labourers per day under road construction may not be cent per cent reliable. However, during the primary investigation, the contractors were found paying on an average ` 450.10 for male and ` 354.54 per female per day in study region. For the daily wage earners, payment was made by contractors once in a week by cash.

#### 5.45. Deterioration of NGNRY Roads - The Contractors' Views

The roads get deteriorated due to poor design of roads, heavy rains, playing of heavy-laden vehicles on the roads, improper use, poor maintenance and so forth. Taking the above into account as the causes for deterioration and short life of NGNRY roads, with the help of Weight Point Method, the calculations are made weight points are accorded in descending order of 5, 4, 3, 2 and 1. The result is presented in Table 5.50.

**Table 5.50**  
**Short Life of NGNRY Roads-Calculations using Weight Points**

Respondents and Weight Points (WP)												
Causes for Short Life of Roads	No. of Respondents	WP 5	No. of Respondents	WP 4	No. of Respondents	WP 3	No. of Respondents	WP 2	No. of Respondents	WP 1	Total WPs	Rank
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)
Improper Use	1	1x5 5	4	4x4 16	01	1x3 3	01	1x2 2	--	--	<b>26</b>	<b>I</b>
Poor Maintenance	1	1x5 5	1	1x4 4	04	4x3 12	01	1x2 2	--	--	<b>23</b>	<b>IV</b>
Poor Design	1	1x5 5	01	1x4 4	02	2x3 6	01	1x2 2	--	--	<b>17</b>	<b>V</b>
Heavy Rains	3	3x5 15	--	--	02	2x3 6	01	1x2 2	1	1x1 1	<b>24</b>	<b>III</b>
HGVs Playing on Roads	1	1x5 5	03	3x4 12	02	2x3 6	01	1x2 2	--	--	<b>25</b>	<b>II</b>

*Note : 1) Total number of Respondents 11 and 2) WP=Weight Point.*

*Source : Data gathered through Primary Investigation, October and November 2012.*

It is clear from the calculations in Table 5.50 that the causes of improper use of roads and HGVs Playing on Roads have scored the points of 26 and 25 respectively and are ranked I and II in order. With a score of 24 weight points, the cause of heavy rains is placed III rank. Poor maintenance of roads is placed IV rank (23 weight points) and poor design of roads is placed V rank with 17 weight points. Based on the calculations made depended on the contractor views the researcher is of the firm opinion that all these factors are responsible for short life of the NGNRY roads in the study area. This may be the fact elsewhere in the state.

### **PART-III**

#### **For the PIU Authorities of the NGNRY**

In this Section, opinion of the PIU Authorities of the NGNRY are presented. As well contextually, discussion and interpretation are made. In doing so, keeping the programme implementation modalities in view initially, the views gathered, through primary investigation, from the PIU Authority have been analyzed and interpreted.

#### **5.46. The Working of PIU Authorities**

The PIU is the grass root level office of the NGNRY programme. In each district, the PIU office is located. It is the basic unit for project planning, execution

and accounting. The PIU consists of one or two Engineering Divisions in every district, headed by an Executive or Superintending Engineer, Assistant Engineers and Field Engineers to coordinate the works as related with estimation, preparation of proposals and construction of the NGNRY roads. In each district, the PIU office works with the Department of Rural Development and Panchayat Raj offices concerned.

#### **5.47. Authorities Views on Implementation in the Study Region**

Usually, the routine work of the PIU authorities consists of preparation of road map, core network, estimation, tendering, field verification, inspection of road works, keeping of accounts and so forth. Under the programme, proposals should be prepared based on a priority list, where first priority will be given to unconnected habitations with large population habitations to small population habitations; then the single connectivity habitations will be chosen and at the end. The population density of road and maximum benefits getting habitations will be chosen for the purpose. The data provide as regards to the authority's opinion on certain issues of the NGNRY is presented in Table 5.51 in a summary form.

**Table 5.51**  
**PIU Authorities Opinion about NGNRY**

Sl.No.	Authorities views on	Number of Authorities		
		(03)	(04)	(05)
a)	Preparation of Proposal	<b>Easy</b>	<b>Difficulty</b>	<b>Total</b>
		03 (28.00)	08 (72.00)	11 (100.00)
b)	Abiding norms and conditions of (by Contractors)	<b>Yes</b>	<b>No</b>	<b>Total</b>
		11 (100.00)	00 (00.00)	11 (100.00)
c)	Attending to the Contractors’ Problem	<b>Yes</b>	<b>No</b>	<b>Total</b>
		11 (100.00)	00 (00.00)	11 (100.00)
d)	Abiding to Time frame specified	<b>Within 9 months</b>	<b>9 months &amp; above</b>	<b>Total</b>
		04 (36.00)	07 (64.00)	11 (100.00)
e)	Maintenance of roads (by contractors)	<b>Good</b>	<b>Not good</b>	<b>Total</b>
		08 (72.00)	03 (28.00)	11 (100.00)
f)	Releasing of the Fund (per km of road)	<b>Adequate</b>	<b>Inadequate</b>	<b>Total</b>
		11 (100.00)	00 (00.00)	11 (100.00)
g)	Contractor's relationship with PIU Authorities	<b>Good</b>	<b>Not good</b>	<b>Total</b>
		11 (100.00)	00 (00.00)	11 (100.00)
h)	Facing difficulties while quality assessment	<b>Yes</b>	<b>No</b>	<b>Total</b>
		05 (45.00)	06 (65.00)	11 (100.00)
i)	Success of the programme	<b>Highly successful</b>	<b>Moderately successful</b>	<b>Total</b>
		08 (72.00)	03 (28.00)	11 (100.00)

*Note : Figures in bracket are percentage to total.*

*Source : Data gathered through Primary Investigation, October and November 2020.*



**a) Preparation of a Proposal**

Of the total PIU officials interviewed, about 72 per cent opined that preparation of proposal under the programme is not easy rather is difficult and remaining about 28 per cent opined that preparation of proposal under the programme is easy. It is so because the PIU officials are not provided with conveyance to carry out field inspection/verification prior to preparation of intended proposal for approval of road connectivity under the NGNRY (Table 5.51).

**b) Contractors Abiding Norms and Conditions**

As opined by the PIU officials (100%), all the contractors strictly abide by the norms and conditions laid at the time of road works. According to by law, in the case of contractors found violating the norms and conditions stipulated, the authorities are empowered to act against such defaulters.

**c) Attending to Contractor Problems**

Based on the opinion gathered presented in Table 5.51 it can be inferred that all the officials respond to the contractors' problems of land litigation, objection raised by other departments like forest, electricity, revenue department, handling of the court case and so forth, without delay.

**d) Completion of Road Work**

A period of nine month's (time nine working months) will be assigned for completing the construction of roads in plain areas. If the work assigned is adversely affected by monsoon or other seasonal reasons, additional three months'

time may be taken by the contractors to complete the work. About 64 per cent of the PIU officials opined that the work has not been completed within the stipulated time period of nine months.

**e) Maintenance of Roads**

Construction and five years regular maintenance of roads is the one of the prime objectives of the programme. About 72 per cent of the PIU officials interviewed in the study region held the opinion that the maintenance of roads was good. However, an observation was made at different locations where such roads are constructed.

**f) Fund Release**

Cent per cent of the PIU authorities had the same opinion in the study region that the funds released per km of road construction under the programme was adequate.

**g) Contractors-Authority Relation**

The study found that, cent per cent of the officials maintained cordial relationship with the contractors in study region, as is presented in Table 5.51.

**h) Quality Assessment**

The First Tire Quality Assessment of road is the responsibility of the PIUs officials in each district. Of the total officials interviewed, about 45 per cent frankly agreed that due to political pressure, inadequate laboratories set by the

contractors at the field and so forth have complicated the situation at the time of First Tire Quality Assessment.

**i) Success of the Programme**

About 72 per cent of the PIU officials interviewed agreed that the programme has been highly successful in the study districts of Hassan and Yadgir. However, the researcher found many flaws, on observation and first-hand information at the locations, in the implementation of the programme in these regions of Karnataka.

**5.48. Reasons for the Deterioration of Roads - The Authorities Views**

Roads are designed for a 10-year life with two regular's five-year maintenance. The long life or otherwise of these roads depends mainly on defined by means of proper design of roads, plying of low laden vehicles on these roads, proper use, regular maintenance, moisture condition in the regions and so forth. The PIU authorities were asked to reveal causes for the short life of roads in study region. Table 5.52 is to be observed here, where collocations are made using the Weight Point Score Method. The weight points have been accorded to the factors in descending order of 5, 4, 3, 2 and 1 and then by calculation, the causes of short life of the roads were ranked in accordance with the total weight points secured by each factor among the five causes.

**Table 5.52**  
**Short Life of NGNRY Roads - The Causes**

Respondents and Weight Points (WP)												
Causes	No. of Respondents	WPS 5	No. of Respondents	WPS 4	No. of Respondents	WPS 3	No. of Respondents	WPS 2	No. of Respondents	WPS 1	Total WPS	Rank
(01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)
Poor Design of Roads	1	1x5 5	2	2x4 8	1	1x3 3	3	3x2 6	-	-	22	V
Poor Maintenance	1	1x5 5	4	4x4 16	1	1x3 3	1	1x2 2	-	-	26	III
HGVs Plying on NGNRY Roads	3	3x5 15	2	2x4 8	1	1x3 3	1	1x2 2	-	-	28	I
Improper Use by the General Public	1	1x5 5	3	4x3 12	2	2x3 6	2	2x2 4	-	-	27	II
Heavy Rains	1	1x5 5	2	2x4 8	3	3x3 9	1	1x2 2	-	-	24	IV

*Note : 1) Total of 11 officials were interviewed and 2) WPS = Weight Point Score.*

*Source: Data gathered through Primary Investigation, July and August 2012.*

It is proved in Table 5.52, as opined by the officials, that plying of heavy-laden vehicles on the road caused deterioration of the roads in the study region which scored the highest weight point of 28 and topped the list. In many causes, the general public have wrong notion that up keep of public property is the government responsibility and not their own and sometimes misuse the facilities provided. Improper use of roads with a score of 27 weight points is the second cause. Further, improper maintenance of roads was found the third cause with a score of 26 weight points.

Yet another cause identified is related with the monsoon, where, the study found that heavy rains with a score of 24 weight points and secured fourth place. It can now be inferred from the above that the officials were not ready to agree that poor designing of roads is a determining factor of life of the roads; as it scored the last weight points of 22 in that order.

It can be concluded that, NGNRY road construction in the study area explicitly exhibits considerable difference. Based on the data presented in this chapter, it is evident that the Southern region i.e., Hassan district has a clear upper hand over the Northern region i.e., Yadgir district. Among all the parameters considered for the present research work such as allocation of funds, planning and execution of road works, utilization of funds, maintenance of roads and such other factors portray better results in Hassan district. Similarly, it is clearly established that, contribution of NGNRY roads have been comparatively very high in Hassan

district as regards excess to higher education, health services, agricultural marketing, employment generation, progress of allied activities. It is heartening to note that, the divide between north and south regions has either retained the same or has increased overtime.

This is a matter of serious concern. However, it can be stated that there is still greater scope for producing better results in both the regions. This requires effective and timely execution of quality work, in the form of construction of NGNRY roads aimed at better and dependable rural connectivity in Karnataka in general and in the study region in particular. The researcher anticipates for the early results.

## Chapter-06

### FINDINGS, SUGGESTIONS AND CONCLUSION

---

#### **A. Findings Based on Secondary Data**

- 6.1. Road Network in India**
- 6.2. Rural Road Network in India**
- 6.3. Road Network in Karnataka**
- 6.4. Rural Road Network in Karnataka**
- 6.5. The NGNRY in the Study Regions**

#### **B. Findings Based on Primary Data**

##### **PART-I**

#### **6.6. Views of NGNRY Road Beneficiaries**

- 6.6.1. Educational Background of the Respondents**
  - 6.6.2. Occupation**
  - 6.6.3. Awareness about the Programme**
  - 6.6.4. Quality of NGNRY Roads**
  - 6.6.5. Impact on Employment Generation**
  - 6.6.6. Impact on Education**
  - 6.6.7. Health Infrastructure**
  - 6.6.8. Impact on Agricultural Infrastructure**
  - 6.6.9. Impact on Social Aspects**
  - 6.6.10. Impact on Business, Culture and Modernization in the Rural Areas**
  - 6.6.11. Overall Views of Users on Rural Road Conditions**
  - 6.6.12. Users' View on the Short Life of the NGNRY Roads**
  - 6.6.13. Effective Implementation of the NGNRY Roads**
  - 6.6.14. Adequate Maintenance of the NGNRY Roads**
-

---

## **PART-II**

- 6.7. Views of NGNRY Contractors**
  - 6.7.1. Approval of Works**
  - 6.7.2. Allocation of Funds**
  - 6.7.3. Release of Funds**
  - 6.7.4. Success of the Programme in the Study Regions**
  - 6.7.5. Creation of Employment**
  - 6.7.6. Wage**

## **PART-III**

- 6.8. Authority Views**
    - 6.8.1. Preparation of a Proposal**
    - 6.8.2. Contractors Abiding Norms and Conditions**
    - 6.8.3. Attending to the Road Contractors' Problems**
    - 6.8.4. Completion of Road Works**
    - 6.8.5. Maintenance of Roads**
    - 6.8.6. Fund Release**
    - 6.8.7. Contractors'-Authority Relation**
    - 6.8.8. Quality Assessment**
    - 6.8.9. Success of the Programme**
  - 6.9. Problems Identified during the Study**
    - 6.9.1. Regional Disparity**
    - 6.9.2. Ineffective Implementation of NGNRY Roads**
    - 6.9.3. Inadequate Maintenance of NGNRY Roads**
    - 6.9.4. Poor Quality of NGNRY Roads**
    - 6.9.5. Negligence of Remote Villages**
    - 6.9.6. Overall Conditions of the NGNRY Roads**
    - 6.9.7. Lack of Awareness about Rural Development Programmes**
    - 6.9.8. Environmental Pollution**
    - 6.9.9. Red-tapison in the Allocation of Funds**
    - 6.9.10. Unscientific Road Humps**
    - 6.9.11. Improper Maintenance of Water and Drainage System**
-



---

**6.10. Suggestions**

**6.10.1. More Emphasis on North Karnataka**

**6.10.2. More Emphasis on Yadgir District**

**6.10.3. Better Quality of the NGNRY Roads**

**6.10.4. More Emphasis on Remote Areas**

**6.10.5. Inter-Village Connectivities**

**6.10.6. Programme Awareness**

**6.10.7. Role of Government**

**6.10.8. Daily Travel Needs**

**6.10.9. Increase Enhancement in Grants and Maintenance Period**

**6.10.10. Proper Speed Breaker**

**6.10.11. Proper Drainage System**

**6.10.12. Public Co-operation**

**6.11. Conclusion**

---

## Chapter-06

### FINDINGS, SUGGESTIONS AND CONCLUSION

Having presented the analysis of the data and research results in the previous chapter, this chapter proceeds to present the findings of the study, problems, some suggestions prior to a formal conclusion at the end.

For convenience, the Findings are presented by dividing them into Findings based on Secondary Data and the ones based on Primary Investigation.

#### A. Findings Based on Secondary Data

The major findings based on the secondary information are presented below:

##### 6.1. Road Network in India

The total road length of per lakh population in India was found to be about 476.68 km and per 100 sq.km was about 194.27 km. In the total road length, the length of rural roads was the highest with 71.62 per cent share. Further, it is found that there is 544 km rural road per lakh population and 138 km per 100 sq. km in the country in the year 2020-21.

It is evident from the study that, during 70 years period (1950-51 to 2020-21), the total road length of per lakh population has increased by from 110.76 km to about 476.68 km and per 100 sq.km the length has increased from 12.16 km to about 194.27 km.

##### 6.2. Rural Road Network in India

It is evident from the secondary data that India's total road connectivity between 1950-51 and 2020-21, rose by 2097.35 percentage points. But during the

period of 70 years, the annual growth of rural roads has been 0.15 percentage points. This provides evidence to the fact that importance towards the development of rural roads needs to be continuously given. It is because from the point of view of infrastructure development, rural road network is more essential in these days of globalized environment.

### **6.3. Road Network in Karnataka**

The data prove that the total road length in Karnataka has increased to 3,31,099 km in 2021 from 43,182 km in 1956. In the other words it has increased by 666.75 percentage points. Thus, the road length during this period registered an increase by 8 times. It is found that while the road length per lakh population stood at 100 km and for 100 sq. km of area at 173 km in the year 2021.

### **6.4. Rural Road Network in Karnataka**

As regards rural roads, it is found that there was 2,373 km of rural road length in 1956, which rose to a high of 1,98,501 km in 2021. This increase amounted to about 8265 percentage points and the length of roads grew by about 84 times between 1956 and 2021, which is a noticeable feature in respect of the trends in the growth of rural roads in the state.

### **6.5. The NGNRY in the Study Regions**

The study reveals that, in Karnataka under the NGNRY, about 14705.64 km of length of rural roads was constructed from 2013-14 to 2019-20. During the same period about 7820.08 km (53.14%) of length of the NGNRY road was found in South Karnataka region and about 6885.56 km (46.86%) of length of NGNRY road was built in North Karnataka region. It is evident from the study that more

length of NGNRY road was constructed in South Karnataka than in the Northern part of Karnataka. *Here, the first hypothesis set that, as compared to the south Karnataka, implementation of NGNRY has partially failed in North Karnataka, has been verified and proved in the study and is accepted.*

## **B. Findings Based on Primary Data**

### **PART-I**

#### **6.6. Views of NGNRY Road Beneficiaries**

##### **6.6.1. Educational Background of the Respondents**

The Researcher found from the study that, the respondents in the sample taluks of Hassan are relatively more literates than those found in the sample taluks of Yadgir district.

##### **6.6.2. Occupation**

The study found that about 39.58 per cent and about 50.48 per cent of respondents depend on agricultural sector in the sample taluks of Hassan and Yadgir districts respectively. Thus, dependence on agriculture is greater in Yadgir district than in Hassan district.

##### **6.6.3. Awareness about the Programme**

Based on programme awareness it is astonishing to find that the awareness about rural development programmes is substantially low in both the districts. While it is just 39.16 per cent in Hassan district it is still lower at 26.40 per cent in Yadgir district.

#### **6.6.4. Quality of NGNRY Roads**

The study revealed that while according to about 53 per cent of the beneficiaries in Hassan district the road constructed under the NGNRY is good and in Yadgir district it is good only to accordingly about 30 per cent of the beneficiary respondents.

#### **6.6.5. Impact on Employment Generation**

The Researcher found that, a high of 88.34 per cent and 76.41 per cent of respondents have found positive impact on employment generation after construction of the NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively.

#### **6.6.6. Impact on Education**

The Researcher also found in the field that, the data about 88 per cent and about 86 per cent of respondents have found with positive impact on education after construction of NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively.

#### **6.6.7. Health Infrastructure**

It is evident from the study that, a high of about 81 per cent and about 61 per cent of respondents have found positive impact on health facility after construction of NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively.

#### **6.6.8. Impact on Agricultural Infrastructure**

From the primary survey it is found that, after construction of the NGNRY roads about 85 per cent and about 89 per cent of respondents have found positive

impact on agricultural infrastructure in the sample taluks of Hassan and Yadgir districts respectively.

#### **6.6.9. Impact on Social Aspects**

It is evident from the primary investigation that, a high of about 84 per cent and about 91 per cent of respondents have found positive impact on social aspects after construction of the NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively.

#### **6.6.10. Impact on Business, Culture and Modernization in the Rural Areas**

The study found that, about 70 per cent and about 65 per cent of respondents have found positive impact on business, culture and modernization after construction of the NGNRY roads in the sample taluks of Hassan and Yadgir districts respectively.

Based on the above findings, 6.6.5 to 6.6.10, *the second hypothesis set for the study that, the rural road connectivity tends to improve employment, education, health, agriculture and other facilities in the study area has been verified in the field, it is proved and is accepted.*

#### **6.6.11. Overall Views of Users on Rural Road Conditions**

The study surprisingly found that, the overall conditions of all the old and new roads are not satisfactory as viewed by the beneficiaries. For the large majority of the respondents' the conditions are not at all satisfactory; only about 23.75 percent and about 11.24 per cent beneficiary respondents, respectively from Hassan and Yadgir districts expressed their satisfaction about the overall conditions of the rural roads, which is really a matter of concern and needs immediate attention in the Northern region.

#### **6.6.12. Users' View on the Short Life of the NGNRY Roads**

The Researcher in order to have a better understanding and interpretation with regard to life of roads has identified five cause responsible for the short life of NGNRY roads, based on *Weight Point Score Method*, it was found that inadequate maintenance of roads topped in the list followed Heavy Goods Vehicles (HGVs) on the road, poor design, heavy rain, and improper use.

#### **6.6.13. Effective Implementation of the NGNRY Roads**

It is evident from the primary investigation that, as regards implementation of the NGNRY programme there is considerable difference in the views expressed by region wise respondents about effectiveness of implementation. In Hassan district the NGNRY have been effectively implemented according to about 72 per cent of the respondents, but only about 33 per cent of the respondents in Yadgir district replied in favour of effective implementation of NGNRY. It must be construed that better quality roads have been constructed under NGNRY programme in Hassan and Yadgir district.

#### **6.6.14. Adequate Maintenance of the NGNRY Roads**

In addition, while about 70 percent of the respondents in Hassan district admitted that the NGNRY roads maintenance has been adequate, in Yadgir district only about 34 per cent of the respondents opined that there is adequate maintenance of the NGNRY roads.

Based on the above findings, 6.6.13 and 6.6.14, *the third hypothesis set for the study that, the implementation and maintenance of the NGNRY in Hassan district has been better than that in Yadgir district has been verified in the field and it is proved and accepted.*

## **PART-II**

### **6.7. Views of NGNRY Contractors**

#### **6.7.1. Approval of Works**

The Researcher found that, the road contractors have been worried about approval process of road works under the NGNRY in the study region, about 73 per cent of the road contractors opined that the sanctioning of road works under the programme was not difficult. For approval of road works under the programme, the contractors must accomplish the two bidding namely technical bids and financial bids process.

#### **6.7.2. Allocation of Funds**

The study revealed that, about 55 percent of the road contractors, allocation of funds per km of road construction is found adequate in the study districts of Hassan and Yadgir.

#### **6.7.3. Release of Funds**

The Researcher found that, releasing of funds under the programme has not been delayed, as opined by all the road contractors interviewed in these regions. Under the programme, funds have been released by means of online monitoring system operated by the National Rural Road Development Agency (NRRDA) at State level and the PIU at the district level. The funds have been released to the contractors, through using of a separate account of online banking, based on the physical progress of the work. In addition, all the road contractors unanimously stated that their problems are immediately attended by the authority concerned. This is highly appreciable.



#### **6.7.4. Success of the Programme in the Study Regions**

It is a matter of great satisfaction that about 65 percent of the road contractors have firmly agreed that the programme has been highly successful in the study region.

#### **6.7.5. Creation of Employment**

The study found that, an average of about 109.54 man-days of employment has been created per km of road work under the NGNRY in the study region of which the share of male and female was about 70.90 and about 38.63 days respectively. This enabled income generation to rural people. Although unemployment is a chronic issue in rural areas, according to the road contractors there is shortage of labour supply for NGNRY both on contract and daily bases.

#### **6.7.6. Wage**

The study revealed that the road contractors made payment in cash to the daily wage earners. On the basis of response by the road contractors the Researcher has found out that male workers received an on average ` 450.10 per day as against ` 354.54 per day paid to the female workers. Thus, wage discrimination is found between the male and female workers in the study region, which is a matter of concern indeed!

### **PART-III**

#### **6.8. Authority Views**

##### **6.8.1. Preparation of a Proposal**

The study found that about 72 per cent of the officials opined that preparation of proposal under the programme is not easy. It is so because the PIU officials are not provided with conveyance to carry out field inspection/

verification prior to the preparation of intended proposal for approval of road connectivity under the NGNRY.

### **6.8.2. Contractors Abiding Norms and Conditions**

The study reveals that, as opined by the officials (cent per cent), all the road contractors strictly abide by the norms and conditions laid down under the NGNRY.

### **6.8.3. Attending to the Road Contractors' Problems**

It can be inferred that all the officials respond to the road contractors' problems of land litigation, objection raised by other departments (forest, electricity, revenue department and so forth).

### **6.8.4. Completion of Road Works**

The study reveals that, about 64 per cent of the officials opined that the work has not been completed within the stipulated time period of nine months.

### **6.8.5. Maintenance of Roads**

It is evident from the field investigation that, about 72 per cent of the officials in the study region held the opinion that the maintenance of roads was good.

### **6.8.6. Fund Release**

The study reveals that, cent per cent of the officials had the same opinion in the study region that the funds released per km of road construction under the programme was adequate.

### **6.8.7. Contractors'-Authority Relation**

The study found that, the officials maintained cordial relationship with the road contractors in the study region.

### **6.8.8. Quality Assessment**

The study found that, about 45 per cent of officials firmly agreed that due to political pressure, inadequate laboratories have complicated the situation at the time of First Tire Quality Assessment.

### **6.8.9. Success of the Programme**

The Researcher found that, about 72 percent of the officials interviewed agreed that the programme has been highly successful in the study districts of Hassan and Yadgir.

## **6.9. Problems Identified during the Study**

The Researcher in his study identified various problems with regard to NGNRY road connectivity in the study area and they are as follows:

### **6.9.1. Regional Disparity**

Disparity between South Karnataka and North Karnataka persists even know. It is evident from data that both allocations of funds as well as utilization of the same are both marginally higher in South Karnataka when compared with North Karnataka.

### **6.9.2. Ineffective Implementation of NGNRY Roads**

Rural road connectivity is a major requirement of rural development. Generally, it is found that such roads are not effectively implemented. During the

field investigation in the study area, the Researcher also observed the problem, which a noticeable 28 percent and 67 percent of the beneficiary respondents viewed that NGNRY roads are not effectively implemented in the districts of Hassan and Yadgir respectively.

### **6.9.3. Inadequate Maintenance of NGNRY Roads**

Construction of NGNRY roads alone is not sufficient, but their maintenance is also equally important. Unless the roads are properly maintained durability of the same will be questionable. The Researcher identified improper maintenance of NGNRY roads as a problem in the field as 28 percent and 66 percent of the beneficiary respondents well viewed that the rural roads are not adequately maintained in the districts of Hassan and Yadgir respectively. Improper maintenance of road network is one of the major causes of the non durability of NGNRY road connectivity anywhere for that matter.

### **6.9.4. Poor Quality of NGNRY Roads**

Quality of the road network is an important factor facilitating smooth operation of transport thereby reducing the cost and time users. The rural people mainly depend on rural road transport, but unfortunately rural roads are poor in quality and have become cause of concern of all users in the region. Based on the field study, it is found that about 47 percent and 70 per cent of road users travel through heavily on poor quality of roads in the districts of Hassan and Yadgir respectively. From this it can be interpreted that due attention is to be paid towards this problem so as to facilitate easy transport in the country side.

### **6.9.5. Negligence of Remote Villages**

Since our country is predominantly of villages. It must be seen that developing villages particularly in remote areas is the need of the hour. The Researcher found from the primary investigation that the construction and maintenance of NGNRY roads is comparably better in the nearby the towns and cities whereas the same is neglected in the areas which are far away from the towns and cities. This is witnessed both in Hassan and Yadgir districts. Therefore, it is necessary on the part of the government to take care of the NGNRY road construction and maintenance particularly in the remote areas of both Hassan and Yadgir districts.

### **6.9.6. Overall Conditions of the NGNRY Roads**

Movement of goods and services becomes effective only when the rural roads are of a greater quality. Since Indian economy is the economy of rural in nature, rural transport particularly the road transport plays a significant role in prompting all types of economic activities across the country. It is evidently found in the field survey that 76.25 per cent and 88.76 per cent of beneficiary respondents expressed their dissatisfaction about the rural roads in Hassan and Yadgir districts respectively. The problem of rural roads is worse in Yadgir district and thus, it demands an immediate action to be taken by the concerned authority.

### **6.9.7. Lack of Awareness about Rural Development Programmes**

Benefits of rural development programme have become futile due to the fact that many of the rural people lack of their knowledge about various rural development programmes. The Researcher identified in the study area that about

60.84 percent and 73.60 percent of beneficiary respondents lack of their knowledge about the rural development programmes in Hassan and Yadgir districts respectively. It is therefore, the need arises to create awareness among the rural masses about various rural development programmes brought into force by the governments both at the state and national level.

#### **6.9.8. Environmental Pollution**

Environment pollution of various types has caused irreparable damage to the ecological system. To lead a satisfactory and happy life the living beings should an access to pollution free environment. The Researcher identified that in primary investigation that pollution has gone beyond the control in various towns and cities of Hassan district due to the transport of sand in an unscientific manner. Further also found that the problem of environmental pollution is less serve in villages when compared to the urban areas/towns and cities.

#### **6.9.9. Red-tapison in the Allocation of Funds**

For the success of any rural development programme sufficient funds need to be allocated on time. It is very important for the completion of the program within a specified period of time. The Researcher in his field survey found that 45 percent of the views of the rural road contractors opined that allocation of funds and releasing same is not up-to the mark. Thus, the concern authority should take immediate action to the release the funds so that the rural road construction becomes useful for the beneficiaries.

#### **6.9.10. Unscientific Road Humps**

No doubt road humps are very much essential to avoid accident but too many road humps are a hindrance to the smooth functioning of transport activities.

It is found from the field survey that road jumps are of unscientific height and they are laid within the shortest distances. It is therefore, suggested to construct the road humps on scientific basis.

#### **6.9.11. Improper Maintenance of Water and Drainage System**

It is important to note that to lead a happy and healthy life; we should have an access to portable water and drainage system. It is found from the primary investigation that the water supply and drainage system is very poor in Yadgir district when compared to Hassan district. It is therefore, the need arises to addresses the problems of drinking water and drainage system in the study area.

#### **6.10. Suggestions**

Based on the findings of the study, the Researcher has proposed the following suggestions to improve the rural road network and for better implementation of the NGNRY program in the study region in general.

##### **6.10.1. More Emphasis on North Karnataka**

Since, in respect of accessibility of road network per unit of population and road length per unit of land area, north Karnataka still lags behind compared with the southern part, it is suggested for still more importance has to be given to the north Karnataka region to create favorable atmosphere for faster development.

##### **6.10.2. More Emphasis on Yadgir District**

Yadgir district (as compared with Hassan district), lags behind in quality of the NGNRY roads, quality of surface of roads, conditions of roads, implementation and maintenances of roads. Therefore, it is suggested for laying more emphasis to provide additional financial grants to this district of the state.

### **6.10.3. Better Quality of the NGNRY Roads**

It has become imperative to suggest to the government the better quality of the NGNRY roads have to be constructed in rural Karnataka more particularly in Yadgir district. Proper supervision has to be done for quality test. This reduces maintenance cost and increases durability of these roads.

### **6.10.4. More Emphasis on Remote Areas**

There is immediate urgency to develop the roads which are far away from towns and cities, so that, such remote areas could be well connected to the towns and cities. This will have major positive impact on the development of rural economy. At the same time, the quality in the construction and maintenance of roads especially in the remote areas must also been paid attention.

### **6.10.5. Inter-Village Connectivities**

Particularly, there is a need for increased inter-village connectivity by way of roads in Yadgir district which may well be extended to the entire state. The Researcher personally experienced the problem of road connectivity to villages in Yadgir district. The Researcher suggests that road project has to be redesigned in such a way throughout the state to provide greater and proper inter village connectivity to overcome the transport bottlenecks and save travel time.

### **6.10.6. Programme Awareness**

Since, the people are not aware about many of the government schemes and programmes, it may be suggested for initiating more programmes in rural areas on creating awareness among the people.

### **6.10.7. Role of Government**

The transport authorities / the government may be suggested to maintain strict vigilance against miss use or wrong use of roads in order to enhance their



life. More particularly, the heavy laden (HGVs) vehicles should be kept out of the NGNRY roads.

#### **6.10.8. Daily Travel Needs**

It is strongly suggested that the department concerned should pay more attention towards providing public transport services by increasing frequency to enable proper mobility of men and materials. If this is done, there could be slight to moderate increase in labour supply. Moreover, people of this region can have better accessibility to basic amenities and services.

#### **6.10.9. Increase Enhancement in Grants and Maintenance Period**

It is suggested that if there is enhancement in both grants and maintenance period it will be possible to have longer life of the NGNRY roads in all the regions.

#### **6.10.10. Proper Speed Breaker**

Road humps in the villages of Yadgir district are coarse and rough with uneven animation and depression. They are in large number affecting normal flow of traffic. Therefore, it is suggested to build road humps strictly on scientific basis.

#### **6.10.11. Proper Drainage System**

Local administration is suggested to construct and maintain proper drainage facility in Yadgir district. By doing so, water logging on roads can be avoided thereby reducing repair and maintenance cost.

#### **6.10.12. Public Co-operation**

The general public should realize that the roads or any other public utilities are created for the benefit of everybody. Therefore, it is suggested that the public

should behave with greater responsibility and be cooperative with the government, for better maintenance of all services including the NGNRY roads.

### **6.11. Conclusion**

Rural roads are an integral part of over all development of the economy. It is evident that a well-developed road network can provide access to health care, nutrition and education. Rural roads provide connectivity in rural areas for the transportation of goods and services for production, consumption and investment and in pursuit of education and employment in addition to transporting the people for the purpose of travel and tourism. The present study has found that there is scope for providing new connectivity in rural regions in the state of Karnataka. It has been proved from the present study that under the NGNRY, providing physical connectivity to rural regions has helped improve the health, education, marketing, transport, dairying and other activities in the rural areas in Hassan and Yadgir districts.

North-South disparity can be overcome by emphasizing special development programmes and by releasing additional financial grants to North Karnataka. Governments' must re-think about the pattern of already existed rural road development programmes in respect of resolving regional imbalances among the divisions. Hence, the governments should have to give more importance to both the qualitative and quantitative aspects of rural road development which may enhance the public and private investment in agriculture sector, human capital. Higher growth of the agriculture sector and human resources would help in reducing other types of regional disparities in India in general and in Karnataka in particular. Let us all hope for the best.

---

## **BIBLIOGRAPHY**

---

## BIBLIOGRAPHY

### 1. Books

- Alam, A. (2015). Rural Connectivity, National Stakeholder Consultation and Capacity Building. In: *Workshop on Development of Sustainable and Inclusive Transport Policy (AITD)*, @ Thimpu Bhutan.
- Awasthi, A. (1994). *History and Development of Railways in India*. Deep and Deep Publication, New Delhi.
- Baraloto, C., Alverga, P., Castro, W. and Rockwell, C. (2015). *Effects of Road Infrastructure on Forest Value Across a Tri-National Amazonian Frontier*. Elsevier Publication Ltd., Biological Conservation 191.
- Beero, S.K. (2016). *Infrastructure Development and Literacy Nexus in Rural India: A District Level Analysis*. Center for Research in Rural and Industrial Development, Chandigarh, Vol. XXXVIII, No. 3.
- Bertha, Z. and Kurantin, N. (2017). The Impact of Infrastructure on Growth and Development : The Case of Ghana, 1986-2016. In: *Handbook of Research on Economic, Financial and Industrial Impacts on Infrastructural Development*.
- Chandola, S.P. (2016). *A Text Book of Transportation Engineering*. S. Chand Publishing Co., New Delhi.
- Desai, V. (2013). *Rural Development in India (Past, Present and Future) Challenge in the Crisis*. Published by Mrs. Meena Pandey for Himalaya Publishing House Pvt. Ltd., Mumbai.
- Ducruet, C. and Lugo, I. (2013). *Structure and Dynamics of Transportation Networks Models Methods and Applications*. The Sage Hand Book of Transport Studies, Sage Publications Ltd., New Delhi.
- Ellis, S.D. (1997). *Key Issues in Rural Transport in Developing Countries*. Transport Research Laboratory, Crowthorne, Berkshire, TRL Report-260.

- Faiz, A. (2012). *The Promise of Rural Roads: Review of the Role of Low-Volume Roads in Rural Connectivity, Poverty Reduction, Crisis Management and Livability*. Transportation Research Circular, Transport Research Board, Washington DC.
- Garrison, W.L. and Marble, D.F. (1962). *The Structure of Transportation Network, Transportation Forecast and Predict on Study Progress Report 62-II*. Defense Technical Information Centre for U.S. Army, Transportation Research Command Fort Eustis, Virginia.
- Guha, S. (1991). *Economics of Rural Transport*. Anil Mittal for Daya Publishing House, Delhi.
- Hermans, E. and Wets, A. (2008). *Combining Road Safety Information in a Performance Index*. Accident Analysis and Prevention, Elsevier Publication Ltd., Vol. 40, Issue 4.
- India (2018). *A Reference Manual*. New Media Wing, Publications Division, Ministry of I&B, GoI, New Delhi, March.
- Indian Economy (2018). *Pratigyogita Darpan*, Upkar Stationary Pvt. Ltd., , p. 247.
- Jayarama Bhat, B. (2018). *Road Transport in India*. Shreyas Publication, Shivamogga, Karnataka.
- Jayarama Bhat, B. (ed.) (2008). Infrastructure and Development Link. In: *Infrastructure Development in India*, Kuvempu University, Shankaraghatta, Shivamogga.
- Kleefeld, B. and Baidy (2009). *Atmospheric Emissions from Road Transport in India*. Published in Energy Policy.
- Kulshreshtha, D.K. (1989). *Management of State Road Transport in India*. Mittal Publications, New Delhi.
- Lahne, J. (2016). *Building Connections: Political Corruption and Road Construction in India*. International Growth Centre (IGC), (JEL Codes: D72.L14.018).

- Manmohan Singh (2006). *Development Infrastructure*. Ministry of Information, GoI, New Delhi.
- Maniruzzaman, K.M. and Mitra, K. (2005). *Road Accidents in Bangladesh*. International Association of Traffic and Safety Sciences (IATSS) Research, Elsevier Publication Ltd., Vol. 29, No. 2.
- Mohapatra and Chandrashekhar (2007). *A Study on Rural Roads, India Infrastructure Report 2007*. Oxford University Press, New Delhi.
- Nanjundappa, D.M. (1973). *Transport Planning and Finance*. Prasaranga, Karnatak University, Dharwad.
- Pfingsten, W. and Mull, R. (1990). Transport And Storage Phenomena In A Fracture Matrix System: Experimental Investigations and Numerical Modeling. In: *International Association Of Hydrological Sciences (IAHS), Proceedings of the Conference, The Hague, Calibration and Reliability in Groundwater Modeling*, No. 195.
- Ramanatham, V.V. (1948). *Road Transport in India*. The University Publishers Ltd., Lucknow.
- Ramaninujam, K. N. (1993). *Rural Transportation in India*. Mittal Publications, New Delhi.
- Ramaswami (1993). *Rural Transport India*. Mittal Publications, New Delhi.
- Rastogi, A. (2007). *Infrastructure Sector in India*. Oxford University Press, New Delhi.
- Rodrigue, J.P. (2006). *The Geography of Transport System*. Routledge Taylor & Francis Group, London and New York.
- S.N.D. - North Director (1908). *Transportation by Water : 1906 United States*. Department of Commerce and The Labour Bureau of the Census, Bulletin 91, Washington, Govt. Printing Office.

- Sahoo, P. (2011). *Transport Infrastructure in India: Developments, Challenges and Lessons from Japan*. Institute of Developing Economics, Japan External Trade Organization, V.R.F. Series, No. 465.
- Sahoo and Sexena (1999). *Infrastructure and Economic Development: Some Empirical Evidence*. The Indian Economic Journal, Vol. 47, No. 2.
- Sahu, K.K. (2017). *Trend, Growth and Problems of Road Transport in India, Handbook of Research on Economic*. Financial and Industrial Impacts on Infrastructure Development.
- Samanta, P.K. (2015). *Development of Rural Road Infrastructure in India*. Pacific Business International Volume, Vol. 7, Issue 11.
- Sarkar, P.K., Maitri, V. and Joshi, G.J. (2014). *Transportation Planning Principles, Practices and Policies*. Prentice Hall India Learning Pvt. Ltd., New Delhi.
- Shiferaw, A., Soderboom, M., Siba, E. and Alemu, G. (2012). *Road Infrastructure and Enterprise Development in Ethiopia*. Working Paper, International Growth Centre (IGC), United Kingdom.
- Shrestha, J. and Lopes, N. (2014). *A Multi-objective Analysis of Rural Road Network Problem in the Hilly Regions of Nepal*. Transportation Research Part A; Policy and Practice, Vol. 64.
- Singh, R.K. (1988). *Road Transport and Economic Development*. Deep and Deep Publication, New Delhi.
- Starkey, P., Simon, H., John and Ternell (2002). *Improving Rural Mobility: Options for Developing Motorized and Non-motorized Transport in Rural Areas*. World Bank Technical Paper (WTP)-525, World Bank Group, Washington DC.
- Thomas Holdich (1901). *The Indian Borderland 1882-1900*. Published in the United States of America, Cambridge University Press, New York.
- Tingvall, C., Stigson, H., Eriksson, L. and Johansson, R. (2010). *The Properties of Safety Performance Indicators in Target Setting, Projections and Safety Design of the Road Transport System*. Elsevier Publication Ltd., Vol. 42, Issue 2.

- Uttama, K.H. (2010). *Performance of Karnataka State Road Transport Corporation - A Case Study of North-West Karnataka Road Transportation Corporation*. Ph.D. Thesis, Kuvempu University, Shimoga.
- Vaidya, B.C. (2003). *Geography of Transport Development in India*. Concept Publishing Company, New Delhi, Vol. XXVI.
- Vasant Desai (2013). *Rural Development in India (Fast, Present and Future) Challenge in the Crisis*, Himalaya Publishing House Pvt. Ltd., Mumbai.
- Wang, X.B. and Yan, X. (2015). *Vehicle-to-Vehicle Connectivity on Parallel Roadways with Large Road Separation*. Transportation Research, Elsevier Publication Ltd., Emerging Technologies Part-C, Vol. 52.
- Yilmaz, D. and Isin, C. (2017). The Impact of Infrastructure on Growth in Developing Countries: Dynamic Panel Data Analysis. In: *Handbook of Research on Economic, Financial and Industrial Impacts on Infrastructural Development*.

## 2. Journal Articles/Research Papers

- Abdullah-al-Ghafli and Mohamad, E. (2015). Effect of Single Phase Sequences on Signalized Intersection Safety Performance - Case Study from Abu Dhabi. *International Road Federation (IRF) Examiner, USA*, Vol. 5.
- Adeniyi and Tunde, A.M. (2012). Impact of Road Transport on Agriculture Development: A Nigerian Example. *Ethiopian Journal of Environmental Studies and Management (EJESM)*, Vol.5, No.3.
- Aklekar, R. (2016). Connecting India, Building Roads for the Poor. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 64, No. 11.
- Al-Madani, H. (2014). Arab World during the Three Decades Challenges and Opportunities. *International Road Federation (IRF) Examiner, USA*, Vol. 4.
- Apparao, C.R. and Rao, S.P. (2009). A Case Study of RIDF Road Project in Srikakulam District of Andhra Pradesh. *Kurukshetra - A Journal of Rural Development*, Publication Davison, Ministry of I&B, GoI, New Delhi, Vol. 52, No. 6.



- Balappa (2016). Impact of Rural Roads on Rural Economy: A Case Study of Kolar District. *Journal of Development and Social Change*, Vol. XII, No. 1-2.
- Bandari, S.B. (2013). Overview of Rural Roads. *The Open Transportation Journal*, pp. 53-65.
- Bhandari, S.B., Shahi, P.B. and Shrestha, R.N. (2014). Multi-Criteria Evaluation for Ranking Rural Road Projects: Case Study of Nepal. *Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, Vol. 11, Issue 6.
- Chiru, S.J. (2018). Moving Towards Integration. *Yojana - A Development Monthly* (Special Issue), Vol. 62.
- Dev, K. (2015). Travelling to The Future with Green Transport. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 59.
- Dev, K. (2017). Union Budget 2017-18: A Take-off for Infrastructure. *Yojana - A Development Monthly*, Vol. 61.
- Dev, N. (2017). Transforming India: The Story of Triumph Rural. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 65, No. 7.
- Dorosh, P., Wang, H.G., Liangzhi and Schmidt, E. (2012). Road Connectivity, Population and Crop Production in Sub-Saharan Africa. *Journal of International Association of Agricultural Economists-(IAAE), Agricultural Economics*, Vol. 43, Issue 1.
- Frizzelle, B.G., Evenson, K.R., Rodriguez, D.A. and Laraia, B.A. (2009). The Importance of Accurate Road Data for Spatial Applications in Public Health: Customizing A Road Network. *International Journal of Health Geographics (IJHG)*.
- Ganguli, B. (2016). Rural Roads: The Artery of Indian Economy. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 46, No. 4.
- Garrison, W. (1960). Connectivity of The Interstate Highway System. *Regional Science Association International (RSAI)*, Vol. 6, Issue 1.

- Gururaj, G.K., Rao, U.N., Jayarama and Venkatesh (2014). Burden, Pattern and Outcomes of Road Traffic Injuries in a Rural District of India. *International Journal of Injury Control and Safety Promotion*, Vol. 23, Issue I.
- Hassan, H.M., Al-Faleh, H., Al-Rashidi, A. (2015). Comprehensive Analysis of the Severity and Nature of Traffic Crashes Occurring on Rural Road in the Kingdom of Saudi Arabia. *International Road Federation (IRF) Examiner*, USA, Vol. 5.
- Hazra, A. (2012). Strengthening Infrastructural - Base of Rural India : Realities and Constraints. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, Vol. 60, No. 12.
- Ishita and Tripathy (2014). Development of Rural Roads. *Kurukshetra – A Journal of Rural Development*, Division Ministry of I & B, Government of India, New Delhi, Vol. 62, No. 12.
- Jagdish, S.B., Kumar, P. and Kumar, K. (2015). Pavement Evaluation Study of Road Stretches Constructed using Nanotechnology adopted by Zydex Industries. *International Journal for Scientific Research and Development*, Vol. 3, Issue 7.
- Jaya, P. and Juyal, S. (2018). Rural Infrastructure. *Kurukshetra - A Journal of Rural Development* (Special Issue-Union Budget 2018-19), Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 66, No. 5.
- Jones, S. and Walsh, J. (2016). Public Transport and Health Outcome in Rural Sub-Saharan Africa - A Synthesis of Professional Opinion. *Journal of Transport & Health*, Vol. 3, Issue 2.
- Kalra, K. (2015). Managing Urban Transport Needs. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 59.
- Kar, S. (2009). “Development Managing Rural: Rural Roads are a Catalyst of Development”, *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 12.

- Kaushik, A. (2012). Boosting Rural Development through Road-Connectivity: The Orissa Experience. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi.
- Keshava and Fernandis (2014). Economic Analysis of Regional Disparities in Karnataka. *Southern Economist - A Journal*, Vol. 53, No. 8.
- Kumar, H., Das, P. and Kumar, B. (2014). Cell-Filled Concrete Roads: An Alternative to Rural Roads - A Case Study in Karnataka. *International Journal of Emerging Technology and Advanced Engineering*, Vol. 4, Issue 10.
- Kurien, V.K. and Chathurkulam (1995). Jawahar Rozgar Yojana - An Assessment. *Political Weekly*, Vol. XX, No. 6.
- Mahipal (2016). "Road Connectivity Through PMGSY: Achievements, Initiatives and Challenges", *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 65, No. 2.
- Mahipal (2016). Rural Roads: Pradhan Mantri Gram Sadak Yojana - Rural Upliftment Connectivity. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi.
- Malydri, P. (2010). Rural Infrastructure: An Engine For Poverty Mitigation. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58, No. 10.
- Moray, N. (1990). Designing for Transportation Safety in the Light of Perception Attention and Mental Models. *Journal of Ergonomics*, Vol. 33, Issue 10-11.
- Mukherjee, D. (2012). Rural Roads : Faster Connectivity for Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, Vol. 60, No. 12.
- Patel, A. (2012). Rural Infrastructure: Road to Progress. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, Vol. 60, No. 12.

- Piecyk, M. and McKinnon, A.C. (2010). Forecasting the Carbon Footprint of Road Freight Transport in 2020. *International Journal of Production Economics*, Vol. 128, Issue 1.
- Raghuram (2015). Transport Infrastructure: Way Forward. *Yojana - A Development Monthly*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi.
- Raghuram, G. (2018). Infrastructure Creation: Integrating the Nation. *Yojana – A Development Monthly (Union Budget 2018-19, Special Issue)*, Publication Division, Government of India, New Delhi.
- Raghuram, G. (2020). Transport Infrastructure in India. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 66, No. 3.
- Rajamani (2014). Rural Infrastructure Key to Inclusive Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi.
- Rao, K.R. (1986). Rural Bus Transport Operations of the Andhra Pradesh State Road Corporation. *Journal of Finance India*, Vol. X, No. 2.
- Rao, S. (2009). Rural Infrastructure an Impetus to Economic Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 12.
- Rao, S. and Shekhar, C. (2010). Rural Infrastructure - A Vital Ingredient for Double Digit Growth. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58, No. 10.
- Rouse, P. and Chiu, T. (2009). Towards Optimal Lifecycle Management in a Road Maintenance Setting using DEA. *European Journal of Operational Research*, Vol. 196, No. 2.
- Saikia, S.P. (2019). Connectivity: Transforming Rural India. *Kurukshetra - A Journal of Rural Development (Perspective in Rural Development)*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 67, No. 5.

- Sarhan, M.E. (2015). Driver Behavior in Signalized Intersection and Response to End of Green Flash Intervals. *International Road Federation (IRF) Examiner*, USA, Vol. 5.
- Sarkar, A. (2015). Issues and Challenges of Rural Roadways in India. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi.
- Satish, P. (2007). Rural Infrastructure and Growth: An Overview. *Indian Journal of Agricultural Economics*, Vol. 62, No. 1.
- Senagupta, A. and Pal, A.K. (2015). Urban Sustainable Transportation Development: A Case of West Bengal. *Indian Journal of Economics*, Vol. XCVI, No. 381.
- Shankaran, P.N. (2010). Rebuilding Rural India: A Review of Bharath Nirman. *Kurukshetra - A Journal of Rural Development*, Publication Division (Annual Issue), Ministry of I&B, GoI, New Delhi, Vol. 58, No.12.
- Sharma, A. (2009). Rural Roads - A Path to Rural Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 6.
- Sharma, A. (2013). Government Programmes for Rural Infrastructure. *Kurukshetra - A Journal of Rural Development*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, Vol. 61, No. 12.
- Shrestha, J.K., Shrestha, A., Bunta, R.B., Lopes and Lopes, N. (2013). A Methodology for Definition of Road Networks in Rural Areas of Nepal. *Engineering and Technology International Journal of Civil and Environmental Engineering*, Vol. 7, No. 6.
- Shrinivasan, G. (2010). Need for Rural Infrastructure Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58, No. 10.
- Singh (2009). Developing Rural Roads: Some Policy Issues. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 6.

- Singh, A.P., Sarji, P., Rao, G.N., Jayaram, A.N. and Venkatesh, P. (2011). Road Safety in Improvement : A Challenging Issue on Indian Roads. *International Journal of Advanced Engineering Technology (IJAET)*, Vol. II, Issue II.
- Talvitie, A. (2000). Evaluation of Road Projects and Programmes in Developing Countries. *Journal of Transport Policy*, Vol. 7, No. 1.
- Tarique (2009). Rural Infrastructure and Economic Development. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 12.
- Tripathy (2014). Review of Rural Infrastructure under Bharat Nirman. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58.
- Tripathy, I.G. (2014). Development of Rural Roads - Are We on The Right Track?. *Kurukshetra - A Journal of Rural Development*, Publication Division (Special Issue), Ministry of I&B, GoI, New Delhi, Vol. 62, No. 12.
- Tripathy, K.K. (2019). Infrastructure for Rural Transformation. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 67, No. 5.
- Varghese, M. (2016). Building Roads for Rural Prosperity (Budget 2016-17). *Kurukshetra - A Journal of Rural Development*, Vol. 64, No. 6.
- Veloga, N., Croft, B., Nelson, J.D. and Corsar, D. (2012). Transport Poverty Meets the Digital Divide: Accessibility and Connectivity in Rural Communities. *Journal of Transport Geography*, Vol. 24.
- Verma, M. (2014). Urban Transport Models BRTS Ahmedabad. *Yojana - A Development Monthly*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58.
- Yadav, K. (2009). Rural Road Connectivity : A Growth Narrative. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 57, No. 6.

Yadav, K. (2010). Road Connectivity as a Stimulate for Rural Poverty Reduction. *Kurukshetra - A Journal of Rural Development*, Publication Division, Ministry of I&B, GoI, New Delhi, Vol. 58, No. 10.

Yuvaraja, U. and Jayarama Bhat, B. (2016). Regional Disparities of Rural Road Connectivity in Karnataka: An Analysis. *Global Journal for Research Analysis*, Vol. 5, Issue 12.

Ziegler, A.D. and Giambelluca, T. (1997). Importance of Rural Road as Source Areas for Runoff in Mountainous Areas of Northern Thailand. *Journal of Hydrology*, Vol. 196, No. 1.

### 3. Theses

Devaraja, P. (2009). *Rural Transport Services - A Case Study in Chikamagalur District*. Unpublished Ph.D. Thesis, Kuvempu University, Shankaraghatta, Shivamogga.

Jayarama Bhat, B. (1989). *Road Transport and Rural Development - A Case Study of Dakshina Kannada District*. Unpublished Ph.D., Thesis, Mangalore University, Mangalore, Karnataka.

Kantharajappa, H.C. (1998). *Rural Road System and its impact on Rural Development (Special reference to Agriculture)*. Unpublished Ph.D., Thesis, Bangalore University, Jnana Bharathi, Bangalore.

Shamasundar (2004). *Passenger Road Transport System - A Case Study of Shimoga District*. Unpublished Ph.D., Thesis, Kuvempu University, Shimoga.

Sharada, N. (1994). *Nationalized Road Transport In Karnataka - An Economic Study*. Unpublished Ph.D., Thesis, Karnatak University, Dharwad.

Tyagaraja, C.M. (2006). *Problems and Prospects of Goods Transport - A Case of Shimoga District*. Unpublished Ph.D., Thesis, Kuvempu University, Shankaraghatta, Shimoga, Karnataka.

Vadivelu, A. (2008). *Performance of State Owned Road Transport Corporation - A Case Study of Davangere Division*. Unpublished Ph.D., Thesis, Kuvempu University, Jnana Sahyadri, Shankarghatta, Shimoga.

Yuvaraj, U. (2013). "Rural Road Connectivity in Karnataka - A Study of PMGSY", Unpublished Ph.D., Thesis, Kuvempu University, Shankaraghatta, Shimoga.

#### **4. Reports**

Annual Report - 2010-11 to 2020-21/ Ministry of Ports, Shipping & Waterways, Government Of India, New Delhi.

Annual Report 2007-08 to 2020-21. Rural Development and Panchayat Raj Department, Bengaluru, GoK, March.

Annual Report on Road Safety Review - 2010 and 2019. The Road Safety Authority (RSA), Ballina, Co. Mayo, Ireland.

Basic Road Statistics in India - 2015-16. Ministry of Road Transport and Highways, Transport Research Wing, Government of India, New Delhi.

Census of India 2011. Register General of India, Hassan and Yadgir Districts.

Directorate of Economics and Statistics - 2010-11 to 2020-21, Bengaluru, GoK, Rural Development and Panchayat Raj Department, March.

Deepak Parekh Committee Report (2007). Public Private Partnerships in Infrastructure Projects. GoI, New Delhi.

Rakesh Mohan Committee Report (1997). Infrastructure Development in India. Ministry of Finance, GoI, New Delhi.

Economic Survey of Karnataka - 2010-11 to 2021-22, Department of Planning, Programme, Monitoring and Statistics, Publication Division, Government of Karnataka, March 2019.

Food and Agriculture Organization (FAO) Report - 1996. United Nations.

Hand Book of Karnataka - 2010. Karnataka State Gazetteer, GoK.

India Infrastructure Report - 2007. New Delhi.

Indian Economy (MAG Book) - 2017. New Delhi.

Nava Karnataka Vision-2025, Report on Infrastructure Sector, Government of Karnataka, December 2017.

Report of World Bank - 2015. Rural Roads - A Lifeline for Villages in India. The World Bank Report, South Asia sustainable Development Unit (Transport) 70, New Delhi.



## **5. Internet Sources**

<http://www.springer.com/978-3-319-23783>.

<http://www.ripublication.com>.

[https://en.wikipedia.org/wiki/List\\_of\\_airports\\_in\\_India](https://en.wikipedia.org/wiki/List_of_airports_in_India),

<https://morth.nic.in>.

<https://transport.karnataka.gov.in>.

<https://www.ibef.org/industry/banking-india>.

<https://www.investopedia.com/terms/i/infrastructure.asp>.

<https://www.thoughtco.com/what-is-infrastructure-why-important-177733>.

<webinhai.gov.in>.

<www.economicstimes.com>.

<www.planning.kar.nic.in>.

<www.planningcommission.nic.in>.

<www.railwayzone.en.in.wikipedia.org>.

<www.shipindia.com>.

---

## **INTERVIEW SCHEDULES**

---

## INTERVIEW SCHEDULES FOR FIELD SURVEY

**Research Topic : RURAL ROAD CONNECTIVITY IN KARNATAKA - A  
STUDY OF NAMMA GRAMA NAMMA RASTE YOJANE (NGNRY)**

***Name of the Researcher***

**Sunil Kumar P.**  
Research Scholar  
Department of P.G. Studies  
and Research in Economics  
Kuvempu University, Jnana Sahyadri  
Shankaraghatta - 577 451

***Research Supervisor***

**Dr. B. Jayarama Bhat**  
Professor  
Department of P.G. Studies  
and Research in Economics  
Kuvempu University, Jnana Sahyadri  
Shankaraghatta - 577 451

### PART-I

#### For the NGNRY Road Beneficiaries/Users

1. General Information:

a. Name and Address of the Respondent:

.....  
.....  
.....  
.....

b. Age ( in years):

- a. Below 30 ( )      b. 31-40 ( )  
c. 41-50 ( )      d. 51-60 ( )  
e. Above 60 ( )

c. Gender :

- a. Male ( )      b. Female ( )

d. Educational Level:

i. Illiterate	ii. Primary	iii. SSLC	iv. Pre. Uni.	v. Graduation	vi. Post Graduation

e. Occupation

i. Agriculturist	ii. Employment in Office	iii. Business	iv. Self-Employment	v. Student

2. Category of roads passing by your village:

- a. National Highways
- b. State Highways
- c. Major District Roads
- d. Village Roads
- e. All the above



8. Whether you are aware of Rural Development Programmes / Schemes?

(i) Yes  (ii) No

If Yes, please specify : SGSY/ SGY/ SGRY/ IREP/ CMGSY/ PMGSY/  
NGNRY/ MGNREGA/ Bharat Nirman Special  
Component Plan & Tribal

9 Whether NGNRY roads add a positive impact on employment generation?

(i) Yes  (ii) No

If yes, reveal your opinion as 1, 2, 3, 4 & 5 about reason for employment generation to give positive impact (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very Poor)

Reasons	Scores Assigned				
	5	4	3	2	1
i. Improving farm and non-farming employment					
ii. Reducing gender wage inequality					
iii. Increasing rate of wages					
iv. Helping to reach work place on time					
v. Improving the informal jobs like selling wood, vegetable, dairy products and locally made items like pickles, papad etc.					
vi. Helping to get better job opportunity					

10. Whether NGNRY roads add a positive impact on education sector?

(i) Yes  (ii) No

If yes, reveal your opinion as 1, 2, 3, 4 & 5 about reason for education sector to give positive impact; (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very Poor)

Reasons	Scores Assigned				
	5	4	3	2	1
i. Priority of best school					
ii. Reaching institution on exact time					
iii. Helping higher education and reducing drop-outs					
iv. Leading to an increase in the no. of girls going to school					
v. Regular attendance of teachers and students					

11. Whether NGNRY roads add a positive impact on health infrastructure?

(i) Yes  (ii) No

If yes, reveal your opinion as 1, 2, 3, 4 & 5 about reason for health infrastructure to give positive impact; (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very poor)

Reasons	Scores Assigned				
	5	4	3	2	1
I. Priority of best hospital					
ii. Increases ambulance facility and reaching exact on time					
iii. Helps to pregnant women for pre-natal and post-natal care					
iv. Helps children, women and old-aged people for quick health facility					
v. Increases the medical facilities					

12. Whether NGNRY roads add a positive impact on agricultural infrastructure?

- (i) Yes                       (ii) No

If yes, reveal your opinion as 1, 2, 3, 4 & 5 about reason for agricultural infra-structure to give positive impact; (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very poor)

Reasons	Scores Assigned				
	5	4	3	2	1
i. Made it easier to transport chemical fertilizers, seeds and pesticides					
ii. Brought change in cropping pattern and cropping					
iii. Increased the allied activities like dairy, fishery, poultry, forestry, animal husbandry in the rural areas					
iv. Increased the cottage and village industry in the rural areas					
v. Increased the marketing facility and minimum support price					
vi. Increased the machinery and equipment					

13. Whether NGNRY roads add a positive impact on social aspect?

- (i) Yes                       (ii) No

If yes, reveal your opinion as 1, 2, 3, 4 & 5 about reason for social aspect to give positive impact; (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very Poor)

Reasons	Scores Assigned				
	5	4	3	2	1
i. Increasing housing facilities					
ii. Increasing drinking water and sanitation facility					
iii. Increasing electricity and gas connectivity					
iv. Increasing proper implication of the Govt schemes and programme					
v. Increasing banking and postal services					

14. Whether NGNRY roads add a positive impact on business, culture, modernization in the rural areas?

- (i) Yes                       (ii) No

14. What is your opinion about the overall rural road of NGNRY condition in your village?

- a. Surfaced                                      b. Un-surfaced  
c. Partially surfaced                      d. Partially un-surfaced

15. How satisfied are you with the overall condition of rural roads of NGNRY in your village?
- a. Highly Satisfied
- b. Fairly Satisfied
- c. Highly Dissatisfied

17. Are you satisfied with the quality of NGNRY roads?
- (i) Yes  (ii) No

If No, Why? .....

18. Your opinion on adequacy of NGNRY roads:

- (i) Adequate  (ii) Inadequate

19. Do you view that NGNRY Roads with road's life is short?
- (i) Yes  (ii) No

If Yes, reveal your opinion as 1, 2, 3, 4 & 5 about reasons for short life of NGNRY Roads  
(5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very poor)

Reasons	Score Assigned				
	5	4	3	2	1
a. Poor design of roads					
b. Heavy rains					
c. Heavy laden vehicles on road					
d. Improper use of roads					
e. Improper maintenance of roads					

20. How would you compare NGNRY roads with the other rural roads?
- a. Much Better    b. Better    c. Poor

21. Your opinion about the maintenance of NGNRY Roads.
- a. Very good    b. Good    c. Better    d. Poor    e. Very Poor

22. Have you observed adequate construction of the NGNRY in your village?
- (i) Yes  (ii) No

23. Do you feel that the NGNRY roads are safe for travel?
- a. Absolutely safe    b. Fairly safe    c. Unsafe

24. NGNRY Road user's satisfaction Index.

User Index of NGNRY Roads				
Opinion in				
a. Pavement condition	Good		Not Good	
b. Road width	Adequate		Inadequate	
c. Road marking	Proper		Not Proper	
d. Shoulders	Adequate		Inadequate	
e. Smoother	Highly	Fairly	Not smoother	
f. Drainage Provision	Very good	Good	Poor	
g. Leveling of surface	Very good	Good	Satisfactory	Poor

25. Issues on Marketing of your Agri. Produce:

Agri-crops	2009-10 (Dependency)	2019-20 (Dependency)
a. Food grains (Paddy, Maize, Ragi, Jowar, Barley, Wheat etc.)	a. Middlemen b. Mandies c. Primary Market Centers d. Regulated Markets e. Co-operative Societies	a. Middlemen b. Mandies c. Primary Market Centers d. Regulated markets e. Co-operative societies
b. Pulses (Bengalgram, Black gram, Red gram, Horse gram, Green gram, white gram etc)	a. Middlemen b. Mandies c. Weekly sands d. Primary market centers e. Regulated markets f. Co-operative societies	a. Middlemen b. Mandies c. Weekly sands d. Primary market centers e. Regulated markets f. Co-operative societies
c. Commercial crops (Coconut, Arecanut, Chili, Cotton, Sugarcane etc.)	a. Middlemen b. Mandies c. Primary market centers d. Regulated markets e. Co-operative societies	a. Middlemen b. Mandies c. Primary market centers d. Regulated markets e. Co-operative societies
d. Oilseeds (Ground nut, sun flower, Gingely, Mustard etc.)	a. Middlemen b. Mandies c. Primary market centers d. Regulated markets e. Co-operative societies	a. Middlemen b. Mandies c. Primary market centers d. Regulated markets e. Co-operative societies
e. Vegetables (Onion, Potato, Snake Gourd, Luffa Gourd, Brinjal, Lady's Finger, Cucumber, Bitter Gourd, Drumstick, Greens, Tomato, Carrot, Cauli Flower, Legume etc)	a. Middlemen b. Mandies c. Weekly sands d. Primary market centers e. Regulated markets f. Co-operative societies	a. Middlemen b. Mandies c. Weekly sands d. Primary market centers e. Regulated markets f. Co-operative societies



26. Availability of Facilities /Provisions in Your Village:

Facilities /Provisions	In the year 2009-10		2019-20	
	Yes	No	Yes	No
a. Anganawadi / Convent	Yes	No	Yes	No
b. Primary School	Yes	No	Yes	No
c. High School	Yes	No	Yes	No
d. Primary Health center	Yes	No	Yes	No
e. Veterinary Hospital	Yes	No	Yes	No

27. Do you own any type of vehicle?

(i) Yes  (ii) No

If Yes, your opinion on the following issues (after construction of NGNRY road in your village):

Issues	Opinion	
a. Travel Time	Saved	Remained as earlier
b. Fuel efficiency of the vehicle	Increased Substantially	Remained as earlier
c. Maintenance cost of the vehicle	Reduced to some extent	Remained as earlier
d. Smooth Travel	Facilitated	Not Offered
e. Road Accident	Reduced	Increased

28. Specific problems you face in the NGNRY roads:

.....

.....

.....

.....

29. Your suggestions for the better implementation of the rural roads

.....

.....

.....

.....

**PART-II**

**For the NGNRY Road Builders/Contractors**

1. General Information :
  - a. Name and Address of the Respondent :  
.....  
.....  
.....
  - b. Age ( in years):
    - a. Below 30 ( )      b. 31-40 ( )
    - c. 41-50 ( )      d. 51-60 ( )
    - e. Above 60 ( )
  - c. Gender :
    - a. Male ( )      b. Female ( )
  - d. Educational Level:
2. How long are you in the road construction field? .....
3. Class of Constructor:
  - (i) Class I
  - (ii) Class II
4. No. of works undertaken by you : (as on March 2020) : .....
5. Types of works undertaken by you : (as on March 2020)
  - a. New connectivity      Length ..... km
  - b. Up-gradation      Length ..... km
6. Do you face competition from other constructors in bidding for works?
  - (i) Yes
  - (ii) No
7. Whether the funds allocated are adequate?
  - (i) Yes
  - (ii) No
8. Whether you abide by arranged first time quality mechanism lab of NGNRY roads?
  - (i) Yes
  - (ii) No

If No, Why?

.....

.....
9. Whether work order is issued on time?
  - (i) Yes
  - (ii) No

If No, reasons for delay.

.....

.....

10. Is there any delay in fund release for the programme?

(i) Yes  (ii) No

If No, Why?

.....  
 .....

11. Whether the PIU attends the contractors administrative/other problems regularly?

(i) Yes  (ii) No

12. Whether you are able to stick on to the 9 months period stipulated for the completion of works?

(i) Yes  (ii) No

13. Costs incurred on the following of New Connectivity and Upgradation (Rs. per Km)

Heads	Cost incurred per km for NGNRY road works
a. Labour	
b. Materials	
c. Machines	
d. Others	

14. Employment created per Km NGNRY road construction under the programme  
 ..... Man Days.

a. Male \_\_\_\_\_ Days      b. Female \_\_\_\_\_ Days

15. Labour employed on:

a. Daily Basis      b. Contract Basis

i. Disbursement of wages(Labours)

Daily Basis ( )	
For Male	
For Female	

ii. Payment Mode is:

a. Daily      b. Weekly

iii. Method of payment:

a. By cash      b. Through Bank Account

iv. Labour Availability:

a. Easy      b. Difficult

16. i. Availability of inputs:

a. Easy      b. Difficult

ii. Cost of inputs

a. Reasonable      b. Not reasonable

17. From whom do you face problem during construction?  
 a. Authorities b. Elected Members  
 c. General Public d. Labourers

Please specify the problems .....

18. Normal lifespan of NGNRY Roads  
 a. Gravel (mud) Roads  
 b. Black Top Roads  
 c. WBM Roads

19. Normal life span of the NGNRY Roads is short? Yes  / No

If No, reveal your opinion as 1, 2, 3, 4 & 5 about reasons for short life of NGNRY Roads (5 Very good, 4 Good, 3 Better, 2 Poor and 1 very poor)

Reasons	Scores Assigned				
	5	4	3	2	1
a. Poor design of roads					
b. Heavy rains					
c. Heavy laden vehicles on road					
d. Improper use of roads					
e. Improper maintenance of roads					

20. The performance of the NGNRY roads compared with Zilla Parishad/Municipalities/ Forest/ Other/ Rural Development Department is.....  
 a. Very Good      b. Good      c. Better      d. Poor      e. Very Poor

21. Whether the NGNRY programme has been successful? Yes  / No

If Yes, How far is it successful?

- a. Highly successful                      b. Moderately successful

22. Do you believe that NGNRY roads are able to;

Items	Yes	No
a. Improve transport facilities in rural areas		
b. Help providing other rural infrastructure		
c. Encourage rural small scale industries		
d. Improve agriculture / allied activities		
e. Increase education level of rural people		
f. Improve health accessibility for the rural people		
g. Support overall development of the rural area		

23. Specific problems you face in the construction of NGNRY Roads  
 .....  
 .....

24. Your suggestions for the better implementation of the programme:  
 .....  
 .....  
 .....

**PART-III**

**For the PIU Authorities of the NGNRY**

1. General Information:
  - a. Name and Address of the Respondent: .....
  - b. Age (in years) :
    - a. Below 30 ( )
    - b. 31-40 ( )
    - c. 41-50 ( )
    - d. 51-60 ( )
    - e. Above 60 ( )
  - c. Gender :
    - a. Male ( )
    - b. Female ( )
  - d. Educational Level:
2. Designation : .....
3. Responsibility of the PIU in NGNRY implementation:
  - a. In preparing the Proposals
  - b. In Calling for the Tenders
  - c. In approving the Works
  - d. In inspecting the Works
  - e. In Releasing the Funds
  - f. Any other, Specify ...
4. Basis for preparation of Proposals:
  - a. Population Density
  - b. Excepted Benefits
  - c. Political Pressure
  - d. Pre-determined
  - e. Public Demand
  - f. Need based
5. Do you face any difficulty while preparing proposals?  
(ii) Yes  (ii) No   
If yes, please specify  
.....  
.....
6. Basis for Approval of Works
  - a. Authenticity of Contractors
  - b. Experience in the field of road construction
  - c. Previous performance of the contractors in the field
  - d. Political pressure
  - e. Other considerations

7. Time taken for the approval of works by the PIU, sanctioned by NRRDA: \_\_\_\_\_ Months
8. Whether the contractors strictly abide by the norms and conditions stipulated?  
 (i) Yes  (ii) No
9. Whether the contractors complete the works within the 9 months stipulation?  
 (i) Yes  (ii) No
- If No, what are the reasons? .....
10. Whether the PIU attends the contractors administrative/other problems regularly?  
 (i) Yes  (ii) No
11. Whether the contractors effectively maintain the NGNRY roads during the mandatory 5 year maintenance period?  
 (i) Yes  (ii) No
- If No, what are the reasons? Please specify .....
12. Whether the funds released are adequate for the purpose?  
 (i) Yes  (ii) No
- If No, What is the alternative? .....
13. PIU-Contractors relationship is:  
 a. Good                      b. Very Good                      c. Poor
14. The performance of the NGNRY roads compared with Zilla Parishad/ Municipalities/ Forest/ other Rural Development Department is ...  
 a. Good                      b. Very Good                      c. Poor
15. Do you face any difficulty in quality assessment of the NGNRY roads?  
 (i) Yes  (ii) No
- If Yes, Specify the difficulty .....
16. Do you believe that NGNRY roads facilitate in
- | Items                                                  | Yes | No |
|--------------------------------------------------------|-----|----|
| a. Improving transport facilities in Rural Areas       |     |    |
| b. Helping to provide other rural infrastructure       |     |    |
| c. Encouraging rural small scale industries            |     |    |
| d. Improving agriculture/allied activities             |     |    |
| e. Increasing educational level of the rural people    |     |    |
| f. Improving health accessibility for the rural people |     |    |
| g. Supporting overall development of rural area        |     |    |

17. DO you view that the NGNRY Roads' life span is short?

(iii) Yes

(ii) No

If No, reveal your opinion as 1, 2, 3, 4 & 5 about reasons for Short life of NGNRY Roads (5 Very good, 4 Good, 3 Better, 2 Poor and 1 Very poor)

Reasons	Scores Assigned				
	5	4	3	2	1
a. Poor design of roads					
b. Heavy rains					
c. Heavy laden vehicles on road					
d. Improper use of roads					
e. Improper maintenance of roads					

18. Whether the NGNRY programme has been successful:

(iv) Yes

(ii) No

If Yes, How far is it successful?

a. Highly successful

b. Moderately successful

19. What are the difficulties are you facing in the implementation of the NGNRY in the district? Please specify

.....  
 .....  
 .....

20. Your Suggestions for the better implementation of the Programme:

.....  
 .....  
 .....  
 .....

---

## **PUBLICATION DETAILS**

---



## PUBLICATION DETAILS

- **Sunil Kumar P.** and B. Jayarama Bhat (2021). Road Transport in India - An Overview. *International Journal of Social Science and Economic Research*, Vol. 06, Issue 02, pp. 644-660, ISSN: 2455-8834.
- **Sunil Kumar P.** and B. Jayarama Bhat (2021). Rural Road Connectivity in Karnataka - An Analysis. *Journal of Emerging Technologies and Innovative Research (JETIR)*, Vol. 6, Issue 3, pp. 158-166, ISSN: 2349-5162.
- B. Jayarama Bhat and **Sunil Kumar P.** (2019). Development of Road Transport in Karnataka – An Analysis. *Acme Intellects International Journal of Research in Management, Social Sciences & Technology*, Vol. 25, Issue 25, ISSN: 2320-2939.