SYNOPSIS

INVESTIGATING THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF MGNREGA WORKS FOR GREENING RURAL DEVELOPMENT: A CASE STUDY OF DEBRA BLOCK, PASCHIM MEDINIPUR

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1. Introduction:

Near about a century ago, the father of the Indian nation, M. K. Gandhi realized that the life of India breathing from rural regions (Joshi 2002; Sarkar and Kundu 2016). However, these rural regions are continuously suffering from many challenges and the rural people who depend on natural resources for existence and livelihoods are continuously suffering from the vicious cycle of poverty (Jha et al. 2017). They have to combat to survive for their needful stuffs in their daily life and are enforced to migrate to urban areas looking for alternative income sources (Chopra et al. 2012; Sebastian and Azeez 2014). At present, India has 6.4 lakhs villages with a population of 83.3 crores (68.86 percent), which is the largest rural population globally; this is 12 percent of world population (Annual-Report 2014; Ganiee 2014; Raheja 2015). So, it is obvious that India is usually rural in its nature and formation. The actual growth of India does not indicate generally the increase and expansion of industrial urban areas but most of all the development of rural areas.

Sustainability has become a vital element in India's planning process since 1997 (ninth five year plan). The concept Greening Rural Development (GRD) which is integral part of sustainable development was introduced in the twelfth five year plan (2012-2017) by the Ministry of rural development (MoRD), with the assistance of United Nations Development Programme (UNDP). The Government of India's 12th Five Year Plan for the first time has set for itself the aim of faster, sustainable and more inclusive growth. The MoRD, India, is operating the following major rural developmental programmes (**Table-1.1**). These programmes have a pivotal role in the overall development strategies of the country and also led to environmental benefits and sustainability all over the world.

Table-1.1: Green objectives of various rural development programmes in India

Sl. No	Flagship Programme	Launching year	Objectives	Green outcomes
1.	Indira Awaas Yojana. (IAY)	1985	Providing dwelling units to Below Poverty Line (BPL) households	Used environmental friendly construction materials for reducing greenhouse gas emission.
2.	Integrated Watershed Development Programme. (IWDP)	1989	To bring back the ecological balance in degraded watershed.	Maintenance of ecological balance
3.	Nirmal Bharat Abhiyan. (NBA)	1999	To stop untreated solid and liquid waste from re-entering the environment.	Solid and liquid west management for clean and healthy life
4.	Mahatma Gandhi National Rural Employment	2005	Providing at least 100 days of wage employment with in a	Improve the local and global environmental condition

	Guarantee Scheme. (MGNREGS)		financial year for rural unskilled adult people.	
5.	National Rural Drinking Water Programme (NRDWP)	2009	Ensure safe and permanent drinking water security for all rural households.	Conserve surface and ground water for ensuring drinking water availability
6.	National Rural Livelihoods Mission. (NRLM)	2011	For self-service and build up the skill of rural people.	Sustainable livelihood

Source: Website of MoRD, India

This research work envelops a unique aspects of the largest ever Government Programme, MGNREGA. MGNREGA is a wonderful scheme is running in 18th year of its beginning. The scheme is a reflection of Gandhian Thought that refer to the development of India depends on its villages. The requirement of a village is environmental sustainability as well as sustainable economic development

1.1 Greening Rural Development (GRD)

UNDP has declared in their report 'One Planet to Share' that the rural regions are the dominant food provider and carbon sinks (Chopra et al. 2012). India's 74 percent of the rural people is depended on natural resources, in consequence of that the biodiversity of rural region comes under increasing pressure (Thong and Trung 2019).

Developing world is focusing on environmental conservation and sustainable development through clean technological infrastructure in different economic and social sectors, which is considered as green economy. In the broader concept of green economy which encompasses social security and cultural development along with economic growth and environmental protection is known to us as green development (Chandrasekharan et al. 2013). GRD in India is fully interlinked between green economy and green development, refers to diverse activities that rejuvenate and sustain the natural resource, create and apply clean materials, develop technological processes to generate eco-friendly products and create employment opportunities for rural people (Chopra et al. 2012). Viable poverty reduction and appropriate use of natural resources are the powerful tool of GRDs, which is a dynamic process of interconnections among economic growth, social equality and environmental sustainability (Rist et al. 2007). (**Fig-1.1**) represents at a glance concept of GRD.

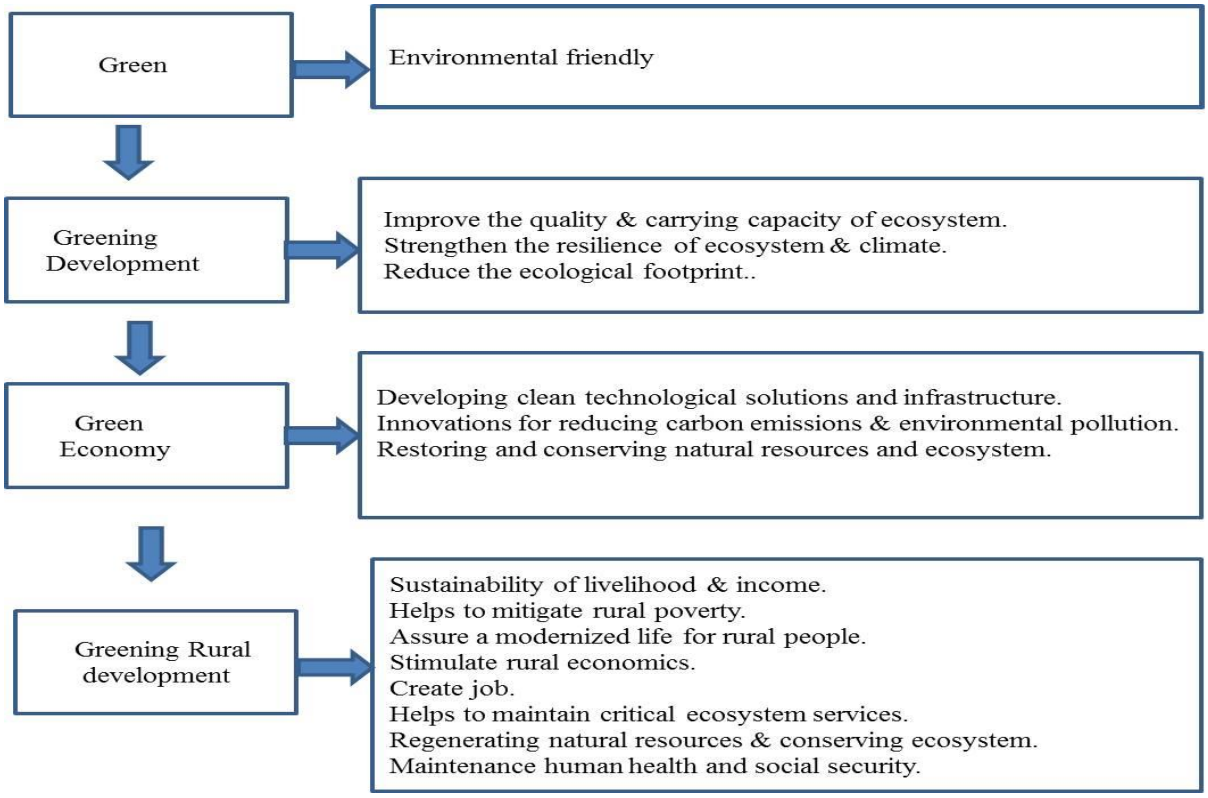
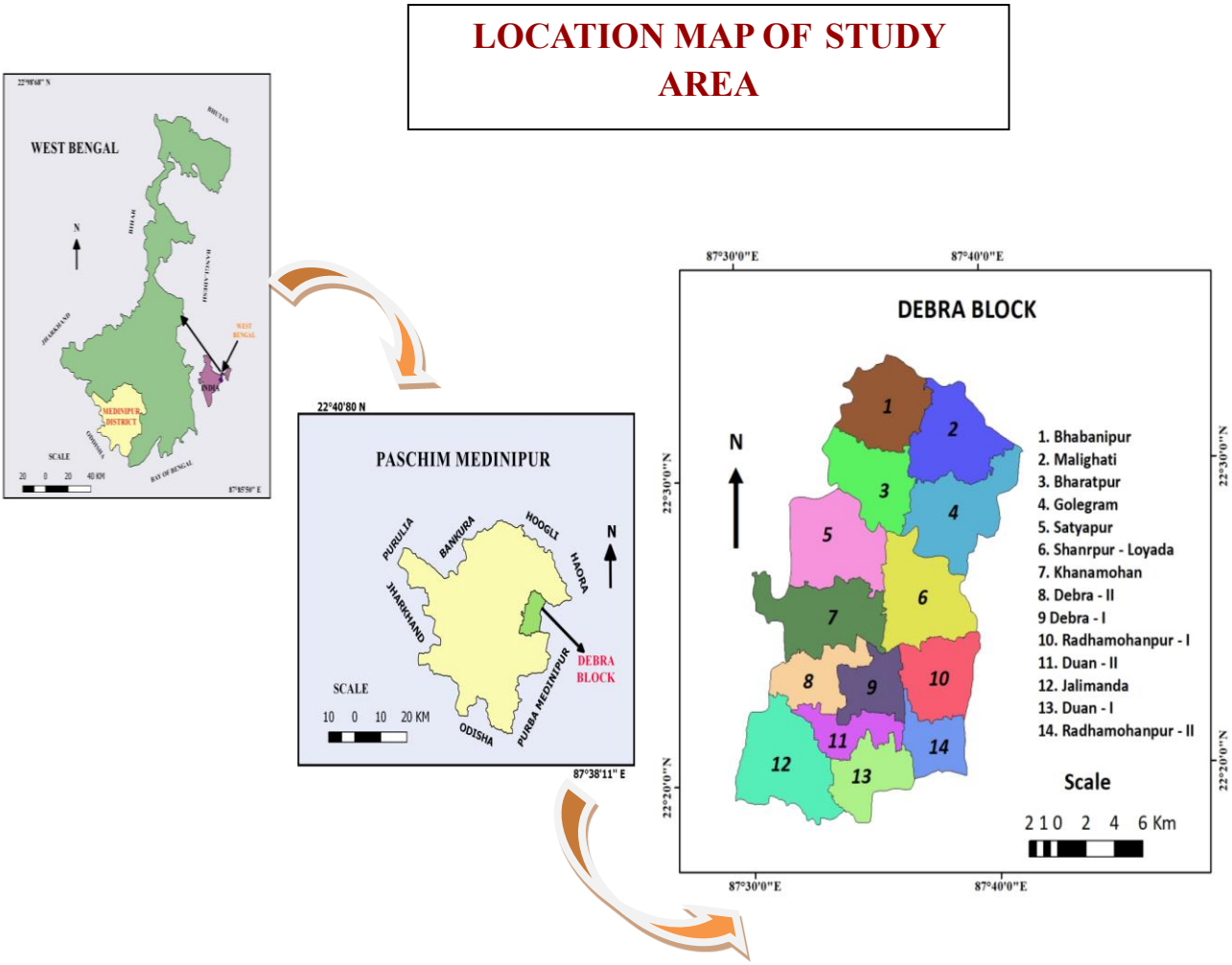


Fig-1.1: Greening Rural Development concept at a glance.
Source: Author

2. Study Area

The study was carried out at Debra Community Development (C.D.) Block of Paschim Medinipur district, West Bengal (**Map.-2.1**). The block covers 342.29 sq. k.m and is divided into 14 Gram Panchayats and 487 mouzas or villages. Among those, 472 are Inhabitant mouzas and another 15 are depopulated mouzas. The population of the block is 2, 84,968 of which 1, 44,566 are male and 1, 40,402 are female and the population density is 832 sq. km, according to the census 2011.

As per reports, among fourteen Gram Panchayat (G.P.) of Debra block, where sixteen major types of works are currently in progress under the MGNREGA. The work under MGNREGA is related to both environment and sustainable development. Environment related work has the potential to improve environmental quality through the conservation and regeneration of ecosystem services like water, soil or land and forest. Also, the development related work has the potential to empower rural people and strengthen the livelihood capacity through generating employment opportunity and create durable assets in rural region (Kharkwal and Kuma 2015). (**Fig-2.1)** represents the MGNREGA works according to environment and Socio-economic development purpose.



Map- 2.1: Location Map of Study area

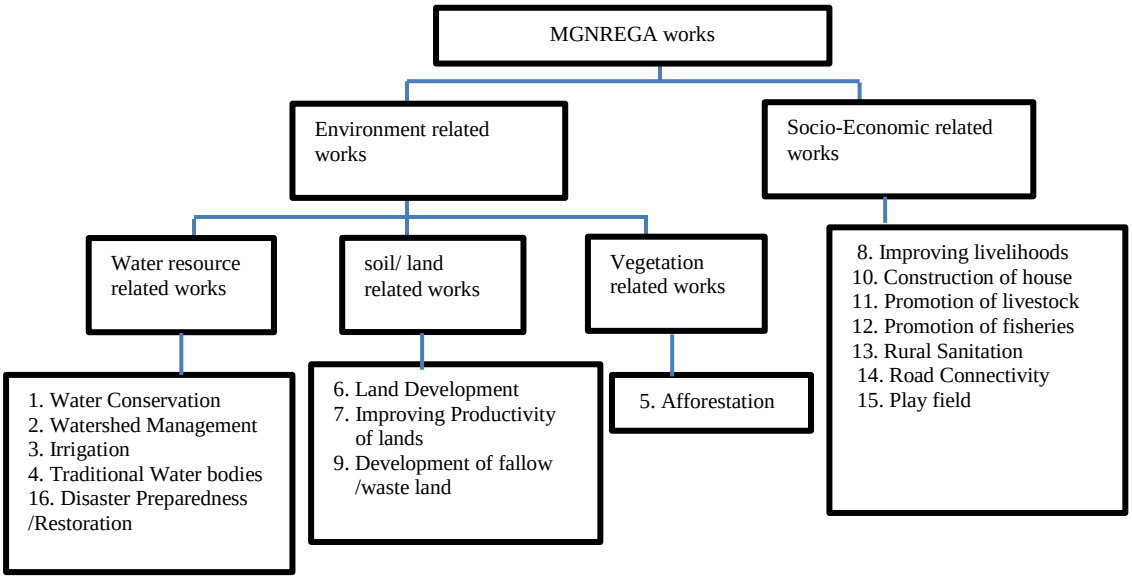


Fig-2.1: Perspectives of MGNREGA works
Source: Author

2.2 Justification for selection of the study area

The main basis for selecting the Study area was the year of initiation of MGNREGS works and the extent of implementation of MGNREGS works.

i) Debra block was selected as it is a representative of rural area in West Bengal. This Block has high level of implementation of MGNREGA works and also the Block where the works were implemented during the first phase (2006) of the programme were selected.

ii) This Block is well connected through rail (South-Eastern Railway), road (NH-6) and water transport (Kangsabati River), and it is located near about 100 km away from the capital city of West Bengal (Kolkata) and 40 km away from district headquarter, Medinipur.

iii) One other fact which I would like to notice that this block is one of places where Rural and Urban livelihood both are presented. The census town Balichak, under Duan -II Gram Panchayat is one and only urban area in Debra block. This is known as 'Urban Village' (Samsurijan., M.S. et. al 2017).

3. Literature Study

Review of literature is a significant tool in all research works. This chapter contains the view points and findings of different researchers and studies conducted in the area of rural development and to review the work already done in respect of MGNREGA. The reviews are broadly categorised under:

- Literature study on rural development
- MGNREGA and socio-economic development
- MGNREGA and green development
- Literature study on different indices for sustainable rural development

3.1 Literature review on Rural Development

F. Gobattoni, et. al (2015) pointed out Traditional farming systems and other activities such as craftsmanship (e.g. manufacturing activities, local food production), represent a sustainable example of human integration with nature. Their maintenance and development, with opportune adaptations to the current socio-economic situation and cultural/technological advancements, are therefore valuable. The research conducted on the six municipalities of the

Teverina Consortium provided a different perspective on today's increased need for rural re-development and social innovation.

K. Raheja, (2015) who have worked in the field of rural development of Haryana has stated that the upgradation of living standard of the rural people by providing ways to develop rural parts of Haryana at grass-root level and improving food security of rural poor. This will also assist in minimizing the rural-urban gap in terms of basic infrastructure facilities essential for 'Sustainable Development' of a settlement.

E. D. Fóris and K. F. Kovács, (2016) studied Green infrastructure as a tool of rural development in Hungary by examined local projects. Green infrastructure development in rural regions contributes to the improvement of urban life quality as well. It would be important to strengthen the spatial character of planning in rural development and it also highlights the interdependency of cities and rural regions.

A. K. Panda and A. K. Tripathy, (2020) studied on Puri district, Odisha, to understand the implementation procedures of MGNREGA and its impact on rural livelihoods. The research pointed out from case study analysis that the villagers are very much satisfied with the works done under MGNREGA. So it is concluded that in the sphere of rural development the role of MGNREGA scheme is very pertinent. The success and effectiveness of these programmes will depend upon the sustained, intelligent and enthusiastic involvement and cooperation of the village community.

3.1.1 Findings

Development of a developing country depends on Rural Development. Rural developmental project is a tool of rural infrastructure development, which contributes to the improvement of urban region as well. MGNREGA provided a different perspective on today's increased need for rural re-development and social innovation. MGNREGA will also assist in minimizing the rural-urban gap for Sustainable Development. Therefore, the national developmental policy is must necessary for rural development

3.2 MGNREGA and Socio-Economic Development

N. Jacob, (2008) pointed out of the study in Villupuram District, Tamil Nadu that MGNREGA would improve their economic position, reduce vulnerability and discourage migration to facilitate their continued access to health, education and welfare facilities available in the village. NREGA is also a lifeline for the rural poor through generating employment in a massive scale.

K. H Rao, (2014) examined MGNREGA for reducing poverty in Karnataka, Madhya Pradesh, Maharashtra and Rajasthan that MGNREGA plays an important role on overall poverty reduction basically it reduce the intensity of poverty of the beneficiary households. MGNREGA has strengthened the rural livelihood through sustainable poverty reduction and improved natural resource conservation and use. This is an innovative approach for the way of Greening Rural Development.

S. Narayanan et. al (2014) assessed about MGNREGA Works and Their Impacts in Maharashtra, that this work has two goals: the first was to verify the durable assets and the second was to bring out the user perceptions about problems and benefits of the work. Allover 91% respondents claim that the MGNREGA work was very useful and they also suggest that their livelihood have been changed after implementation of MGNREGA.

K. T. Karthika, (2015) pointed out that MGNREGA is an Act that aims to strengthen the women employment by enforcing that about 33 percent of total work force should be women and also that there will be equal wages for men and women. The study reveals that, 95% of participants are women workers in Kerala. The extensive participation of women in MGNREGA has meant that women are coming out of their homes, not only to work but also to visit banks and Panchayat offices, which they may not have done previously. This enhanced mobility comes with the higher status of being income-earning workers.

3.2.1 Findings

MGNREGA would improve the rural livelihood creating durable and productive assets. MGNREGA would also improve the villager's economic status, reduce vulnerability and discourage migration to facilitate their continued access to health, education and welfare facilities available in the village. India consists of the largest rural population globally. The livelihood of these rural people is improved by MGNREGA works.

3.3 MGNREGA and Green Development

K. Kareemulla et al (2009) observed the impacts of MGNREGA on rural livelihoods and the progress of soil and water conservations activity in Andhra Pradesh. They constructed a liner regression function to explain the participation of the persons in MGNREGA works with four explanatory variables viz family size, wage income other than MGNREGA, migration condition before MGNREGA and land holdings. It was observed that the variables were positively related to dependency on the MGNREGA works. The NREGS earnings are being used mainly for food, education and health security. In Andhra Pradesh, soil and water conservation (SWC) works have accounted for over 80 per cent.

R. Tiwari et al (2011) studied a multidisciplinary evaluation in Chitradurga district of Karnataka to examine the effect of the MGNREGA in improving livelihood through environmental facility and decreasing vulnerability to climate variability. The findings clearly point out that the NREGA has provided multiple environmental services include groundwater recharge, water percolation, and more water storage in tanks, increased soil fertility, reclamation of degraded lands and carbon sequestration. Also it is reducing the vulnerability of production systems and livelihoods in the short and long term, especially against the background of increasing climate variability and climate change.

S. Verma, and T. Shah, (2012) observed the water assets created by MGNREGA on the basis of the study in Bihar, Gujarat, Kerala and Rajasthan that MGNREGA is also among the world's largest water security programs, investing some US$ 3 billion annually in constructing, repairing, renovating rural water structures, public and private. This study synthesizes over 140 case studies of MGNREGA water structures that were useful, productive and durable.

N. Ravindranath, and I. Murthy, (2013) examined MGNREGA works in their green aspect by using Green Index throughout India. The study revealed that the MGNREGA works are generally linked to water, soil or land and vegetation. The environment related MGNREGA works have the potential to deliver green impact through the regional and global level. In the context of greening MGNREGA, the focus should be on sustainable economic development through the natural resource conservation

3.3.1 Findings

MGNREGA assets have been conducive to the environment and have contributed towards natural resource regeneration; any country's sustainable economic development depends on rural development if it walks on protecting the environment. As we move more and more towards going to be a developed country, simultaneously we are reaching towards deteriorating our environmental condition. In this circumstance, we have crept into a situation where we should not ignore the environment anymore. Hence any implemented programme, like MGNREGA has to be examined in terms of its effect on the environment. So, it is essential to examine MGNREGA works in their green aspect

3.4 Literature Review on Indices for Sustainable Rural Development

S. kharkwal and A. Kumar (2015) assessed the socio economic impact of MGNREGA at Udham Singh Nagar in Uttarakhand, by using socio economic index. To assess the impact of MGNREGA on the socio-economic condition of beneficiaries, twelve qualitative and quantitative socio-economic indicators were evaluated using three point scale for two selected years, i.e. 2007-08 and 2013-14. The changes in the value of these indicators over the six years period were examined. It was found that in the initial year of implementation (2007-08) of MGNREGA in the study area 29 (36.25%) out of total 80 beneficiary households were in poor socio-economic condition. In 2013-14 only 10 households (12.5%) were found under poor category. These results suggest that MGNREGA is effective in improving the socio economic conditions of job participants.

N. Hashemi, and G. Ghaffary, (2017) fostered a Sustainable Rural Development Index (SRDI), which is a new proposed indicator that compares the current situation to future conditions in the development plans. The SRDI value is the weighted average of the values of 20 indicators. This study has introduced a novel dynamic index to better evaluate the sustainability in the rural development as a result of tourism development in Hajij village, Iran. They define sustainability based on participation and the attitude of the community members

S. K. Jha, (2017) and co-author evaluated the potential of well-designed government programmes to contribute to sustainable development through improving adaptive capacity and by combating poverty and vulnerability to climate change among marginalised people in a tribal region of Dhar district of Madhya Pradesh state, India. This study confirms that well

designed programmes can reduce both the socio-economic and climate change vulnerability of marginalised tribal peoples. The Capacity Assessment Index (CAI) is used to measure the effectiveness of the program based on the specified indicators.

N. Kumar and R. Rani (2019) examined the regional disparities in social development in India by using social development index (SDI). Social indicators represent social conditions of various sections of the society. Indicators should be selected by bearing in mind all economic, social and ethical norms of culture. Choice of the social indicators also depends on the accessibility of the data. The present study used 12 social indicators for the construction of SDI and ranking of the UTs and states of India. The study used these indicators because all of these signify the basic necessities of the society.

3.4.1 Findings

The requirement of a village is environmental sustainability as well as sustainable economic development. With all these important aspects, the findings explored that the regional disparities in Socio–Economic Development by using Socio-Economic Development Index (SEDI) and Environmental Improvement by using Green Index (G.I.). Among other indices, these two indices are appropriate for small scale (Gram Panchayat) impact assessment study. This study is significant for the measurement of ground level development.

4. Hypothesis

In the light of the above Research Gaps, the following hypotheses is proposed

There is a positive correlation between the socio-economic and environmental impacts of MGNREGA works, suggesting that investments in green rural development can yield co-benefits in terms of poverty reduction, sustainable livelihoods, and ecological conservation.

5. Objectives of the study

The main objectives of the study are:

1. Assessing the socio-economic impacts of MGNREGA works on rural communities, including income generation, employment opportunities, poverty reduction, and overall livelihood improvement.

2. Evaluating the environmental impacts of MGNREGA works in terms of natural resource conservation, land restoration, water management, and biodiversity enhancement.

3. Examining the correlation between socio-economic development and environmental improvement created by MGNREGA works in a rural region.

4. Providing recommendations and strategies for maximizing the socio-economic and environmental benefits of MGNREGA works and promoting sustainable and green rural development.

6. Methodology

Designing the research plan is the most important stage of any research work. Planning is very important for the successful implementation of any programme, research plan elucidates the launching pad towards identifying direction of the work. A description of the research plan (**Fig-6.1**) for the present study has been discussed in this chapter. The design of study can be observed as under:

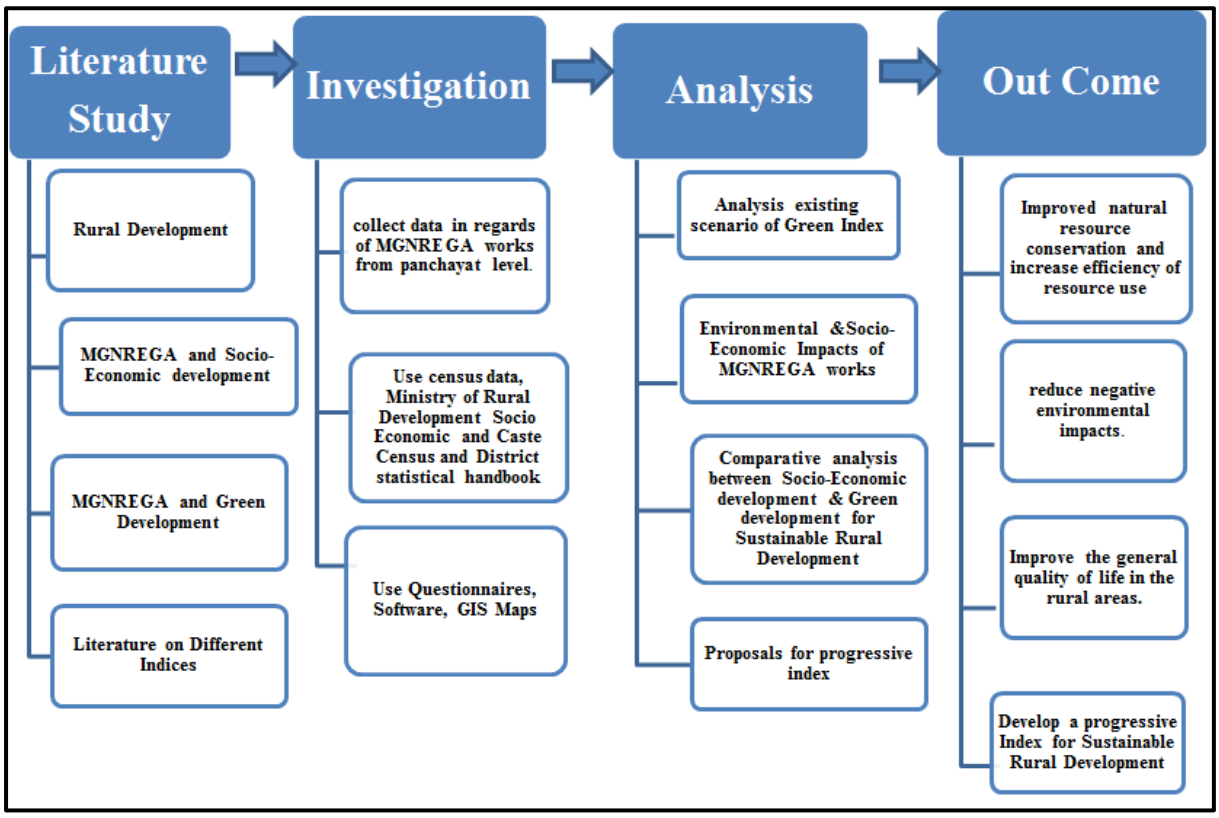


Fig-6.1: Research design

6.1 Data Extraction and Synthesis Methods

Survey data was analysed through some statistical techniques and suitable cartographic presentation. To meet the different objectives of the study, mixed research methods were used i.e. Green Index, Socio-Economic Development Index, Progressive Index, tabular analysis, percentage, and Co-relation. This combines both qualitative and quantitative forms, for analysing the role of MGNREGS in improving the socio-economic development and environmental improvement of a rural region.

6.1.1 Green Index (GI)

The term Green Index is a significant index and easy to measure and understand the green outcomes of MGNREGA works. Green indicators and mathematical functions are used for observing and evaluating the outcomes of MGNREGA works. Dr Ravi Chopra proposed the formula of Green Index (GI). The formula is

$$\boldsymbol{GI}_{GP} = \frac{\sum_{i=1}^{N}(GV)_i}{4N}.$$

Where, N= No of MGNREGA works undertaken in a G.P

GV= Green Value (Green Potential * Effectiveness parameter).

6.1.2 Socio-Economic Development Index (SEDI)

Social indicators represent social conditions of various sections of the society. Here socio-economic development index is developed using four widely recognized components, those are a) economic b) education c) health, and d) modernization. The formula is

$$SEDI(Ij) = \frac{\Sigma Iij}{n}$$

Where, Ij is Index of jth Indicator of study, and

n is the no. of indicators used in study

6.1.3 Spearman's rank correlation coefficient

Spearman's rank correlation coefficient is defined in statistics as the measurement of the strength of the relationship between two variables and their association with each other. The formula for Spearman's rank correlation coefficient is

$$\rho = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

Where, $\boldsymbol{\rho}$ = Spearman's rank correlation coefficient
d = Difference between the two ranks of each observation
n = Number of observations

7. Findings of the study

7.1 Analysis of the environmental impact of MGNREGA works by using Green Index (GI):

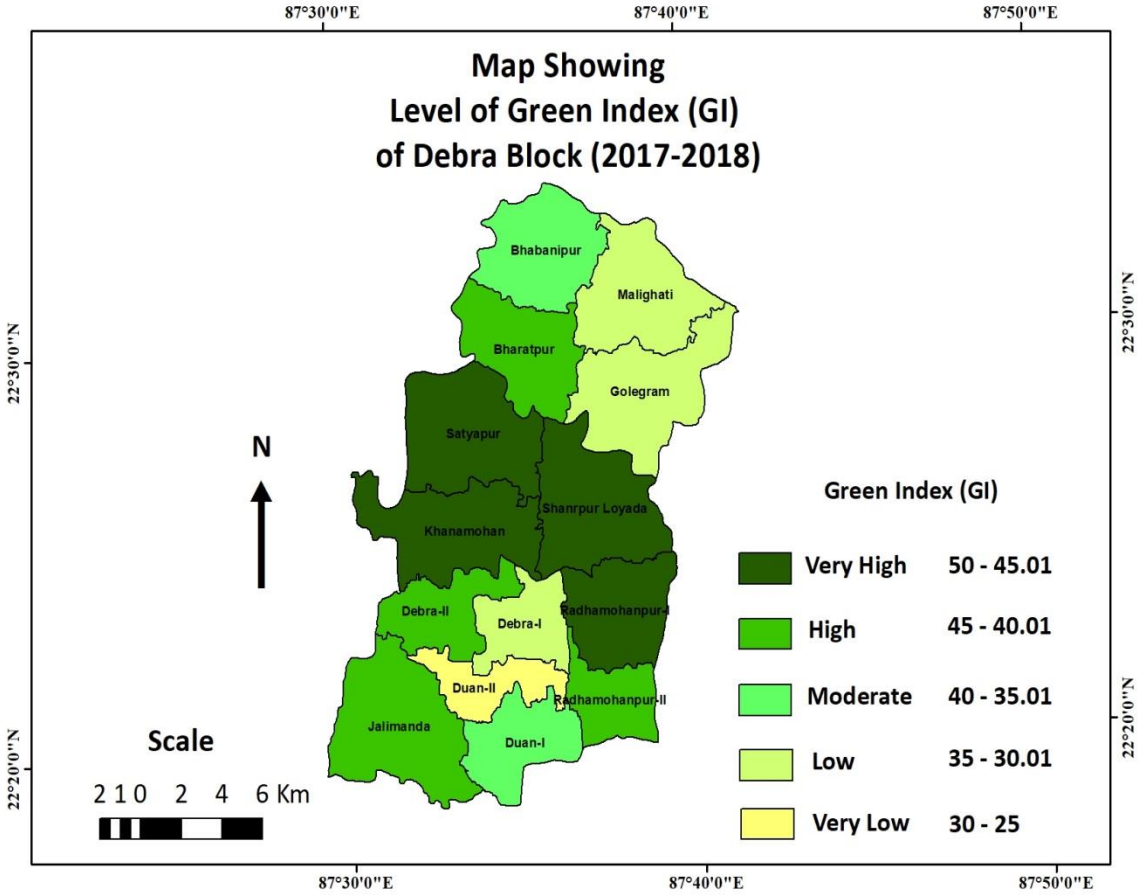
Environmental conservation (land, water, forest conservation) which is upgraded by MGNREGA works were examined by green index or to assess the qualitative and quantitative measurement of MGNREGA works through Green Index. The measurement of GI started from a Gram Panchayat level, which is a micro level study. The formula of GI is applied on each and every G.P. of the study area. (**Table -7.1)** represents the Green Index (G.I.) of MGNREGA of all Gram Panchayet of Debra Block

Table -7.1: Green Index (G.I.) of MGNREGA at fourteen G.P. of Debra Block (Based on Financial Year 2017-18)

Gram panchayat (G.P.)name	Work Type(N)	Total works	Estimated Outcome (hec.)	Expenditure(in Lakhs)	Green Value ∑G.V	Green Index value(G.I.)= ∑G.V/4N	Green Index	Green Index In %	Green Index	Rank
Bharatpur	9	556	313.75	129.23	15.85	15.85/(4*9)	0.4402	44.02	High	7
Bhabanipur	11	557	184.3	139.88	17.6	17.6/(4*11)	0.4000	40.00	Moderate	9
Debra -I	10	576	503.22	145.06	12.2	12.2/(4*10)	0.3050	30.50	low	13
Debra -II	10	408	205.19	123.57	18	18/(4*10)	0.4500	45.00	High	5
Duan -I	9	304	373.27	142.86	13.65	13.65/(4*9)	0.3791	37.91	Moderate	10
Duan -II	10	615	126.16	57.01	10.5	10.5/(4*10)	0.2625	26.25	very low	14
Golgram	12	753	340.17	197.37	16	16/(4*12)	0.3333	33.33	low	12
Jalimanda	9	1020	505.34	261.13	16	16/(4*9)	0.4444	44.44	high	6
Khanamohan	8	941	136.06	286.22	15.3	15.3/(4*8)	0.4781	47.81	Very high	2
Malighati	13	554	143.45	136.2	18.05	18.05/(4*13)	0.3471	34.71	low	11
Radhamohanpur -I	10	743	233.11	174.03	18.85	18.85/(4*10)	0.4712	47.12	Very High	4
Radhamohanpur -II	10	777	457.98	159.84	16.875	16.875/(4*10)	0.4218	42.18	High	8
Satyapur	9	892	129.46	254.59	17.15	17.15/(4*9)	0.4763	47.63	very High	3
Shanrpur - Loyada	11	1003	126.13	234.04	22	22/(4*11)	0.5000	50.00	Very high	1

Source: computed by author

From the above table **(Table – 7.1)** the highest G.I. value of (50 %) was found at Snarpur – Loyada G.P., followed by Khanamohan (47.81%) and Satyapur (47.63), and the lowest value (26.25%) found at Duan –II G.P. Green Index value of all the fourteen G.P. have been prepared in five categories in descending order (**Map.- 7.1**).



Map- 7.1: Level of G.I. of Debra block

7.2 Analysis of Socio-Economic impacts of MGNREGA works by using Socio-Economic Development Index (SEDI)

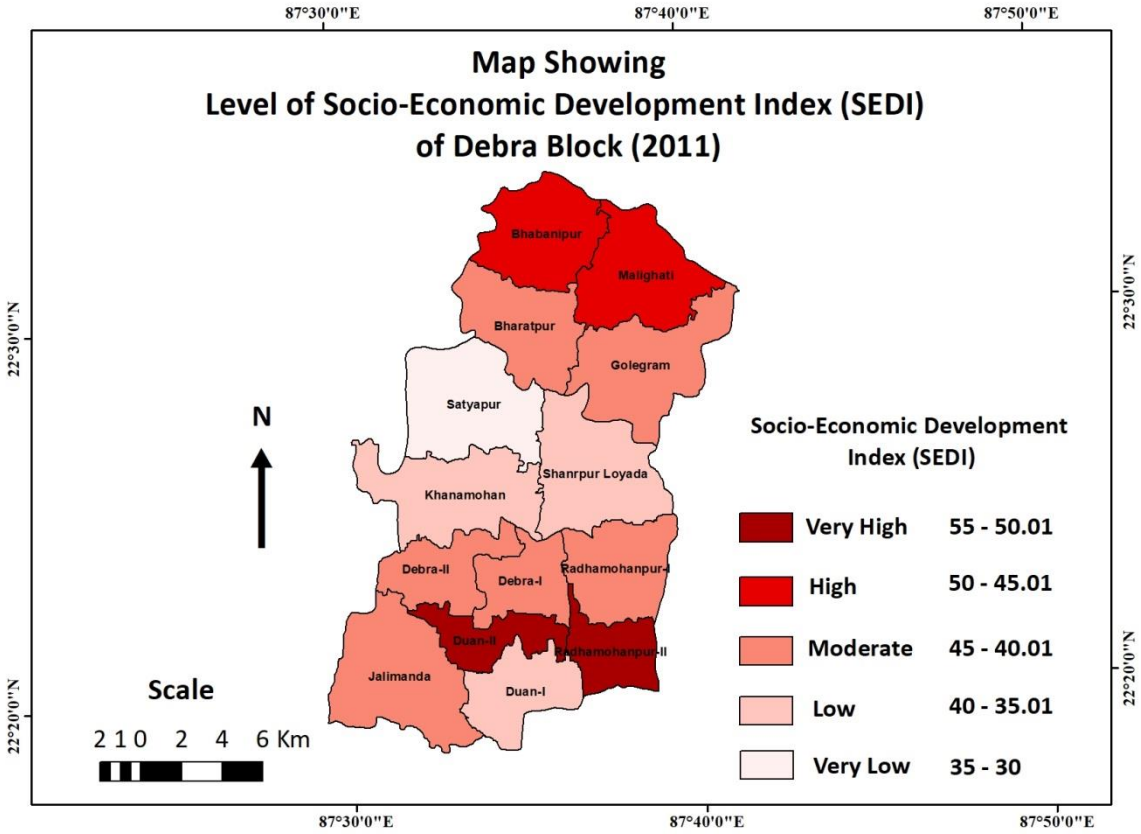
Socio-economic Development Index (SEDI) is necessary to understand the entire depiction of development of a society. This societal development index explores the actual variability of inter-G.P. (micro-level) progress and explains the responsibility of indicators to create diversity in development of a society. (**Table-7.2)** represents SEDI value of all G.P. of the study area.

Table-7.2: Socio-Economic Development Index (SEDI) of fourteen G.P. of Debra Block (Census data 2011)

name of the G.P.	Indicators												Socio-Economic development index (S.E.D.I.) = Ij = (Σ Iij / n)	Socio-Economic development index	Rank
	Economic growth		Level of Education			Health services			Degree of modernization						
	Index of worker	Index of Households with any member earning more than Rs. 10,000 p.m	Index of literacy	Index of female literacy	Index of school	Index of mouza having safe drinking water	index of mouza having nutrition centre	Index of mouza having health centre	Index of Urbanization	Index of mouza having electrification for all users	Index of household with three/ more rooms with concrete wall and roof	Index of mouza having communicated by rail and road			
Bharatpur	46.88	2.24	67.86	60.44	0.33	83.33	89.91	12.1		90.91	3.6	24.24	40.16	moderate	**10**
Bhabanipur	45.81	3.27	73.35	67.44	0.27	94.83	93.1	31		77.59	4.15	55.17	45.5	high	**4**
Debra –I	45.82	8.34	70.28	64.2	0.26	100	85.52	13		78.26	8.28	43.48	43.12	moderate	**5**
Debra -II	47.16	8.8	73.06	66.79	0.35	96.67	66.67	6.67		85	7.85	36.67	41.31	moderate	**8**
Duan -I	46.72	5.15	77.97	72.61	0.34	58	76	12		80	5.12	16	37.49	low	**11**
Duan -II	40.11	18.37	77.95	73.65	0.09	83.33	76.14	42.9	71.43	75	13.53	71.43	53.66	Very high	**1**
Golgram	46.47	5.65	72.14	65.54	0.37	77.03	76.57	18.9		85.14	7.46	35.15	40.87	moderate	**9**
Jalimanda	48.85	4.96	72.47	65.52	0.31	98.84	87.6	9.3		94.19	2.92	16.29	41.77	moderate	**7**
Khanamohan	47.15	3.71	74.19	68.91	0.37	65.39	58.97	7.69		77.69	4.41	12.31	35.07	low	**13**
Malighati	46.27	4.77	74.45	67.87	0.34	91.43	74.29	28.6		94.29	5.87	77.14	47.11	high	**3**
Radhamohanpur -I	44.66	3.95	73.52	68.36	0.2	73.08	89.73	19.2		76.92	6.4	53.85	42.49	moderate	**6**
Radhamohanpur -II	39.69	8.92	78.41	73.21	0.2	100	96.33	33.3		83.33	6.37	100	51.65	Very high	**2**
Satyapur	47.13	3.41	68.3	61.15	0.33	76.14	85.61	13.6		64.77	7.73	31.82	34.41	Very low	**14**
Snarpur - Loyada	44.82	6.77	71.58	65.27	0.4	75.45	64.85	45.5		69.09	4.95	32.73	36.38	low	**12**

Source: computed by Author

Socio-economic Development Index is a statistical index that refers to the levels of development among fourteen G.P. of Debra block. The index value is highest in Duan-II (53.66), followed by Radhamohanpur-II (51.65) and lowest in Satyapur (34.41). SEDI value of all the fourteen G.P. have been prepared as five categories in descending order (**Map.-7.2**).



Map - 7.2: Level of SEDI of Debra block

7.3 Correlations between Socio-Economic Development and Environmental Improvement

Spearman's correlation coefficients method is applied here to correlate the SEDI and GI value. Spearman's rho is a significant choice for this type of ordinal data. Correlation between GI and SEDI is determined **-0.657**. There is a negative correlation between the two variables. So, it can be interpreted that the Green Index is low where SEDI value is more. So, the relation between SEDI and GI is inversely proportional.

Table-7.3: Calculation Table for Spearman's Rank correlation between SEDI and GI

Gram panchayat (G.P.)name	Green Index	Green Index In %	Green Index	Rank (R_1)	Socio-Economic development index (S.E.D.I.) = Ij = (Σ Iij / n)	Socio-Economic development index	Rank (R_2)	$R_1 - R_2$ = d	d^2	$\rho = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$
Bharatpur	0.4402	44.02	High	**7**	40.16	moderate	**10**	**- 3**	**9**	**-0.657**
Bhabanipur	0.4000	40.00	Moderate	**9**	45.5	high	**4**	**5**	**25**	
Debra -I	0.3050	30.50	low	**13**	43.12	moderate	**5**	**8**	**64**	
Debra -II	0.4500	45.00	High	**5**	41.31	moderate	**8**	**-3**	**9**	
Duan -I	0.3791	37.91	Moderate	**10**	37.49	low	**11**	**-1**	**1**	
Duan -II	0.2625	26.25	very low	**14**	53.66	Very high	**1**	**13**	**169**	
Golgram	0.3333	33.33	low	**12**	40.87	moderate	**9**	**3**	**9**	
Jalimanda	0.4444	44.44	high	**6**	41.77	moderate	**7**	**-1**	**1**	
Khanamohan	0.4781	47.81	Very high	**2**	35.07	low	**13**	**-11**	**121**	
Malighati	0.3471	34.71	low	**11**	47.11	high	**3**	**8**	**64**	
Radhamohanpur -I	0.4712	47.12	Very High	**4**	42.49	moderate	**6**	**-2**	**4**	
Radhamohanpur -II	0.4218	42.18	High	**8**	51.65	Very high	**2**	**6**	**36**	
Satyapur	0.4763	47.63	very High	**3**	34.41	Very low	**14**	**-11**	**121**	
Snarpur - Loyada	0.5000	50.00	Very high	**1**	36.38	low	**12**	**-11**	**121**	
									ΣD^2 = 754	

Source: computed by author

The Green Index (GI) combines socio-economic and environmental factors to assess overall green performance of a region. By examining the relationship between these indices, the study seeks to shed light on interplay between Socio-Economic Development (SED), Environmental Improvement (EI), and green initiatives. Therefore, to understand the Sustainable Rural Development we used progressive index, which is the combined index of SEDI for societal purpose and GI for environmental purpose.

Overall, this study reinforces the notion that sustainable development requires a balanced approach that considers both socio-economic development and environmental sustainability. By integrating green initiatives, fostering inclusive growth, and prioritizing climate action, societies can work towards achieving the Sustainable Development Goals and building a more sustainable and resilient future. The insights from this study can inform policymakers,

researchers, and sustainable development practitioners in designing effective strategies and policies for sustainable development at local, regional, and global levels.

8. Conclusion

MGNREGA achieved highest rank among the other significant programmes ever undertaken to improve the rural environment and modify the rural life and livelihood (Ambasta, et. al., 2008). Also MGNREGA is a milestone in Indian history of social security legislation after independence. MGNREGA also appraised as an overall developmental tool to emphasize the social security, economic development and environmental improvement of rural India. It provides different scope to rehabilitate rural infrastructure through watershed management, restoration and regeneration of water bodies such as tanks and pond, activities related to forestry, land development, soil erosion and flood control, and construction of roads and institutional facilities. MGNREGA was revised in 2011 with a large scope including 30 new works aligning with other development related work (MoRD, 2012).

8.1 Summary of Key Findings

This research work is concentrated on the impact of MGNREGA works on regional environment and sustainable rural development. The findings clearly point out that

i) Most of the MGNREGA works has considerable positive impact on the environment and also has the potential to conserve the environmental condition i.e. conserving water resources, soil quality and biodiversity.

ii) From the scientific assessment of GRD and GI, we can conclude that MGNREGA can achieve a great role on rural development in coming decade.

iii) GRD is a major step to get better lives of millions of rural people. And GI is an attempt to reshape about the environmental development.

iv) Rural development is essential to improve the standard of living in most developing countries. As, the economies of most developing countries are still dependent on natural resources, both renewable (land, water and forests) and non-renewable (oil and minerals).

v) The sustainable flow of natural resource is well controlled through MGNREGA activities, which is necessary for future generations to meet their own needs.

8.2 Implications for Future Research

The present study has clearly demonstrated that the potential of MGNREGA works to deliver environmental benefits and reduce vulnerability to climate risk. Some of the suggested follow up steps based on the lessons learnt from this study are as follows:

i) Generate and create access to information on natural resources, production systems, environmental impacts of MGNREGS works, status of the assets created etc. to assist in village-level resource planning, designing and implementation of MGNREGS works.

ii) Develop and demonstrate mechanisms to promote maintenance and management of assets created under MGNREGS

iii) Develop guidelines and approaches for monitoring environmental benefits generated through MGNREGS works

iv) Assess and suggest the institutional arrangements and management systems to optimize the flow of Sustainable Rural Development, synergistically.

v) The analysis considers five sample villages in every G.P. of Debra Block. Consideration of more villages in each G.P. could have improved the robustness of the results. This along with the inter-temporal consideration of data should be the future research agenda.

8.3 Limitation of the study

Even a well-planned research methodology may not be free from limitations. Hence, the present methodology adopted for the research and analysis have its own limitations. Some of which are listed below:

i) There was no baseline or benchmark or pre-MGNREGS scenario data or information for comparison with the post-MGNREGS implementation scenario.

ii) There is no access to knowledge and information on baseline status of natural resources.

iii) For many villages, secondary data was not readily available for various indicators (such as change in area irrigated and area afforested).

iv) It is a long process to realize The Environmental condition improvement through MGNREGA activities

v) We can realize the environmental condition but everywhere we cannot quantify environmental condition with digital form

vi) Members of respondent households were found hesitating in disclosing the information about various section. Hence, the information given by the members of respondent households were not free from a possible margin of error.

Hence campaigns are required at panchayat level to increase the awareness of the local people for the proper use of natural resources as securing availability of resource in future.

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