OPPORTUNITIES AND CONSTRAINTS IN SUSTAINABILITY OF NIRMAL GRAMS IN RAJASTHAN

Ph.D. Thesis

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Submitted in

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by

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Under the Supervision of

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December 2018

DECLARATION

I, Satish Raj Mendiratta, declare that this thesis titled, "Opportunities and Constraints in Sustainability of Nirmal Grams in Rajasthan" and the work presented in it, are my own. I confirm that:

- ✧ This work was done wholly or mainly while in candidature for a research degree at this university.

- ✧ Where any part of this thesis has previously been submitted for a degree or any other qualification at this university or any other institution, this has been clearly stated.

- ✧ Where I have consulted the published work of others, this is always clearly attributed.

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Date: 6 December 2018

Satish Raj Mendiratta

(2013RCE9507)

CERTIFICATE

This is to certify that the thesis entitled "Opportunities and Constraints in Sustainability of Nirmal Grams in Rajasthan" being submitted by Satish Raj Mendiratta (2013RCE9507) is a bonafide research work carried out under our supervision and guidance in fulfillment of the requirement for the award of the degree of **Doctor of Philosophy** in the Department of Civil Engineering, Malaviya National Institute of Technology, Jaipur, India. The matter embodied in this thesis is original and has not been submitted to any other University or Institute for the award of any other degree.

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ABSTRACT

Safe water, sanitation and hygiene are essential for achieving sustainable development and contribute to healthier environment, better human welfare and more livelihood opportunities by impacting on economic development, education, health, nutrition and climate resilience. The results of several evaluations of *Nirmal Gram Panchayats* reveal that the health indicators in *Nirmal Gram Panchayats* have improved but their sustainability is a major problem in all the states of India. The sustainability of *Nirmal Grams* (fully sanitized and open defecation free villages) is continuous and satisfactory functioning as well as effective use of water and sanitation facilities by all households in the *Gram Panchayat* throughout the year. The rapid assessments were carried out in ten *Nirmal Gram Panchayats* in ten districts out of twenty eight districts of Rajasthan utilizing household survey questionnaire, structured observations, spot-checks, visual inspections, focus group discussions, and testing bacteriological quality of water utilizing H2S strip vials. The results of the assessments reveal that the State Sustainability Index of Rajasthan is 46.52 percent which has been categorised as low with high concern. The factor analysis reveals that the institutional dimension having lowest sustainability score ad highest value of correlation coefficient with its variables needs highest priority. The environmental sustainability having low score and very high coefficient of correlation needs very high priority. Similarly the technical dimension and socio-economic dimensions having high and moderate scores of sustainability and high and moderate coefficient of correlations need high and moderate priorities respectively. The simultaneous remedial measures both at *Gram Panchayat* and household level would enhance the sustainability scores of all the four dimensions of sustainability. The findings of assessments in terms of constraints and opportunities have been analysed utilizing force field analysis and the appropriate strategies and policy guidelines have been evolved to ensure sustainability of *Nirmal Gram Panchayats* which can be adopted by the state in the light of ample opportunities available under the National *Swachh Bharat Mission-Gramin*. The institutional development for environmental management in *Nirmal Gram Panchayats* is essential for their sustainability and can be achieved through strengthening the *Gram Panchayats*, *Block Panchayats* and *District Panhayats* (*Jila Parishad*) by providing them with adequate funds and skilled functionaries as well as building their capacities in all aspects of community water and sanitation facilities as well as solid and liquid waste management, and strictly enforcing legislations pertaining to environmental management in rural areas.

List of Figures

List of Tables

Abbreviations and Acronyms

ANM	Auxiliary Nurse Midwife
APL	Above Poverty Line
ASHA	Accredited Social Health Activist
AWW	Anaganwadi Worker
AY	Advocacy
BCC	Behaviour Change Communication
BDO	Block Development Officer
BPL	Below Poverty Line
BWSC	Block Water and Sanitation Committee
BWSM	Block Water and Sanitation Mission
CB	Community Building
CBO	Community Based Organisation
CCDU	Communication and Capacity Development Unit
CEP	Community Education and Participation
CESS	Centre for Economic and Social Studies
CRSP	Central Rural Sanitation Programme
CMS	Centre for Media Studies
CSC	Community Sanitary Complex
CSE	Centre for Science and Environment
CSR	Corporate Social Responsibility
DSI	District Sustainability Index
DWSC	District Water and Sanitation Committee
DWSM	District Water and Sanitation Mission
ESA	External Support Agency
ESC	Ensuring Supply Chain
FGD	Focus Group Discussion
GOI	Government of India
GOR	Government of Rajasthan
GP	Gram Panchayat
HH	Household

H_2S	Hydrogen Sulphide
HWTS	Household Water Treatment and Safe Storage
ICDS	Integrated Child Development Services
ICEDA	Icelandic International Development Agency
IEC	Information Education and Communication
IFAD	International Fund for Agriculture Development
IPC	Inter personal Communication
IRC	International Water and Sanitation Centre
IVAC	International Vaccine Access Centre
JMP	Joint Monitoring Programme
KGBV	*Kasturba Gandhi Balika Vidyalaya*
KRC	Key Resource Centre
MDG	Millennium Development Goal
MDWS	Ministry of Drinking Water and Sanitation
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MHRD	Ministry of Human Resources Development
MSEA	Mobilising Support from External Agencies
NARSS	National Annual Rural Sanitation Survey
NBA	*Nirmal Bharat Abhiyan*
NGO	Non-Governmental Organisation
NGP	*Nirmal Gram Puraskar*
NRDWP	National Rural Drinking Water Programme
NSSO	National Sample Survey Organisation
ODF	Open Defecation Free
O&M	Operation and Maintenance
PHC	Primary Health Centre
PHED	Public Health Engineering Department
PMUSSO	Programme Management Unit and Sanitation Support Organisation
PPP	Public Private Partnership
PRI	Panchayati Raj Institution
PTA	Parents Teacher Association

RMSA	*Rashtriya Madhiymik Shiksha Abhiyan*
RRR	Resource Recovery and Reuse
RSM	Rural Sanitary Mart
SBM	*Swachh Bharat Mission*
SBM-G	*Swachh Bharat Mission-Gramin*
SBSV	*Swachh Bharat Swachh Vidyalya*
SDG	Sustainable Development Goal
SHG	Self Help Group
SI	Sustainability Index
SIDA	Swedish International Development Agency
SIRD	State Institute of Rural Development
SLWM	Solid and Liquid Waste Management
SPRI	Strengthening Panchayati Raj Institutions
SSA	*Serva Shiksha Abhiyan*
SSHE	School Sanitation and Hygiene Education
SSI	State Sustainability Index
TSC	Total Sanitation Campaign
TSM	Technical Support and Monitoring
UN	United Nations
UNICEF	United Nations Children Fund
VWSC	Village Water and Sanitation Committee
WASH	Water, Sanitation and Hygiene
WASSI	Water and Sanitation Sustainability Index
WATSAN	Water and Sanitation
WHO	World Health Organisation
WQMS	Water Quality Monitoring and Surveillance
WSMS	Water and Sanitation Management System
WSS	Water Supply and Sanitation Service
WSSO	Water Supply and Sanitation Support Organisation
WSP	Water and Sanitation Programme

Table of Contents

Chapter 1

Introduction

This chapter covers the impact of sanitation on sustainable development, its importance and motivation for research as well as the aim and objectives of the research and chapter outline of the thesis are studied.

1.1 Background

Sustainable Development is the development that meets the need of present without compromising the ability of future generations to meet their own needs (UN, 1987). Sustainable development requires to meet the basic needs of everyone and providing opportunity to all to satisfy their ambitions for better quality of life. Sustainable development requires that the adverse impact on quality of air, water and other natural elements are minimised so as to maintain the ecosystem's overall integrity. In principle sustainable development is a process of change in which exploitation of resources, the direction of investments and technological development as well as institutional changes are all in agreement and augment both present and future prospects to meet human needs and aspirations (UN, 1987). Seventeen Sustainable Development Goals (SDGs) were adopted by 193 countries including India at United Nations (UN) General Assembly meeting held from 25 to 27 September 2015 at New York, USA. These are universal Goals involve the entire world both developed and developing countries and balance the three dimensions of sustainable development viz. social, economic and environmental. The Goal 6 aims to "Ensure availability and sustainable management of water and sanitation for all by the year 2030". It was emphasised that the quality of water should be improved along with the availability of drinking water and the management of fecal waste (UN Water/WHO, 2015).

1.2 Importance of Sanitation

Safe water, sanitation and hygiene are essential for achieving sustainable development. The Goal 6 has linkage with nine out of the remaining sixteen SDGs and contributes to the fulfillment of these nine SDGs (UNICEF, 2016).The sustainable water, sanitation and hygiene (WASH) contributes in ending poverty and hunger, ensuring healthy lives, quality education and gender equity. WASH promotes economic growth and reduces inequality. WASH also helps in making cities sustainable and taking action to combat

climate change and its impact. WASH contributes to healthier environment, better health and livelihood opportunities and impact on health, education, nutrition and climate resilience (UN Water/WHO, 2017).The expenditure on health is reduced and the productivity of the adults and the attendance of children at school is increased due to making improvements in sanitation. The expenditure on improved sanitation gives nine times worth benefits to the communities in the developing countries (UN Water, 2008).The sustainable WASH is essential for the fulfillment of nine out of seventeen SDGs. The linkage of sustainable WASH (Goal 6) with nine SDGs is shown at Figure 1.1:

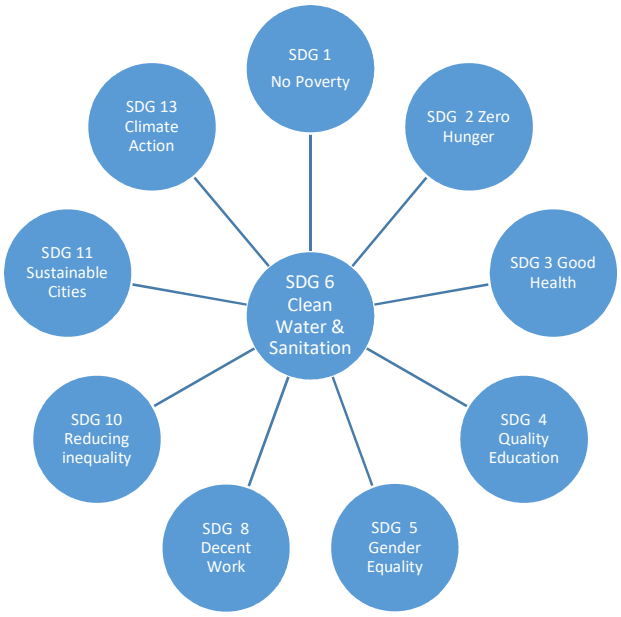

Figure 1.1: Linkage of WASH with nine SDGs

1.3 Sanitation for better Health

There is a direct relationship of water, sanitation, and hygiene (WASH) with health. Primary Health Care includes safe water supply, sanitary means of excreta disposal and basic hygiene. Contaminated water and poor sanitation are directly linked to transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio. About 88 percent of all diarrhoeal diseases are attributed to unsafe drinking water, poor sanitation and inadequate hygiene (WHO, 2004). The mortality due to diarrhoea accounts for 8 percent among children aged under 5 years, each year and could be prevented by providing safe water supply, good sanitation and adequate hygiene services (UNICEF, 2017). The under-five child mortality due to pneumonia is 16

percent caused due to lack of safe water, poor sanitation, malnutrition, air pollution and inadequate health care (UNICEF, 2018).Washing hands with soap, drinking safe water, adequate sanitation, good nutrition and improved living conditions can protect children from pneumonia. Almost 240 million people are affected by schistosomiasis an acute and chronic disease caused by parasitic worms contracted through exposure to infected water (WHO, 2018).The analysis of data of 144 studies reveals the reduction in morbidity and mortality of various diseases due to improved water and sanitation. The percentage reduction in morbidity and mortality caused due to improved water and sanitation derived from the analysis are given at Table 1.1 (Esrey, S.A et.al, 1991):

Table 1.1: Reduction in Morbidity and Mortality from improved WATSAN

S. No	Name of Disease	Percentage Reduction
1.	Diarrhoeal Diseases Morbidity Mortality	 22 65
2	Ascariasis	26
3.	Dracunculiasis	76
4.	Hookworm infection	4
5	Schistosomiasis	73
6	Trachoma	50
	Child Mortality	60

Almost 60 percent diarrhoeal deaths in the world take place due to lack of safe water, poor sanitation and inadequate hygiene (UNICEF, 2016 b). According to the Pneumonia and Diarrhoea progress report about 0.3million children died of these two diseases in 2016 in India. The report released by International Vaccine Access Centre (IVAC) at John Hopkins Bloomberg School of Public Health reveals that the top five countries with the highest global burden of child pneumonia and diarrhoea deaths are India, Nigeria, Pakistan, Democratic Republic of Congo and Angola (IVAC, 2017). WASH interventions are critical for child survival and development. The percentage reductions in diarrhoeal diseases due to hygiene, water supply, water quality and sanitation assessed from the meta-analysis of data from various studies are presented at Figure 1.2 (Fewtrell, L & Colford Jr, J.M, 2005):

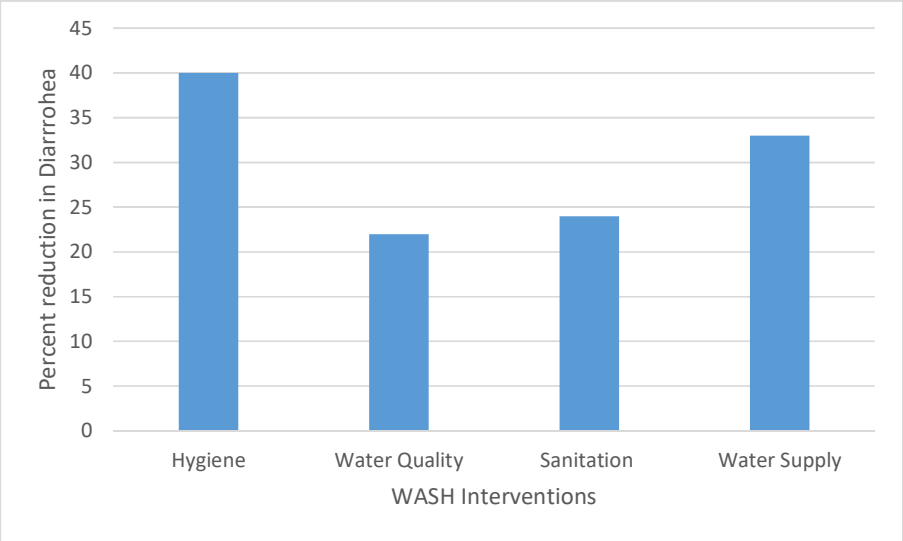

Figure1.2: Percentage reduction in diarrhoea morbidity due to WASH interventions

Improved water supplies both in terms of quantity and quality, adequate sanitation facilities and hygiene behaviour are all important and interrelated elements. Providing access to a toilet can reduce diarrhoeal deaths by more than 30 percent and hand washing with soap before cooking/eating and after defecation by more than 40 percent (UN Water, 2008). A safe and sustainable water supply, basic sanitation and good hygiene are essential for healthy, productive and dignified life (IFAD, 2009). WASH is one of the basic determinants of quality of life and affects not only the general health but also plays a very important role in our social life. Good Sanitary practices prevent contamination of water and soil and thereby prevent diseases.

1.4 History of Sanitation in India

After Independence a sanitation programme was launched in the first Five Year Plan. The National Water Supply and Sanitation Programme (NWSSP) was launched for the first time in the health sector by the Ministry of Health, Government of India (GOI).Afterwards the NWSSP was transferred to the Ministry of Urban Development (Park, 2000). In the initial years the focus of sanitation programme was on eliminating the practice of manual scavenging in urban areas and majority of people in rural areas continue to defecate in the open as a traditional practice. The Mar del Plata (Argentina) resolution of 1977 at UN Water Conference declared the period 1981-90 as the international decade of water and sanitation expressing global concern for low sanitation coverage (UN, 1977). The 1981 census of India revealed that rural sanitation

in India was only around one percent. India's sixth five year plan (1980-1985) stated that the sanitation facilities could be provided to 25 percent rural population by the end of 1990.The seventh plan document also reiterated this target emphasizing the need for sanitation for improving the quality of life of rural population in India. Assigning high priority to rural sanitation the Government of India (GOI) introduced the Central Rural Sanitation Programme (CRSP) in the year 1986 with the objective of improving the quality of life of rural people and providing the privacy and dignity to women. But despite of the major initiative by the GOI the increase in rural sanitation coverage was only 7 percent during the period 1981 to 1991. In order to accelerate the rural sanitation coverage and eliminate the practice of open defecation the GOI launched Total Sanitation Campaign (TSC) replacing the CRSP in the year 1999.TSC was developed from the experience and learnings of CRSP .The TSC is a demand driven and people centred programme. The key intervention areas of TSC are individual household latrines, school sanitation and hygiene education (SSHE), community toilets and *Anganwadi* toilets supported by Rural Sanitary Marts (RSMs) and production centres (PCs).The earlier concept of sanitation, limited to disposal of human excreta was expanded to include solid and liquid waste disposal, domestic hygiene and environmental hygiene. In June 2003 GOI initiated an incentive scheme for fully sanitized and open defecation free (ODF) *Gram Panchayats*, Blocks and Districts, known as *Nirmal Gram Puraskar* (NGP).

The NGP awards were given from 2005 to 2011 by the Ministry of Drinking Water and Sanitation (MDWS), GOI. In the year 2012, the GOI authorised the respective state to select the *Gram Panchayats* for award of NGP.

Nirmal Bharat Abhiyan (NBA) was launched by the GOI from 1 April 2012 with the objective of creating totally sanitized villages with more focus on PRIs. The incentive for individual households (HH) toilet was further increased through its linkage with Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). But there were difficulties in getting funds from NBA and MGNREGS at the same time to complete the construction of household toilets in time due to which motivated households reverted back to open defecation.

Prime Minister of India launched *Swachh Bharat Mission* (SBM) in rural and urban areas on 2 October 2014 to make India clean by 2019.The *SBM-Gramin* was for rural

areas to make rural India clean by 2019. Ministry of Human Resources Development (MHRD) launched *Swachh Bharat Swachh Vidyalaya* (SBSV) campaign as part of *Swachh Bharat Mission* to provide functional and well maintained toilets with water, sanitation and hygiene facilities for girls and boys to all the elementary and secondary schools that did not have the required number of toilet facilities for girls and boys, by 15 August 2015. After the launch of SBM the responsibility of Anganwadi toilets was given to the Ministry of Women and Child Development, GOI. The states were asked by the GOI to prioritize the construction of toilets in the remaining Anganwadi centres through funds available with them under various sources (GOI, 2016a).

The NGP awards were given from 2005 to 2011 by the Ministry of Drinking Water and Sanitation (MDWS), GOI. In the year 2012, the GOI authorised the respective state to select the *Gram* Panchayat for award of NGP. In India 28003 *Gram Panchayats* were awarded NGP up to 2011, out of which 321 GPs were from Rajasthan. In the year 2012 NGP was not awarded. In the year 2013 total 587 GPs were awarded NGP, out of which 5 GPs were from Jhunjhunu district of Rajasthan. With the launch of *Swachh Bharat Mission-Gramin* in 2014 to make all the GPs open defecation free, clean and fully sanitized by 2019 the award of NGP was discontinued by the GOI. The key events in the history of rural sanitation programme (RSP) in India after independence are given at Table 1.2:

Table 1.2: Key Events in the history of Rural Sanitation Programme in India

Year	Key Event in RSP in India
1954	NWSSP introduced in the First Five Year Plan.
1981	International Drinking Water and Sanitation Decade Started
1986	Central Rural Sanitation Programme Launched
1999	Total Sanitation Campaign Launched
2003	*Nirmal Gram Puraskar* Launched
2012	*Nirmal Bharat Abhiyan* Launched
2014	*Swachh Bharat Mission-Gramin* Launched

1.5 Eligibility of *Nirmal Gram Puraskar*

The NGP was set up by the GOI to fulfil the following objectives (GOI, 2009):-

- To bring the subject of sanitation to the forefront of social and political development dialogue in rural India.
- To develop open defecation free and clean villages which will act as models for others to follow.
- To give incentive to Panchayati Raj Institutions (PRIs) to sustain initiatives taken by them to eliminate the practice of open defecation.
- To enhance social mobilization in the implementation of TSC by recognizing the organizations who played active part in attaining full sanitation coverage in their respective areas.

The parameters taken for the eligibility of NGP are as follows (GOI, 2009):

- All households in the *Gram Panchayat* (GP) have access to individual toilets or community toilets.
- All Schools and *Anganwadi* centres must have functional and clean toilets and urinals.
- All co-educational schools above primary level must have separate urinals and toilet blocks for boys and girls.
- Toilets and urinals should be available separately for boys and girls in adequate proportion.
- Complete elimination of open defecation within the boundaries of the *GP.*
- All water sources to have proper platform and drainage around them.
- Functional mechanism for household solid waste disposal and functional waste water disposal system.

1.6 Sanitation Strategy of Rajasthan

Total 326 GPs in 28 districts of Rajasthan were awarded NGP up-to 2013 (GOI, 2016b).The district wise list of *Nirmal* GPs is given at Appendix 1. Rajasthan the largest state by area in India is divided into seven geographical divisions having 33 districts, 295 *Panchayat Samities* and 9900 GPs (GOR, 2015).The Sanitation Vision of Government of Rajasthan (GOR) is of *Nirmal Rajasthan* (Clean Rajasthan) where everyone practices personal hygiene and maintains clean environment that

contributes to well-being of thriving and healthy population. The GOR has developed both short to medium term (2012-17) and medium to long term (2017-2022) strategy to achieve this vision by 2022. In short to medium term strategy the focus was on strengthening PRIs for planning, implementation and monitoring of sanitation interventions and raising community awareness for sanitation and hygiene. The focus of medium to long term strategy is on scaling up effective use of water and sanitation facilities, establishing systems for operation and maintenance of WATSAN facilities and sustaining hygiene behaviour (GOR, 2011).

1.7 Motivation for Research

NGP proved very successful as financial incentive for scaling up rural sanitation and there has been a geometrical increase in the number of NGP awardee GPs and their number increased from 40 to 28590 from 2005 to 2013. Although the NGP contributed in raising awareness about rural sanitation and health but the sustainability of *Nirmal Grams* has been a persistent challenge in all the states and Union Territories (UTs) of India. The findings of several independent evaluations revealed that most of *Nirmal Gram Panchayats* were not able to sustain their *Nirmal* Status. With the launch of *SBM-Gramin* in 2014 to make all the GPs Open Defecation Free, clean and sanitized by 2019 the NGP was discontinued by the GOI. It is of vital importance to ensure the sustainability of all the NGP awardee GPs which would continue to be model for remaining about 90 percent GPs of India aspiring to become *Nirmal* GPs by 2019 as envisaged in SBM-*Gram*in. This was the motivation for undertaking a research to assess and analyse the constraints and opportunities in sustainability of *Nirmal Grams* in Rajasthan and evolve appropriate strategies and policy guidelines for ensuring the sustainability of *Nirmal Grams Panchayats*. The outcomes of this research would also be applicable to the *Nirmal Grams* in other states and union territories of India.

1.8 Aim and Objectives of the Research

The aim of the research is to assess the constraints and opportunities and develop appropriate strategies and policy guidelines for improving the sustainability of *Nirmal Gram Panchayats* in Rajasthan.

The following objectives were set forth to fulfil the aim of the Research:-

- To assess the existing conditions of water and sanitation facilities and institutions for sustainable development in *Nirmal Grams*.
- To assess and analyse constraints; socio-economic, technical, environmental and institutional affecting the sustainability and effective use of WATSAN facilities in *Nirmal Grams.*
- To assess and analyse the opportunities for WATSAN institutional development and environmental management for sustainability in *Nirmal Grams*.
- To evolve strategies and policy guidelines for sustained and effectively used and managed WATSAN system in *Nirmal Grams.*

1.9 Chapter Outline of thesis

The chapter wise outline of contents covered in this thesis are as follows:

Chapter 1: Introduction-Background, importance of sanitation, history of sanitation, eligibility of *Nirmal Gram Puraskar*, motivation as well as aim and objectives of the research, and chapter outline of the thesis.

Chapter 2: Literature Review-Critical review of literature on the problem, extent of the problem, causative factors, outcomes and impact, lessons learned, conclusions drawn from various studies reviewed on the subject.

Chapter 3:Research Methodology-Framework of assessment, research methodology, research methods, sample size determination, Force Field Analysis and Factor Analysis for priority setting.

Chapter4: Results and Discussions-Brief description and detailed presentation of results of sustainability parameters/indices/dimensions in tables, bar charts, photographs and spider diagrams. Analysis of constraints and opportunities, assessment of District Sustainability indices, State Sustainability Index and its significance. Evolving strategies and policy guidelines for ensuring the sustainability of *Nirmal Grams* in Rajasthan utilizing the force field analysis and factor analysis using SPSS software.

Chapter 5: Conclusion-Major findings derived from results and conclusions drawn from the findings of the research.

References-Reference list in alphabetical order of citation in the body of thesis.

Chapter 2

Literature Review

The critical review of literature has been undertaken with regard to the problem of sustainability of *Nirmal Grams*, its causative factors and findings of assessments of *Nirmal Grams*. The lessons learned from various water and sanitation projects in India and other developing countries have also been reviewed and conclusions drawn regarding the methodology of assessing the sustainability of *Nirmal Grams*.

2.1 Sustainability of Sanitation and Water Systems

The improved sanitation facilities protect household environment from contamination and their effective use ensures optimal health and environment impact. The following aspects are essential for the sustainability of sanitation and water systems:

2.1.1 Improved Sanitation Facilities

Open defecation free village is the one in which every household as well as community/public institution use safe technology for disposal of faeces and there is no faeces in the village environment (GOI, 2016a). Basic sanitation facilities are those that effectively separate excreta from human contact and do not allow the excreta to re-enter the immediate household environment. The pit latrine with slab, ventilated improved pit latrine, compost toilet, flush/pour flush toilet connected to pit latrine, septic tank, piped sewer system come under the category of improved sanitation (WHO/UNICEF, 2010). Availability of water influences demand for sanitation because flushing excreta and hand washing after defecation require sufficient quantity of water and poor sanitation affect the quality of water. TSC programme has linkage with GOI flagship national rural water supply programme. A *Nirmal Gram Panchayat* needs to ensure availability of 55 litres per person per day of potable water for each inhabitant of *Gram Panchayat* and water source for each household should be within 100 metres, with arrangement for regular testing of water quality of all water sources (GOI, 2012).The regular surveillance and monitoring of water quality at household and community level prevent them from getting polluted from septic tank/leach pit effluent and faecal waste littering around them. Once the bacteria and viruses reach the water table they can be carried over to considerable distances in the direction of ground water flow. Although pit latrines

have potential for ground water contamination but are used on large scale for on-site human excreta disposal. The pit latrines are most commonly used options for developing countries to decrease open defecation by providing access to improved sanitation. Areas with shallow ground water and low lying areas prone to flooding present the greatest risk of contamination because required vertical separation is necessary between the base of latrine pits and saturated zone to prevent pollution of ground water level. The minimum 3 metres horizontal distance between water source and leach pit is needed in case of fine sand, clay and silt to prevent the contamination of water source. In case of coarse sand 500 mm envelope of sand of 0.2 mm effective size is provided all round the leach pit and also the bottom of leach pit is sealed to prevent the contamination of water source. In case the vertical distance between the bottom of the pit and maximum ground water level is less than 2 metres, the horizontal distance of 10 metres between water source and leach pit is needed for fine sand, clay and silt to prevent pollution of water source (TAG-India, 1985).Therefore a minimum horizontal distance of 10 metres is kept between the water source and leach pit to prevent the contamination of water source. Septic tank needs sludge removal at regular intervals in accordance with its design and capacity. But mostly when a septic tank is filled beyond its holding capacity and overflows the sludge removal is carried out. The overflow from septic tank enters into the nearest water sources, land surface, water bodies with nutrient posing a threat of eutrophication of surface waters. The animals and human beings coming in contact with polluted areas are susceptible to infections and the ground water gets contaminated when sludge percolates near the water source (CSE, 2011). In rural India, waste is a severe threat to the public health and maintaining clean environment in the villages. Although the solid and liquid waste generated is mostly organic and biodegradable but it is a major problem to overall sustainability of the ecological balance (Shah, P.et.al, 2015).

2.1.2 Sustainable Sanitation System

A sustainable sanitation system protects and promotes human health, does not contribute to environmental degradation or depletion of resource base and is technically and institutionally appropriate as well as economically viable and socially acceptable (Kvarnstorm E et.al, 2004).The findings of the East and Southern Africa regional

synthesis report on sustainability of water and sanitation service by the Water and Sanitation Programme (WSP) reveals as follows (WSP-ESA, 2000):-

- Ownership of water and sanitation facilities and the legality of management committee affect the sustainability of water and sanitation service.
- The effectiveness of water and sanitation service depends on users' participation. There are greater chance of effective functioning, financing and management of water and sanitation service if the users have to play a bigger role in establishing and running the service.
- When a water and sanitation service meets the demands of the users in terms of quality, quantity and reliability there is a better chance that users will contribute the actual costs and manage it leading to sustainability.
- Community efforts towards effective management of water and sanitation service become weak due to lack of institutional support for access to spares, technical support and refresher training.
- Training of both men and women is an essential element for effective management of water and sanitation services.
- There is a link between effective financing, functioning and management of water and sanitation service.

2.1.3 Indicators of Sustainability

Sustainability is the ability to maintain efforts and derived benefits at community and agency level without detrimental effects on the environment after the managerial, financial and technical assistance has been phased out. Sustainability can be achieved by building problem solving capacities in communities and in partnership agencies. Sustainability cannot be achieved without building the capacity and confidence of people in communities and agencies, in management, knowledge generation and technical skills. Sustainability is a dynamic concept and is assessed from time to time to check whether the sustainability has been achieved at that point of time. There are five main indicators of sustainability (UNDP, 1989):

- Installed and functioning water and sanitation systems in terms of quantity, quality, reliability, operation and maintenance, and capital cost recovery.
- Competent community and agency with management abilities, knowledge, skills and confidence.

- Strong Organizations having autonomy, supportive leadership and system of learning and problem solving.
- Environmental Conservation including preservation, development and protection of water sources from contamination.
- Inter-departmental collaboration in planning, execution, operation and maintenance of water and sanitation facilities.

2.1.4 Effective Use of Water and Sanitation Facilities

The effective use of water and sanitation facilities include optimal use, hygienic use, and consistent use. The hygienic use consist of five indicators as follows:

- Maintaining water quality from source to mouth.
- Preventing contamination during collection and carriage.
- Home treatment to improve water quality.
- Home Hygiene- safe disposal of excreta, solid and liquid waste.
- Personal hygiene-hand washing at critical times, handling of child excreta, nail cutting, body cleaning etc.

Effective use of water and sanitation facilities integrates the need of hygiene education and other support system to ensure optimal health, social, economic and environmental impact. In order to promote hand washing at critical times, it is necessary to ensure the availability of water source and soap at household level. There is a link between owning a hand washing facility and increased rates of hand washing following a latrine use and those households that value hand washing install hand washing facilities near the toilet for ease of hand washing after defecation. The presence of children faeces in areas away from house is not considered as a problem and due to this reason, faeces which are cleaned away from the front of a house are often not disposed of in a latrine instead disposed of in the garden or by the side of street and the critical risk practices to be addressed in Kyrgyzstan are: not washing hands with a cleaning agent after likely faecal contact and not disposing of all faeces in a latrine (Brian, A., 2005).

Well sustained and effectively used water supplies and sanitation facilities mean that for a period that cover the design life of technologies used to provide services, each member of all households in the project area has a regular and dependable delivery of

water-acceptable in terms of quality and quantity, and practises safe disposal of waste 365 days per year (WSP, 2003).

2.1.5 Sustainable Water Supply Systems

Managing small water supplies including those serving rural village is a concern worldwide in both developed and developing countries. Experience shows that small community water supplies are more at risk of breakdowns and contamination resulting in outbreaks of water borne diseases and decrease in their functionality and service (WHO,2012).The present approaches to monitoring rural water supply focus on coverage in terms of number of systems installed and population served. But many systems breakdowns within a few years of installation due to lack of appropriate maintenance .The following three factors need monitoring on regular intervals to create more sustainable water services at scale:-

- The water supply services by users-in terms of quantity, quality, accessibility and reliability over time.
- The performance of service providers-in terms of fulfilling the required technical, financial, management and organizational functions to deliver a sustainable service.
- The performance of local authority or elected local body in terms of fulfilling, planning, monitoring and coordination, regulatory and support functions to ensure the establishment of system for sustainable service delivery.

The long-term functioning of water systems and sustainability of water services depends on good performance of service providers. Where coverage is already high, countries can shift their attention to establishing systems that track not only the service provided but also the performance of service providers and service authorities (IRC, 2011). As per the multi district assessment on water safety (MDWS) conducted by UNICEF in all the 47 districts of Madhya Pradesh and 13 other districts spread over 11 states including Rajasthan, overall 47% of water sources were found polluted with faecal coliform. The main priority of villagers is availability of sufficient quantity of water not the availability of safe water and they do not differentiate between clean water and safe water. In cases where sufficient water is available the next priority of villagers is that the water source should be nearer and reachable (UNICEF, 2011). For those who have sufficient quantities of water but the water is of poor or uncertain bacteriological quality

an alternate is to treat water at home. Water treatment at household level reduces the risk of water borne diseases arising from recontamination of water during collection, transport, storage and use at home (Wright, J. et. al., 2003). The research has concluded that simple and affordable water treatment methods at household and community level can improve the microbial quality of household water and decrease the risks of diarrhoeal diseases and death in developing and developed countries (Sobsey, M D., 2002). Boiling is the most common method of household water treatment with 21 percent households practise boiling, 5.6 percent households use chlorine, 4.3 percent households practise filtration and only 0.2 percent households use solar disinfection. A drinking water, sanitation or hygiene service is considered to be sustainable if it continues to deliver the designated level of service with respect to affordability, availability, quality and accessibility over the long-term. Sanitation is the provision of facilities and services for the safe disposal of human urine and faeces. Adequate sanitation facilities at home/school/health centre are those that effectively separate excreta from human contact, and ensure that excreta do not re-enter the immediate environment. There should be one toilet per 25 girls, and at least one toilet for female school staff, one toilet plus a urinal per 50 boys, and minimum one toilet for male school staff in a school (WHO/UNICEF JMP, 2015).The Handbook of *Swachh Bharat Swachh Vidyalaya* (SBSV) campaign recommends one separate toilet unit with three urinals each for forty boys and forty girls at a School (SBSV, 2014).

2.2 Sustainability of Open Defecation Free (ODF) and Fully Sanitized Village

Open defecation free village is the one in which every household as well as community/public institution uses safe technology for disposal of faeces and there is no faeces in the village environment (GOI, 2016a). Sustainability of ODF is the existence and maintenance of conditions, facilities and behaviours including cleanliness and hygienic use of toilets by all in a community over time and the safe management of faecal sludge. The ODF community shall fulfil the following criteria (Cavell, S.et.al, 2015):

- Eradication of open defecation in the community.
- Household toilets are hygienic, provide safe containment of faeces, offer privacy, having lid on the defecation hole and roof to protect them from rain.

- Use of sanitation facilities by all household members and everyone in the community.
- A hand washing facility with water, soap or ash close to toilet and in regular use.

The additional elements which make an ODF village fully sanitized or ODF plus village are; hand washing, safe storage and handling of drinking water, proper disposal of solid waste, proper disposal of waste water, provision of institutional latrines in schools, markets for passer-by.

2.3 Sustainability of WASH

Sustainability of WASH is a persistent challenge needing urgent attention. The key factors affecting the sustainability of WASH and their implications in measuring sustainability are as follows:

2.3.1 Sustainability of WASH is continuous satisfactory functioning and effective use of water supply and sanitation (WSS) systems. Sustainability has five key interrelated dimensions: social, technical, environmental, institutional and financial as shown at Figure 2.1 (WSP/World Bank, 2003):

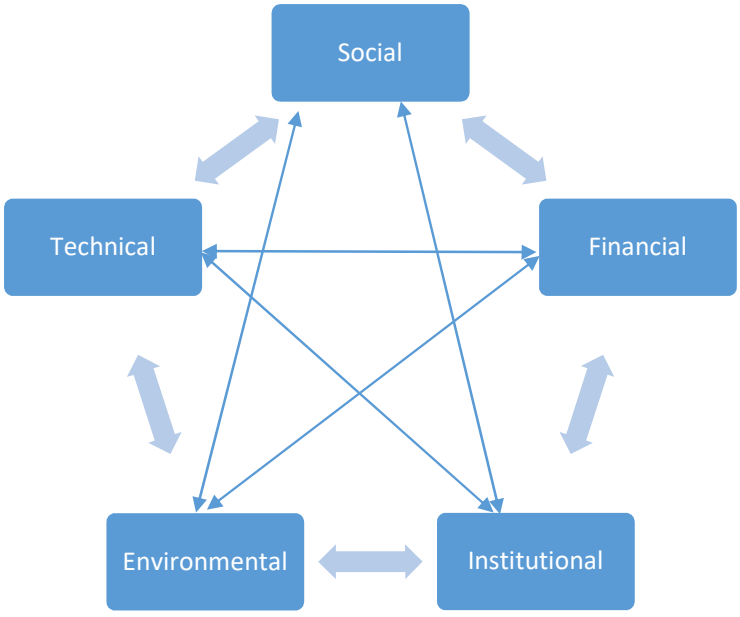

Figure 2.1: Five interrelated dimensions of Sustainability

Technical sustainability refers to appropriate design, good construction, efficient operation and maintenance and reliable functioning of Water Supply and Sanitation

(WSS) systems. Financial sustainability is availability of funds for operation and maintenance of WSS systems. Institutional sustainability is availability of institutions to keep systems operational, accessible and widely used. Social Sustainability is accessibility, acceptability and effective use of WSS systems by all the households in the community. Environmental sustainability is the safe disposal of human waste, solid waste and waste water without posing threat to environment.

2.3.2 Sanitation is sustainable to the extent it addresses social, technical, financial, institutional and environmental challenges posed by local conditions having building blocks shown at Figure 2.2 (Arghyam, 2010):

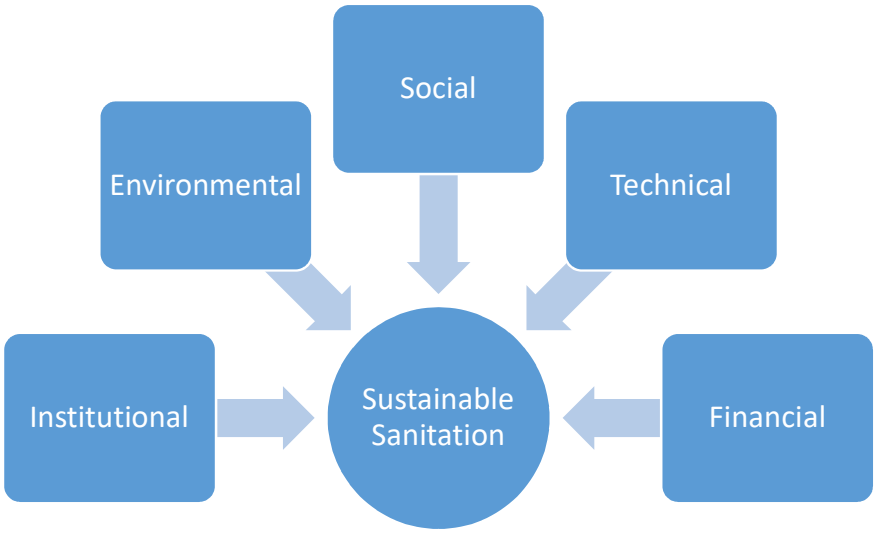

Figure 2.2: Building Blocks of Sustainable Sanitation

Therefore it is essential to overcome the constraints posed by each block of sustainable sanitation. Facilitating behaviour change and community education can overcome social constraints. An appropriate user friendly technology and the availability of water can overcome technical constraints. Strengthening village institutions, building capacities at *Gram Panchayat* and *Block Panchayat* levels, participatory planning, and water quality monitoring as well as ensuring the quality of construction can overcome institutional constraints. Adoption of affordable and financially sustainable options for toilets and solid and liquid waste management, mobilisation of financial resources and convergence with existing programmes can help in overcoming financial constraints.

The use of environmental friendly technologies proper management of solid and liquid waste and preventing pollution of surface and ground water resources can overcome the environmental constraints. The progression of a village towards sustainable sanitation is measured through the following key visual parameters:

- The village is free from open defecation
- All households have toilet and all family members in each household use toilet.
- The household toilets are convenient for elderly, specially abled and pregnant women.
- All schools have required number of separate toilets for girls and boys.
- Water is available for use, operation and maintenance of toilets.
- The drainage system exists and well maintained.
- Women and children are not required to fetch water for toilet cleaning.
- The waste water is treated and reused.
- The solid waste is properly collected and managed.
- Hand washing with soap is practised before cooking/eating and after defecation.
- Drinking-water is properly stored and handled.
- Proper management of menstrual hygiene.
- Availability of skilled workers for operation and maintenance of sanitation system.
- System for biannual water quality testing by the community is operationalized.
- Sustainable reduction of water borne diseases and no mortality due to diarrhoea.

2.3.3 Long term sustainability of Water, Sanitation and Hygiene (WASH) intervention is widely recognized as complex and persisting challenge faced by communities, government and international development partners alike (AQUACONSULT, 2013).A framework called Sustainability Index Tool (SIT) was developed focusing on four key factors Institutional, Management, Financial and Technical that were of critical importance to the long term sustainability of WASH interventions. The Sustainability Index (SI) includes data collected at the household as well as community/village or system level. Each factor is made of indicators and sub-indicators that take the form of question(s). Sub-indicators are averaged for an indicator score and then the indicator scores are averaged for a factor score. The factor scores for each community are plotted using spider diagrams for five or more communities and bar charts for less than five

communities. The average score of all the factor scores is the sustainability Index (SI). A factor with higher score contributes more to the SI compare to factor with lower score. The factors are interrelated and so score for one factor may influence the score for other factor (AGUACONSULT, 2014).

2.3.4 A comprehensive Water and Sanitation Sustainability Index (WASSI) was developed and used to assess the sustainability of water and sanitation management system (WSMS) of the city of Salta, Argentina. The Index was based on a conceptual framework that perceives sustainability as combination of territorial, temporal and personal features. Each feature has a set of three determinants and each determinant has one or more indicators. The indicators measure the extent to which the system has moved towards sustainability. The WASSI is a relatively absolute account of sustainability. The quantitative and qualitative values assigned to different indicators were converted onto a sustainability scale as follows: Value≤25 unacceptable, 25<value<50 danger, 50<value<75 Good and value≥75 excellent. A thorough analysis of the entire index provide the information of the areas where improvements are most needed. The WASSI and its indicators are presented in spider diagram, which help in understanding the assessment of various indicators of sustainability in a single diagram. The measurement of a single sustainability score for an entire city was considered as powerful tool to disseminate the results to wider audiences and convey clear meaning to policy makers. The information contained in the determinants and indicators of WASSI framework provides information on wide range of variable issues affecting the sustainability of WSSM (Iribarnegary, M.A et.al, 2012)

2.3.5 The MDWS, GOI based on the analysis of data from various districts of the country has decided to define cleanliness Index and Solid and Liquid Waste Management (SLWM) Index as follows (GOI, 2016):

Cleanliness Index(C) $=0.4\ x_1+0.3x_2+0.1x_4$

SLWM Index(S) $= 0.5x_2+0.33x_3+0.17x_4$

x_1= percentage of households having access to and using safe toilets

x_2= percentage of houses having no litter outside their premises

x_3= percentage of public places having no litter

x_4= percentage of houses having no waste water stagnating around them

While 'C' captures overall cleanliness of the village and S captures Environmental cleanliness. The purpose of working out these two indices is to rank the villages in the state/country. These indices do not depict the extent to which the sustainability has been achieved and what areas needed improvement. Only three parameters have been included in each index and other parameters relating to the sustainability of *Nirmal Grams* have not been considered in working out both these indices. Therefore these indices have very limited scope to improve the sustainability of water, sanitation and hygiene interventions.

2.4 Outcomes and Impact of *Nirmal Grams*

The impact and outcomes of various assessments and evaluation of *Nirmal Grams* carried out in several states of India are as follows:

2.4.1 The findings from Andhra Pradesh, India under WASH cost project implemented by International Water and Sanitation Centre (IRC) and centre for Economic and Social Studies (CESS) reveal the following(Snehalatha. M et.al, 2012):-

- In 5 out of 21 villages that received the NGP, more than 50% households do not have access to a toilet and in 7 out of 21 villages more than 60 percent of household practise open defecation.
- Having an access to toilet does not mean its usage and therefore use of toilet is an indicator reflecting sustainable sanitation service.
- 72 percent *Nirmal Grams* showed poor levels of solid and liquid waste disposal system and households were dumping the solid waste on the streets and the waste water flows on the streets polluting the environment in *Nirmal Grams*.

2.4.2 The evaluation study on TSC conducted by Planning Commission, GOI of 156 *Nirmal GPs* in 20 states including Rajasthan in the year 2013 revealed that only 100 out of 156 *Nirmal GPs* were best performing GPs and lack of awareness as well as established age old practice stand out as predominant reasons for open defecation in case of households where toilet facilities are already available. The results of evaluation study reveals that the health status and hand washing behaviour of the community in *Nirmal GPs* compare to GPs without *NGP* award was substantially improved during 2006 to 2008 as is evident from the Table 2.1 (Planning Commission, 2013):

Table No 2.1: Improvement in health status of community in *Nirmal Gram Panchayats*

Status of GP	Year-wise average number of family members get sick in a family			
	2006	2007	2008	Average of three years
Nirmal GP	0.24	0.22	0.17	0.21
Not *Nirmal* GP	0.63	0.55	0.46	0.55

Poor sanitation can limit the impact of drinking water quality improvements. The risks of water contamination during household storage and handling sharply increase in environments that lack toilets. Contamination of local water resources used to supply drinking water can lead to unnecessary investment in more distant and expensive sources. Sanitation contributes to dignity and social development by aiding progress toward gender equality, by promoting social inclusion, by increasing school attendance, and by contributing to poverty eradication (UN Water, 2008).

2.4.3 The study of 162 *Nirmal Gram Panchayats* in 6 states viz. Andhra Pradesh, Chhattisgarh, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal in 2008 by TARU Leading Edge consultants reveals that only 4 percent of *Nirmal Gram Panchayats* were genuinely ODF, 40 percent of the population in 32 percent *Nirmal GPs* surveyed still resorted to open defecation and the reasons of slippages were poor site selection, poor quality construction, incomplete construction, absence of superstructure, lack of water, inadequate behaviour change, blockage of pan and poor disposal of excreta. One of the major positive changes that took place with NGP has been on the health status of the people and was reported by the households in six states. The households from 22 percent *Nirmal GPs* in six states reported that there has been more than 80 percent reduction in water borne diseases, households from 20 percent *Nirmal GPs* reported 60 to 80 percent reduction in water borne diseases, households from 15 percent *Nirmal GPs* reported 40 to 60 percent reduction in water borne diseases, households from 16 percent *Nirmal GPs* reported 20 to 40 reduction in water borne diseases and households from 27 percent *Nirmal GPs* reported less than 20 percent reduction in water borne diseases after the award of NGP to the *Gram Panchayats* as shown at Table 2.2 (TARU, 2008):

Table 2.2: Percentage of *Nirmal GPs* reporting Reduction in Water Borne Diseases

State	Proportion of *Nirmal GPs* reporting Households observation about percentage reduction in waterborne diseases in six states of India				
	<20%	20%-40%	40%-60%	60%-80%	>80%
AP	-	30	60	-	10
Chattisgarh	80	10	10	-	-
Maharashtra	7	10	8	22	53
Tamil Nadu	61	36	3	-	-
UP	67	13	7	13	-
West Bengal	3	6	29	53	9
Total	27	16	15	20	22

2.4.4 The study across 40 GPs in ten districts across Bihar, Chhattisgarh, Haryana, Karnataka and Tripura reveals that TSC was becoming increasingly state led and target driven programme and a large number of *Nirmal Grams* are neither ODF nor fully sanitized. In the states and districts where PRIs have been actively involved in TSC, the results have been quicker and more sustainable but there is lack of awareness of disaster risks related to floods, droughts, earthquakes, landslides, cyclones and other events and there possible impact on sanitation facilities at household and community levels. The adaption needs of the people resulting from climate change have not been considered in planning and installation of sanitation facilities (WaterAid, 2008).

2.4.5 The key findings of the assessment study of impact and sustainability of 664 *Nirmal GPs* in 56 districts of 12 states carried out by the Centre for Media Studies(CMS) on behalf of MDWS, GOI in 2011 revealed that the poverty combined with neglect by *Gram Sarpanch/Panchayat Members* were responsible for not constructing a household toilet, the community toilets were inadequate in numbers or very far from the houses and the major challenges to sustainability were; provision of sustainable potable water supply, maintaining safe distance of 10 metres between toilet pits and nearest water source, exposure of PRIs to various low cost options for sanitation, disposal of solid and liquid waste and recommended that PRIs, Self Help Groups(SHGs),Village Water and Sanitation Committees (VWSCs) and other micro level groups should be facilitated and empowered to spearhead the awareness

campaigns, home visits and other Information, Education and Communication (IEC) activities by building their capacities through appropriate trainings. The major impact of NGP was on Health. The incidence of diarrhoea among the family members of households was reported 'nil' by 92 percent of the households and 8 percent households reported one member of the family suffered from diarrhoea in past two weeks. According to 61% households the occurrences of water-borne diseases viz. diarrhoea, dysentery, jaundice, intestinal worms, dengue, malaria, typhoid, chikungunia are on decline.74 percent health workers informed that less cases of water borne diseases were reported in health sub centres and the infant mortality and maternal mortality also declined after latrine construction. 51 percent households reported that the number of man days lost due to water borne diseases have been reduced after the village became *Nirmal Gram* (CMS,2011).

2.5 Lessons Learned from WASH projects

2.5.1 The lessons learned from India on scaling up rural sanitation revealed that there was no fixed model and most toilets had positive effect on toilet coverage but the usage was declining among those who were forced to construct toilets in Maharashtra, the institutional model for TSC in West Bengal was dependent on local government and Rural Sanitary Marts (RSMs) situated at block level making the Block Development Officer (BDO) a key player in the TSC but the long term sustainability of RSMs was uncertain, and in Andhra Pradesh, TSC gave rise to environmental problems because the solids from the leach pits or the sludge from the septic tank was discharged in open and little attention was paid to prevent open defecation, and solid waste and liquid waste disposal (WSP,2005). In Uttar Pradesh sales on RSMs followed a seasonal pattern with higher sales during winter than summers because people have more time and money to take up construction household toilets during winter and most RSMs do not face competition in their area due to availability of wide range of sanitation products (Mendiratta, S. R., 2000).

2.5.2 The final evaluation report of Malawi WATSAN project recommends the close monitoring of past achievements of the project. It also recommends hand holding of project communities for a couple of years after the completion of project for the development of their knowledge and skills in operation, maintenance, monitoring and management of project. The communities should be facilitated to develop strong ties

with the local Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs) working in the area of WATSAN during the handholding period for getting their support when needed (ICEIDA, 2014).

2.5.3 Rural Water, Sanitation and Hygiene (RWSH) provision supports rural livelihood by promoting food security, health and productive activities. RWSH faces the following main challenges (IFAD, 2009):-

- Migration of young and skilled people from rural to urban areas creating seasonal labour shortage.
- Poor rural people do not have resources and capacity to cope with the effects of climate change viz. droughts, heavy rainfall and floods in low-lying areas.
- Poor awareness of hygiene in many areas results in open defecation leading to contamination of soil and water.
- Urban approaches and strategies are often followed in rural areas which prove unsuitable for rural people due to their socio-economic and cultural background.
- The rural people many a times do not afford the financial, operational and institutional resources required for the sustained provision of basic improved water and sanitation services.
- The supportive policies and legislation for ensuring the sustained provision of water and sanitation services.
- The financial sustainability of community water system continues to be a major challenge particularly for the dispersed rural communities who cannot even bear the cost of operation and maintenance.

2.5.4 The Indo-German project "*Aapni Yojana"* "(Our Project)" in semi-arid region in north-east Rajasthan covering one million rural population in 360 villages in Churu and Hanumangarh districts through regional water supply schemes extracting water from Indira Gandhi Canal funded by KFW Development Bank on the behalf of German Government was implemented by the PHED Rajasthan during 1993 to 2007. The system was designed to provide 30 litres water per person per day through stand posts without keeping any provision for house connection. The scheme was designed to provide continuous supply with dedicated power system that allows 16-20 hours pumping daily and storage tanks are provided for balance of supply. The project also has provision for construction of household toilets. In the beginning of the project only

9% of the households had latrines. The people were not interested to build household toilets due to the problem of foul smell and wastage of water. In order to build confidence and foster acceptance of the people “pilot latrines” were built and village water committees (VWCs) were formed with the help of Non-Governmental Organizations. The water committees ensured equitable distribution of water, collection of water charges and cleanliness of toilets. The village water committee developed a combined model of sample pour flush latrine with a separate wash room and about 30000 latrines and 95 sanitation facilities for schools were financed by the project. 55% of the households have their own private toilets till 2007.The women were involved in deciding the location of toilets and washrooms to ensure their privacy. The women and children have become aware of good hygiene due to the implementation sanitation pilot project (GTZ, 2000).

2.5.5 The following key lessons have been learned from the UNICEF supported and SIDA assisted Child’s Environment Project in Tehri Garhwal district, Uttrakhand (Mendiratta, S.R., 2001):

- Involvement of Panchayati Raj Institutions at village level resulted in better response from the community.
- Effective coordination between Government and NGOs was instrumental in the success of the project.
- Improvement and protection of traditional fresh water sources on the hill slopes not only resulted in conservation of water but also prevented soil erosion.
- Use of Ferro-cement squatting platforms substantially reduced the cost of household latrines in hill areas resulting in increased coverage.
- Participatory planning and monitoring of the project through the district coordination committee headed by the District Magistrate resulted in effective and timely implementation of the project.

2.5.6 The role of a mason to assist with latrine construction is important in context where labour is relied upon to build latrines, landscape is challenging, deeper pits are required or improved latrines/upgrades are desirable. Perceived availability of sanitary marts or masons ranges from 34 percent of latrine owners and 46 percent of improved latrine owners in Meghalaya, 73 percent of households in Rajasthan, 80 percent households in Bihar and 85 percent households in Tanzania. Open

defecation is considered as traditional, habitual and part of everyone's daily routine and those who defecate in the open strongly hold to the social norms. In Rajasthan 28 percent open defecators considered this as an age old practice and 47 percent were habitual of defecating in open. The high cost of materials and labour, coupled with lack of savings and access to credit is a major constraint for those households having unimproved toilets. The construction of a toilet is also not considered as a good investment among the villagers compare to buying additional livestock or land (World Bank, 2014).

2.5.7 The analysis of 144 studies to examine the impact of improved water supply and sanitation on six endemic diseases concluded that the improvements in one or more components of water supply and sanitation can substantially reduce the rates of morbidity and severity of these diseases viz. ascariasis, diarrhoeal diseases, dracunculiasis, hookworm infection, schistosomiasis and trachoma and therefore following recommendations were made (Esrey, S.A et.al, 1991):-

- To achieve broad health impact, greater attention should be given to safe excreta disposal and proper use of water for personal and domestic hygiene rather than to drinking water quality,
- Sanitation facilities should be installed at the same time as water facilities when faecal related diseases are prevalent.
- Access to water supply should be as close to the home as possible in order to use larger quantity of water for hygiene practices.
- Water supply and health programmes should emphasize hygiene education to encourage the use of more water for personal and domestic hygiene.
- Sanitation facilities should be culturally appropriate to ensure their use.
- Use of sanitation facilities is essential especially during critical seasonal transmission periods for diseases such as dracunenliasis.

The research data demonstrated that hygiene behaviours are sustained beyond the end of an intervention and there is a significant relationship between the water source close to the homestead and good hygiene behaviour. The Indian data set shows that small group meetings are sufficient to encourage people to keep their courtyards swept, but more intensive contact through series of up to ten house visits is required to bring about more demanding changes in practice such as regular hand washing and consistent use

of a latrine. If men folk are likely to be absent during such visits, other approaches are needed to complement the home visits and ensure that whole target population is reached successfully (Cairncross, S & Shordt. K, 2004).

2.6 Status of Water and Sanitation

Globally the Millennium Development Goal No.7C of halving the proportion of population of people without sustainable access to safe drinking water and basic sanitation has not been achieved. Since 1990, the proportion of the global rural population without access to improved sanitation has declined by about a quarter and open defecation rates in rural areas have fallen from 38 percent to 25 percent in 2015. Still nearly half of people in rural areas do not have improved sanitation facilities and one in four still practise open defecation (UN, 2015).

2.6.1 As per the progress report on drinking water, sanitation and hygiene, 2017 of WHO/UNICEF Joint Monitoring Programme India has also not achieved the Millennium Development Goal No.7C of halving the rural population without sustainable access to safe drinking water and basic sanitation during the period from the year 2000 to 2015. The proportion of rural population not using the improved water supplies has declined from 71 to 51 and not using improved sanitation has declined from 91 to 69 in India. The proportion of rural population using safe drinking water, and basic sanitation in 2000 and estimated figures for 2015 are given at Table 2.3 and 2.4 respectively (WHO/UNICEF JMP, 2017):

Table 2.3: Proportion of rural population using improved WS in India

Year	Proportion of rural population using improved WS in India					
	Accessible on Premises	Available When Needed	Free from Contamination	Piped Water Supply	Non-piped Water Supply	Safely managed water supply
2000	29	71	64	31	49	29
2015	49	77	64	31	59	49

The safely managed drinking water supply consists of improved facility accessible on premises, available when needed and free from contamination. The safely managed sanitation is the private improved facility where faecal wastes are safely disposed on site or transported and treated offsite, plus a hand-washing facility with soap and water.

Table 2.4: Proportion of rural population using improved sanitation facilities in India

S.NO	Proportion of rural population using improved sanitation facilities						
	Excreta disposed of in situ	Excreta emptied and treated off site	Waste water from sewer treated	Latrine and others	Septic tanks	Sewer connections	Safely Managed Sanitation
2000	9	0	0	2	8	0	9
2015	30	0	1	15	18	1	31

The progress report reveals that the proportion of rural population in India using safely managed water supplies has increased from 29 to 49 and the proportion of rural population using safely managed sanitation facilities increased from 9 percent to 31 percent during the period 2000 to 2015.

2.6.2 The key findings of National Annual Rural Sanitation Survey (NARSS) 2017-18 conducted between November 2017 and mid-march 2018 covering 29 states and 3 UTs to establish baseline with respect to the disbursement linked indicators for the World Bank project support to the *Swachh Bharat Mission-Gramin* are:

- 77% of households found to have access to toilets.
- 95.6 percent of ODF verified villages confirmed as ODF.
- 93.4 percent of the people who had access to toilets use them regularly.
- 70 percent villages found to have minimal litter and stagnant water.

The NARSS used PPS (Probability Proportion to Size) sampling methodology. About 200 households were listed in each village, of these, 15 households per village were randomly selected, along with a government school, an Anganwadi centre, a public/community toilets and open spaces in the same village for survey visits. The above sampling design yield results within a 95 percent confidence interval (MDWS, 2018)

2.6.3 As per the National Sample Survey conducted during May-June 2015 by National Sample Survey Organization (NSSO) on behalf of *Swachh Bharat Mission-Gramin* covering 26 states, Rajasthan ranked 20th with 38 percent households having sanitary toilet out of which 94.2 percentage of people using households/community toilets having toilets and thus 35.8 percentage of households having access to sanitary toilets are using them (MDWS, 2016).

2.6.4 India as a whole and Rajasthan state have not been able to achieve the Millennium Development Goal No.7C of halving the proportion of people without access to water and sanitation by 2015.The extensive literature review reveals that the sustainability of *Nirmal Grams* has been a serious problem in all states and union territories of India including Rajasthan since the beginning of NGP.

The critical review of the literature reveals that four interrelated key factors affecting the sustainability of *Nirmal Grams* are: technical, socio-economic, institutional and environmental. It also reveals the various parameters affecting the sustainability of WASH in *Nirmal Grams*. There is need to develop and assess the most relevant parameters for each of the four dimensions of sustainability of *Nirmal Grams* through an appropriate research methodology. The results of the key parameters of four dimensions of sustainability are to be analysed for deriving a comprehensive state sustainability Index (SSI) for *Nirmal Grams* of Rajasthan. The analyses of constraints and opportunities is to be undertaken and appropriate strategies and policy guidelines are to be evolved for ensuring the sustainability of *Nirmal Grams* in Rajasthan.

Chapter 3

Research Methodology

A conceptual framework of sustainability consisting of four interrelated dimensions of sustainability has been developed for assessing the sustainability of *Nirmal Grams*. The key parameters for assessments under each dimension of sustainability have been developed. The appropriate research methodology for assessment of these parameters in randomly selected *Nirmal Garams* have been developed.

3.1 Framework of Assessing Sustainability

The sustainability of *Nirmal Grams* (fully sanitized and open defecation free villages) is continuous and satisfactory functioning as well as effective use of water and sanitation facilities by all the households (HHs) throughout the year in that *Nirmal Gram Panchayat*. A conceptual framework to assess the sustainability of *Nirmal Grams* has been developed taking into account the four interrelated dimensions of sustainability viz. socio-economic, technical, environmental and institutional as shown at Figure 3.1:

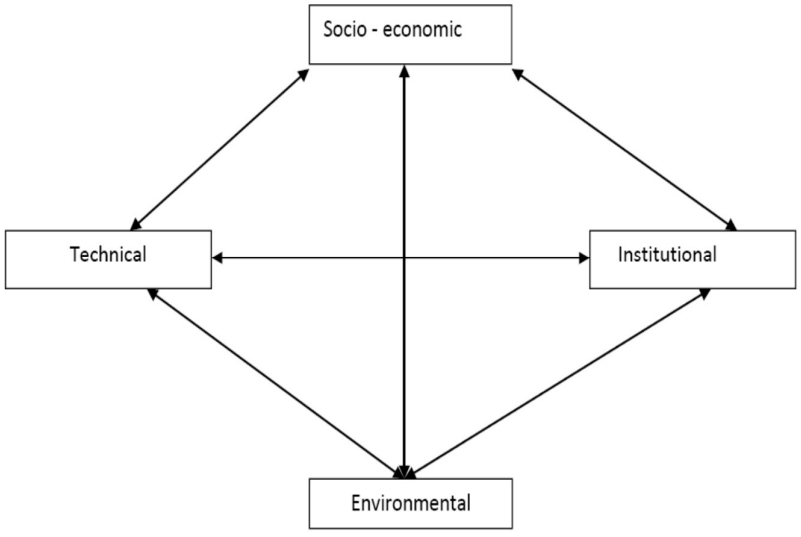

Figure 3.1: Framework of assessing sustainability of *Nirmal Grams*

3.2 Key Parameters for Assessment

Five key parameters each for each of the four dimensions which are closely related to that dimension have been identified and developed for assessment. The parameters developed for all the four dimensions are given at Table 3.1:

Table 3.1: Dimension wise Parameters of Sustainability of *Nirmal Grams*

S No	Dimension	Parameters
1.	Socio-economic (SD)(at HH level)	• Toilet used by all family members • Proper storage and handling of water • Hand-washing with soap/ash by all family members • Proper collection and disposal of solid waste • Proper disposal of waste water
2.	Technical(TD) (at HH level)	• Toilet structure in good condition and functional • Toilet pit at safe distance(≥10m) from water source • Availability of Hand-washing facility • Water is available within/near house • Water is potable by appearance/testing
3.	Environmental(ED) (at GP level)	• Well maintained functional Community, institutional toilets in use by men & women • Well maintained functional School/*Anganwadi* toilets in use by boys and girls and clean school environment • Potable community water sources with proper drainage and clean surroundings • Proper arrangement for collection and disposal of solid waste • Proper arrangement for disposal of waste water
4.	Institutional(ID) (at GP level)	• Functional and active village water and sanitation committee(VWSC) • Community participation in planning and monitoring of WATSAN facilities • Availability of staff and funds for O&M of Community/Institutional WATSAN facilities • Availability of plans and funds for implementation of solid and liquid waste management systems • Technical and financial support by external support agencies in planning, execution, operation & maintenance and monitoring of WATSAN facilities.

These twenty parameters for four dimensions have been assessed through rapid assessment. Equal weightage has been assigned to all the parameters and each parameter under a dimension is assigned the maximum score of twenty provided it is fully met. The average assessed score of all the five parameters under each dimension is worked out as percentage of total maximum score of that dimension i.e. hundred.

3.3 Selection of *Nirmal GPs* for Assessment

The district wise list of 326 *Nirmal Gram* Puraskar awarded *Gram Panchayats* from 28 districts of Rajasthan is given at Appendix 1.Ten *Nirmal GPs* from all the years of NGP award (2007 to 2013), one each in each district covering total 10 out of 28 districts in all the seven geographical divisions of Rajasthan were randomly selected for rapid assessment of all the twenty parameters in each *Nirmal GP*. The district wise names of randomly selected *Nirmal GPs* are given at Table 3.2:

Table 3.2: District wise randomly selected *Nirmal GPs*

S.No	Name of District	Name of Block	Name of *Nirmal GP*	Year of NGP Award
1	Ajmer	Masooda	Jamola	2011
2	Bundi	Hindoli	Basoli	2007
3	Churu	Taranagar	Somiasar	2011
4	Hanumangarh	Bhadra	Malsisar	2010
5	Jaipur	Dudu	Mahalana	2008
6	Jhunjhunu	Nawalgarh	Mohanbadi	2013
7	Karauli	Todabhim	Sankarwada	2011
8	Pali	Raipur	Jhoontha	2009
9	Rajasamand	Rajsamand	Piplantri	2007
10	Sikar	Lachhmangarh	Magloona	2009

The rapid assessment was carried out in 15 randomly selected households in each of the ten *Nirmal Grams*. Thus total 150 HHs were covered in ten *Nirmal Grams*. The average population per village is 1354 and average household population is 5.38 as per 2011 census in ten districts selected for rapid assessment. The total population of 150 HHs covered under rapid assessment as per 2011 census is 807 which is 6 percent of total population of ten *Nirmal Grams* randomly selected for rapid assessment. The confidence interval worked out at 95 percent confidence level is 4%, which is reasonable. The calculation of sample size and confidence interval are given at Appendix 2. One or more randomly selected community and institutional WATSAN facilities were visually inspected in each *Nirmal Gram* to assign score under environmental parameters in all the ten *Nirmal Grams*. The focus group discussions

with the community and semi-structured interviews with various stakeholders including *Gram Sarpanch*, Ward Members, *Gram Sevak*, School Principal/teachers were held to assign score under institutional parameters.

All the 20 parameters were assigned equal score because all of them are interrelated and influence the score of each other. Each parameter under each dimension was assigned a maximum score of 20 and the average assessed score of all the five parameters under that dimension represent the percentage score of that dimension. The average score of all the four dimension in each *Nirmal Gram* represent the District Sustainability Index of that district. The average score of all the ten District Sustainability Indices represent the State Sustainability Index (SSI) of Rajasthan.

3.4 Research Methods

The rapid assessments were carried out in ten *Nirmal Grams* utilizing the following research methods:-

3.4.1 Household Survey Questionnaire

Household Survey Questionnaire was developed in Hindi language to collect information on socio-economic parameters. The questionnaire covered twenty nine questions with two to eight options for each question for 6 to 10 family members in each household, regarding use of toilet , storage and handling of water , collection and disposal solid waste, disposal of liquid waste and hand washing before cooking, eating and after defecation as well as socio-economic status and priorities of each household. Total 29 questions covered in the household survey questionnaire are as follows:

- Do you have a toilet at your home?
- Reasons for not building a toilet?
- Do you have any plan to build a toilet in your house future?
- What are the reasons for not building a toilet?
- How have you arranged funds for building your toilet?
- Under which Government scheme have you obtained the financial assistance?
- How much cost of construction was met from the subsidy?
- What type of toilet has been built by you?
- Where from have you purchased material for construction of the toilet?
- Where from did you get mason and helper for construction of your toilet?

- Do you have a water source/water connection at your house?
- If not, where from you get water?
- How much is the distance between water source and toilet pit?
- Do all family members use toilet?
- If all do not use toilet, when do they go for open defecation?
- What are the reasons for not using the toilet?
- Do family members wash hands before cooking/eating and after defecation?
- If yes, how do you wash hands?
- If no, why don't you all wash hands?
- How do you dispose of the faeces of children?
- At what interval you clean your toilet?
- What material do you use for cleaning your toilet?
- Do you or any family member has Radio/TV/Mobile phone/cooking of your gas/phone/fridge/scooter/car/animal?
- How do you dispose of solid waste of your house?
- How do you dispose of waste water of your house?
- Do any one in your family suffered from diarrhoea/typhoid/jaundice/malaria/ dengue/chikengunia?
- How do you take out the drinking water from the storage container?
- How do women in your family dispose of menstrual clothes/napkins?
- Which one of these you will choose; cycle/ cow/ goat/ ox/ buffalo/ mobile/ cooking gas/fridge/toilet/Scooter/car/tractor/none?

The questionnaire was field tested at *Nirmal Gram*, Mahalana, Dudu Block, Jaipur district and the inputs of the expert focus group in the GP were incorporated to ensure that all the relevant issues are covered in the questionnaire and there are no involuntary biases. The final questionnaire was utilized in all the ten *Nirmal Grams* in ten districts for surveying total 150 households. The household questionnaire in Hindi language and English language have been attached at Appendix 3 & 4 respectively.

3.4.2 Structured Observations were carried out for observing behaviours and the signs of particular behaviour such as soap/ash and water present near toilet. The structured observations are best suited for measuring the hygiene behaviours (Curtis V., 1993).

The structured observations were followed by unstructured interviews with family members to assess the extent to which each behaviour was practised by the family.

3.4.3 Spot checks

Spot checks were carried out at each HH to collect the information regarding the existing practice of each behaviour for example collection of solid waste, storage and handling of water, disposal of liquid waste, toilet use. Spot-checks are rapid and efficient methods for assessing household level hygiene (Webb, A.L, 2006)

3.4.4 Visual inspections

The visual inspections and assessment of WATSAN facilities at household level and community level were carried out in ten *Nirmal Grams* to assess the appropriateness of technology from the socio-economic, technical, environmental and institutional perspectives as well as their effective use, maintenance and functioning, completing the check list containing thirty three check list questions. The visual inspections were carried out at 150 households, 16 randomly selected schools, 20 randomly selected *Anganwadi centres*, 20 randomly selected community toilets and 50 randomly selected community water sources in 10 *Nirmal Grams* in ten districts.

3.4.5 Village Walk

In order to assess the presence of excreta, solid waste and liquid waste on streets, disposal sites, open defecation sites, drains, and in open spaces the village walk was carried out in ten *Nirmal Grams* during the rapid assessment.

3.4.6 Focus Group Discussion (FGDs)

FGDs were conducted at five places with the community/ward members at five places at each *Nirmal Gram*. A list of twenty questions to elicit relevant information for assessment was used. The process adopted was participatory and involved men, women, youth and children. The responses were noted down during the FGD and complete information was recorded for assessment after the FGD. The information gathered in focus groups was used to fine tune the surveys and discussions with other group.

3.4.7 Semi-structured Interview

The semi-structured interviews utilizing eleven items checklist were carried out with various stakeholders including Gram Sarpanch, Gram Sevaks, Ward Members,

Anganwadi Workers, PHED staff and School Principal/Teachers to assess the environmental and institutional parameters at Nirmal GP level.

3.4.8 Water Quality Testing

The bacteriological quality of water using H_2S strip vial was tested at total 150 randomly selected households and 50 randomly selected community water sources in ten *Nirmal Grams*. The water was collected in the H_2S strip vial direct from the water source or stored drinking water in a water pot and was kept covered in the vial for 48 hours. If the colour of water turned black, it indicated bacteriological contamination else it remains yellow. The test is based on measuring bacteria that produce H_2S by its reaction with iron to form an insoluble, black precipitate. The test was utilized due to its affordability, simplicity and reliability. This simple and affordable test has great value for drinking water management and health education in water and sanitation sector (WHO, 2002).

3.4.9 Secondary Data

The secondary data were extracted from the reports of *Swachh Bharat Mission*, Ministry of Drinking Water and Sanitation, Government of India and Rural Development and Panchayati Raj Department, Government of Rajasthan. The secondary data was also collected by visiting the Rural Development and Panchayati Raj Department, Government of Rajasthan by visiting their office at Jaipur. The secondary data was also collected from each of the ten *Nirmal Gram Panchayats* and *Block Panchayats* at different locations in Rajasthan during the rapid assessments.

3.5 Analysis of Results

3.5.1 The force field analysis of opportunities and constraints was carried out as shown at Figure 6 for evolving strategies and policy guidelines for ensuring the sustainability of *Nirmal Grams* as well as sustained and effectively used and managed WATSAN systems in *Nirmal Gram Panchayats*. The conceptual framework of force field analysis is given at Figure 3.2:

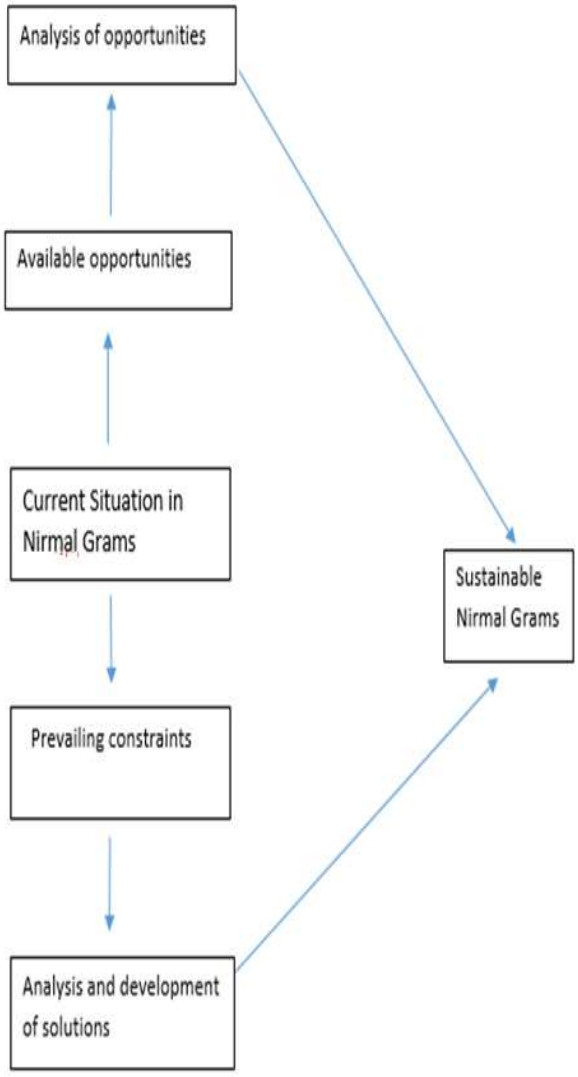

Figure 3.2: Force Field Analysis of Constraints and Opportunities

3.5.2 The Factor Analysis of the data of ten districts for four dimensions of sustainability having ten values for each dimension was carried out utilizing SPSS software to determine the coefficient of correlation of each dimension with its variables for assigning level of priority to each dimension. The determination that the use of factor analysis is justifiable, is obtained from the statistical output that SPSS provides in the request for a factor analysis of the data. The remedial action for each dimension are taken up as per their level of priority.

Chapter 4

Results and Discussions

4.1 Results of Assessments

The district-wise scores of four dimensions of sustainability and ten District Sustainability Index (DSI) derived from the results of rapid assessments of five parameters each of the four dimensions of sustainability in ten *Nirmal Gram Panchayats*, one each in each of the ten districts as well as the State Sustainability Index (SSI) worked out by averaging the District Sustainability Indices of ten districts are presented at Table 4.1:

Table 4.1: District-wise Scores (%) of four dimensions of Sustainability

District	T D	SE	E D	I D	DSI
Ajmer	68	36	39	20	40.75
Bundi	68	63	41	30	50.50
Churu	60	64	28	20	43
Hanumangarh	64	33	30	20	36.75
Jaipur	76	39	40	25	45.00
Jhunjhnu	76	56	35	30	49.25
Karoli	70	60	25	20	43.75
Pali	64	57	40	25	46.5
Rajsamand	79	71	56	45	62.75
Sikar	70	70	28	20	47
Rajasthan	69.5	54.9	36.2	25.5	46.52

The district-wise and dimension-wise assessed data of relevant parameters for all the four dimensions of sustainability for ten districts was analysed and presented in twenty two data sheets at Appendix 7.The contents of data sheets are as follows:

4.1.1 The district-wise scores of assessments of all the five parameters of environmental dimension assessed at Gram Panchayat level as well as the average scores of environmental dimension for all the ten districts are given at Data Sheet No. 1 at Appendix 7.Similarly the district-wise scores of assessment of all the five parameters of institutional dimension for all the ten districts are given at Data Sheet No.2 at Appendix 7.

4.1.2 The district-wise scores of five parameters of technical dimension for fifteen households each of ten districts assessed at households have been analysed for all the ten districts and are presented in district-wise data sheets. Similarly the district-wise scores of five parameters of socio-economic dimension for fifteen households each of ten districts assessed at household level have been analysed for all the ten districts are presented in district-wise data sheets. The district-wise results of technical dimension and socio-economic dimension are presented in Data Sheets No.3 to 22 at Appendix 7.

4.1.3 All the four dimensions or factors of sustainability are interrelated and there is a true correlation between the variables and factors. For factor analysis the minimum value of coefficient of correlation should be 0.30 and the KMO test value should be about 0.5. There should be minimum four factors and forty observations for undertaking factor analysis and the SPSS also determines the justification of factor analysis in the beginning through KMO test which measures the adequacy of sampling for the factor analysis. Therefore factor analysis was carried out using the principal component method utilizing SPSS software to get new insights about the relationships among set of variables. The results of factor analysis are given at Appendix 5. The results of factor analysis comprises of Correlation Matrix, KMO and Bartlett's Test, Table of Communalities, Table of Total Variance Explained, Scree Plot and Component Matrix. KMO Test, tests the suitability of data for factor analysis and its value vary between 0 and 1. KMO test value is 0.452, close to 0.5, was accepted for factor analysis. Bartlett's Test, tests the null hypothesis that the correlation matrix is identity matrix. The significance value worked out in the test is 0.005, which is less than 0.05 at 95% confidence level. This shows that the correlation matrix is not an identity matrix and there is significant correlation among variables. The communalities measure how much of the variance in the variables has been accounted for extraction of factor. The "table of total variance explained" reveals that technical factor accounted for highest variance and was extracted as principal component. The Scree Plot begins to flatter at second

factor, hence only the first factor was retained. The component matrix contains the factor loadings of each factor on a set of its ten variables. A factor loading is the correlation of the factor with its variable. The results of the component matrix are very clear and straight forward and showed strong correlations between the variables and factors. The factors with higher loading value viz. institutional, environmental and technical contributed more to their variables. Similarly the factors with moderate factor loading viz. socio-economic contributed moderately to its variables. Since only one component was extracted the SPSS could not rotate the solution and therefore the inferences were drawn from the un-rotated factor loadings retained in single component matrix. The results of the factor analysis are utilized in prioritizing the four dimensions of sustainability while analysing the constraints and opportunities.

4.2 District wise Results of Assessment

The district wise results of each of the four dimensions of sustainability as well as the results the district sustainability indices worked out as the average of four dimensions of sustainability are presented in tables and bar charts along with their analysis for each of the ten districts. The results of ten districts in the alphabetical order of the names of district are as follows:

4.2.1 Ajmer district

The results of rapid assessment in *Nirmal GP* Jamola, Masooda block, Ajmer district about 250 km from Jaipur the capital of Rajasthan are given at Table 4.2 and are presented in the bar chart diagram at Figure 4.1:

Table 4.2: Sustainability Scores and District Sustainability Index of Ajmer district

Name of District	Name of Nirmal GP	Technical Sustainability Score	Socioeconomic sustainability Score	Environmental Sustainability Score	Institution Sustainability Score	District Sustainability Index
Ajmer	Jamola	68	36	39	20	40.75

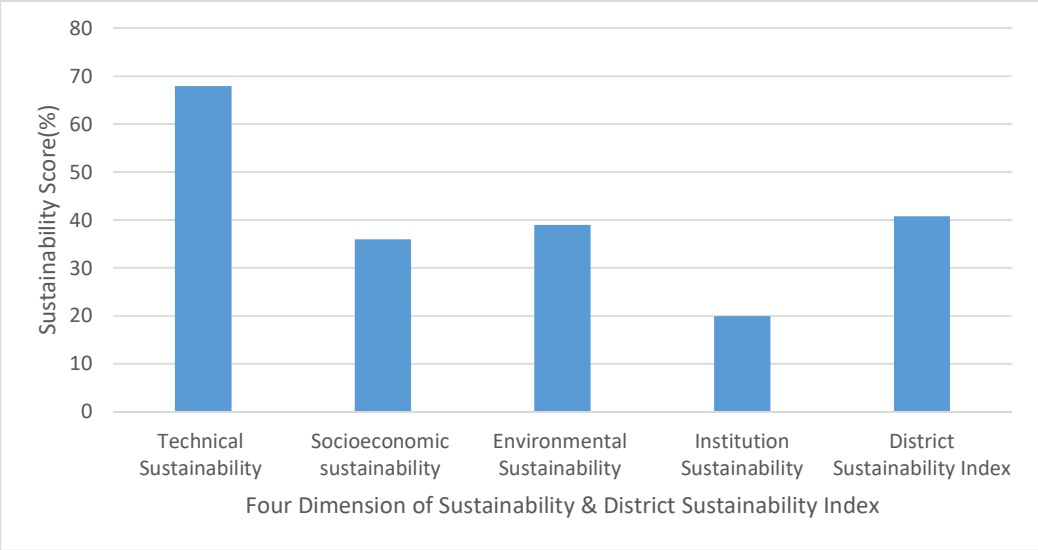

Figure 4.1: Sustainability Scores and District Sustainability Index of Ajmer district

The district sustainability Index of Ajmer district is 40.75 percent which is less than state sustainability index of Rajasthan. The technical sustainability score is 68 percent and is higher than the scores of other three dimensions of sustainability.100 percent households have the availability of water within/near house but 87 percent households have potable water and only 27 percent households have hand-washing facility. 53 percent households have functional toilets and in 73 percent households the water source is more than 10 metres from the toilet pit.

The socio-economic score is only 36 percent. Only in 33 percent households all the family members use toilet and none of the households is following the practice of safe storage and handling of water. 67 percent households wash hands with soap before cooking/eating and after defecation and 60 percent properly dispose of their waste water, but only 20 percent households properly collect and dispose of their solid waste.

The environmental sustainability score is 39 percent. There is no functional community toilet hence the score of this parameter is nil. Only in 45 percent schools and *Anganwadi* centres the environment is clean, the toilets are well maintained, functional and in use by both boys and girls. 50 percent community water sources have clean surroundings and drainage for proper disposal of safe water. There is no system for regular disposal of solid waste and occasional arrangements are made by the *Gram Panchayat* from time to time to collect solid waste from community spots and dispose it in pits away from the *Gram* Panchayat. There is a partial drainage system and drains are not cleaned due

to which waste water flows on roads/streets in some localities of *Gram Panchayat*. The scores of both solid waste management and liquid waste management parameters are 50 percent each. The low scores on all the five parameters results in low score of environmental sustainability.

The institutional sustainability score is only 20 percent. The village water and sanitation committee (VWSC) of the *Gram Panchayat* is not active and functional, the GP is not involving the communities in planning and monitoring of water and environmental sanitation facilities at *Gram Panchayat* level. The GP is not getting support from any of the external support agencies viz. UN agencies, corporate sector, national/international Non-Governmental Organizations (NGOs) in planning, implementation, monitoring and operation & maintenance of WATSAN facilities in the *Gram Panchayat* viz. Institutional/Community toilets, solid and liquid waste management, development of community water sources etc. But a local donor, known as *Bamashah* in local terms has supplied water purifier to the government higher secondary school. The water supply in the school through water connection is not sufficient and water is supplied in the storage tank through a water tanker twice a month at the cost of Rs.300 per tanker. The GP does not have adequate funds and required staff for operation and maintenance of community WATSAN facilities and establishing solid and liquid waste management systems. All these reasons resulted in the lowest score of institutional sustainability. A women group during the FGD near a functional hand pump suggested that the waste water from hand pump should be connected to street drains and street drains should be interconnected at the crossings for proper collection and disposal of waste water in the GP.

The photographs were taken randomly at various locations at *Nirmal Gram Panchayat* Jamola and utilized in assessment of relevant parameters under four dimensions of sustainability. The photographs taken during the focus group discussion and visual inspection at community hand pump and household toilet to show the existing condition and use of household and community water and sanitation facilities as well as the necessary improvements required for their effective and sustained use are given at Figure 4.2 and 4.3:

Figure 4.2: Household Toilets built under *Swachh Bharat Mission* in use

Figure 4.3: Hand-pump without arrangement for waste water disposal in use

4.2.2 Bundi district

The results of rapid assessment at *Nirmal GP* Basoli, Hindoli block, Bundi district about 250KM from Jaipur the capital of Rajasthan are given at Table 4.3 and Figure 4.4:

Table 4.3: Sustainability Scores and District Sustainability Index of Bundi district

Name of district	Name of Nirmal GP	Technical Sustainability Score	Socio economic sustainability Score	Environmental Sustainability Score	Institutional sustainability Score	District sustainability Index
Bundi	Basoli	68	63	41	30	50.5

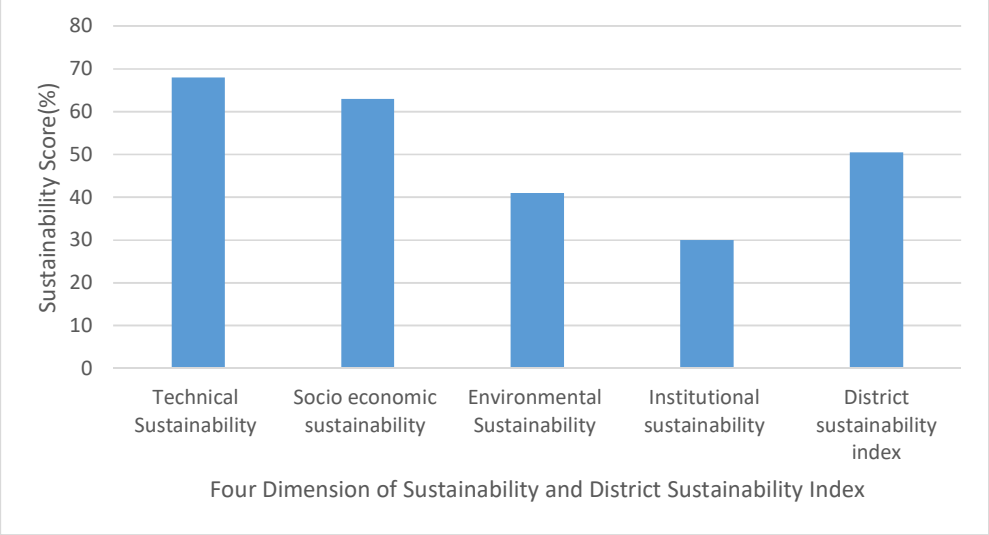

Figure 4.4: Sustainability Scores and District Sustainability Score of Bundi district

The district sustainability index of Bundi district is 50.5 percent, which is more than the state sustainability index of Rajasthan. The technical sustainability score of Bundi district is 68 percent and is higher than the scores of other three dimensions of sustainability.100 percent households have the availability of water within/near house but only 60 percent households have potable water. 67 percent have functional toilets and 60 percent have hand washing facility but only in 53 percent households distance between the toilet pit and water source is more than 10 metres. The household toilets are built with large size leach pit.

The socio-economic sustainability score is 63 percent. In 67 percent households all the family members use toilet and 80 percent household wash hands with soap/ash before cooking/eating and after defecation. 80 percent households properly collect and dispose of their solid waste but only 67 percent households properly dispose of their waste water. Only 20 percent households properly store and handle the drinking water due to which the average socio economic score is 63 percent despite of higher scores in its other parameters.

The environmental sustainability score is 41 percent. There is no functional community toilet. Only in 30 percent schools and *Anganwadi* centres the school environment is

clean and the toilets are well maintained, functional and in use by both boys and girls.75 percent community water sources have clean surroundings and proper drainage for waste water disposal. The GP has employed a sanitation worker on contract basis to collect the solid waste daily from all the households and throw it in places close to *Gram Panchayat*. A tractor trolley is hired by the GP every month to transport the solid waste collected in heaps away from the village in open pits. There is a partial drainage system and when drains get choked the cleaning is done by GP by engaging casual labour. There is no regular system of cleaning drains and there is no proposal for extending drains to cover the whole GP.

The institutional sustainability score is only 30 percent. The VWSC of GP is not functional. In the GP under *Janta Jal yojna*, 5 water tanks have been built to supply water. The water charges are not levied from the households by the GP. The pipe line laid by the Public Health Engineering Department (PHED) has been damaged and water supply system is non-functional. The GP has employed two *Swachhta Doots* for motivation and demand creation for the households who do not have toilet. 50 percent area of GP is in the forest land. The know-how and funds for planning and establishing solid and liquid waste management systems are not available with the GP. There is no technical or financial support from the external support agencies in planning, implementation, operation and maintenance of WATSAN facilities in the GP. All these reasons resulted in lowest score of institutional sustainability among the four dimension of sustainability. During the FGD held close to the construction site of new household toilet, the community members suggested that the local masons should be trained in building low cost toilets with appropriate size leach pits and improving the old toilets put to disuse to save heavy expenditure on construction of large size pits. The photographs were taken at randomly selected households at *Nirmal Gram* Basoli during visual inspections and unstructured interviews with the family members to assess the existing situation of household water and sanitation facilities. The photograph of household toilet with very big size leach pit having capacity to store excreta for twenty years under construction is given at Figure 4.5. The photograph of an existing household toilet given at Figure 4.6 was never used and therefore put to disuse and its structure remained without roof and door.

Figure 4.5: Household Toilet with very big size leach pit under construction

Figure 4.6: HH toilet not in use at Basoli

4.2.3 Churu district

The results of rapid assessment in *Nirmal GP* Somiasar, Taranagar block, Churu district about 250 km from Jaipur the capital of Rajasthan are given at Table 4.4 and are presented in the bar chart diagram at Figure 4.7:

Table 4.4: Sustainability Scores and District Sustainability Index of Churu district

Name of district	Name of Nirmal Gram Panchayat		Socioeconomic Sustainability Score	Environmental Sustainability Score	Institutional Score	District Sustainability Index
Churu	Somiasar	60	64	28	20	43

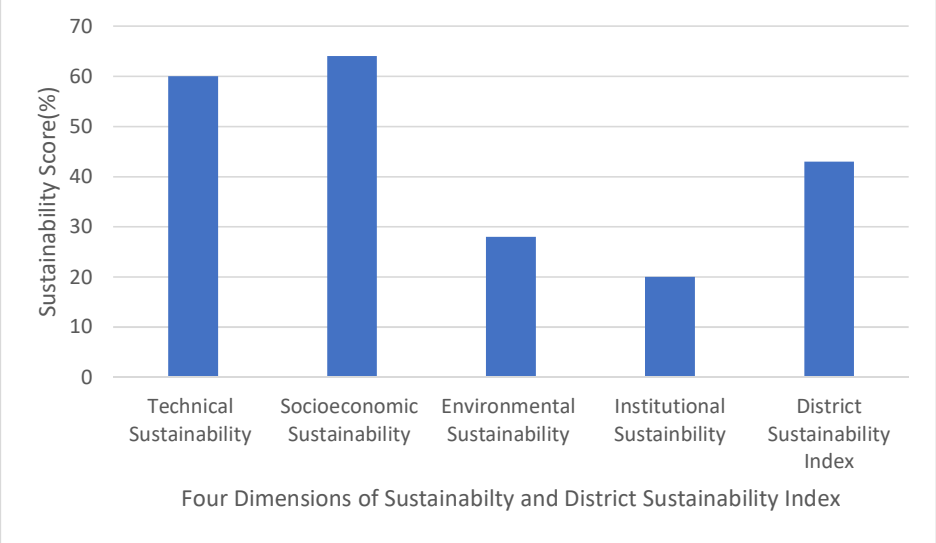

Figure 4.7: Sustainability Scores and Sustainability Index of Churu district

The District Sustainability Index of Churu district is 43% which is less than the state sustainability index of Rajasthan. The technical sustainability score is 60 percent. In 87 percent households the toilet structure is in good condition and functional.100 percent households have water availability within/near home but only in 27% households the water is potable. In 53 percent households the toilet pit is at a safe distance of 10 metres or more from the water source and only in 33 percent households hand-washing facility is available.

The socio-economic sustainability score is 64 percent which is higher than the scores of other three dimensions of sustainability. In 73 percent households all the family members use toilet. 87 percent households properly dispose of their waste water but

only 40% households properly collect and dispose their solid waste. Only 40 percent households each properly store and handle drinking water, and wash hands with soap/ash before cooking/eating and after defecation.

The environmental sustainability score is 28 percent .There is no community toilet for those who do not have household toilet in the GP. Only in 30% schools and Anganwadi centres the environment is clean and the toilets are well maintained, functional and in use by both boys and girls. Only 10% community water sources have clean surroundings and proper arrangement of waste water disposal because all the community water sources are non-functional due to failure of regional water supply scheme. None of the five Water Tanks (WTs) in the village is getting water from the German funded regional water supply scheme named *Aapni Yojana* (Our Scheme) commissioned in the year 2001 because village Somiasar is the tail end village of the regional scheme. There is no hand pump in the village and the water from the open wells is highly saline and the animals die after drinking open well water. There is a traditional Rain Water Harvesting Tank (RWHT) with no water. The people of Somiasar village are compelled to drink water from polluted irrigation canal 100m from the village. The villagers fetch water from the canal in tractor trolley mounted water tankers and store it in water storage tanks at their houses for domestic use. The test of water carried out at canal and at household level using H_2S strip vial showed bacteriological contamination in canal water as well as the water stored at all most all the households. Some households fetch potable water through private tankers from Sawa 40 km from the village by paying high transportation cost. There is no drain in the village. The roads are not built in the streets and waste water either stagnates on the streets or absorbed by the soil. There is no regular system of solid waste disposal. The heaps of animal dung mix with solid waste are stacked on the streets. The solid waste also litter in the court yards and community water sources.

The institutional sustainability score is 20 percent. The VWSC formed at the time of planning and implementation of *Aapni Yojana* project is non-functional. There is no community participation in planning and monitoring of water and sanitation facilities. The people make their own arrangement of water supply by drawing water from the canal. There is no community toilet in the village. There is no support from any of the external support agency in operationalizing the closed water supply scheme. The local donors from the village contributed some money for building school toilet. The staff

and funds for solid and liquid waste management are not available with the *Gram* Panchayat. The GP does not have funds and technical staff for preparing and implementing solid and liquid waste management. The GP is also not getting support from Block Panchayat and *Jila Parishad* for preparation of solid and liquid waste management plan for getting funds under *SBM-Gramin*. The villagers gathered near empty water reservoir, expressed serious concern during the FGD on non- availability of safe water from *Aapni Yojana* since last four years and emphasised the urgent need for operationalizing the closed *Aapni Yojana* water supply scheme.

The photographs taken at *Nirmal Gram* Somiasr are given at Figure 4.8 and 4.9:

Figure 4.8: FGD near Dry WT at Somiasar

Figure 4.9: Dry RWHT at Somiasar

4.2.4 Hanumangarh district

The results of rapid assessment in *Nirmal* GP Malsisar, Bhadra Block, Churu district about 450 KM from Jaipur the capital of Rajasthan are given at Table 4.5 and are presented in the bar chart diagram at Figure 4.10:

Table 4.5: Sustainability Scores and District Sustainability Index of Hanumangarh district

Name of District	Name of Nirmal Gram Panchayat	Technical Sustainability Score	Socio economic sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Index
Hanumangarh	Malsisar	64	33	30	20	36.75

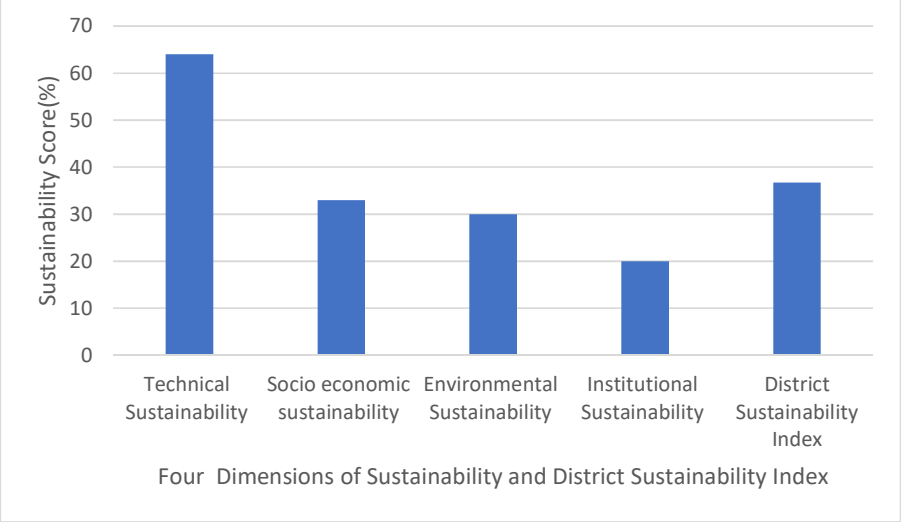

Figure 4.10: Sustainability Scores and DSI of Hanumangarh district

The sustainability index of Hanumangarh district is 36.75percent and is the lowest among the ten districts and less than the state sustainability index of Rajasthan.

The technical sustainability score is 64 percent and is higher than the other three dimensions of sustainability. In 93 percent households the toilet structure is in good conditions and functional but only 33% households have hand washing facility. Although water is available within/near house in 100 % households but only in 33 percent households the water is potable because the households get water from *diggies* (open reservoirs) which are contaminated. In 60 percent households the distance between toilet pit and water source is 10 m or more.

The socio-economic sustainability score is only 33 percent. In 67 percent households toilet is used by all family members but only in 47 percent households all family members wash their hands with soap/ash before cooking/eating and after defecation. 27 percent households each properly store and handle water and properly collect and dispose of their solid waste but only 7percent households properly dispose of their waste water.

The environmental sustainability score is 30percent. There is no community toilet for those not having household toilet in the GP. There is less than required number of toilets for boys and girls in schools. The water supplied to the children in the Government higher secondary school is not safe to drink. The *Anganwadi* toilet is neither clean nor used by children. The water of open water reservoirs are not safe to drink. There is stagnant water and littering solid waste around water sources. There is no arrangement for proper collection of solid waste and liquid waste. The solid waste is removed occasionally by the *Gram Panchayat* by deploying tractor trolley. There are only three drains in the GP. For want of roads and drains in the streets the waste water either stagnates in the courtyard of the house or flows on the streets from the houses resulting in unclean environment and mosquito breeding.

The institutional sustainability is 20 percent and is lowest of all the four dimensions of the sustainability. The VWSC is not functional. The community is not involved in planning and monitoring of WATSAN facilities by the GP. But the major repair work in the Government higher secondary school at a total cost of Rs.12 lakh was carried out by mobilising funds from the local donors in the village. There is no technical and financial support from any external support agency in planning, execution, operation and maintenance of community/institutional WATSAN facilities. The GP has not prepared plans for establishing solid and liquid waste management systems in the GP for getting assistance from the Government of India under *SBM-Gramin*.

The photographs taken in Malsisar GP are given at Figure 4.11 and Figure 4.12:

Figure 4.11 HH flush toilet in use

Figure 4.12: HH Pit Toilet in use at Malsisar

4.2.5 Jaipur District

The results of rapid assessment in *Nirmal GP* Mahalana, Dudu block, Jaipur district about 70 km from capital town Jaipur are given at Table 4.6 and presented in the bar chart at Figure 4.13:

Table 4.6: Scores of Sustainability and District Sustainability Index of Jaipur district

Name of District	Name of Nirmal GP	Technical Sustainability Score	Socio economic Sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Score
Jaipur	Mahalana	76	39	40	25	45

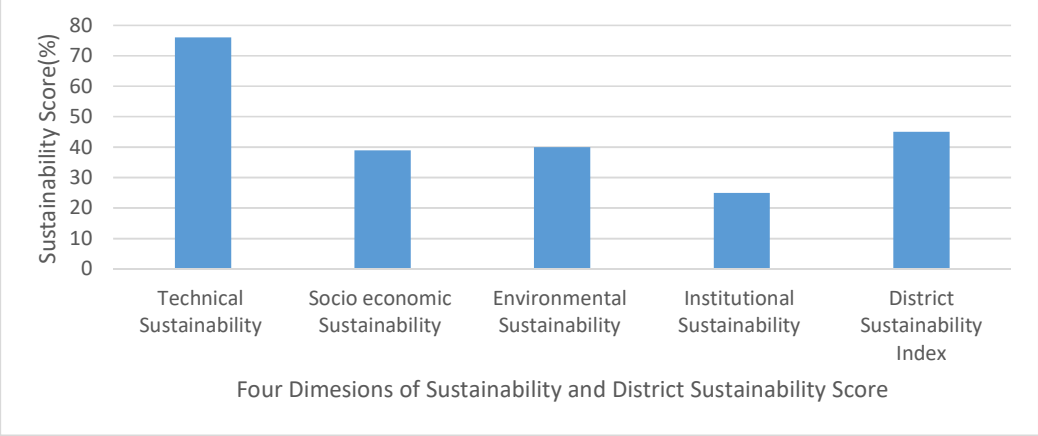

Figure 4.13: Sustainability Scores and District Sustainability Index of Jaipur District

The sustainability index of Jaipur district is 45 percent and is less than the state sustainability index of Rajasthan.

The technical sustainability score is 76 percent and is higher than the scores of other three dimensions of sustainability. In 80 percent household toilet structure is in good condition and functional but only 53 percent have hand-washing facility. In 100% households the water availability is within/near house but in 87 percent households the water is potable. In 60% households the distance between the water source and toilet pit is 10 m or more.

The socio-economic sustainability score is 39 percent. In 67 percent households toilet is used by all family members but only in 53 percent households all family members wash hands with soap/ash. None of the households properly store and handle water at household level.40 percent households properly collect and dispose of the solid waste at household level and 33 percent properly dispose of liquid waste respectively. All these reasons resulted in lower score of socio-economic sustainability.

The environmental sustainability score is 40 percent. The community toilets are neither well maintained nor used by women. The *Gram Panchayat* does not have sufficient funds for operation and maintenance of community toilets. The toilets in schools and *Anganwadi* centres are well maintained and used by boys and girls and the school environment is clean. There are potable community water sources i.e. hand-pumps with proper drainage of waste water. The arrangement for proper collection and disposal of solid waste and proper disposal of liquid waste has not been established.

The institutional score is 25 percent. The VWSC is non-functional. The community is not participating in planning and monitoring of WATSAN facilities. There is no support from external support agencies in planning, implementation and monitoring of WATSAN facilities except Mahindra & Mahindra support in provisions of water tanks in schools. The staff and funds for operation and maintenance of community toilets and institutional toilet are not available with the GP. *Gram Panchayat* uses funds from different heads for cleaning community toilets, removing solid waste heaps and cleaning drains. The villagers during FGD mentioned that the water supply for half an hour on alternate days did not fulfil their requirement and should be one hour daily. The main drain choked with solid waste should be cleaned regularly to allow smooth flow of waste water in the drain.

The photographs taken during rapid assessment at Mahalana are given at Figure 4.14 and Figure 4.15:

Figure 4.14: WT in school at Mahalana Figure 4.15: Choked *Nallah* at Mahalana

4.2.6 Jhunjhunu district

The results of rapid assessment in *Nirmal* GP Mohanbari, Nawalgarh block, Jhunjhunu district about 200KM from Jaipur the capital of Rajasthan are given at Table 4.7 and are presented in the bar chart at Figure 4.16:

Table4.7: Sustainability Scores and District Sustainability Index of Jhunjhunu district

Name of district	Name of *Nirmal* GP	Technical Sustainability Score	Socioeconomic Sustainability Score	Environmental Sustainability Score	Institutional Score	District Sustainability Index
Jhunjhunu	Mohanbari	76	56	35	30	49.25

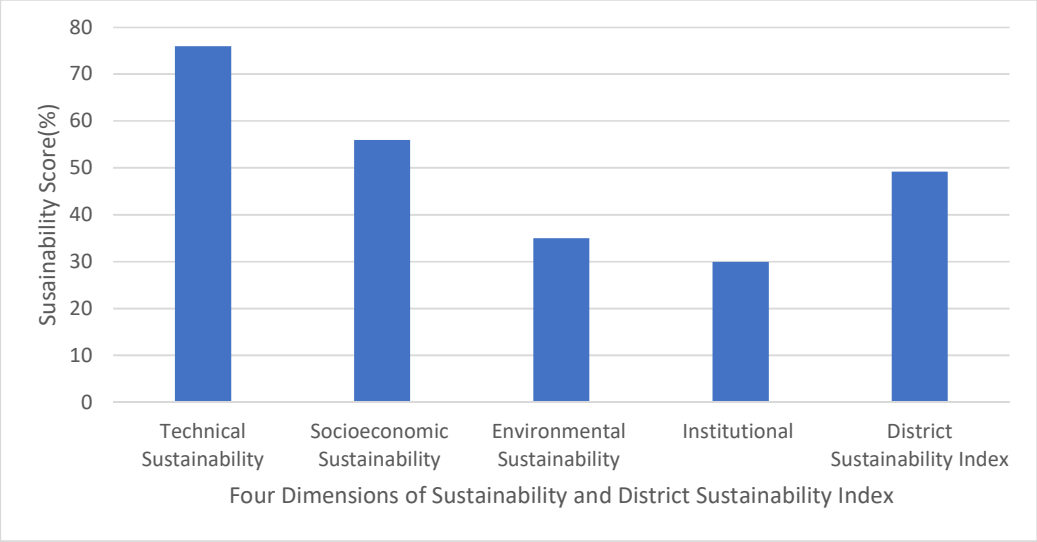

Figure 4.16: Sustainability Scores and District Sustainability Index

The district sustainability index of Jhunjhunu district is 49.25 percent and is higher than the state sustainability index of Rajasthan.

The technical sustainability score of Jhunjhunu district is 76 percent and is higher than the scores of other three dimensions of sustainability. In 93 percent households the toilet structure is in good condition and functional but the hand washing facility exists only in 47 percent households. In 60 percent households the distance of toilet pit from water source is 10 m or more. In 100 percent households the water is available within/near house but the water is potable in 80 percent households.

The socio-economic sustainability score is 56 percent and is lower than the technical sustainability score but higher than the environmental and institutional sustainability score. In 73 households the toilet is used by all family members. In 73 percent

households all family members wash hands with soap/ash before cooking/eating and after defecation. 33 percent households each properly store and handle water, and properly dispose of their waste water. 67 percent households properly collect and dispose of their solid waste.

The environmental sustainability score is 35 percent. There is no community toilet in the *Gram Panchayat*. The drains have not been built. A tractor trolley is hired by the *Gram Panchayat* once in three to four months to transport the heaps of solid waste away from the *Gram Panchayat*. The community soakage pits constructed for disposal of waste water have been choked and are non-functional. The potable community water sources with drainage arrangement are available in the *Gram Panchayat*. There are five tube wells attached to five ground service reservoirs of 10000 to 20000 litres capacity each depending upon the number of households served by each tube well. The potable water is available in schools. There are functional toilets in schools for boys and girls but their number is much less than the norms prescribed under SBSV campaign. There is a functional toilet at *Anganwadi* centre but is not used by children. The water available at *Anganwadi* Centre is not potable and waste water and solid waste is not managed properly at the *Anganwadi* campus.

The institutional sustainability score is 30 percent. The VWSC is not functional *Gram* Panchayat is active in ensuring water supply to households. The electricity charges for pumping water from tube wells to Service Reservoir are born by the *Gram Panchayat*. The subsidy for construction of new household toilets is provided by the GP to those households not having toilets. The local mason are available for construction of household toilets. Rs.200 fine is charged from a person who defecate in the open. The community is not involved in planning and monitoring of WATSAN facilities in the GP. But the development committee of the GP consisting of eleven ward members and two retired government officials is active in planning and implementation of development works in GP. A toilet block has been built by the development committee in the government higher secondary school at a total cost of Rs.3.6 lakh. The funds and technical staff for planning and implementation of solid and liquid waste management is not available with the GP. The GP is not getting any technical and financial support from external support agencies in planning, implementation, operation, maintenance and monitoring of WATSAN facilities. The villagers during the FGD expressed the need for regular arrangement for collection and disposal of solid waste and building

drains for disposal of waste water for ensuring cleanliness and controlling mosquito breeding in the village. The photographs taken during the rapid assessment are given at Figure 4.17 and Figure 4.18:

Figure 4.17: Clear Water Tank at Mohanbari

Figure 4.18: School Water Tank at Mohanbari

4.2.7 Karauli district

The results of rapid assessment at *Nirmal GP* Sankarwada, Todabhim block, Karauli district about 120 km from Jaipur the capital of Rajasthan are given at Table 4.8 and presented in a bar chart diagram at Figure 4.19:

Table 4.8: Sustainability Scores and District Sustainability Index of Karauli district

District	Name of *Nirmal* GP	Technical Sustainability Score	Socioeconomic Sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Index
Karauli	Sankarwara	70	60	25	20	43.75

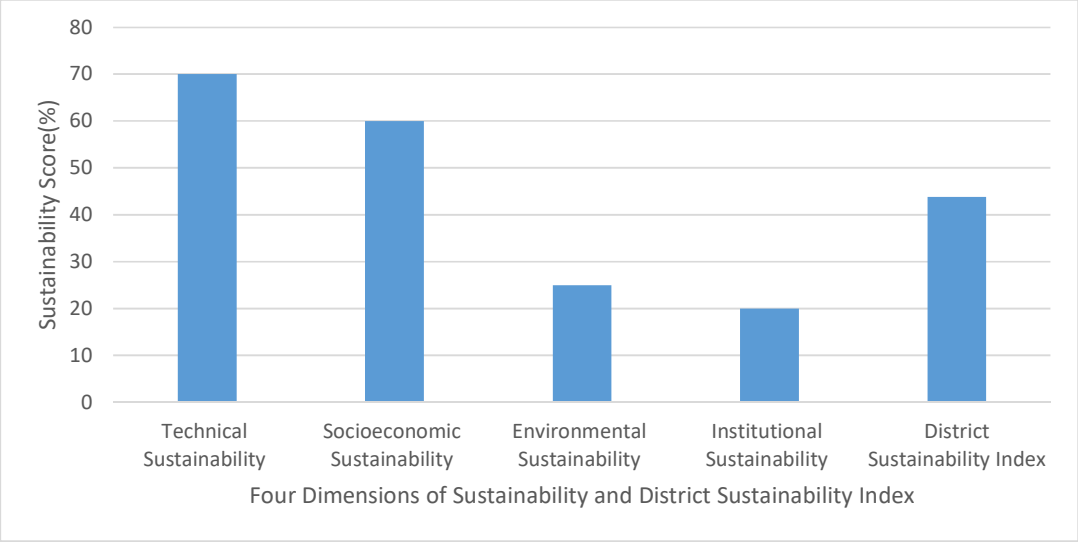

Figure 4.19: Sustainability Scores and District Sustainability Index of Karauli district

The District Sustainability Index of Karauli district is 43.75 percent and is less than the State Sustainability Index of Rajasthan.

The technical sustainability score of Karauli district is 70 percent and is higher than the scores of other three dimensions of sustainability. In 100 percent households the toilet structure is in good condition and functional but the hand-washing facility exist only in 27 percent households. In 73 percent households the distance of toilet pit from water source is 10 metres or more. In 100 percent households the water is available within/near home but the availability of potable water is only in 53 percent households.

The socio-economic sustainability score is 60 percent and is lower than the technical sustainability score but higher than the other two dimensions of the sustainability. In 87 percent households each all the family members use household toilet, and wash hands

with soap/ash before cooking/eating and after defecation. 53 percent households properly collect and dispose of their solid waste, 47 percent household properly dispose of their waste water and only 27 percent household store and handle their water properly.

The environmental sustainability score is 25 percent. There is no community toilet in the *Gram* Panchayat. There is no drainage system for proper disposal of waste water in the village and the waste water stagnates in the streets. The villagers who encroached the road side land do not allow the GP to build drains on the sides of the roads. There is no community water source viz. hand-pump, public stand post etc. but there are couple of private stand posts for supplying water to those not having water source within the house. In government senior secondary school having 346 students (167 boys and 179 girls) and 16 teachers, only one toilet and three urinals each are provided for boys and girls. The number of toilets and urinals are very less keeping in view the strength of school children and teachers. Water is supplied to school children through a water tank filled by pumping water from a private tube well. The water supplied through tank is not potable. The school does not have its own water supply. The *Anganwadi* toilet is neither clean nor used by children and the water available a*t Anganwadi centre* is not potable. The environment of *Anganwadi* centre is clean and there is no littering of solid waste and no stagnant water in the *Anganwadi* campus.

The institutional sustainability score is 20 percent and the lowest of all the four dimensions of sustainability. The VWSC does not exist in the GP. There is a health, water and sanitation committee in the GP headed by the *Upsarpanch* having 5 ward members as members of the committee but the committee is not active. There is no water supply in the *Gram Panchayat* office due to which toilet in *Gram Panchayat* office is not used. There is no community participation in planning, implementation, operation and maintenance of WATSAN facilities. There is no technical and financial support to the GP from the external support agencies. The required staff and funds are not available with GP for establishing solid and liquid waste management systems in the GP. The water supplied by the PHED from a deep tube well covers only one part of the village and the households in the other part are taking water from the private tube wells by laying their own pipe line and paying for water charges. Most of the households having their house connections from private tube wells do not get sufficient quantity of water and also the water quality is not up to the mark. The villagers during the FGD

expressed serious concern about the non-availability of safe drinking water to part of the population in the village. They desired that the PHED should develop another safe source of water supply and lay additional pipe lines to supply safe water in adequate quantity to the remaining part of the village and also install Public Stand Posts (PSPs) for those who cannot take individual water connections. They also mentioned that the children and adults in many families suffer from diarrhoea especially during summer season by drinking water from unsafe sources, when there is an acute shortage of water in the whole village.

The photographs taken in Sakarwada are given at Figure: 4.20 and Figure: 4.21:

Figure 4.20 : PSP in use at Sakarwada

Figure 4.21: HH Toilet at Sakarwada

`4.2.8 Pali district

The results of rapid assessment in *Nirmal GP* Jhoontha, Raipur block, Pali district about 250 km from Jaipur are given at Table 4.9 and are presented in at Figure 4.22:

Table 4.9: Sustainability Scores and District Sustainability Index of Pali district

Name of district	Name of *Nirmal* GP	Technical Sustainability Score	Socio economic Sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Index
Pali	Jhoontha	64	57	40	25	46.5

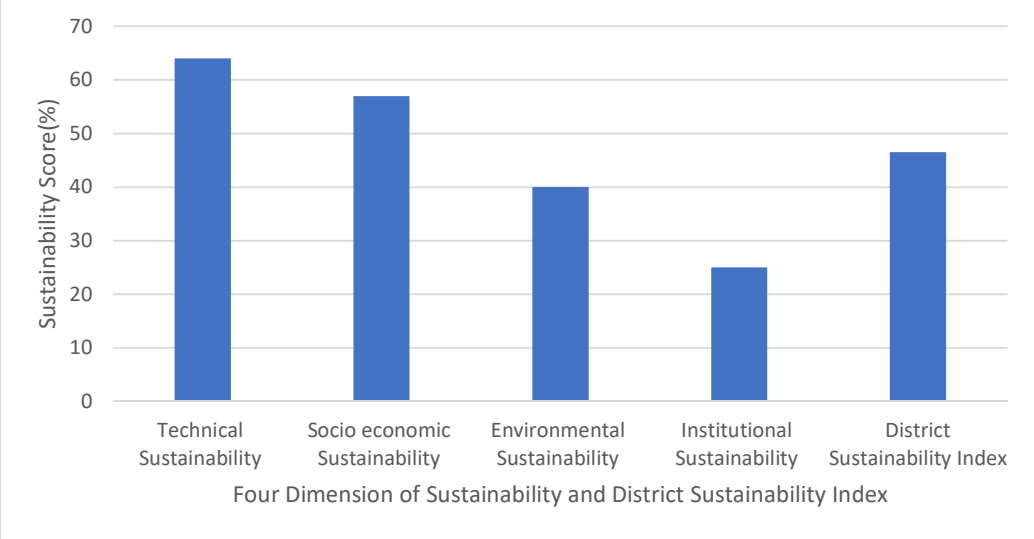

Figure 4.22: Sustainability Scores and District Sustainability of Pali District

The district sustainability score of Pali district is 46.5 percent and is equal to the state sustainability score of Rajasthan.

The technical sustainability score is 64 percent and is higher than the scores of other three dimensions of sustainability. In 80 percent households the toilet structure is in good condition and functional but hand-washing facility exist in only 27 percent households. Water is available within/near house in 100 percent households but the water is potable only in 73 percent households. Only in 40 percent households the toilet pit is 10 metres or more from the water source.

The socio economic score of Pali district is 57 percent. In 73 percent households all the family members use toilet but none of the households properly store and handle their water. In 80 percent households all the family members wash hands with soap/ash

before cooking/eating and after defecation. 60 percent household properly collect and dispose of their solid waste at household level and 73 percent households properly dispose of their waste water at household level.

The environmental sustainability score is 40 percent. There is no functional community toilet in the GP. All the three community toilets have been put to disuse for want of regular maintenance and are kept locked. Although the drainage system exist but it is not maintained and waste water flows on road/streets and in open spaces. The drain when get choked are cleaned by the GP by employing casual labour. There is no arrangement for proper disposal of solid waste. The GP occasionally deploy tractor-trolley to collect and transport the solid waste heaps in low lying areas and the pits away from the GP. Fourteen hand-pumps having high fluoride content in water are used for washing, bathing and cleaning utensils and five hand-pumps having fluoride within permissible limit are used for drinking and cooking by the households not having water connection. The drainage arrangement for disposal of waste water from the hand-pump is not proper. There are 478 students (243 boys and 235 girls) and 18 teachers (9 males and 9 females) in government senior secondary school. But there are only two toilets with 6 urinals for boys and male teachers and two toilets with two urinals for girls and female teachers, which are much less than the norms prescribed under SBSV campaign. There is a drinking water tank with taps for storing and supplying water to school children but the water stored in the tank is not potable. The school does not have sufficient funds for maintaining school WATSAN facilities and cleaning school premises on daily basis.

The institutional sustainability score is only 25 percent and is the lowest of the four dimensions of sustainability. The VWSC is non-functional. The GP is not getting any support from the external support agencies for planning, implementation, operation and maintenance and monitoring of WATSAN facilities. Two toilet complexes built from the Member of Parliament's funds have been put to disuse due to lack of maintenance. The community is not involved in planning and monitoring of WATSAN facilities. Sometimes ward members and *Gram Sarpanch* take initiative and guide the community for proper disposal of solid waste. The funds for solid and liquid waste management are not available with the *Gram Panchayat*. One sanitation worker makes house to house visits and collects solid waste every day for which he is paid in cash or kind by each individual household. The villagers during the FGD expressed the need for increasing

water supply duration from half an hour on alternate days to one hour daily and operationalizing the defunct community toilets.

The photographs taken during rapid assessment at GP Jhoontha are given at Figure 4.23 and Figure 4.24:

Figure 4.23: HH toilet in use at Jhoontha

Figure 4.24: Handling of water at Jhoontha

4.2.9 Rajsamand district

The results of rapid assessment in *Nirmal Gram Panchayat* Piplantri- situated in the vicinity of marble mining area, Rajsamad block, Rajsamand district and Udaipur division, about 300 km from Jaipur the capital of Rajasthan are given at Table 4.10 and presented in a bar chart diagram at Figure 4.25:

Figure 4.10: Sustainability Scores and DSI of Rajsamand District

Name of district	Name of *Nirmal* GP	Technical Sustainability Score	Socioeconomic Sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Index
Rajasamand	Piplantri	79	71	56	45	62.75

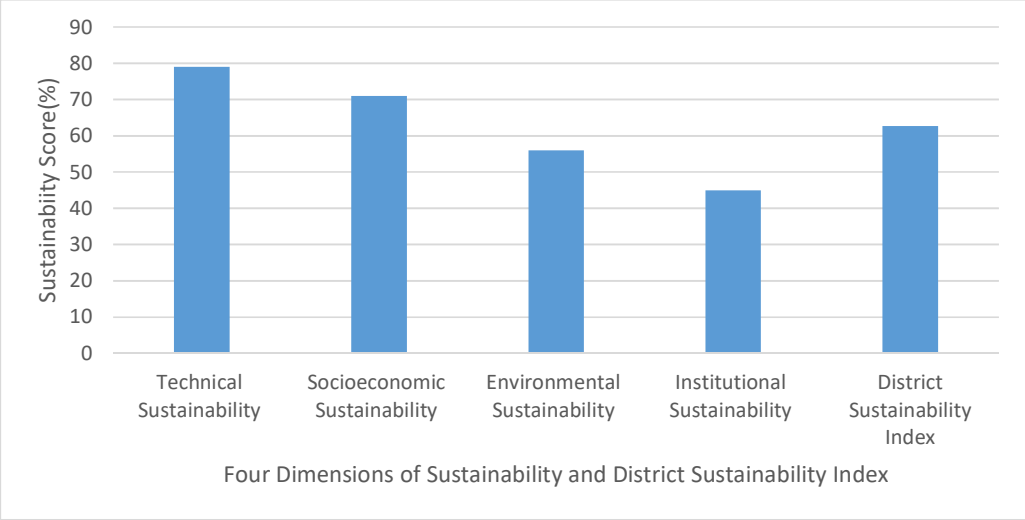

Figure 4.25: Sustainability Scores and DSI of Rajsamand district

The district sustainability index of Rajsamand district is 62.75 percent and is higher than the state sustainability index for Rajasthan as well as the remaining nine districts.

The technical sustainability score is 79 percent and is higher than the other three dimensions. In 93 percent households the toilet structure is in good condition and functional but the hand-washing facility exists in only 60 percent households. Water is available within/near house in 100 percent households but potable water is available in 67 percent households. In 73 percent households the distance between toilet pit and water source is 10 metre or more.

The socio-economic sustainability score is 71 percent. In 80 percent households all family members use toilet. 33 percent households properly store and handle water at the

household level, 87 percent households properly collect and dispose of solid waste and 67 percent households properly dispose of waste water at household level. In 87 percent households all the family members wash hands with soap/ash before cooking/eating and after defecation.

The environmental sustainability score is 56 percent. The community toilet is functional and have separate toilet blocks for men and women. The location of community toilet is appropriate and fifteen families not having individual household toilet use the community toilet daily. But the toilet is not properly maintained. The drainage system for waste water disposal exists in the GP but the drains are not properly maintained and waste water overflows on the roads. The drains get choked because some people throw their solid waste into the drains or close to the drains. There is one sanitation worker in the GP who collects the solid waste from all the houses on alternate days and throws it on the disposal site. The water pipe line is laid inside the drain which may result in contamination of drinking water during leakage or breakage of pipe line. There is no arrangement for removal of animal dung from streets/roads. The toilet block in government higher secondary school has two toilets and five urinals for 138 boys and one toilet and five urinals for 113 girls which are less than the norms prescribed under SBSV campaign. There is a functional hand-pump in the school premises and water from hand-pump is potable. There is a water connection and water storage tank in the school. The school environment is clean. The Anganwadi centre has a functional toilet and a hand-pump within its campus but the toilet is not used by the children and there is stagnant water around hand-pump due to choking of drain of hand-pump platform.

The institutional sustainability score is 45 percent. Although the VWSSC formed in 2001 for planning, implementation, operation and maintenance and monitoring of water supply scheme is not very active. But the operation and maintenance of water supply scheme is still being looked after by the same VWSC. One member of the VWSC collects Rs.200 monthly charges per household from 70 households who have water connections and water charges are utilized for paying electricity bill for pumping water from tube well to reservoir situated on high ground and paying salary of the valve man cum pump driver. The total monthly expenditure on operation and maintenance of water supply scheme is met by the VWSC from the water charges and mobilising funds from the local businessmen. The water level is going down and the village environment is harmed due to excavation in marble mines and cutting trees close to the GP. R.K

Marbles who has marble mines close to the GP occasionally provides financial support for water supply and sanitation interventions. GP has not prepared plans to get funds for solid and liquid waste management from the Government of India under *SBM-Gramin*. The villagers during the FGD desired that permanent system for solid and liquid waste management should be established in the GP on priority basis to get rid of from accumulation of solid and liquid waste on the streets and roads.

The photographs taken in Piplantri are given at Figure 4.26 and Figure 4.27:

Figure 4.26: C T in use at Piplantri

Figure 4.27: Hand-pump in use at Piplantri

4.2.10 **Sikar district**

The results of rapid assessment in *Nirmal* GP Magloona, block Lachhmangarh, Sikar district 200 km from Jaipur town are given at Table 4.11 and are presented in bar chart diagram at Figure 4.28:

Table 4.11: Sustainability Scores and District Sustainability Index of Sikar District

Name of District	Name of Nirmal GP	Technical Sustainability Score	Socioeconomic Sustainability Score	Environmental Sustainability Score	Institutional Sustainability Score	District Sustainability Index
Sikar	Magloona	70	70	28	20	47

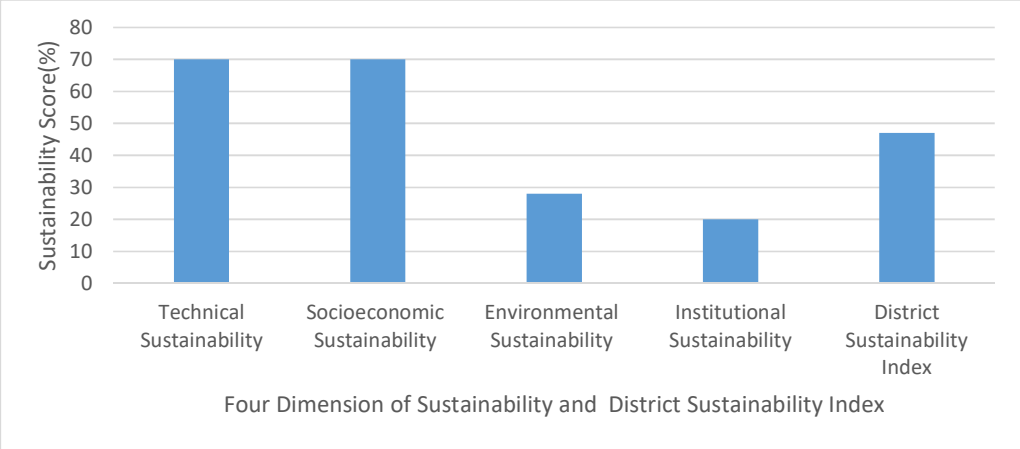

Figure 4.28: Sustainability Score and DSI of Sikar district

The district sustainability index of Sikar district is 47 percent and is higher than the state sustainability index of Rajasthan.

The technical sustainability score is 70 percent. In 73 percent households the toilet structure is in good condition and functional but only 60 percent households have hand-washing facility. 100 percent households have water within/ near house but water is potable in 73 percent households. In 47 percent households the distance between toilet pit and water source is 10 metres or more.

The socio-economic sustainability score is also 70%.In 67 households all family members use household toilet and 47 percent households properly store and handle water, 87 percent households properly collect and dispose of solid waste and 80 percent properly dispose of wastewater at household level. In 73 percent households all family members wash hands with soap/ash before cooking/eating and after defecation.

The environmental sustainability score is 28 percent. There is one community toilet away from the village and is utilized by the floating population while going to Salasar temple 7KM from the village, in procession during the festivals. The community toilet is not cleaned and remains dirty and unused during the rest of the year. This results in damage to toilet structure as well as pipes and fittings due to which heavy expenditure is incurred by the GP in making the community toilet functional during the festivals. There is no proper system for collection and disposal of solid waste. The solid waste is stacked in heaps in open spaces and on the side of streets. A tractor-trolley is deployed by the GP after every two to three months to collect and transport the solid waste and dump it in the pits away from the GP. There is a partial drainage system for collection and disposal of waste water. The waste water is disposed of in a pond outside the government secondary school posing threat to school campus during rainy season due to flooding of water in the pond. All the hand-pumps in the GP are defunct. The people are getting water from a regional water supply scheme through house water connection. The ground water is highly saline. The hand-pump provided in the senior secondary school campus is functional. The water is safe to drink but very few children drink water from hand-pump. Most of the children drink water from the ground water reservoir provided with taps and is filled by pumping water from a tube well located inside school campus. There is only one toilet without any urinal for 180 girls and one toilet and 10 urinals for 250 boys which are much less than the norms prescribed under SBSV campaign. There is one common toilet and ten urinals for 23 staff members. There is no toilet for female teachers. The *Anganwadi* centre is located in GP office premises but does not have toilet and drinking water facility. The water available in the water pot at *Anganwadi* centre was not safe to drink.

The institutional sustainability score is only 20%. The VWSC is not functional. Only the sub-committee of watershed programme is active. The community is not participating in planning and monitoring of WATSAN activities. None of the external support agency is supporting GP in WATSAN activities. The Occasional arrangements are made by the GP for removing solid waste from the streets and cleaning drains utilizing funds from different programmes as well as mobilizing funds from community and local donors. The funds and staff for planning and implementation of solid and liquid waste management are not available with the GP. The villagers during the FGD expressed urgent need for establishing solid and liquid waste management system to

maintain clean environment in the village. They wanted that the disposal site of waste water presently located outside the school compound should be shifted to a place away from the village. The taken at Magloona are shown at Figure 4.29 and 4.30:

Figure 4.29: PC at Magloona

Figure 4.30: School WT at Magloona

4.3 State Sustainability Index and its categorisation

The district wise sustainability scores of four dimension of sustainability and state sustainability scores are presented in a spider diagram at Figure 4.31:

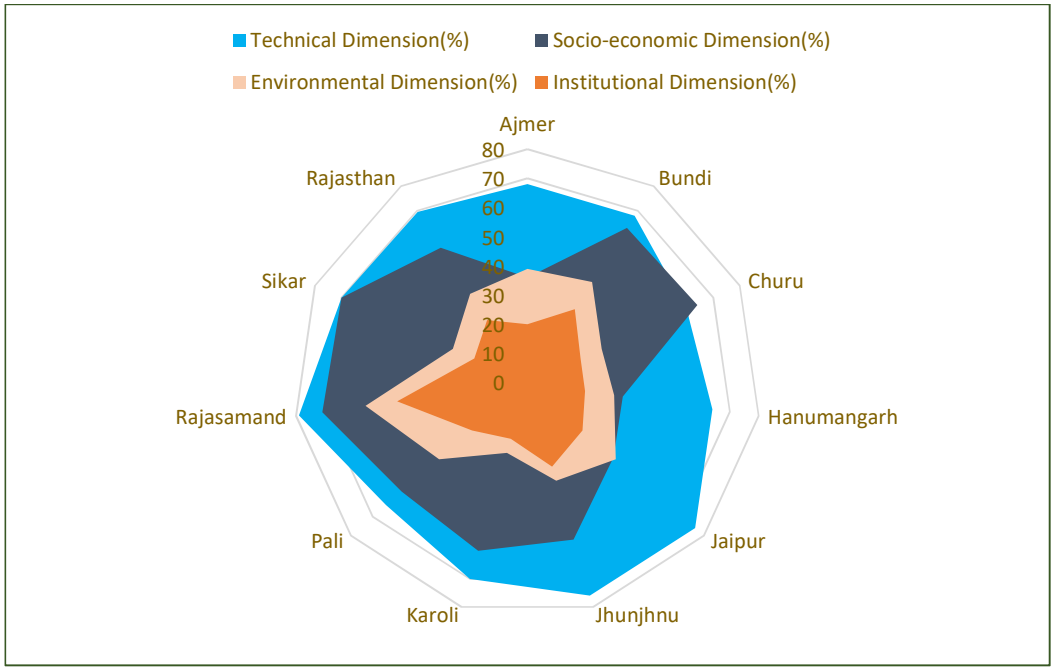

Figure 4.31: State/District wise scores of four dimensions of sustainability

The District wise Sustainability Index for each of the ten districts are presented in a bar chart diagram at Figure 4.32:

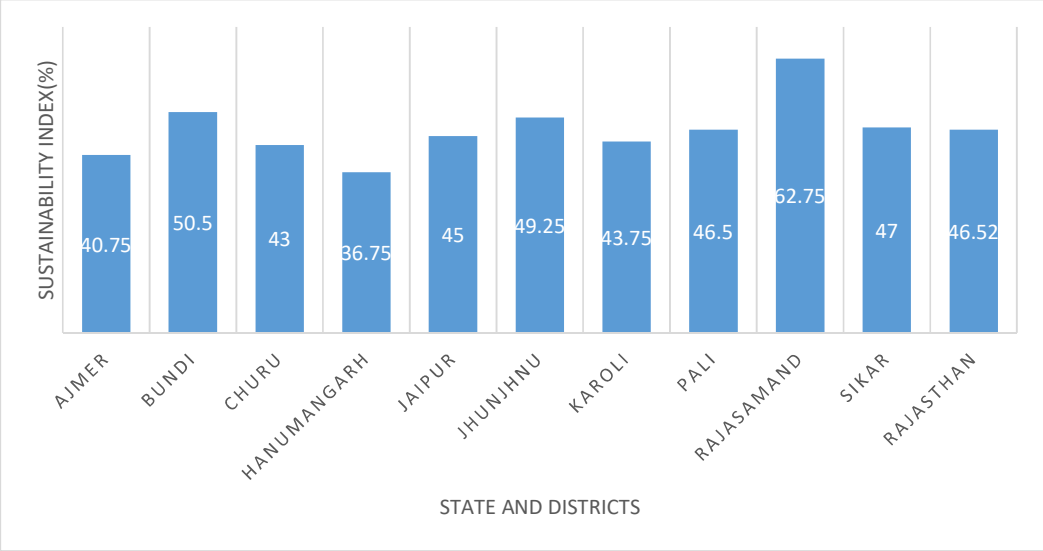

Figure 4.32: District and State Sustainability Index of Rajasthan

4.3.2 The State Sustainability Index (SSI) has been worked out by averaging the district sustainability indices of all the ten districts. The value of SSI is 46.52. State Sustainability Index/ District Sustainability Index (DSI) is based on conceptual framework that perceives sustainability as combination of four interrelated dimensions. SSI/DSI is the absolute account of sustainability. A thorough analysis of the entire index provides the information of the areas where improvement is needed. The SSI/DSI and its four dimensions presented in spider diagram help in understanding the assessment of four dimensions in a single diagram. The measurement of a single sustainability score for the *Nirmal* GPs in Rajasthan is a powerful tool to disseminate results to policy makers, planners, implementers and all the three tiers of PRIs. The information contained in five parameters each of the four dimensions of sustainability helps in finding solutions, developing appropriate strategies and policy guidelines as well as comparisons among *Nirmal Grams*/Blocks/Districts/States. A dimension with higher score contributes more to the Sustainability Index compare to the dimension with lower score. The dimensions with high scores are drivers of sustainability and the dimensions with lower scores are barriers of sustainability. Keeping in view the significance and utility of SSI it has been categorised into four categories as follows:

SSI<50 Low-with High Concern

SSI>50 and <75 Medium- with medium concern

SSI>75 and <100 High with low concern

SSI= 100 Highest with no concern

The above categorization of SSI highlights its importance, expresses concern and draws attention of policy makers, implementers and elected representatives for taking timely remedial measures to achieve the highest sustainability score of *Nirmal* GPs in Rajasthan.

4.3.3 The contributions of four dimensions of sustainability to the state sustainability index and the district sustainability index for each of the ten districts have been worked out in terms of percentage contribution to the respective sustainability index. The contribution of institutional sustainability to SSI is the lowest with 6.37 percent and the technical sustainability is highest with 17.37 percent against the maximum contribution of 25 percent of each of the four dimensions of sustainability. The percentage contribution of each of the four dimensions of sustainability to its respective SSI/DSI for Rajasthan state and the ten districts are presented at Table 4.12 and in bar chart diagram at Figure 4.33:

Table 4.12: State and district-wise percentages of four dimensions contributing to SI

Name of District	Sustainability Index (SI)	Technical Dimension (% of SI)	Socio economic Dimension (% of SI)	Environmental Dimension (% of SI)	Institutional Dimension (% of SI)
Ajmer	40.75	17	9	9.75	5
Bundi	50.5	17	15.75	10.25	7.5
Churu	43	15	16	7	5
Hanumangarh	36.75	16	8.25	7.5	5
Jaipur	36.75	19	9.75	10	6.25
Jhunjhnu	49.25	19	14	8.75	7.5
Karoli	43.75	17.5	15	6.25	5
Pali	46.5	16	14.25	10	6.25
Rajsamand	62.75	19.75	17.75	16	11.25
Sikar	47	17.5	17.5	7	5
Rajasthan	46.52	17.37	13.73	9.05	6.37

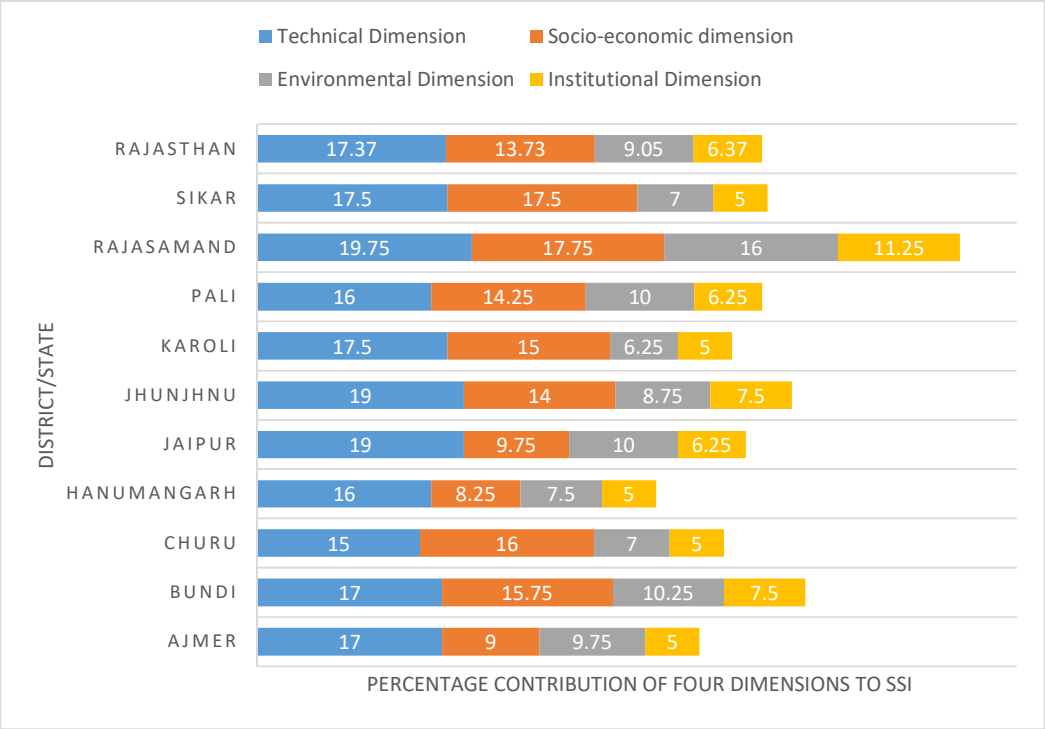

Figure 4.33: State and district-wise percentages of four dimensions contributing to SI

4.4 Prioritization of four dimensions of Sustainability

The SSI of Rajasthan for *Nirmal Gram Panchayats* is 46.52 percent which is categorised as low with high concern needing urgent attention to enhance its value by enhancing the scores of all the four dimensions of sustainability. The factor analysis reveals that institutional dimension has extremely high correlation with its variable and environmental dimension has very high correlation with its variables whereas technical dimension has high correlation with its variables and socio-economic dimension has moderate correlation with its variables. Both institutional and environmental dimensions pertain to GP level whereas technical and socio-economic dimensions pertain to household level. The institutional dimension having the lowest sustainability score (25.5) and highest value of correlation coefficient (0.972) needed highest priority for remedial measures at GP level. The environmental dimension having low sustainability score (36.2) and high value of correlation coefficient (0.878) needed very high priority for remedial measures at GP level. The technical dimension having highest sustainability score (69.5) and high value of correlation coefficient (0.791) needed high priority for remedial actions at household level. The socio-economic dimension having moderate sustainability score (54.9) and moderate value of correlation coefficient

(0.412) needed moderate priority for remedial actions at household level. Table 4.13 shows the priority needed for each of the four dimensions of sustainability:

Table 4.13: Dimension wise priority needed for four dimensions of sustainability

S.No	Sustainability Dimension	Sustainability Score	Correlation coefficient value	Level of priority needed	Action level
1	Institutional(ID)	25.5	0.972	Highest	*Nirmal Gram* Panchayat
2	Environment(ED)	36.2	0.878	Very High	*Nirmal Gram* Panchayat
3	Technical(TD)	69.5	0.791	High	Household in *Nirmal* GP
4	Socio economic(SD)	54.9	0.412	Moderate	Household in *Nirmal* GP

The simultaneous remedial action both at *Nirmal Gram* Panchayat level and household level would enhance the scores of all the four interrelated dimensions of sustainability.

4.5 Analysis of Constraints and Opportunities

4.5.1 The constraints affecting the sustainability of *Nirmal Grams* derived from the rapid assessment of twenty parameters of four dimensions of sustainability are as follows:-

Socio-economic constraints at household level

- Individual household toilets are not used by all the family members in 31.3 percent households.
- Water for drinking and cooking is not stored and handled properly in 77.3 percent households
- All family members do not wash hands before cooking/eating and after defecation in 31.3 percent households.
- Solid Waste is not collected and disposed of properly in 43.9 percent households
- Wastewater is not disposed of properly at household level in 44.6 percent households.

Technical constraints at household level

- In 27.5 percent households toilet structure is not in good condition and non-functional.
- In 40.8 percent households the minimum safe distance of 10 m between the toilet pit and water source is not maintained posing threat to contamination of drinking water.
- In 57.3 percent households the hand-washing facility for washing hands after defecation and before cooking/eating is not available.
- Although water is available within/near house in 100 percent households but water is not potable in 36 percent households.

Environmental constraints at *Nirmal Gram Panchayat* level.

- 90 percent community/institutional toilets in *Nirmal Gram Panchayats* are not functional due to lack of maintenance.
- In 51 percent school/*Anganwadi centres* in *Nirmal Gram Panchayats* the school environment is not clean, the toilets are neither functional nor used by both girls and boys due to lack of maintenance. The number of toilets for boys, girls, male teachers and female teachers are much less than the norms of one toilet unit each for 40 boys and 40 girls, one separate unit each for male teachers and female teachers prescribed under *Swach Bharat Swach Vidyala* campaign.
- In 65 percent *Nirmal Gram Panchayats* proper arrangement for collection and disposal of solid waste has not been established and operationalized.
- In 64 percent *Nirmal Gram Panchayats* proper arrangement for disposal of liquid waste has not been established and operationalized.

Institutional Constraints at *Nirmal GP* level

- In 87 percent *Nirmal* GPs the community participation in planning, implementation, operation & maintenance and monitoring of WATSAN facilities is not there.
- In 70 percent *Nirmal GPs* the funds and staff for operation and maintenance of community toilets and institutional toilets are not available.
- In 67 percent *Nirmal GPs* the technical staff and funds for preparation and implementation of plans for solid and liquid waste management are not available.

- 75 percent *Nirmal GPs* were not able to mobilise funds for planning, implementation, operation and maintenance and monitoring of WATSAN facilities from the external support agencies/local donors.

4.5.2 The following opportunities are available in *Swachh Bharat Mission–Gram*in programme to overcome the constraints (GOI, 2014):

- Administrative and Technical Experts viz. Information, Education and Communication (IEC) and Behaviour Change Communication (BCC), Capacity Building, Technical Supervision, Solid and Liquid Waste Management(SLWM) and Monitoring & Evaluation, can be hired at state, district and block levels.
- *Swachta Doots* (Sanitation Motivators) can be engaged at *Gram Panchayat* level for awareness creation, demand generation and monitoring the implementation of sanitation programme in the *Gram Panchayat*. The GP can engage technical staff who supervise the construction work and train the local masons in construction of household toilets. The operation and maintenance of community sanitary complexes (CSC) rests with the respective *Gram Panchayat*. User families in case of complexes specifically mean for households may be asked to contribute a reasonable monthly user charge for cleaning and maintenance. The maximum support per unit prescribed for a community sanitary complex is Rs. 2 Lakh under *Swachh Bharat Mission-Gramin*. Sharing pattern amongst central government, state government and the community is 60:30:10.The community contribution can be made by the *Gram* Panchayat out of its own resources. For funding the CSC the state may also source additional funds from various source for raising the cost in Public-Private Partnership made for catering the need of operation and maintenance of the CSC.
- The objective of *SBM-G* is to bring about improvement in the cleanliness, hygiene and the general quality of life in rural areas. Solid and Liquid Waste Management (SLWM) is one of the key components of the programme. To create and sustain clean villages it is essential that the IEC intervention focus on SLWM so as to create felt need for these activities among the villages. The total assistance under *SBM-G* for SLWM project is worked out on the basis of total number of households in each GP, subject to a maximum of Rs.7 lakh for a GP having up-to 150 households, Rs.12 lakh up-to 300 households, Rs.15 lakh up-to 500 households and Rs.20 lakhs for GPs having more than 500 households.

Funding for SLWM project under *SBM-G* is provided by the central and state government in the ratio 75:25. Any additional cost is to be borne by the state/GP from other sources like finance commission funding, corporate social responsibility (CSR), *Swachh Bharat Kosh* and through Public-Private Partnership model. Every state should have minimum one SLWM Consultant at the state level and one SLWM consultant in each district. The District water and sanitation mission (DWSM) should guide the preparation of SLWM projects for each GP. The project preparation, supervision and monitoring cost of SLWM project payable to professional agencies may be made a part of the project cost itself. Maintenance cost for the first five years of operation may be made a part of the project cost itself.

- Rural School Sanitation focusing on separate toilets for girls and boys remains a major intervention and is to be implemented under the departments of education. Toilets in *Anganwadi* centres are to be provided by the Department of Women and Child Development. The *Swach Bharat Swach Vidyalay* (SBSV) campaigns, a component of *SBM-Gramin* aims to provide separate toilet for girls and boys as per the norm of one toilet unit each for 40 boys and 40 girls in each School. The implementation of SBSV campaign is through Ministry of Human Resources Development, GOI.
- The capacity of existing resources in the GP like ward members, cooperatives, ASHA *Sahyoginis*, *Anganwadi* workers, Women Groups, Valve man, Pump driver, Community based organizations, Self-help Groups etc. is built in sanitation and hygiene promotion to work as motivators for sanitation.5 percent of total budget is earmarked for IEC Start-up activity and capacity building under *Swachh Bharat Mission-Gramin*.
- Reputed Civil Society Organizations, Self Help Groups (SHGs), NGOs, international, national and local organizations with a proven track record for working in social sector may be involved in IEC/BCC, capacity building, monitoring and implementation.
- National Rural Drinking Water Programme (NRDWP) and *Swachh Bharat Mission- Gramin* should work together to ensure the availability of water in the villages to maximize the use of individual household toilets.

- The state shall develop a tailor made communication strategy, a communication plan and IEC material and train community mobilises to use these materials. In order to bring about the desired behaviour changes for relevant sanitary practices, intensive IEC and advocacy based on inter-personal communication with the participation of one or more of the following *Swachta Doot*, ASHA, ANM, *Anganwadi* workers, NGOs, SHG, Ward members is envisaged. The *Swachhta Doots* can be given a suitable incentive from the funds earmarked for IEC. The incentive can be performance based i.e. in terms of number of households and schools/*Anganwadis* to construct toilet and use them and should continue for one year post construction so that sustainability of toilet usage is ensured.
- Funds available under IEC may be used for imparting hygiene education to the rural communities, general public as well as students in educational institutions and the IEC plan should include a component for raising awareness among students, teachers and parents.
- The incentive amount provided under *SBM-G* to Below Poverty Line (BPL)/Identified Above Poverty Line (APL) households is up-to 12000 for construction of one unit of individual household toilet and providing for storage for hand-washing and cleaning of toilet. A Handbook of technical options for on-site sanitation, issued by Ministry of Drinking Water and Sanitation, GOI provides design specifications of some of the onsite technologies of toilets and may be referred at the website of MDWS- http://www.mdws.gov.in/sites/upload_files/ddws/files/pdfs/Final%20Handbook.pdf. A household sanitary toilet unit comprise of a substructure that safely confines human faeces and eliminate the need of human handling before it is fully decomposed, a super structure, with tanker facility and hand-washing unit for cleaning and hand-washing. The handbook gives the design criteria for various types of household toilets as well as key technological issues in implementing household toilets including the safe distance of 10 metres from drinking water source to toilet pit and is useful for the technical staff and masons as well as the technical experts engaged by PRIs. The force field analysis of opportunities and constraints carried out to overcome the constraints is given at Appendix 6.

4.6 Remedial measures for enhancing SSI

The results of force field analysis of constraints and opportunities reveals that the opportunities are available under *SBM-G* to address all the constraints affecting the sustainability of *Nirmal Grams* assessed during the rapid assessments in ten *Nirmal Gram Panchayats* in ten districts. It is concluded from the results of factor analysis and the forced field analysis that the following remedial measures are necessary at various levels in the order of priority for all the four dimensions of sustainability for enhancing the score of state sustainability index to the highest level to achieve the sustainability of all the *Nirmal Gram Panchayats* in Rajasthan:

Institutional Sustainability

Rural Development and Panchayati Raj Department, GOR should strengthen the three tiers of *Panchayati Raj Institutions* viz. *Gram Panchayat, Panchayat Samiti* and *Jila Parishad* by providing them with adequate funds and skilled functionaries for planning, implementation, operation and maintenance and monitoring of WATSAN interventions at *Nirmal Gram Panchayat* level. The capacity of *Nirmal GPs* should be built in involving and sustaining VWSCs, ensuring community participation, developing plan of actions for mobilising technical/financial support from GOI/GOR/CSR/Donors/UN agencies etc. for implementation of WATSAN interventions, operation and maintenance of community/institutional toilets and maintaining clean environment in the respective *Nirmal Gram Panchayat*.

Environmental Sustainability

State Water and Sanitation Mission (SWSM) and District Water and Sanitation Mission (DWSM) should provide technical support to all the *Nirmal GPs* in developing solid and liquid waste management plans of action for obtaining financial support under *Swach Bharat Mission-Gramin* for their implementation and operationalization. All the *Nirmal* GPs should make their defunct community toilets functional and take the responsibility of their operation and maintenance with active participation of user families. The Education Department, GOR should provide adequate funds for construction of separate toilets for boys and girls, male and female teachers in all the schools as per the norms prescribed under SBSV campaign Handbook based on number of male/female students and teachers in the school. The ICDS should provide adequate fund for construction of child friendly toilets in all *Anganwadi* centres. The VWSC in

each *Nirmal GP* should involve local communities in maintaining the clean environment around community/institutional water supply sources and community sanitation facilities as well as on streets and in open spaces in the GP.

Technical Sustainability

The capacity of elected representatives, technical staff and local masons of all the *Nirmal Gram Panchayats* and the respective *Block Panchayats* should be built in all the aspects of various technological options of household toilet, community toilet, school/*Anganwadi* toilet, hand-washing facility and hand-pump/stand post platform and drainage viz. site selection, ground water pollution, design, construction, use, operation & maintenance and monitoring. *Nirmal Gram Panchayats* should develop, implement and monitor the water quality surveillance and monitoring plan of actions with the technical and financial support from SWSM and DWSM in partnership with CBOs and active involvement of VWSC and local communities. SWSM should review the effectiveness of water supply schemes in all the *Nirmal Gram Panchayats* and take up the up-gradation/improvement of water supply schemes wherever necessary especially in Bikaner division where the villagers are facing acute shortage of potable drinking water, to ensure minimum 55 litres potable water per person per day throughout the year.

Socio-economic Sustainability

SWSM should develop area-specific evidence based cost-effective behaviour change communication strategy with clear and targeted messages for men, women, adolescent and children and also provide adequate funds, technical support and trained motivators to all the *Nirmal Gram Panchayats* for its time bound implementation monitoring and follow-up. All the schools in *Nirmal GPs* should enhance the involvement of school children through child to child, child to parent and child to community communication in disseminating and reinforcing the hygiene education messages as part of School Sanitation and Hygiene Education (SSHE) strategy to ensure that the key hygiene behaviours are practised 365 days per year by hundred percent households in all the *Nirmal Gram Panchayats*.

4.7 Evolving Strategies

Considering the results of rapid assessment of relevant parameters the strategies and policy guidelines for sustained and effectively used and managed WATSAN systems have been evolved.

4.7.1 The results of rapid assessment reveal that it is necessary to overcome the following constraints through appropriate strategies to ensure sustained and effectively used and managed water supply and sanitation facilities in *Nirmal Gram Panchayats*. In order to overcome the constraints and achieve hundred percent result on each parameter of sustained and effectively used and managed water supply and sanitation systems, it is necessary to evolve and implement appropriate strategies. The appropriate strategies evolved for each parameter of sustained and effectively used and managed water supply system (WSS) and sanitation systems (SS) are given at Table 4.14 and 4.15.

Table 4.14: Strategies for sustained and effectively used and managed WSS

SNO	Parameter	Strategies
1	Proper storage and handling of water at household level.	Behaviour Change Communication(BCC) Information Education and Communication(IEC)
2	Maintaining safe distance between toilet and water source at household level.	Capacity Building(CB) Technical support and monitoring(TSM) Information Education and Communication(IEC)
3	Ensuring potable drinking water at household level	Household Water Treatment and safe storage(HWTS) Water Quality Monitoring and Surveillance(WQMS)
4	Proper collection and disposal of solid waste at household level	Behaviour Change Communication(BCC) Information Education and Communication(IEC) School Sanitation & Hygiene Education(SSHE)
5	Proper disposal of waste water at household level.	Behaviour Change Communication(BCC) Information Education and Communication(IEC) School Sanitation & Hygiene Education(SSHE)
6	Ensure potable community water source at GP level	Water Quality Surveillance and Monitoring(WQSM) Information Education and Communication(IEC)

Table 4.15: Strategies for sustained and effectively used and managed SS

S. No	Parameter	Strategies
1.	Toilet in good condition and functional at HH level.	Capacity Building(CB) Technical Support and Monitoring(TSM) Ensuring Supply Chain(ESC)
2	Availability of Hand-washing facility at HH level	Capacity Building(CB) Technical Support and Monitoring(TSM) Ensuring Supply Chain(ESC)
3	All family members wash hands with soap at HH level	Behaviour Change Communication(BCC) Information Education and Communication(IEC) School Sanitation & Hygiene Education(SSHE) Advocacy(AY) Community Education & Participation (CEP) Mobilising Support from External Support Agencies(MSESA)
4	Community/Institutional toilets functional at GP level.	Community Education and Participation(CEP) Public-Private Partnership(PPP) Strengthening Panchayati Institution(SPRI)
5	Well maintained functional/adequate School/Anganwadi toilets for boys, girls and school teachers in use and clean environment	School Sanitation & Hygiene Education(SSHE) Community Education Participation Mobility Support from External Support Agencies
6	Proper system for disposal of solid waste operational at GP level.	Strengthening PRIs Public-Private Partnership IEC Strategy
7	Proper system for disposal of solid waste operational at GP level	Strengthening PRIs Public-Private Partnership IEC Strategy

4.7.2 The strategies evolved at Table 4.14 and 4.15 for ensuring the sustained and effectively used and managed WATSAN systems in *Nirmal Gram Panchayats* in Rajasthan are as follows:-

- Behaviour Change Communication(BCC)
- Information Education and Communication(IEC)
- Capacity Building(CB)
- Technical Support and Monitoring(TSM)
- Household Water Treatment and Safe Storage(HWTS)
- Water Quality Monitoring and Surveillance (WQMS)
- School Sanitation and Hygiene Education(SSHE)

- Ensuring Supply Chain(ESC)
- Community Educational & Participation(CEP)
- Public-Private Partnership(PPP)
- Strengthening Panchayati Raj Institutions(SPRIs)
- Mobilising Support from External Support Agencies(MSESA)

4.7.3 The salient features of each of the thirteen strategies evolved for the sustained and effectively used and managed WATSAN systems are as follows:

4.7.3.1 Behaviour Change Communication (BCC)

The BCC should be area-specific, cost-effective and evidence based with clear and targeted messages for men, women, adolescent and children to trigger behaviour change and demand generation for water and sanitation facilities at all levels viz. household, community, school, *Anganwadi*, health centre and private/public institutions/places to ensure that key hygiene behaviours are sustained at all levels every time and every day. The inter-personal communication (IPC) and home visits are undertaken by the motivators and VWSC members. The BCC should be implemented through trained motivators and with active participation of VWSC, *Gram Panchayat*, and CBO in a time bound manner with the technical support, monitoring and follow up by the DWSM in all the *Nirmal Gram Panchayats* throughout the year. 3.75 percent of each district allocation under *SBM-G* can be utilized at GP/Block and district levels for IEC/BCC/IPC activities and 0.25 percent for state level activities. Girls and women have hygiene and sanitation needs linked to their menstrual cycle. Funds available for IEC/BCC under *SBM-G* can be used to raise awareness, disseminate information and skills on Menstrual Hygiene Management (MHM) among all stakeholders. It is also envisaged under *SBM-G* that the administrative and technical experts viz. BCC and IEC, Capacity Building, Technical Supervision, Solid and Liquid Waste Management and Monitoring and Evaluation should be made available at all the three levels viz. state, district and block to strengthen the implementation and monitoring mechanism of *SBM-Gramin*. The motivator can be given a suitable incentive from the funds earmarked for IEC as decided by State Government. The Water and Sanitation Support Organization (WSSO) set up at the state level having IEC consultants should support the districts in developing, implementing and monitoring the IEC plans. A VWSC should be constituted as sub-committee of *Gram Panchayat* under *SBM-G* for providing support

in motivation, mobilization, implementation, supervision and monitoring of rural sanitation programme. The GP/VWSC can engage *Swachhta Doots* to carry out and be responsible for identification of beneficiaries, assisting in the IEC, maintaining records and tracking programmes at GP level.

4.8.3.2 Information Education and Communication (IEC)

The objective of IEC is to create mass awareness on one or more hygiene behaviours utilizing relevant information, education and communication through different channels of communication viz. Radio, T.V, Newspaper, poster displays, exhibitions and inter-personal communication etc. The IEC is mostly undertaken on the days earmarked to highlight the significance of water, sanitation and hygiene viz. Mahatma Gandhi birthday, World Environment Day, World Water Day, World Toilet Day, Hand-washing Day etc. at the *Gram Panchayat*, Block , District and State level with the participation of PRIs, government officials, field functionaries, NGOs, SHGs, CBOs, Schools, *Anganwadi* centres etc. IEC should strive to bring about community wide behaviour change and to trigger the demand for households toilets, School toilets, *Anganwadi* toilets, community toilets, institutional toilets, hand-washing facilities, solid and liquid waste management systems through provision of information and raising awareness in the community. Once the demand is created and construction of sanitation facilities start the IEC should focus on sustained and effective use of water and sanitation facilities at household and GP level. IEC is not a onetime activity and should be repeated from time to time. 3.75 percent of each district allocation under *SBM-G* can be utilized within GP/Block and district levels for IEC/BCC/IPC activities and 0.25 percent for state level activities.

4.7.3.3 Capacity Building (CB)

Capacity Building is essential for all stakeholders, *Swachta Doots*, Members of PRIs, VWSCs, SHGs, Masons, Motivators, School teachers, *Anganwadi* workers, ASHA *Sahyoginis*, ANM, Staff of CBOs/NGOs for implementing various strategies as well as monitoring water and sanitation facilities and hygiene behaviour at household and GP level. The local masons, plumbers and technical staff of GP/Block Panchayat/DWSM should be trained in construction of toilets, hand pump/stand post platforms, hand washing facilities, community/institutional toilets, School/*Anganwadi* toilets, solid and liquid waste management. The training should cover all the aspects of WATSAN

facilities viz. site selection, ground water pollution, design, construction, use, operation, maintenance and monitoring. The state level training institutes, Key Resource centre (KRCs), district level training institutes, NGOs, CBOs and individual/agencies having experience in capacity building should be utilized for various training programmes at state, district, block and GP level. The SWSM and respective DWSM should monitor the capacity building action plan for each district covering all the *Nirmal GP*. Funds for implementing capacity building action plan could be utilized from the IEC budget up-to 0.75 percent of each district total project cost under *Swachh Bharat Mission-Gramin*. The sharing pattern of expenditure for capacity building is in the ratio of 75:25 between GOI and the GOR.

4.7.3.4 Technical support and monitoring (TSM)

TSM is necessary for ensuring the quality and workmanship of appropriate technology options for construction of household toilets and hand-washing facilities covering all the aspects viz. site selection design of pits, maintaining safe distance of 10 m between pit and water source etc. The technical support is provided to the trained masons during the construction of household toilets and hand-washing facilities. The construction work of household toilet should be supervised and monitored by the technical staff of GP/Block Panchayat/District *Panchayats* in all the *Nirmal Gram Panchayats*. The design of household toilets and hand-washing facilities should consider the needs of people with disabilities in the family so the facilities are utilized by all the family members in the household. The expenditure on the support costs viz. fuel charges, vehicle hire charges, stationary, travel charges, salary of temporary staff should be met from the administrative charges to be utilized annually under *SBM–Gramin*. 2 percent of district budget allocation is earmarked for administrative cost out of which 0.2 percent is for meeting administrative cost at state level and remaining 1.8 percent is for meeting administrative expenses at district/block/GP levels. The administrative charges are not meant for purchasing vehicles, lands, buildings and utilizing funds on other schemes.

4.7.3.5 Household Water Treatment and Safe Storage (HWTS)

Household water treatment and safe storage (HWTS) includes boiling, filtration, chemical, solar and UV lamp disinfection, flocculation for the removal of Turbidity and other techniques. Safe storage minimizes the risk of recontamination, including use of

narrow-mouth, screened and covered containers as well as dispensing devices such as taps or spigots. Safe storage is a must for household water management because improper storage may cause re-contamination of stored water by microbial pathogens nullifying the benefits of effective treatment. Proper handling of water by pouring or using long handle ladle is also essential to prevent recontamination of water. All those households doubtful about their water safety should use HWTS. The HWTS is practised until the households develop the practice of proper storage and handling of water. The simple techniques are boiling water wherever possible as it is a simple way of killing all classes of microbial pathogens. However use of fuel make it costly. Chemical addition measures such as dilute hypochlorite solutions and chlorine tablets require minimal capital investment by consumer and are available in the market. But the problem associated with the use of chlorine tablets/solutions is possibility of chemical odour and taste that some beneficiaries find objectionable therefore all HWTS measures require some user education to ensure that the techniques are properly applied. As many households are unaware of health risk associated with drinking contaminated water, the IEC strategy should emphasize the link of safe water and good health while promoting use of HWTS measures.

4.7.3.6 Water Quality Monitoring and Surveillance (WQMS)

The bacteriological quality of all the community/institutional water sources utilizing H_2S strip vials should be tested on a monthly interval to ensure the water safety at each water source. The surveillance around water sources should be carried out and the surrounding of all the water sources should be kept clean. The bacteriological quality of stored drinking water should be tested in ten percent randomly selected households utilizing H_2S strip vials. The water testing should be carried out both at household and GP level by the trained *Swachhta Doots*/field functionaries. The *Swachhta Doots*/Motivators should also reinforce messages on proper storage and handling of drinking water as well as HWTS strategy to ensure water safety at household level. The *Swachhta Doots*/Motivators should also create awareness on keeping minimum distance of 10 metres between toilet pit and water source and also on proper collection and disposal of solid and liquid waste as envisaged in BCC strategy. The water quality of water sources around which solid waste/excreta/stagnant waste water was found during the surveillance, should be tested again after making the surroundings of water source clean to ensure that water is safe. The *Gram Sarpanch*/Ward members/VWSC

members should monitor the work of *Swachhta Doots* and Motivators from the time to ensure the quality of WQMS. The water quality monitoring and surveillance of all water sources at schools should also be carried out through the trained school teachers and school children on monthly basis as a part of SSHE strategy. The Auxiliary Nurse Midwife (ANM) should also trained on WQMS. The *Anganwadi* worker, ANM and *ASHA Sahyoginis* should undertake WQSM in their respective *Anganwadi* centres and Public health centre/Sub centre to ensure water safety at *Anganwadi* centre and Health sub centre respectively. The IEC material developed should be utilized during hygiene promotion.

4.7.3.7 Advocacy (AY)

Advocacy on the use of household toilet by all the family members every time every day and hand-washing with soap/ash before cooking/eating and after defecation by all the family members every time, every day should carried out at all levels viz. Household, Schools, *Anganwadi* Centres, *Gram Panchayat*, Community Toilets, Health Centres, Sanitary Marts, Market places through interpersonal communication in rallies, exhibition, posters, wall writings, leaflets, village meetings, by the *Swachhta Doots*/Motivators/Ward Members/VWSC members/*Gram* Sarpanch/school teachers/children/AWW/ANM/*ASHA Sahyoginis*/Health Offices/Sanitary Mart managers/masons/*Gram Sevaks*. Special events should be organized in the *Gram* Panchayat on special occasions viz. Toilet day, Hand-washing Day, *Gandhi Jayanti* for creating awareness among the villagers about hand-washing at critical times, using household toilet and stopping open defecation, keeping the village/ schools/ Anganwadi/ public places/open spaces clean. The *Swachhta* rallies by the school children on such occasions help in creating awareness and reinforcing the messages on safe water, sanitation and hygiene. The members from block panchayat and district panchayat should also participate in all such events. The funds available under SBM-G for IEC activities may be used for all advocacy related events/activities.

4.7.3.8 School Sanitation and Hygiene Education (SSHE)

The children are open to new ideas and schools/*Anganwadis* are institutions where behaviour change of children takes place easily. The *Anganwadi* is the centre for delivering the complete package of child development services to children and mothers under the integrated child development services(ICDS).The promotion of sanitation and

hygiene including use of toilets in *Anganwadi* centres helps inculcate good hygiene habits among children from their early years of childhood. The children also act as agents of change and the hygiene education they get in the school from their teachers reaches home through child to child and child to parent communication. They practise the hygiene behaviour which they adopt at school and also influence the community for adopting the hygiene practices at home through child to community communication. Therefore School Sanitation and Hygiene is extremely important for the sustainability of hygiene behaviours at household level. As most of the *Anganwadis* are located in school premises, the school children can promote sanitation and hygiene among young children at the *Anganwadi* centres located in the schools. It is essential that all schools should have separate toilets for girls, boys, male and female teachers as per the norms prescribed under SBSV campaign and at least one teacher in each school and *Anganwadi* worker from each *Anganwadi* must be trained in school sanitation and hygiene education who in turn should train the children through learning by doing activities. The school children should also be involved in advocacy, IEC and BCC on special occasions through rallies, exhibitions, morning processions etc. to promote use of toilets, hand-washing with soap/ash at critical times and create demand for proper disposal of solid and liquid waste maintaining cleanliness at public places and open spaces in the village. The IEC plan of the district should include the cost of School Sanitation and Hygiene Education strategy from the funds allocated under SBM-*Gram*in. Girls and women have hygiene and sanitation needs linked to their menstrual cycle, therefore the IEC plan should also include Menstrual Hygiene Management (MHM) component for raising awareness among all the stakeholders in the *Gram* Panchayat. To ensure availability of sanitary pads the GOR is required to provide sanitary vending machines and women SHGs should be involved in setting up and managing sanitary napkin production centres. The GOR needs to prioritise funds from various sources for construction of toilets in All *Anganwadi* centres on priority basis. The hand-washing facilities should be provided in all schools and *Anganwadi* centres and hand-washing by all children at schools and *Anganwadis* should be practiced before the Mid-day meal is served to them. In order to ensure the success of SSHE strategy the GOR should allocate adequate budget for operation and maintenance of WATSAN facilities in Schools and *Anganwadis* including the cost of soap, detergent, broom, brush etc. necessary for ensuring hygiene practices at all schools and *Anganwadis*.

4.7.3.9 Ensuring Supply Chain (ESC)

It is essential to ensure supply chain for sanitation products and services such as trained masons for construction of toilets, pit emptying etc. In order to ensure good quality toilet construction at household as well as community level it is necessary to maintain the supply chain of all the sanitation products and services close to the community. Therefore the existence of supply chain mechanisms such a rural sanitary marts/ sanitary shops and production centres in/near the GP is extremely important to ensure that household toilets built are of appropriate design and quality and specifications of materials used are also appropriate. The GP should conduct the training of local mason on all the aspects of construction of household /community toilets, hand-washing facility and hand pump/ stand post platform and drainage through the team of trainers assigned by the DWSM. RSM/Sanitary Shop (SS) should keep the list of trained masons as well as the drawings and designs of various technological options of household toilet. The production centre (PC) attached to one or more RSMs should manufacture various items viz. squatting plates, cement concrete rings for leach pits, pit covers, doors, manhole covers, ventilators etc. as per the requirements of RSMs. RSMs/SS should ensure that variety of Water Closet (WC) Pans made of ceramic, fibre glass, cement concrete etc. are available so that the purchasers could buy the WC pans as per their choices. The RSM/PC can be operated by SHGs/Women Groups/CBOs/NGOs etc. The private shop keepers selling sanitation products at the Block /*Gram Panchayats* need to be oriented at block level for maintaining the supply chain by providing variety of sanitation products and services for toilet construction and pit emptying to the households in their respective *Gram Panchayats* and neighbouring *Gram Panchayats*. The quality standards for each sanitation product should be strictly adhered to. An interest free loan of Rs.5 lakh is available for establishing RSM/PC under SBM-G which is recoverable in instalments in 12 to 18 months commencing after one year from the date of receiving the loan.

4.7.3.10 Community Education and Participation (CEP)

In order to ensure sustained and effective use of community WATSAN facilities the CEP is essential. The users should be educated in proper use and maintenance of community WATSAN facilities. If the community WATSAN facilities are to function and used for their design life, the community must participate in planning them. If the

community members are not involved in planning the community water/sanitation facility they do not own it and believe that the agency who built the facility should also operate, maintain and repair the facility. The lack of community education and participation has resulted in the disuse of community toilets in 90 percent *Nirmal Gram Panchayats*. The VWSC members should facilitate the community education and participation to ensure that the people understand the value of community WATSAN facilities and have skills to utilize the facilities correctly and effectively. The community education takes place when the planners of the community water/sanitation facility and VWSC members interact with the people to assess their needs and help them decide the action they have to take to fulfil their needs. The community participation starts when the community takes the ownership of the community water/sanitation facility and prepare their action plan for effectively utilizing and maintaining the facility on long term basis. The planners should not impose upon the community, the technologies which they believe to be appropriate. The imposed technologies are soon rejected by the people because they have their own perceptions of what is appropriate and that was one of the major reasons behind non-functional community toilets in 90 percent *Nirmal Gram Panchayats* in Rajasthan. If a community water/sanitation facility not a felt need of the community, the GP and VWSC members should continue the CEP process to create a felt need before taking up the construction of new facility.

4.7.3.11 Public-Private Partnership (PPP)

PPP is partnership between public authorities and private sector which aim to ensure the long term funding for construction, renovation, operation and maintenance and management of community WATSAN facilities including management of solid and liquid waste at *Gram Panchayat* level. The private agency is contracted to design and built the community toilet for which the funds are provided by the *Gram Panchayat*. The community toilet is owned by the *Gram Panchayat* and the responsibility of its operation and maintenance is given to private agency. The private agency takes up the operation and maintenance of community toilet and collect user's charges to meet the operation and maintenance expenditure and earn some profit. The arrangement of water supply and electricity should be made by *Gram Panchayat*. Similarly the design and execution work of solid and liquid waste management (SLWM) systems are carried out by the private agency. The ownership of the SLWM system remains with the *Gram Panchayat* and the responsibility of its operation and maintenance is given to the private

agency on long term basis. The private agency recovers the cost of operation and maintenance with some profit by selling the treated solid waste and waste water as well as the compost from solid waste for agriculture. The waste stabilization ponds are a low cost low maintenance but high efficiency system, and for waste water reuse this high efficiency related to their very high removal excreted pathogens. The resource recovery and reuse (RRR) enhances food security and contribute to cost recovery in the sanitation chain. The financially viable approaches to RRR focussing on waste water treatment to get valuable resource for safe reuse can be adopted in *Nirmal Gram Panchayats*. There is provision under *SBM-G* that the PPP may be adopted to cater to the need of operation & maintenance of community Toilet complexes and operationalizing SLWM in the GPs.

4.7.3.12 Strengthening PRIs (SPRIs)

73rd constitutional amendment Act, 1993 gives powers and functions for managing water bodies/water supplies and sanitation to *Gram Panchayats*. Creation of *Swachh GPs* incorporating ODF status and SWLM is the Goal of *Swachh Bharat Mission-Gramin*. Each and every GP should ensure that *Swachh* Status is sustainable. Each GP is responsible for planning, implementation, maintenance and monitoring of WATSAN interventions including water quality monitoring and sustaining toilet usage. The GP supervise and guide VWSC in the execution of WATSAN interventions. The GP ensures convergence of various programmes viz. health, education, child development by various government agencies. The GP is responsible for operation and maintenance of School/*Anganwadi*/Community toilets as well solid and liquid waste management within the jurisdiction of *Gram Panchayat*. In order to perform so many functions related to WATSAN there is a need to strengthen the GP by providing adequate funds and functionaries. The functionaries need to be trained to acquire necessary skills for efficiently carrying out the functions assigned to them. Similarly the other two tiers of PRIs viz. Block Panchayat and District *Panchayats* should also be strengthened by providing adequate funds and skilled functionaries to support and monitor the work of *Gram Panchayats* and Block *Panchayats*.

4.7.3.13 Mobilising Support from External Agencies (MSEA)

There are several external support agencies viz. UN agencies, International NGOs, National NGOs, Corporate Sector, Private Entrepreneurs, and Bilateral Funding

Agencies who are supporting water, sanitation and hygiene interventions in rural and urban areas of the country. The *Gram Panchayats*, Block *Panchayats* and District *Panchayats* with the support of DWSM/SWSM/State Government should mobilise financial and technical support from these agencies especially in the area of community toilets, solid and liquid waste management, water quality surveillance and monitoring, advocacy, strengthening PRIs, School sanitation and Hygiene, Household water treatment and storage, capacity building, Public-Private Partnership etc. so as to overcome the constraints affecting the sustainability of *Nirmal Gram Panchayats*. The support could be mobilised for WASH interventions from the corporate sector under their corporate social responsibility of supporting various rural development programme in their adopted villages. The financial support could also be mobilised from the respective Member of Parliament and Member of legislative Assembly for implementing solid and liquid waste management systems in the GPs covered under their constituencies.

4.7.3.14 Ranking of Strategies

The ranking of strategies has been done taking into account the number of constraints overcome by each strategy. The strategy that addresses more constraints get higher ranking. The ranking of strategies is shown in a bar chart at Figure 4.34:

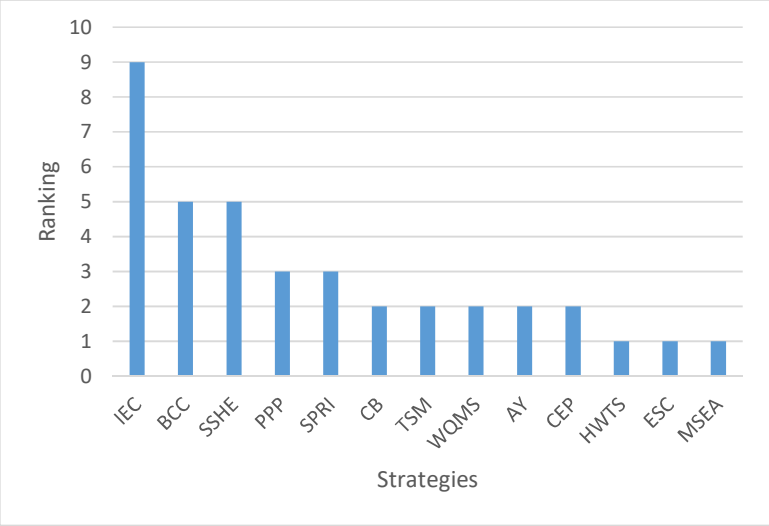

Figure 4.34: Ranking of strategies evolved to overcome the constraints

4.8 Remedial Measures to overcome Institutional Constraints

The institutional Constraints (ICs) assessed during the rapid assessments in ten *Nirmal* GPs in ten districts of Rajasthan and remedial measures to overcome the ICs are given at Table 4.16:

Table 4.16: ICs and remedial measures to overcome ICs

S.NO	Institutional Constraints	Responsible Institutions	Remedial Measures
1.	VWSCs are not active/functional in 87 percent *Nirmal* GPs	Gram Panchayat Communication and Capacity Development Unit	Training of Gram Sarpanchs and Ward Members in activating VWSCs by CCDU
2.	Community Participation in planning and monitoring of WATSAN facilities is missing in 72 percent in *Nirmal* GPs.	Gram Panchayat B W S M DWSM CCDU WSSO	Capacity Building of GPs/ BWSM/DWSM members in CEP by the CCDU and WSSO
3	No support from ESAs in Execution and O&M of WATSAN facilities in 75 percent *Nirmal* GPs.	Gram Panchayat BWSM DWSM SWSM CCDU WSSO State Institute of Rural Development	Capacity building of GPs BWSM,DWSM and SWSM in mobilising funds from ESAs by CCDU/WSSO
4.	Staff & Funds for O&M community/Institutional WATSAN facilities not available in 70 percent GPs.	GOR SWSM DWSM BWSM GP	GOR to provide funds and functionaries to GPs. SWSM/DWSM to facilitate release of funds and sanctioning of staff by GOR. BWSM/GP to mobilize funds through PPP.
5.	Plans and funds for implementation and management of SLWM system not available in 67 percent GPs.	GOR SWSM DWSM BWSM GP	GOR to provide funds for SLWM. SWSM/DWSM to facilitate preparation of plans of SLWM. BWSM/GP to mobilise funds through PPP.

4.9 Policy Guidelines

The policy guidelines have been evolved for sustained and effectively used and managed WATSAN systems taking into account the strategies and remedial measures to overcome all the constraints are as follows:

4.9.1 The institutional framework for implementation of *Swachh Bharat Mission-Gramin* (*SBM-G*) is as under:

National: The National Swachh Bharat Mission has been set up at the MDWS, GOI, New Delhi. The Secretary to the GOI is the Mission Director assisted by the Joint Secretaries, Directors, Technical Advisors and Consultants. The National Mission has three units viz. Communications National Resource Centre, and Monitoring & Evaluation.

Rajasthan state: State Water and Sanitation Mission. It has Apex Committee, Executive Committee of Sanitation, Programme Monitoring Unit and Sanitation Support Organization (PMUSSO) and Communication and Capacity Development Unit (CCDU) and Water Sanitation Support Organization (WSSO).

Disrict: *Jila Parishad* functions as District Water and Sanitation Mission (DWSM) and has the overall responsibility of implementation and coordinates with SWSM.DWSM is supported by District Water and Sanitation Committee (DWSC).

Block: *Panchayat Samiti* functions as Block Water & Sanitation Mission (BWSM) and is supported by the Block Water & Sanitation Committee (BWSC). The BWSM is responsible for planning, implementation and monitoring of Water and Sanitation Programmes. BWSM coordinate with DWSM and GP.

Gram Panchayat: *Gram Panchayat* is responsible for planning, implementation, maintenance of rural sanitation/water supply interventions and is supported by VWSC. The GP converges with the programme implemented by Education, Health, Child Development, PHED etc. The GP is responsible for execution and O&M of community and institutional sanitation facilities, solid and liquid waste management and accountable for sustainability of *Nirmal Gram Panchayats*. The GP coordinates with VWSC and BWSM.

VWSC: Is a sub-committee of GP and ensures community participation and is responsible for advising GP and supervise the work related to rural water supply and sanitation in addition to BCC/IEC activities and O&M of community WATSAN facilities.

The responsibilities of PMUSSO, CCDU, WSSO, State Institute of Rural Development (SIRD) and key Resource Centres (KRCs) supporting the SWSM and DWSMs are as follows:

PMUSSO: Supports the planning and monitoring of rural sanitation programme and assist SWSM, Apex committee and Executive Committee of Sanitation.

Key Resource Centres (KRCs): These are institutions recognized by the National *SBM-Gram*in having experts in the field of water, sanitation and hygiene. The KRCs are located in various states and are utilized by the SWSM/DWSM for imparting trainings in water, sanitation and hygiene to their functionaries.

WSSO: It is the lead agency for rural water supply and guided by National Rural Drinking Water Programme (NRDWP) and supports IEC, Human Resource Development, and capacity building related to planning and implementation of rural drinking water including water quality monitoring and water testing.

CCDU: Organises trainings of elected representatives and government functionaries on programme implementation policies and procedures. Also undertakes capacity building and awareness creation for officials at state, district and block levels.

State Institute of Rural Development (SIRD): Undertakes mostly state/national level trainings/workshops for Senior Officials of the State Government, NGOs, KRCs and trainers.

4.9.2 Within the institutional framework for implementation of *SBM-Gram*in and the availability of funds to the SWSM and DWSM the following strategies are to be implemented to ensure the sustainable and effective use and management of WATSAN facilities in 326 *Nirmal Gram Panchayats* in 28 districts of Rajasthan.

- Behaviour Change Communication
- Information Education and Communication
- Capacity Building
- Technical Support and Monitoring
- Household Water Treatment and Safe Storage
- Water Quality Monitoring and Surveillance
- Advocacy
- School Sanitation and Hygiene Education
- Ensuring Supply Chain
- Community Education and Participation
- Public-Private Partnership
- Strengthening Panchayati Raj Institutions
- Mobilising Support from External Agencies.

4.9.3 The *SBM-G* provides flexibility to the states in implementation and the states can adopt strategies considered most appropriate for them. The outcome parameters of *SBM-Gramin* include reduction in open defecation, achievement of ODF villages and

improvement of SLWM. The implementation responsibility and budget provision for implementation of all the thirteen strategies are given at Table 4.17:

Table 4.17: Strategy-wise Implementation Responsibilities & Budget Heads

S No	Strategy	Responsible Agencies	Budget Head
1	BCC	DWSM,GP,VWSC,CCDU	IEC
2	IEC	DWSM,GP,VWSC,CCDU	IEC
3	CB	SWSM, DWSM, KRCs, SIRD,CCDU,WSSO	IEC
4	TSM	Zila Parishad, Block Panchayat, GP,VWSC	Admin. Cost
5	HWTSS	Block Panchayat, GP, VWSC, Households	IEC Household contribution
6	WQMS	SWSM,DWSM,BWSM,GP,VWSC,WSSO	NRDWP
7	AY	SWSM,DWSM,WSSO,CCDU,GP,VWSC	IEC
8	SSHE	Education Department, ICDS,DWSM,GP,VWSC, School Teachers/children	SBSV Campaign IEC
9	ESC	BWSM,GP,VWSC,RSMs,PCs,Masons	Revolving Fund for RSMs/PCs
10	CEP	VWSC,GP	IEC
11	PPP	GP, BWSM, DWSM, SWSM, Private Agency	SLWM funds, community toilet funds, Private agency's fund
12	SPRIs	SWSM, KRC, SIIRD, State Government	IEC funds
13	MSEA	GP, Block Panchayat, Jila Parishad	Funds provided by ESA

4.9.4 The financial support could also be mobilized for operationalizing existing community/institutional toilets and establishing SLWM through other Government programmes wherever possible.

- MGNREGA
- Rashtriya Madhymik Shiksha Abhiyan (RMSA)
- 13th Finance Commission
- Sarva Shiksha Abhiyan (SSA)
- ICDS
- Mid-Day meal Scheme
- Kasturba Gandhi Balika Vidyalaya (KGBV)

- National Biogas and Manure Management Programme
- National Project on Organic Farming
- PHED
- NRDWP

4.9.5 The financial/technical support could be mobilized from National/International NGOs, UN agencies supporting WATSAN interventions, corporate sector under their CSR programme. The loans could be obtained from the banks for the additional cost of SLWM system provided the SLWM project has inbuilt business model of earning profit from the treated waste. The community should be educated and encouraged to adapt 3Rs (Reduce, Recycle and Reuse) system for collection and disposal of Solid Waste at household level to reduce the treatment cost of community SLWM system and to get health benefits, economic benefits and aesthetic benefits. The drainage improvements around the existing community drinking water sources could be carried out through the PHED from the funds available with them for operation and maintenance of water supply systems to ensure availability of potable water from the community water sources.

4.9.6 The following national legislation relevant to rural WATSAN could also help in environmental management in *Nirmal Gram Panchayats* in Rajasthan:

National Water Policy, 2012 is on management of water resources and highlights that improved rural sanitation will have positive impact on human health.

National Environment Policy, 2006 gives overall guidance on environment management and highlights the poor sanitation creates environmental degradation.

Water (Prevention and Control of Pollution) Act, 1974 relates to enforcement of water quality and effluent standards by Rajasthan State Pollution Control Board.

Wetland (Conservation and Management) Rules 2010 are on protection and management of wetlands and prohibits waste dumping, material sourcing and construction in and near wetlands.

Sixth Schedule Article 244(2) and 275(1) of the India constitution authorise the Regional/District Council in identified areas to manage non-reserved forests, public health and sanitation helping the PRIs to plan and implement WATSAN interventions.

Disaster Management Act, 2005 provides for disaster prone areas codes of construction, disaster relief codes and relief & rehabilitation. The *Nirmal GPs* may mobilise funds for rehabilitation of households and community WATSAN facilities damaged due to floods.

73rd constitutional amendment transfers powers and functions for managing water bodies/water supplies and sanitation to *Gram Panchayats* for local level planning to ensure economic development and social justice.

Panchayat Extension to Schedule areas (PESA) Act, 1996 gives special powers to the PRIs in predominant tribal areas notified under Schedule V of the constitution. It also empowers the people to decide for their development. *Gram Panchayat* is the competent Authority to safeguard the traditions and customs of people and their cultural identity in planning and implementation of WATSAN facilities.

Schedule Tribes and other traditional forest dwellers act, 2006 recognises the traditional rights of forest dwellers, schedule tribes and particularly vulnerable groups to access services and create structures required for their use including individual and community toilets.

Mahatma Gandhi National Rural Employment Guarantee Act 2005 provides for the entire implementation of MGNREGA works right from demand generation to planning and implementation of WATSAN interventions.

Right to Information Act, 2005 provides opportunity to all citizens to keep an eye on the instruments of governance, promote transparency and accountability in the government programmes including WATSAN.

Employment of manual Scavengers and construction of Dry Latrines (Prohibition) Act, 1993 and the Prohibition of Employment as manual Scavengers and their rehabilitation Act 2013 give boost to construction of hygienic toilets in place of dry latrines and completely abolish the manual scavenging.

4.10 Institutional Development for Environmental Management

In order to address the constraints due to lack of proper operation and maintenance of community/institutional toilets and absence of SLWM system the following actions are required for institutional development at GP, Block and district level:

Developing guidance material and IEC material dealing with environmental sanitation, community toilet options, Institutional Toilets in Schools & *Anganwadis* and Health centres, various technology options of solid and liquid waste management, various technology options of household toilet, drainage improvement around hand pumps, hygiene education, water quality monitoring and surveillance etc. in Hindi language and making it available in all the *Gram Panchayats*, *Block Panchayats*, *District Panchayats* and SWSM at state level. In addition to the guidance material the area specific detailed manuals with drawings, designs, norms and photographs on household toilet options, Community toilet options, School/*Anganwadi*/Health centre toilet options. Solid and liquid waste management options need to be developed and disseminated in all the GPs, *Block Panchayats* and *District Panchayats*.

The capacity of staff, masons, plumbers, contractors, RSM Managers , *Swachhta Doots,* VWSCs, Ward Members involved in planning and implementation of WATSAN interventions need to be strengthened. There is inadequate skilled staff in *Gram Panchayats* to handle WATSAN interventions including water quality monitoring and surveillance. Therefore the skilled staff should be provided to the *Gram Panchayats* and the capacity of existing staff should be built to effectively implement and monitor the programme.

The monitoring of WATSAN interventions should be carried out weekly by the VWSC and timely corrective actions should be taken. The VWSC should meet every month and discuss issues related to sustainability of WATSAN system and hygiene behaviours plan and implement BCC and IEC activities with the participation of the community, *Swachhta Doots* and field functionaries. The Evaluation of WATSAN interventions should be carried out through an external agency once in a year.

Chapter 5

Conclusion

5.1The findings of the research reveals that the State Sustainability Index (SSI) of Rajasthan is 46.52 which is categorised as low (<50 percent) and therefore is of high concern needing urgent attention of implementers and policy makers. The factor analysis reveals that the institutional dimension having lowest sustainability score and highest value of correlation coefficient needs highest priority, and the environmental dimension having low sustainability score and very high correlation coefficient needs very high priority for remedial measures at the *Gram Panchayat* level. Similarly the technical dimension having high sustainability score and high correlation coefficient needs high priority, and the socio-economic dimension having moderate sustainability score and moderate correlation coefficient needs moderate priority for remedial actions at the household level. The simultaneous remedial measures both at the *Gram Panchayat* level and the household level would enhance the sustainability scores of all the four dimensions of sustainability. The results of force field analysis of constraints and opportunities reveals that the opportunities are available under *Swachh Bharat Mission-Gramin* to address the constraints assessed during the rapid assessment of *Nirmal Gram Panchayats*. It is concluded from the results of the factor analysis and forced field analysis that the following remedial measures are necessary at various levels in the order of priority for all the four dimensions of sustainability to enhance the score of state sustainability index and achieving the sustainability of *Nirmal Gram Panchayats* in Rajasthan:

5.1.1 Institutional Sustainability

Rural Development and Panchayati Raj Department, Government of Rajasthan should strengthen all the *Nirmal Gram Panchayats* by providing them with adequate funds and skilled functionaries for planning, implementation, operation & maintenance and monitoring of WATSAN facilities. The capacity of *Nirmal Gram Panchayats* should be built in; involving and sustaining VWSCs, ensuring community participation, developing plans of action for mobilising technical/financial support from Government of India/Government of Rajasthan/Corporate Social Responsibility/UN agencies etc. for implementation of WATSAN interventions, operation and maintenance of

community/institutional toilets, solid and liquid waste management and maintaining clean environment.

5.1.2 Environmental Sustainability

State Water and Sanitation Mission (SWSM) and District Water and Sanitation Mission (DWSM) should arrange to provide technical support to all *Nirmal GPs* in developing their solid and liquid waste management plans of action for obtaining financial support under *Swachh Bharat Mission-Gramin* for their implementation and operationalization. All the *Nirmal GPs* should make their defunct community toilets functional and take the responsibility of their operation and maintenance with active participation of user families .The Education department Government of Rajasthan should provide adequate funds for construction of separate toilets for boys and girls, male and female teachers as envisaged in *Swach Bharat Swach Vidyala* campaign .The VWSC in each *Nirmal GP* should involve local communities in maintaining clean environment around community/institutional water supply sources and sanitation facilities as well as street and open spaces.

5.1.2 Technical Sustainability

The capacity of elected representatives, technical staff and local masons of all the *Nirmal GPs* and respective *Block Panchayats* should be built in all the aspects viz. site selection, ground water pollution, design, construction, use, operation and maintenance and monitoring of various options of household toilets, community toilets, hand-pump/stand post platforms and hand-washing facilities. All the *Nirmal GPs* should develop, implement and monitor the water quality surveillance and monitoring plans of action, with the technical and financial support from SWSM and DWSM in partnership with Community Based Organization and active involvement of Village Water & Sanitation Committee. SWSM should review the effectiveness of water supply schemes in all the *Nirmal GPs* and take up the up-gradation/improvement of water supply schemes wherever necessary especially in Bikaner division facing acute shortage of drinking water to ensure supply of minimum 55 litres water per day per person.

5.1.3 Socio-economic Sustainability

SWSM should develop area specific cost-effective evidence based behaviour change communication strategy with clear and targeted messages for men, women, adolescent

and children and also provide adequate funds, technical support and trained motivators to all the *Nirmal GPs* for its time bound implementation and follow up. All the schools in *Nirmal GPs* should enhance the involvement of their school children through child-to-child, child-to-parents and child-to-community communication in disseminating and reinforcing hygiene education messages as part of School Sanitation and Hygiene Education (SSHE) strategy to ensure that the key hygiene behaviours are practised 365 days per year by hundred percent households in all the *Nirmal Gram Panchayats*.

5.2 Strategies for sustainable management in *Nirmal Grams:*

The following strategies are needed to address constraints and ensure sustained and effectively used and managed water supply and sanitation systems in *Nirmal GPs*:

- Behaviour Change Communication
- Information, Education and Communication
- Capacity Building
- Technical Support and Monitoring
- Household Water Treatment and Safe Storage
- Water Quality Monitoring and Surveillance
- Advocacy
- School Sanitation and Hygiene Education
- Ensuring Supply Chain
- Community Education and Participation
- Public-Private Partnership
- Strengthening Panchayati Raj Institutions
- Mobilising Support from External Agencies

These strategies could be implemented through the organisations/institutions responsible for the implementation of *Swachh Bharat Mission-Gramin* at State, district, block and GP level as the National *Swachh Bharat Mission-Gramin* provides flexibility to the states in implementation and the state can adopt strategies considered most appropriate for them. Apart from the funds earmarked under *Swachh Bharat Mission-Gramin* the financial support could be mobilised through other Government Programmes and external support agencies. The environmental management in *Nirmal GPs* could be achieved through development and dissemination of relevant guidance material in Hindi language, strengthening

Panchayati Raj Institutions and regular monitoring of WATSAN interventions by the Village Water and Sanitation Committees and annual assessments through an external agency as well as enforcing relevant legislations.

5.3 The following five areas of further research have emerged from this research:

- Assessment and development of result based behaviour change communication strategy for improving and sustaining hygiene behaviours at household and community level in Nirmal Gram Panchayats.
- Assessment and development of household technology options for excreta disposal for ensuring water safety at household level by preventing the contamination of water source from the leach pit effluent.
- Assessment and development of socially acceptable and affordable community managed options for solid and liquid waste management for Nirmal Gram Panchayats.
- Assessment of the existing capacities and resources of all the three tiers of Panchayati Raj Institutions viz. District Panchayat, Block Panchayat & Gram Panchayat and development of these institutions for effective environmental management in their respective Gram Panchayats.
- Assessment and development of relationship between the sustainability and human health in terms of reduction in water borne diseases and improvement in nutritional status of children in Nirmal Gram Panchayats.

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Appendix 1

Ministry of Drinking Water and Sanitation
Nirmal Gram Puraskar 2012-13

List of Awarded GPs Year :- ALL YEARS

SL.No.	State Name	District Name	Total Awarded GPs
1	RAJASTHAN	AJMER	1
2	RAJASTHAN	ALWAR	12
3	RAJASTHAN	BARAN	2
4	RAJASTHAN	BHARATPUR	2
5	RAJASTHAN	BHILWARA	18
6	RAJASTHAN	BIKANER	51
7	RAJASTHAN	BUNDI	2
8	RAJASTHAN	CHITTAURGARH	3
9	RAJASTHAN	CHURU	19
10	RAJASTHAN	DHAULPUR	1
11	RAJASTHAN	DUNGARPUR	5
12	RAJASTHAN	GANGANAGAR	80
13	RAJASTHAN	HANUMANGARH	21
14	RAJASTHAN	JAIPUR	3
15	RAJASTHAN	JAISALMER	2
16	RAJASTHAN	JALOR	5
17	RAJASTHAN	JHALAWAR	3
18	RAJASTHAN	JHUNJHUNU	5
19	RAJASTHAN	JHUNJHUNUN	30
20	RAJASTHAN	JODHPUR	10
21	RAJASTHAN	KARAULI	5
22	RAJASTHAN	NAGAUR	11
23	RAJASTHAN	PALI	4
24	RAJASTHAN	RAJSAMAND	6
25	RAJASTHAN	SIKAR	18
26	RAJASTHAN	SIROHI	3
27	RAJASTHAN	TONK	1
28	RAJASTHAN	UDAIPUR	3
Total :-			**326**

*** Few NGP awarded GPs may have been urbanised**

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Appendix 2

APPENDIX 2

Calculations for Sample Size and Confidence Interval

Average population per village for ten districts selected for rapid assessment=1354

Average Household Size=5.38

Total Households randomly selected in each of the ten Nirmal Gram=150 Nos

Total estimated population of 150 households is 150x5.38= 807

Percentage population to be covered in 10 Nirmal Grams is (807÷13540)*100=6

The family members to be interviewed and household WATSAN facilities to be visually inspected in 6% randomly selected households in each Nirmal Gram.

The confidence interval considering 6 percent sample size can be worked out as follows:

Sample Size (SS) = Z^2 X p X (1-p)/C^2

C=Confidence Interval or Margin of Error

Z at 95% Confidence Level is 1.96

P= percentage picking choice=0.5

C^2= $(1.96)^2$x0.50x0.50x100/6

C=4%

Thus the 4% confidence interval or margin of error with 6 percent sample size is reasonable. The confidence level of 95% represents the population who would pick up an answer that lies within confidence interval or margin of error of 4%.The percentage picking size is used as 50% i.e. the worst case for determining the sample size for given level of accuracy.

Appendix 3

घरेलू सर्वेक्षण प्रशानवली

जिले का नामः | उपखण्ड का नामः | ग्राम पंचायतः

ग्रामः | गृह का क्रमांकः | पताः

क्षेणीः गरीबी रेखा से नीचे/ऊपर | जातिःअनुसूचित/जन/अन्यपिछडी/साधारण जाति | परिवार के सदस्यों की संख्याः

प्रश्न–1 क्या आपके घर शौचालय है? ☐ हाँ ☐ नही

प्रश्न–2 शौचालय नही बनवाने के क्या कारण है?

☐ आर्थिक ☐ जल की कमी ☐ स्थान की कमी

☐ प्राथमिकता नहीं ☐ खुले में शौच जाना पसंद करते है ☐ सांस्कृतिक

☐ अन्य कारण (उल्लेख करे.....
.....)

प्रश्न–3 क्या भविष्य में आपकी अपने घर में शौचालय बनवाने की कोई योजना है?

☐ हाँ ☐ नहीं

प्रश्न–4 यदि प्रश्न 3 का उत्तर हाँ हो तो, आप के द्वारा घरेलू शौचालय बनवाने के क्या कारण है?

☐ निजी गोपनीयता ☐ सम्मान ☐ सुरक्षा ☐ अच्छा स्वास्थ्य

☐ सामाजिक दबाव ☐ उच्च स्तर ☐ सुविधा

☐ अन्य कारण (उल्लेख करे.....)

प्रश्न–5 आपने शौचालय निर्माण हेतु धन राशि की व्यवस्था किस प्रकार से की है?

☐ स्वयं के धन से ☐ पूर्ण राजकीय सहायता से

☐ स्वयं की धनराशि एवं राजकीय सहायता से ☐ ऋण लेकर

☐ किसी परियोजना के अन्तर्गत ☐ अन्य स्त्रोत (उल्लेख करे.

.....)

प्रश्न–6 राज्य सरकार की किस योजना के अन्तर्गत आपने आर्थिक सहायता प्राप्त की?

☐ स्वच्छ भारत मिशन ☐ संपूर्ण स्वच्छता अभियान

☐ एमजी नरेगा ☐ अन्य (उल्लेख करे.....

.....)

प्रश्न–7 राज्य सरकार द्वारा प्राप्त धनराशि शौचालय निर्माण की लागत का कितने प्रतिश है?

☐ ढ 25: ☐ 25–50: ☐ 50–75:

☐ 75–99: ☐ 100:

प्रश्न–8 आपने किस प्रकार के शौचालय का निर्माण करवाया है?

☐ सूखे गड्डे वाला शौचालय ☐ एक गड्डे वाला जलबंध शौचालय

☐ दो गड्डो वाला जलबंध शौचालय ☐ सेप्टीक टेंक वाला शौचालय

☐ अन्य (उल्लेख करे.....

.....)

प्रश्न–9 आपने शौचालय निर्माण हेतु सामान कहां से खरीदा है?

☐ स्वच्छता केन्द्र ☐ सामान बेचने वाले दुकानदार से

☐ अन्य (उल्लेख करे.....

.....)

प्रश्न–10 आपने शौचालय निर्माण हेतु राजमिस्त्री एवं बेलदार कहां से प्राप्त किये?

☐ इसी ग्राम पंचायत से ☐ स्वच्छता केन्द्र से ☐ सामान बेचने वाले से

☐ अन्य (उल्लेख करे .....

..)

प्रश्न–11 क्या आपके घर पर जल स्त्रोत्र/संबंध है? ☐ हाँ ☐ नही

प्रश्न–12 यदि नहीं तो पानी कहां से लाते है?

☐ हैंड पंप ☐ पीएसपी ☐ सामुदायिक केन्द्र ☐ कुआं

☐ अन्य (उल्लेख करे .....
..)

प्रश्न–13 जल स्त्रोत से शौचालय की दूरी क्या है?

☐ बहुत करीब है ☐ 10 मीटर से कम ☐ 10 मीटर से अधिक

प्रश्न–14 क्या सभी परिवार के सदस्य सदैव शौचालय का प्रयोग करते है? ☐ हाँ

☐ नही

प्रश्न–15 यदि आप सब सदैव शौचालय का प्रयोग नही करते तो कब–कब खुले में शौच जाते है?

☐ प्रतिदिन ☐ कभी–कभी ☐ मुश्किल से कभी

प्रश्न–16 शौचालय को उपयोग मे न लेने के क्या कारण है?

☐ साफ नही है ☐ सुविधाजनक नहीं है ☐ जल का अभाव

☐ बिजली नहीं है ☐ दरवाजा नहीं है ☐ अनुपयोगी है

☐ खुले में शौच जाना अधिक सुविधाजनक है ☐ अन्य (उल्लेख करे .....
.....)

प्रश्न–17 क्या परिवार के सदस्य खाना बनाने/खाने से पूर्व एवं शौच जाने के बाद हाथ धोते है?

☐ हाँ ☐ नही

प्रश्न–18 यदि प्रश्न–16 का उत्तर हाँ हो तो आप हाथ किस प्रकार से धोते है?

☐ केवल पानी से ☐ पानी एवं साबुन से ☐ पानी एवं राख से

☐ पानी एवं मिट्टी से ☐ अन्य पदार्थ से (उल्लेख करे.....

.....)

प्रश्न–19 यदि प्रश्न– 16 का उत्तर ना हो तो आप सब हाथ क्यो नहीं धोते है?

☐ पानी की कमी ☐ साबुन या राख का ना होना

☐ समय की कमी ☐ आवश्कता महसूस नही करते

☐ अन्य (उल्लेख करे .....
...)

प्रश्न–20 आप बच्चो के मल का निपटारा कहा करते है?

☐ कचरा पात्र ☐ कचरा गड्डा ☐ नाली ☐ शौचालय

☐ गली में ☐ बच्चे नही है ☐ अन्य (उल्लेख करे .....
.....)

प्रश्न–21 आप आने शौचालय को कब–कब साफ करते है?

☐ प्रतिदिन ☐ दो–तीन दिन में एक बार ☐ सप्ताह में एक बार

☐ पन्द्रह दिन में एक बार ☐ माह में एक बार ☐ समय ज्ञात नही है

प्रश्न–22 शौचालय साफ करने हेतु किस पदार्थ का उपयोग करते है?

☐ पानी ☐ साफ करने वाला पाउडर ☐ साबुन की टिकिया

☐ ब्रुश ☐ अन्य पदार्थ (उल्लेख करे .....
.....)

प्रश्न–23 क्या आपके या आपके परिवार के किसी सदस्य के पास निम्न में से एक या उससे अधिक वस्तुएं है?

☐ रेडियो ☐ टीवी ☐ मोबाइल फोन ☐ खाना बनाने की गैस

☐ फोन ☐ फ्रीज ☐ स्कूटर ☐ कार ☐ जानवर

प्रश्न–24 आप सूखे कचरे का निपटारा कैसे करत है?

☐ कचरा गड्डा ☐ गली/खुला स्थान ☐ जलाकर

☐ सामुदायिक कचरा पात्र ☐ अन्य (उल्लेख करे .....)

प्रश्न–25 आप घर के गंदे पानी का निपटारा कैसे करते है?

☐ आंगन में ☐ रसोई हेतु सब्जी उगाने में ☐ सोखते गड्डे में

☐ गली/सड़क पर ☐ नाली में ☐ अन्य (उल्लेख करे .....)

प्रश्न–26 पिछले एक वर्ष में आपके परिवार के किसी सदस्य को निम्न से एक या एक से अधिक बीमारी हुई है?

☐ दस्त रोग ☐ टाइफाइड ☐ पिलिया ☐ मलेरिया/डेंगू/चिकनगुनिया

☐ दांतो का फ्लोरिसीस ☐ अन्य रोग (उल्लेख करे .....)

प्रश्न–27 आप पीने के पानी को उपयोग करने के लिए किस प्रकार से बर्तन से निकालते है?

☐ बर्तन से उड़ेल कर ☐ डंडी वाले लौटे के द्वारा

☐ बर्तन में लोटा/गिलास डालकर ☐ अन्य विधि (उल्लेख करे .....)

प्रश्न–28 घर की महिलाऐं महावारी में काम मे आने वाले कपड़ों/नेपकीनों का निपटारा कैसे करती है?

☐ कचरा गड्डे में ☐ सड़क पर फेंकती है। ☐ नाली में

डालती है।

☐ सामुदायिक कचरा पात्र में ☐ जलाती है। ☐ अन्य (उल्लेख करे ....)

प्रश्न–29 यदि आपको निम्न वस्तुओ मे से किसी एक को चुनना हो तो सबसे पहले किस को चुनेगें?

☐ साइकिल ☐ गाय/बकरी/बैल/भैस ☐ मोबाइल ☐ खाना बनाने की गैस

☐ फ्रिज ☐ शौचालय ☐ स्कूटर/कार/ट्रैक्टर ☐ किसी को भी नही

☐ अन्य (उल्लेख करे ....)

Appendix 4

APPENDIX 4

Household Survey Questionnaire

Name of District

Name of Block

Name of Gram Panchayat

Name of Village

House No.

Address

Class: APL/BPL

Caste: SC/ST/OBC/General No. of family Members

Q.No.1 Do you have a toilet at your house? Yes /No

Q.No.2 Reasons for not building a toilet

- Financial
- Lack of Water
- Lack of Space
- Not a Priority
- Like to go out for defecation
- Cultural
- Any other reason (Mention…….)

Q.No.3 Do you have any plan to build a toilet in your house in future?

- Yes
- No

Q.No.4 If answer to question No.3 is yes then tell me the reason for building a toilet?

- Privacy
- Dignity
- Protection
- Good Health

- Social Pressure
- High Status
- Convenience
- Any Other reason
  (Mention……)

Q.No.5 How have you arranged funds for building the toilet?

- Own money
- Full Subsidy
- Own money & Subsidy
- Borrowing Money
- Under some scheme
- Any other source
  (mention……)

Q.No.6 Under which Government Scheme have you obtained financial assistance?

- Swachh Bharat Mission
- Total Sanitation Campaign
- MGREGS
- Any other Scheme (Mention……..)

Q.No.7 How much cost of construction of toilet was met from subsidy?

- <25%
- 25-50%
- 50-75%
- 75-99%
- 100%

Q.No.8 What type of toilet has been built by you?

- Dry Pit Toilet
- Single Pit Flush Toilet
- Two Pit Flush Toilet
- Septic Tank Toilet

- Any other type (Mention …….)

Q.No.9 Where from have you purchased material for construction of the toilet?

- Sanitary Mart
- Sanitary Shop
- Any other (……..)

Q.No.10 Where from did you get mason and helper for construction of the toilet?

- This Gram Panchayat
- Sanitary Mart
- Sanitary Shop
- Other (Mention……)

Q.No.11 Do you have a water source/water connection at your house?

- Yes
- No

Q.No.12 If not, where from you get water?

- Hand-pump
- PSP
- Community Source
- Open Well
- Other (Mention……..)

Q.No.13 Distance between the water source and toilet pit?

- Very near
- Less than 10 metres
- More than 10 metres

Q.No.14 Do all the family members use toilet?

- Yes
- No

Q.No.15 If you all do not use the toilet then when do you go for open defecation?

- Every Day
- Occasionally
- Rarely

Q.No.16 What are the reasons for not using the toilet?

- Not Clean
- Not Convenient
- Scarcity of Water
- No electricity
- No Door
- Put to disuse
- Open defecation is more convenient
- Other (mention…….)

Q.No.17 Do family members wash hands before cooking/eating and after defecation?

- Yes
- No

Q.No.18 If the answer to question 17 is yes, then how do you wash hands?

- Only with water
- Water and Soap
- Water and Ash
- Water and Soil
- Any other material (……..)

Q.No.19 If the answer to question 17 is no, then Why do not you all wash your hands?

- Scarcity of Water
- Non Availability of Soap or Ash
- Shortage of Time
- Do not feel the need
- Other reason

Q.No.20 How do you dispose of faeces of children?

- Dust bin

- Garbage pit
- Drain
- Toilet
- On streets
- No Children

Q.No.21 At what interval you clean your toilet?

- Everyday
- Once in two-three days
- Once in a week
- Once in fifteen days
- Once in a month
- Do not know

Q.No.22 What material do you use for cleaning the toilet?

- Water
- Detergent
- Soap bar
- Brush
- Others (Mention…….)

Q.No.23 Do you or any of your family member has one or more of the following:

- Radio
- TV
- Mobile Phone
- Cooking Gas
- Phone
- Fridge
- Scooter
- Car
- Animal

Q.No.24 How do you dispose of the solid waste?

- Garbage Pit
- Street or Open Space
- By Burning
- Community Garbage Bin
- Others (mention…….)

Q.No.25 How do you dispose of waste water of your house?

- In courtyard
- Growing vegetables
- Soakage pit
- Steel/road
- Drain
- Others (mention……)

Q.No.26 Do any one in your family suffered from one or more of the following diseases:-

- Diarrhoea
- Typhoid
- Jaundice
- Malaria/Degree/Chikungunia
- Dental Fluorosis
- Other Disease (mention……..)

Q.No.27 How do you take out the drinking water from the storage container?

- By Pouring
- Using long handle ladle
- Dipping tumbler/glass in water container
- Others (mention……..)

Q.No.28 How do women in your family dispose of menstrual clothes/napkins?

- Garbage Pit
- Thrown on road
- Thrown in a drain
- Community Garbage bin

- Burn them
- Other (mention……)

Q.No.29 If you have to choose one among the following which one will you choose?

- Cycle
- Cow/Goat/Ox/Buffalo
- Mobile
- Cooking Gas
- Fridge
- Toilet
- Scooter/Car/Tractor
- None
- Other (mention……..)

Appendix 5

```
FACTOR
  /VARIABLES Techical Socioecoomic Evirometal Istitutional
  /MISSING LISTWISE
  /ANALYSIS Techical Socioecoomic Evirometal Istitutional
  /PRINT INITIAL CORRELATION SIG KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

Factor Analysis

[DataSet1] C:\Users\Abhishek\Desktop\Climate Change3\Untitled1.sav

Correlation Matrix

		Techical	Socioecoomic	Evirometal	Istitutional
Correlation	Techical	1.000	.138	.552	.672
	Socioecoomic	.138	1.000	.114	.424
	Evirometal	.552	.114	1.000	.867
	Istitutional	.672	.424	.867	1.000
Sig. (1-tailed)	Techical		.351	.049	.017
	Socioecoomic	.351		.377	.111
	Evirometal	.049	.377		.001
	Istitutional	.017	.111	.001	

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.452
Bartlett's Test of Sphericity	Approx. Chi-Square	18.429
	df	6
	Sig.	.005

Communalities

	Initial	Extraction
Techical	1.000	.626
Socioecoomic	1.000	.170
Evirometal	1.000	.771
Istitutional	1.000	.945

Extraction Method: Principal Component Analysis.

Communalities

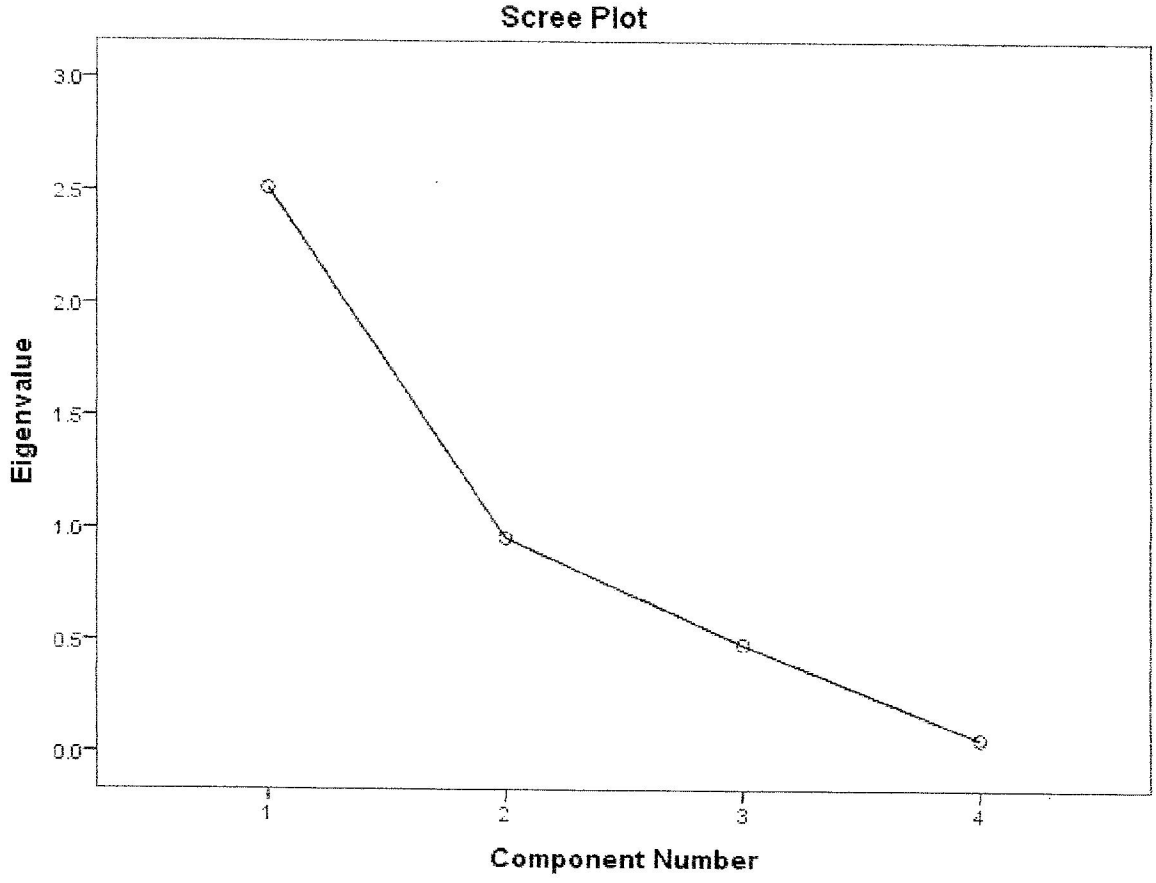
	Initial	Extraction
Technical	1.000	.626
Socioeconomic	1.000	.170
Environmental	1.000	.771
Institutional	1.000	.945

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.511	62.768	62.768	2.511	62.768	62.768
2	.952	23.804	86.572			
3	.478	11.953	98.526			
4	.059	1.474	100.000			

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component
	1
Technical	.791
Socioeconomic	.412
Environmental	.878
Institutional	.972

Extraction Method: Principal Component Analysis.

a. 1components extracted.

Rotated Component Matrix[a]

a. Only one component was extracted. The solution cannot be rotated.

Appendix 6

APPENDIX 6

Force Field Analysis

Level	Constraints Encountered	Opportunities Available
HH	Latrines not used by all family members.	SBM-G has provision for implementing IEC, Advocacy, and BCC strategy.
HH	Water not stored and handled properly.	SBM-G has provision for capacity building and water quality monitoring.
HH	Hands not washed by all family members.	SBM-G has provision for BCC, Advocacy and IEC.
HH	Solid waste not collected and disposed of properly.	SBM-G has provision for BCC, IEC, Advocacy and SSHE.
HH	Waste water not disposed of properly.	SBM-G has provision for BCC, IEC and SSHE.
HH	Toilet Structure not in good condition and not functional.	SBM-G covers capacity building, supply chain, technical support and monitoring.
HH	Safe distance between toilet pit and water source not maintained.	SBM-G covers capacity building, technical support and monitoring.
HH	Hand washing facility not provided.	SBM-G capacity building, supply chain, technical support and monitoring.
HH	Drinking water not potable on testing with H_2S strip vial.	NRDWP has provision for water quality monitoring and surveillance.
GP	Community/Institutional Toilet not maintained and not functional.	SBM-G envisages Community participation, PPP and SPRIs.
GP	Toilets in schools not adequate for boys and girls and not in use.	SBSV has provisions for toilets in schools and SBM-G envisages SSHE.
GP	Solid waste not collected and managed properly.	Provision for implementation of Solid Waste Management exists in SBM-G.
GP	Liquid waste not collected and managed properly.	Provision for implementation of waste water management exists in SBM-G.
GP	Community water source not potable on testing with H_2S strip vial.	NRDWP covers WQMS and SBM-G covers IEC and Advocacy.
GP	VWSC not in planning, O&M and monitoring WATSAN facilities.	SBM-G covers capacity building and strengthening PRIs at all levels.
GP	C P is lacking in planning, O & M and monitoring of WATSAN facilities.	SBM-G covers CP, Capacity building and strengthening PRIs.
GP	Financial Support not mobilised from ESAs for O&M of community toilets.	Provision exists for PPP, CSR and ESA under SBM-G for community toilets.
GP	Lack of funds and staff for O& M of community WATSAN facilities.	73rd Constitutional amendment on devolution of powers to PRIs.

Appendix 7

Data Sheet No.1 :District wise Environmental Parameters Assessed at Gram Panchayat Level									
S No.	Name of District	Name of Nirmal Gram Panchayat	Well maintained Community/ Institutional Toilets used by men & women Score-20	Well maintained and functional school/AWW toilets in use by boys and girls and school environment clean Score-20	Potable community water source(s) with proper drainage and clean surrounding Score-20	Proper system for collection and disposal of solid waste Score-20	Proper system for disposal of waste water Score-20	Sum of scores of five parameter Score-100	% score of all the five parameter
1	Ajmer	Jamola	0	9	10	10	10	39	39
2	Bundi	Basoli	0	6	15	10	10	41	41
3	Churu	Somiasar	0	6	2	10	10	28	28
4	Hanumangrh	Malsisar	0	10	10	5	5	30	30
5	Jaipur	Mahalana	0	20	20	0	0	40	40
6	Jhunjhunu	Mohanbari	0	15	20	0	0	35	35
7	Karauli	Sankarwada	0	7.5	0	10	7.5	25	25
8	Pali	Jhoontha	0	10	15	5	10	40	40
9	Rajsamand	Piplantri	16	10	10	10	10	56	56
10	Sikar	Magloona	3	5	0	10	10	28	28
	Total		19	98.5	102	70	72.5	362	362
	Average (%)		10	49	51	35	36	36	36

Data Sheet No.2: District wise Institutional Parameters Assessed at Gram Panchayat Level									
S No.	Name of District	Name of Nirmal Gram Panchayat	Functional and active Village Water and Sanitation Committee Score-20	Community Participation in planning and monitoring of water and sanitation facilities Score-20	Support from External Support Agencies in execution and O&M of WATSAN facilities Score-20	Availability of staff and funds for O&M of community/ institutional WATSAN facilities Score-20	Availability of plans and funds for implementation/management of solid and liquid waste systems Score-20	Sum of scores of all the five parameter Score-100	Average % score of all the five parameter
1	Ajmer	Jamola	0	0	5	5	10	20	20
2	Bundi	Basoli	0	5	5	10	10	30	30
3	Churu	Somiasar	0	5	5	5	5	20	20
4	Hanumangrh	Malsisar	0	10	0	5	5	20	20
5	Jaipur	Mahalana	0	0	10	10	5	25	25
6	Jhunjhunu	Mohanbari	10	10	10	0	0	30	30
7	Karauli	Sankarwada	5	0	0	10	5	20	20
8	Pali	Jhoontha	0	10	5	0	10	25	25
9	Rajsamand	Piplantri	10	10	10	10	5	45	45
10	Sikar	Magloona	0	5	0	5	10	20	20
		Total	25	55	50	60	65	255	255
		Average (%)	13	28	25	30	33	25	25

Data Sheet No.3: Technical Parameters assessed at Household level					District-Ajmer Block- Masooda		Gram Panchayat- Jamola	
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within near house Score-20	Water is potable by testing using H_2S strip vial test Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	JMAJ1	20	0	0	20	20	60	60
2	JMAJ2	20	20	0	20	20	80	80
3	JMAJ3	0	20	0	20	20	60	60
4	JMAJ4	20	20	20	20	20	100	80
5	JMAJ5	20	0	20	20	20	80	80
6	JMAJ6	0	20	0	20	0	40	40
7	JMAJ7	20	0	0	20	20	60	60
8	JMAJ8	20	0	0	20	20	60	60
9	JMAJ9	20	20	20	20	20	100	100
10	JMAJ10	0	20	0	20	20	60	60
11	JMAJ11	0	20	0	20	20	60	60
12	JMAJ12	0	20	0	20	20	60	60
13	JMAJ13	0	20	0	20	20	60	60
14	JMAJ14	20	20	0	20	0	60	60
15	JMAJ15	0	20	20	20	20	80	80
	Total	160	220	80	300	260	1020	68
	Average (%)	53	73	27	100	87	68	68

Data Sheet No.4: Socio-economic Parameters assessed at Household level District-Ajmer Block- Masooda Gram Panchayat- Jamola								
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	JMAJ1	0	0	0	0	0	0	0
2	JMAJ2	0	0	20	20	20	60	60
3	JMAJ3	0	0	0	20	20	40	40
4	JMAJ4	20	0	20	0	20	60	60
5	JMAJ5	20	0	0	20	20	60	60
6	JMAJ6	0	0	0	20	0	20	20
7	JMAJ7	20	0	0	20	20	60	60
8	JMAJ8	20	0	20	20	20	80	80
9	JMAJ9	0	0	0	20	20	40	40
10	JMAJ10	0	0	0	0	0	0	0
11	JMAJ11	0	0	0	20	20	40	40
12	JMAJ12	0	0	0	0	20	20	20
13	JMAJ13	0	0	0	0	0	0	0
14	JMAJ14	20	0	0	20	0	40	40
15	JMAJ15	0	0	0	20	0	20	20
	Total	100	0	60	200	180	540	540
	Average (%)	33	0	20	67	60	36	36

Data Sheet No.5: Technical Parameters assessed at Household level		District- Bundi			Block- Hindoli		Gram Panchayat- Basoli	
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	BHBI1	20	0	20	20	20	80	80
2	BHBI2	0	0	0	20	0	20	20
3	BHBI3	20	20	0	20	20	80	80
4	BHBI4	20	0	20	20	0	60	60
5	BHBI5	20	20	20	20	20	100	100
6	BHBI6	20	0	20	20	0	60	60
7	BHBI7	20	20	20	20	0	80	80
8	BHBI8	20	0	0	20	20	60	60
9	BHBI9	0	20	0	20	20	60	60
10	BHBI10	0	20	20	20	20	80	80
11	BHBI11	20	0	20	20	20	80	80
12	BHBI12	20	20	0	20	20	80	80
13	BHBI13	0	20	20	20	0	60	60
14	BHBI14	20	0	20	20	20	80	80
15	BHBI15	0	20	0	20	0	40	40
	Total	200	160	180	300	180	1020	1020
	Average	67	53	60	100	60	68	68

Data Sheet No.6: Socio-economic Parameters assessed at Household level					District-Bundi	Block- Hindoli	Gram Panchayat- Basoli	
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of scores of all the five parameters 100	Percentage score of all the five parameters
1	BHBI1	20	20	20	20	20	100	100
2	BHBI2	0	0	0	20	20	40	40
3	BHBI3	20	0	20	20	20	80	80
4	BHBI4	20	0	20	20	0	60	60
5	BHBI5	20	20	20	20	0	80	80
6	BHBI6	20	20	20	20	20	100	100
7	BHBI7	20	0	20	20	0	60	60
8	BHBI8	20	0	20	20	20	80	80
9	BHBI9	0	0	20	20	20	60	60
10	BHBI10	0	0	20	0	20	40	40
11	BHBI11	20	0	20	20	0	60	60
12	BHBI12	20	0	20	0	20	60	60
13	BHBI13	0	0	0	20	0	20	20
14	BHBI14	20	0	0	20	20	60	60
15	BHBI15	0	0	20	0	20	40	40
	Total	200	60	240	240	200	940	940
	Average (%)	67	20	80	80	67	63	63

Data Sheet No.7: Technical Parameters assessed at Household level		District- Churu	Block- Taranagar				Gram Panchayat- Somiasar	
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	STCH1	20	20	0	20	20	80	80
2	STCH2	20	20	0	20	0	60	60
3	STCH3	20	0	20	20	20	80	80
4	STCH4	20	0	0	20	0	40	40
5	STCH5	20	20	20	20	0	80	80
6	STCH6	20	20	0	20	0	60	60
7	STCH7	20	0	0	20	0	40	40
8	STCH8	20	0	0	20	0	40	40
9	STCH9	20	0	0	20	20	60	60
10	STCH10	20	20	0	20	0	60	60
11	STCH11	0	20	0	20	20	60	60
12	STCH12	0	20	20	20	0	60	60
13	STCH13	20	0	0	20	0	40	40
14	STCH14	20	0	20	20	0	60	60
15	STCH15	20	20	20	20	0	80	80
	Total	260	160	100	300	80	900	900
	Average (%)	87	53	33	100	27	60	60

Data Sheet No.8: Socio-economic Parameters assessed at Household level						District-Churu Block- Taranagar Gram Panchayat- Somiasar		
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	TSCH1	20	20	0	20	0	60	60
2	TSCH2	20	0	0	20	20	60	60
3	TSCH3	20	20	0	20	20	80	80
4	TSCH4	20	20	0	20	20	80	80
5	TSCH5	20	0	20	20	20	80	80
6	TSCH6	20	20	0	20	20	80	80
7	TSCH7	20	0	0	20	0	40	40
8	TSCH8	0	20	20	20	20	80	80
9	TSCH9	0	0	20	0	20	40	40
10	TSCH10	20	0	20	20	20	80	80
11	TSCH11	0	0	0	0	20	20	20
12	TSCH12	20	0	0	20	20	60	60
13	TSCH13	20	0	20	20	20	80	80
14	TSCH14	0	0	20	0	20	40	40
15	TSCH15	20	20	0	20	20	80	80
	Total	220	120	120	240	260	960	960
	Average (%)	73	40	40	80	87	64	64

Data Sheet No.9: Technical Parameters assessed at Household level District- Hanumangarh Block- Bhadra Gram Panchayat- Malsisar								
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	MBHG1	20	0	20	20	20	80	80
2	MBHG2	20	0	0	20	0	40	40
3	MBHG3	20	20	0	20	0	60	60
4	MBHG4	20	0	20	20	0	60	60
5	MBHG5	20	20	0	20	0	60	60
6	MBHG6	20	20	0	20	0	60	60
7	MBHG7	20	20	0	20	0	60	60
8	MBHG8	20	0	20	20	20	80	80
9	MBHG9	20	20	0	20	20	80	80
10	MBHG10	20	20	0	20	20	80	80
11	MBHG11	20	0	20	20	0	60	60
12	MBHG12	0	20	0	20	0	40	40
13	MBHG13	20	20	0	20	0	60	60
14	MBHG14	20	20	0	20	0	60	60
15	MBHG15	20	0	20	20	20	80	80
	Total	280	180	100	300	100	960	960
	Average (%)	93	60	33	100	33	64	64

Data Sheet No.10: Socio-economic Parameters assessed at Household level District-Hanumangarh Block- Bhadra Gram Panchayat- Malsisar								
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	MBHG1	20	20	0	20	0	60	60
2	MBHG2	0	0	0	0	0	0	0
3	MBHG3	20	20	0	20	0	60	60
4	MBHG4	20	20	0	20	0	60	60
5	MBHG5	20	0	0	0	0	20	20
6	MBHG6	0	0	0	0	0	0	0
7	MBHG7	0	0	20	0	0	20	20
8	MBHG8	20	0	0	20	0	40	40
9	MBHG9	20	0	20	0	0	40	40
10	MBHG10	20	0	20	20	0	60	60
11	MBHG11	20	0	0	20	0	40	40
12	MBHG12	0	0	0	0	0	0	0
13	MBHG13	0	0	0	0	0	0	0
14	MBHG14	20	0	0	0	0	20	20
15	MBHG15	20	20	20	20	20	80	80
	Total	200	80	80	140	20	500	500
	Average (%)	67	27	27	47	7	33	33

Data Sheet No.11: Technical Parameters assessed at Household level		District- Jaipur		Block- Dudu		Gram Panchayat- Mahalana		
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	MDJP1	20	0	20	20	20	80	80
2	MDJP2	20	20	20	20	20	100	100
3	MDJP3	20	0	20	20	0	60	60
4	MDJP4	20	0	20	20	0	60	60
5	MDJP5	20	20	20	20	20	100	100
6	MDJP6	0	20	0	20	20	60	60
7	MDJP7	0	20	0	20	20	60	60
8	MDJP8	20	20	20	20	20	100	100
9	MDJP9	20	20	0	20	20	80	80
10	MDJP10	20	20	20	20	20	100	100
11	MDJP11	20	0	20	20	20	80	80
12	MDJP12	20	0	0	20	20	60	60
13	MDJP13	20	0	0	20	20	60	60
14	MDJP14	0	20	0	20	20	60	60
15	MDJP15	20	20	0	20	20	80	60
	Total	240	180	160	300	260	1140	1120
	Average (%)	80	60	53	100	87	76	76

Data Sheet No.12:Socio-economic Parameters assessed at Household level						District-Jaipur Block- Dudu Gram Panchayat- Mahlana		
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of scores the five parameters 100	Percentage score of all the five parameters
1	MDJP1	0	0	0	0	20	20	20
2	MDJP2	20	0	0	20	0	40	40
3	MDJP3	20	0	0	20	20	60	60
4	MDJP4	20	0	0	0	20	40	40
5	MDJP5	20	0	0	0	20	40	40
6	MDJP6	0	0	0	20	0	20	20
7	MDJP7	0	0	20	0	20	40	40
8	MDJP8	20	0	20	20	0	60	60
9	MDJP9	0	0	20	0	0	20	20
10	MDJP10	20	0	0	0	0	20	20
11	MDJP11	20	0	20	20	0	60	60
12	MDJP12	20	0	20	20	0	60	60
13	MDJP13	20	0	20	20	0	60	60
14	MDJP14	0	0	0	0	0	0	0
15	MDJP15	20	0	0	20	0	40	40
	Total	200	0	120	160	100	580	580
	Average (%)	67	0	40	53	33	39	39

Data Sheet No.13: Technical Parameters assessed at Household level						District-Jhunjhunu	Block- Nawalgarh Gram Panchayat- Mohanbari	
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within near house Score-20	Water is potable by testing using H_2S strip vial test Score-20	Sum of scores of scores the five parameters 100	Percentage score of all the five parameters
1	MNJJ1	20	0	20	20	20	80	80
2	MNJJ2	20	0	0	20	20	60	60
3	MNJJ3	0	0	0	20	20	40	40
4	MNJJ4	20	20	0	20	20	80	80
5	MNJJ5	20	20	20	20	20	100	100
6	MNJJ6	20	20	20	20	20	100	100
7	MNJJ7	20	20	0	20	20	80	80
8	MNJJ8	20	20	0	20	0	60	60
9	MNJJ9	20	20	0	20	0	60	60
10	MNJJ10	20	20	20	20	20	100	100
11	MNJJ11	20	20	20	20	0	80	80
12	MNJJ12	20	20	20	20	20	100	100
13	MNJJ13	20	0	20	20	20	80	80
14	MNJJ14	20	0	0	20	20	60	60
15	MNJJ15	20	0	0	20	20	60	80
	Total	280	180	140	300	240	1140	1140
	Average (%)	93	60	47	100	80	76	76

Data Sheet No.14: Socio-economic Parameters assessed at Household level						District-Junjhunu Block- Nawalgarh Gram Panchayat- Mohanbari		
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	MNJJ1	20	20	20	20	20	100	100
2	MNJJ2	20	20	20	20	0	80	80
3	MNJJ3	0	0	20	0	0	20	20
4	MNJJ4	20	0	0	20	0	40	40
5	MNJJ5	0	0	0	0	0	0	0
6	MNJJ6	20	20	20	20	0	80	80
7	MNJJ7	0	20	20	0	0	40	40
8	MNJJ8	20	0	20	20	0	60	60
9	MNJJ9	20	0	0	20	20	60	60
10	MNJJ10	20	20	20	20	0	80	80
11	MNJJ11	20	0	0	20	20	60	60
12	MNJJ12	20	0	20	20	20	80	80
13	MNJJ13	20	0	0	20	0	40	40
14	MNJJ14	20	0	20	20	20	80	80
15	MNJJ15	0	0	20	0	0	20	20
	Total	220	100	200	220	220	840	840
	Average (%)	73	33	67	73	33	56	56

Data Sheet No.15 Technical Parameters assessed at Household level		District- Karauli			Block- Todabhim	Gram Panchayat- Sankarwada		
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	STKR1	20	20	0	20	20	80	80
2	STKR2	20	20	0	20	0	60	60
3	STKR3	20	20	0	20	20	80	80
4	STKR4	20	20	20	20	0	80	80
5	STKR5	20	20	0	20	0	60	60
6	STKR6	20	0	20	20	20	80	80
7	STKR7	20	20	0	20	20	80	80
8	STKR8	20	20	20	20	20	100	100
9	STKR9	20	20	20	20	0	80	80
10	STKR10	20	0	0	20	20	60	60
11	STKR11	20	0	0	20	0	40	40
12	STKR12	20	20	0	20	20	80	80
13	STKR13	20	0	0	20	0	40	40
14	STKR14	20	20	0	20	0	60	60
15	STKR15	20	20	0	20	20	80	80
	Total	300	220	80	300	160	1060	1060
	Average (%)	100	73	27	100	53	70	70

Data Sheet No.16 :Socio-economic Parameters assessed at Household level						District-Karauli	Block- Todabhim Gram Panchayat- Sankarwada	
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	STKR1	20	0	0	0	0	20	20
2	STKR2	20	0	0	20	0	40	40
3	STKR3	20	20	20	20	20	100	100
4	STKR4	20	0	0	20	0	40	40
5	STKR5	20	0	20	0	20	60	60
6	STKR6	0	0	20	20	0	40	40
7	STKR7	20	0	20	20	20	80	80
8	STKR8	20	0	20	20	20	80	80
9	STKR9	20	20	0	20	20	80	80
10	STKR10	0	20	0	20	0	40	40
11	STKR11	20	0	0	20	0	40	40
12	STKR12	20	0	20	20	20	80	80
13	STKR13	20	20	20	20	20	100	100
14	STKR14	20	0	20	20	0	60	60
15	STKR15	20	0	0	20	0	40	40
	Total	260	80	160	260	140	900	900
	Average (%)	87	27	53	87	47	60	60

Data Sheet No.17 Technical Parameters assessed at Household level District- Pali Block- Raipur Gram Panchayat- Jhootha								
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	JRPA1	20	0	0	20	0	40	40
2	JRPA2	20	20	20	20	20	100	100
3	JRPA3	20	20	20	20	20	100	100
4	JRPA4	20	0	20	20	20	80	80
5	JRPA5	20	20	20	20	0	80	80
6	JRPA6	20	20	20	20	20	100	100
7	JRPA7	20	20	20	20	20	100	100
8	JRPA8	20	0	20	20	20	80	80
9	JRPA9	20	0	20	20	20	80	80
10	JRPA10	0	20	0	20	20	60	60
11	JRPA11	20	0	0	20	20	60	60
12	JRPA12	20	0	0	20	0	40	40
13	JRPA13	20	0	0	20	20	60	60
14	JRPA14	0	20	0	20	20	60	60
15	JRPA15	20	0	0	20	20	60	60
	Total	240	120	80	300	220	960	960
	Average (%)	80	40	27	100	73	64	64

Data Sheet No.18 Socio-economic Parameters assessed at Household level		District-Pali		Block- Raipur		Gram Panchayat- Jhoontha		
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	JRPA1	20	0	20	20	20	80	80
2	JRPA2	20	0	20	20	20	80	80
3	JRPA3	20	0	0	20	20	60	60
4	JRPA4	20	0	20	20	20	80	80
5	JRPA5	20	0	0	20	20	60	60
6	JRPA6	20	0	20	20	20	80	80
7	JRPA7	0	0	0	0	0	0	0
8	JRPA8	20	0	0	20	20	60	60
9	JRPA9	20	0	0	20	0	40	40
10	JRPA10	0	0	20	0	20	40	40
11	JRPA11	0	0	20	0	20	40	40
12	JRPA12	20	0	20	20	20	80	80
13	JRPA13	20	0	0	20	20	60	60
14	JRPA14	0	0	20	20	0	40	40
15	JRPA15	20	0	20	20	0	60	60
	Total	220	0	180	240	220	860	860
	Average (%)	73	0	60	80	73	57	57

Data Sheet No.19:Technical Parameters assessed at Household level		District- Rajsamand		Block- Rajsamand	Gram Panchayat- Piplantri			
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	PRRD1	20	0	0	20	0	40	40
2	PRRD2	20	20	20	20	20	100	100
3	PRRD3	20	20	20	20	20	100	100
4	PRRD4	20	0	20	20	20	80	80
5	PRRD5	20	20	20	20	0	80	80
6	PRRD6	20	20	20	20	20	100	100
7	PRRD7	20	20	20	20	20	100	100
8	PRRD8	20	0	20	20	0	60	60
9	PRRD9	0	20	0	20	20	60	60
10	PRRD10	20	20	20	20	20	100	100
11	PRRD11	20	20	0	20	20	80	80
12	PRRD12	20	20	20	20	0	80	80
13	PRRD13	20	20	0	20	20	80	80
14	PRRD14	20	0	0	20	0	40	40
15	PRRD15	20	20	0	20	20	80	80
	Total	280	220	240	300	200	1180	1180
	Average (%)	93	73	60	100	67	64	79

Datasheet No.20:Socio-economic Parameters assessed at Household level					District-Rajsamand	Block- Rajsamand	Gram Panchayat- Piplantri	
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	PRRD1	20	0	20	20	20	80	80
2	PRRD2	20	0	20	20	20	80	80
3	PRRD3	20	0	20	20	20	80	80
4	PRRD4	20	0	20	20	20	80	80
5	PRRD5	20	20	20	20	20	100	100
6	PRRD6	20	0	20	20	20	80	80
7	PRRD7	0	20	0	0	20	40	40
8	PRRD8	20	0	20	20	0	60	60
9	PRRD9	0	0	20	20	0	40	40
10	PRRD10	20	20	20	20	0	80	80
11	PRRD11	20	20	20	20	0	80	80
12	PRRD12	20	0	20	20	20	80	80
13	PRRD13	20	0	20	20	20	80	80
14	PRRD14	0	0	0	0	0	0	0
15	PRRD15	20	20	20	20	20	100	100
	Total	240	100	260	260	200	1060	1060
	Average (%)	80	33	87	87	67	71	71

Data Sheet No.21: Technical Parameters assessed at Household level District- Sikar Block- Lachhmangarh Gram Panchayat- Magloona								
S No.	Household Code No.	Toilet Structure in good condition and functional Score-20	Toilet pit at safe distance(10 m or more) from water source Score-20	Hand-washing facility available Score-20	Water available within/near house Score-20	Water is potable by testing using H_2S strip vial Score-20	Sum of Scores of all the five parameters 100	Percentage Score of all the five parameters
1	MLSK1	20	20	0	20	0	60	60
2	MLSK2	20	0	20	20	20	80	80
3	MLSK3	20	0	20	20	0	60	60
4	MLSK4	20	0	20	20	0	60	60
5	MLSK5	20	0	20	20	0	60	60
6	MLSK6	20	20	20	20	20	100	100
7	MLSK7	20	0	20	20	20	80	80
8	MLSK8	20	20	20	20	20	100	100
9	MLSK9	0	20	20	20	20	80	80
10	MLSK10	20	0	20	20	20	80	80
11	MLSK11	0	20	0	20	20	60	60
12	MLSK12	0	20	0	20	20	60	60
13	MLSK13	0	20	0	20	20	60	60
14	MLSK14	20	0	0	20	20	60	60
15	MLSK15	20	0	0	20	20	60	60
	Total	220	140	180	300	220	1060	1060
	Average (%)	73	47	60	100	73	70	70

Data Sheet No.22 : Socio-economic Parameters assessed at Household level						District-Sikar	Block- Lachhmangarh	Gram Panchayat- Magloona
S No.	Household Code No.	Toilet used by all family members Score-20	Proper storage and handling of water Score-20	Proper collection and disposal of solid waste Score-20	Hand-washing with soap/ash by all family members Score-20	Proper disposal of waste water Score-20	Sum of scores of all the five parameters 100	Percentage score of all the five parameters
1	MLSK1	20	20	20	0	20	80	80
2	MLSK2	20	0	20	20	20	80	80
3	MLSK3	0	20	20	0	0	40	40
4	MLSK4	20	0	0	20	20	60	60
5	MLSK5	20	20	20	20	20	100	100
6	MLSK6	20	20	20	20	0	80	80
7	MLSK7	20	0	20	20	20	80	80
8	MLSK8	20	20	20	20	20	100	100
9	MLSK9	0	0	0	20	0	20	20
10	MLSK10	20	20	20	20	20	100	100
11	MLSK11	0	0	20	0	20	40	40
12	MLSK12	0	0	20	20	20	60	60
13	MLSK13	0	0	20	0	20	40	40
14	MLSK14	20	0	20	20	20	80	80
15	MLSK15	20	20	20	20	20	100	100
	Total	200	140	260	220	240	1060	1060
	Average (%)	67	47	87	73	80	70	70

Appendix 8

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Sustainability of Hygiene Behaviours in Nirmal Gram Puraskar Awarded Gram Panchayats in Rajasthan: A Big Challenge

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ABSTRACT

A research was undertaken to assess the extent to which the key hygiene behaviours were sustained in Nirmal Gram Panchayats in Rajasthan. The district wise scores for each of the five key hygiene behaviours in terms of percentage households practising each hygiene behaviour were assessed utilizing household survey questionnaire, structured-observations, spot-checks and interviews with the family members. The results of the research reveal that none of the five key hygiene behaviours was practised by all the households in any of the Nirmal Gram Panchayats in Rajasthan. The percentage households practising the proper storage and handling of water is the lowest at 22.70% and percentage of households using toilet, and washing hands with soap/ash at critical times is the highest at 68.70% each. The percentages of households practising proper collection and disposal of solid waste, and proper disposal of liquid waste are 56.10% and 55.40% respectively. In order to ensure the sustainability of key hygiene behaviours in Nirmal Gram Panchayats in Rajasthan the State Water and Sanitation Mission needs to develop an appropriate, evidence-based, cost-effective behaviour change communication strategy and provide adequate funds, technical support and trained sanitation motivators to all Nirmal Gram Panchayats for its effective implementation, monitoring and continuous follow-up.

Keywords: *Hygiene behaviours, Nirmal Gram Puraskar, Diarrheal diseases, Swachh Bharat Mission, open defecation free, solid waste disposal*

INTRODUCTION

Primary Health care includes safe and adequate water supply, sanitary means of excreta disposal and basic hygiene. These are fundamental determinants of public health. The heavy burden of disease experienced in many developing countries due to illness related to water, sanitation and hygiene is largely attributable to deficiencies in basic services and behaviours [1].Washing hands with soap can reduce the risk of diarrheal diseases by 43%, water quality improvements can reduce diarrheal risk by 17% and excreta disposal can reduce diarrheal risk by 36% [2].There is also a link between poor sanitation and acute respiratory infections such as pneumonia. But better hygiene practices-washing hands with soap after defecation and before eating-could halve the infection rate [3].Well sustained and used water supplies and sanitation facilities mean that for a period that covers the design life of technologies used to provide services, each member of households in the project area has regular and dependable delivery of water-acceptable in terms of quality and quantity, practices safe disposal of waste 365 days per year [4] . Government of India (GOI) has been promoting sanitation coverage in campaign mode to ensure better health and quality of life for people in rural India. To add vigour to its implementation GOI launched an award based incentive scheme for fully sanitized and open defecation free (ODF) Gram Panchayats (GPs), Blocks, districts and states called "Nirmal Gram Puraskar" (NGP) in October 2003 and gave away the first awards in 2005 as a component of flagship scheme total sanitation campaign [5]. NGP awards were given till the year 2013. NGP seeks to recognise the efforts made by Panchayati Raj Institutions (PRIs) and organizations which have contributed significantly towards full sanitation coverage in their areas of operation. ODF is termination of faecal-oral transmission defined by (a) no faeces found in the environment/village; and (b) every

household as well as public/community institutions using safe technology for disposal of faeces [6] .The NGP implicitly recognized that the nature of behaviour change required for the benefits of sanitation to be realized was collective and not merely increased toilet coverage at household level [7]. In India by 2013, 28590 GPs were awarded NGPs out of which 326 GPs in 28 districts were from Rajasthan [8] .The NGP awarded G Ps are called Nirmal Grams Panchayats. Rajasthan, the largest state by area in India is situated in north-west of the country, comprises 33 districts with 248 blocks and 9177 GPs. The Goals for sanitation in rural Rajasthan set forth by the Government of Rajasthan (GOR) are; (i) creation of open defecation free state (ii) adoption of improved hygiene behaviours by all households and (iii) environmentally safe disposal of solid and liquid waste to be achieved by 2022 [9]. Hygiene refers to conditions and practices that help maintain health and prevent spread of diseases [10].In India "lack of awareness and established age old practice" stand out as predominant reasons for open defecation in case of households where toilet facilities are already available [11].The GOI launched a new programme-Swachh Bharat Mission(Clean India Mission) on 2nd Oct 2014 to accelerate efforts to achieve universal sanitation coverage, improve cleanliness and eliminate open defecation in India by 2019 [12].The focus of Swachh Bharat Mission is on behaviour change intervention including interpersonal communication and creation of complete open defecation free villages rather than only construction of individual toilets [13]. The benefits associated with improved hygiene are well established but it was not included in the Millennium Development Goals [14]. Sustainable Development Goal 6 aims to "Ensure availability and sustainable management of water and sanitation for all" by 2030 and places new emphasis on countries to improve quality and availability of drinking water and ensure safe management of faecal waste [15].The objective 6.2 under sustainable development goal 6 aims to achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations [16]. A study carried out by a consulting agency TARU Leading Edge Private Ltd. in August 2008 on impact assessment of Nirmal GPs reveals that only 6 GPs out of 162 Nirmal GPs in six states (4 percent) seems to have maintained the ODF status, 55 percent households wash hands with soap after defecation,22% wash hands with soap before eating,45% wash hands with soap after cleaning child's excreta, immersing glass or tumbler is the most common practice to take out drinking water from a storage vessel, practised by 72% households and dumping solid waste in open space or street is the most common practice being used by most households, likewise disposal of liquid waste in open space or in unused water body is the most common and is practised by 54% households [17].The results of various evaluations reveal that the hygiene behaviours in Nirmal GPs have not sustained and people are reverting back to the unhygienic practices related to water and sanitation. Therefore a research was undertaken to assess the extent to which the key hygiene behaviours were sustaining in Nirmal GPs in Rajasthan and what measures need to be taken to improve the situation.

RESEARCH METHODOLOGY

The following key hygiene behaviours were assessed at the household level in randomly selected ten Nirmal GPs in ten districts of Rajasthan:

- Use of toilet by all family members.
- Hand washing with soap/ash by all family members at critical time's viz. before eating, after defecation, and after handling child's excreta.
- Proper storage and handling of water
- Proper collection and disposal of solid waste
- Proper disposal of waste water

The following research methods were utilized to assess the hygiene behaviours at household level:

- Household Survey Questionnaire in Hindi language was utilized to collect information at household level. The questionnaire covered all questions relevant to use of toilet, storage and handling of water, collection and disposal of solid waste, disposal of liquid waste, and hand-washing with soap/ash at critical times by all family members. The questionnaire was completed at each household through interaction with family members present at the time of survey. The structured-observations were carried out to co-relate and check the reliability of information collected through household questionnaire.
- Structured-observation method was used for observing behaviours as well as signs of behaviours,

signs of particular behaviour such as soap/ash and water present near toilet. The structured-observations are promoted as one of the tools that seem best adapted to the measurement of hygiene behaviours [18].The structured observations were followed by unstructured interviews with family members to assess the extent to which the each behaviour was practised by the family.

- Spot-checks were carried out to collect the information regarding the existing practice of each behaviour for example collection of solid waste, storage and handling of water, disposal of liquid waste, toilet in use. Spot-checks for observing indicators of hygiene are potentially rapid and efficient method for assessing household level hygiene [19].
- H_2S strip vials were utilized for testing the bacteriological quality of drinking water from the household water source and water pots. The water was collected in the H_2S strip vial direct from water source or stored drinking water and kept covered in the vial for 48 hours. If the colour of water turned black, it indicated bacteriological contamination. If the colour of water in the vial remained unchanged after 48 hours the water was free from bacteriological contamination under test conditions employed. The test measures the production of H_2S by its reaction with iron to form an insoluble, black precipitate. The test is simple and affordable and have great value for drinking water management and health education in water and sanitation sectors[20].

The above research methods were utilized in fifteen randomly selected households in each of the ten Nirmal GPs in ten districts of Rajasthan. In order to assess the score of each of the five hygiene behaviours in terms of percentage households practising the hygiene behaviour in that Nirmal GP, each hygiene behaviour was assigned a maximum score of 100 for each household provided it was practised by all the family members .The average of actual scores of all the fifteen households for each hygiene behaviour was shown as percentage households practising that hygiene behaviour in that Nirmal GP. The average score of each hygiene behaviour for ten Nirmal GPs in ten districts represent the percentage households sustaining that hygiene behaviour in all the Nirmal GPs in Rajasthan.

RESULTS AND DISCUSSIONS

The results of the assessments obtained by utilizing the above research methods in ten districts have been analysed and the district wise scores of all the five key hygiene behaviours in terms of percentage households sustaining each key hygiene behaviour in ten Nirmal GPs in ten districts of Rajasthan are given at Table 1:

Table 1: District wise percentage households sustaining five key hygiene behaviours

S. No.	Name of District	Name of Nirmal Gram Panchayat	Use of Toilet by all family members	Hand washing with soap/ash by all family members	Proper storage and handling of water	Proper collection and disposal of solid waste	Proper disposal of liquid waste
1.	Ajmer	Jamola	33	67	0	20	60
2.	Bundi	Basoli	67	80	20	80	67
3.	Churu	Somiasar	73	40	40	40	87
4.	Hanumangarh	Mulsisar	67	47	27	27	7
5.	Jaipur	Mahlana	67	53	0	40	33
6.	Jhunjhnu	Mohanbadi	73	73	33	67	33
7.	Karoli	Sakarwada	87	87	27	53	47
8.	Pali	Jhoontha	83	80	0	60	73
9.	Rajasamand	Piplantri	80	87	33	87	67
10.	Sikar	Magloona	67	73	47	87	80
	Rajasthan		68.7	68.7	22.7	56.1	55.4

The above results for each of the five hygiene behaviours reveal the following:

- In 68.70% households all the family members are using toilets and in remaining 31.30% households one or more members of the family defecate in the open, mostly men go for open defecation in the morning while going to field for work. In some households elderly men prefer to go for open defecation than using a toilet at home. The toilets are mostly build for privacy, dignity, security of women and children and elderly persons in the family but there is a lack of awareness about the health benefits of using a toilet.
- In 68.70% households all family members are washing hands with soap/ash at all critical times viz. before eating food, after defecation and after handling child's excreta. In 31.30% households one or more members of the family are not washing hands with soap/ash at one or more critical times.95% households use soap for washing hands and only 5% households use ash for washing hands .In 31.30% households mostly men use soil and water for washing hands after defecating in the open. Similarly while eating food at home or outside men wash hands with water only. There is a lack of awareness about the health benefits of hand-washing with soap or ash at all critical times.
- Only 22.70% households properly store and handle their drinking water. Those who properly store and handle the drinking water keep it in a covered container and draw water either by pouring or using long handle ladle. In 77.30% households the drinking water is not kept in a covered container and is drawn by dipping a tumbler in the water container. In 64% samples taken from drinking water container the bacteriological contamination was found on testing with H_2S strip vials confirming that the water gets contaminated during storage and handling at household level.
- 56.10% households properly collect and dispose their solid waste and remaining 43.90% households throw their solid waste outside the house or in a nearby drain. Nirmal GP at times arrange tractor trolley for removing and transporting the solid waste from streets to low lying areas away from the Gram Panchayat. There is no system for daily collection and disposal of solid waste and animal dung. The Nirmal GPs do not have technical knowhow and funds for developing, operationalizing and maintaining the solid waste management system in their respective GP.
- 55.40% households properly dispose their waste water and in remaining 44.60% households the waste water stagnates outside their houses. There is no system for collection and disposal of liquid waste and where the drainage system is partial it remains chocked most of the time due to lack of maintenance. The Nirmal GPs do not have technical knowhow and funds for developing, operationalizing and maintaining the liquid waste management system in their respective GPs.

CONCLUSION

It is evident from the results of research that none of the key hygiene behaviours is sustaining in hundred percent households in any of the Nirmal Gram Panchayat in Rajasthan and the sustainability of hygiene behaviours is a big challenge .The State Water and Sanitation Mission(SWSM) needs to develop an appropriate cost-effective, evidence based behaviour change communication strategy with clear and targeted messages for men, women, children and adolescent, and provide adequate funds, technical support and trained motivators to all the Nirmal GPs for its time bound implementation, monitoring and continuous follow-up. The state Education department should involve school children in child to child, child to parent and child to community communication in disseminating and reinforcing hygiene messages as part of School Sanitation and Hygiene Education (SSHE) strategy. SWSM should also provide technical and financial support to the Nirmal GPs to develop, operationalize and maintain the solid and liquid waste management systems, community sanitation facilities, and water quality surveillance and monitoring plan of actions, in partnership with the community based organizations involving the communities to ensure that the key hygiene behaviours are practised and sustained by all the family members of the hundred percent households in all the Nirmal GPs in Rajasthan.

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Source of funding: Self

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Appendix 9

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Ensuring Drinking Water Safety in Nirmal Gram Panchayats In Rajasthan, India - A Major Challenge

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ABSTRACT

A research was undertaken to assess the key parameters which impact the drinking water quality at household and community level in Nirmal Gram Panchayats (fully sanitized and open defecation free village councils) in ten districts of Rajasthan, the largest State by area in India. Five key parameters of water safety were rapidly assessed utilizing household survey questionnaire, structured-observations, visual inspections and testing bacteriological quality of water. The results of the research reveal that three out of five key parameters scored between 50 and 60 percent and two parameters scored between 60 and 70 percent. The State water safety index is 60.26 percent. All the Nirmal Gram Panchayats in Rajasthan needs to develop and implement the water quality surveillance and monitoring plan of actions with the technical and financial support from the state water and sanitation mission and respective district water and sanitation missions to ensure hundred percent water safety in all the Nirmal Gram Panchayats.

INTRODUCTION

Government of India (GOI) initiated the total sanitation campaign (TSC) in the year 1999 in rural areas to eliminate the practice of open defecation. To add push to the TSC in June 2003, GOI initiated an incentive scheme for fully sanitized and open defecation free (ODF) Gram Panchayats, Blocks and Districts called the "Nirmal Gram Puraskar" (Clean Village Award). Eligible Gram Panchayats, Blocks, and Districts are those that achieve (a) hundred percent sanitation coverage of individual households, (b) hundred percent school sanitation coverage, (c) free from open defecation and d) clean environment maintenance (SACOSAN II 2006). By 2013, 28590 Gram Panchayats were awarded Nirmal Gram Puraskar (NGP) after becoming Nirmal Gram Panchayats (fully sanitized and open defecation free village councils) out of which 326 Gram Panchayats in 28 districts were from Rajasthan (GOI 2016). Rajasthan, the largest State by area in India is situated in the north-west of the country and comprises of total 33 districts with 248 blocks and 9177 Gram Panchayats. ODF is termination of faecal-oral transmission, defined by: a) no visible faeces found in the environment/village; and b) every household as well as public/community institution using safe technology option for disposal of faeces. Solid and liquid waste management is also an important component of Swachh Bharat. This includes management of both organic and inorganic waste in villages and management of grey water from kitchen and bathrooms for which Ministry of Drinking Water and Sanitation provides technical and financial assistance to the States (SACOSAN VI 2016). With the launch of Swachh Bharat Mission-Gramin (rural) to make all Gram Panchayats, clean and sanitize by 2019, the award of NGP was discontinued after 2013.

Availability of water is a factor that influences the demand for sanitation as hand-washing after defecation and flushing excreta require a sufficient quantity of water. In turn, sanitation can impact the quality of water. There is a scope to establish linkages between sanitation and water quality and quantity through convergence of GOI flagship rural water programme. An appropriate technology, especially for pit latrines, is a must to prevent groundwater contamination (SACOSAN III 2008). A Nirmal Gram Panchayat should ensure availability of 55 litres per person per day potable water for each inhabitant of Gram Panchayat and the water source for each household should be within 100 metres, with arrangement for regular testing of water quality of all water sources (GOI 2012). A safe and sustainable water supply, basic sanitation and good hygiene are essential for healthy, productive and dignified life (IFAD 2009). Basic sanitation facilities are those that effectively separate excreta from human contact, and ensure that excreta do not re-enter the immediate household environment. A pit latrine with a superstructure, and a platform or squatting slab constructed of durable material, composting latrines, pour flush latrines, ventilated improved pit latrines, flush toilet connected to a septic tank or sewer come under the category of basic sanitation facilities.

The main causes of human enteric diseases are the bacte-

ria, virus, protozoa and helminths. Failure to ensure drinking water safety may expose the community to the risks of outbreaks of intestinal and other infectious diseases (WHO 2006). Globally, 1.5 million annual diarrheal deaths occur among children under five years of age. In India, more than 1000 children under five years die every day due to diarrhoea and 80 percent of these children is under two years of age (UNICEF 2011). About 88% of all diarrheal deaths are caused by unsafe drinking water, poor sanitation and insufficient hygiene (UNICEF/WHO 2009).

Sustainable Development Goal 6 aims to "ensure availability and sustainable management of water and sanitation for all, and places new emphasis on countries to improve services beyond access, which includes measures to improve quality and availability of drinking water and ensures safe management of faecal waste (UN Water/WHO 2015). Safely managed drinking water services consistently supply water which meets household needs and does not present very much risk to health (WHO/UNICEF 2014). Improper disposal of human excreta can cause diarrhoea and intestinal worm infections such as hook worm and round worm (World Economic Forum 2011). As per the multi district assessment on water safety (MDAWS) conducted by UNICEF in all 47 districts of Madhya Pradesh and 13 other districts spread over 11 States including Rajasthan, overall 47% of water sources were found polluted with faecal coliform. The main anxiety of villagers is the availability of sufficient quantity of water, not the availability of safe water and they do not differentiate between clean water and safe water. In cases where sufficient water is available villagers want that the source is near and reachable (UNICEF 2011).

For those who have sufficient quantities of water, but whose water is poor or uncertain bacteriological quality, an alternate is to treat water at home. Water treatment at household level reduces the risk of waterborne diseases arising from recontamination during collection, transport, storage and use at home (Wright et al. 2003). The research has concluded that simple and affordable water treatment methods at household and community level can improve the microbial quality of household water and decrease the risks of diarrheal diseases and death in the developed and developing countries (Sobsey 2002). Boiling is the most common method of household water treatment with 21 percent households practice boiling, 5.6 percent households use chlorine, 4.3 percent households practice filtration and only 0.2 percent households use solar disinfection (Rosa & Clasen 2010).

The assessment study carried out by Centre for Media Studies (CMS), Delhi in 2011 on impact and sustainability of 664 Nirmal Gram Panchayats in 56 districts of 12 states reveal that provision of sustainable water supply, ensuring safe distance (minimum 10 metres) between leach pit and nearest water source, exposure of Nirmal Gram Panchayats to various low cost options for sanitation, and disposal of solid waste and liquid waste are major challenges in ensuring sustainability (CMS 2011). An evaluation study on total sanitation campaign carried out by the planning commission in 2013 in 20 states including Rajasthan reveals that water tap is the major source of drinking water for 36.7% houses, hand-pumps for 41.2% houses, wells for 11.4% houses and other sources for 10.7% houses. Rajasthan was ranked 12th among 20 states based on its performance in total sanitation campaign (Planning Commission 2013).

There is an urgent need for regular surveillance and monitoring of water quality at the household and community level as well as protection of drinking water sources to prevent them from getting polluted from septic tank/leach pit effluent and faecal waste littering around them. Once the bacteria and viruses reach the water table, they can be carried over considerable distances in the direction of groundwater flow. Although pit latrines have potential for groundwater contamination, but are used on large scale for onsite human excreta disposal. The pit latrines are basic sanitation option for low-income countries to decrease the rate of open defecation and increase access to improved sanitation. Areas with shallow groundwater and low lying areas prone to flooding present the greatest risks of contamination because required vertical separation is necessary between the base of latrine pits and the saturated zone to prevent pollution of groundwater (Graham et al. 2013).

To minimize the pollution risk, the distance between the bottom of the pit and the maximum groundwater level should be two meters or more. The minimum horizontal distance of separation between water source and the leach pit should be 3 metres for fine sand, clay and silt, if the distance between the bottom of the pit and the maximum groundwater level is less than 2 metres, the minimum horizontal distance of separation should be 10 metres for fine sand, clay and silt. In case of coarse sand, 500 mm envelope of sand of 0.2 mm effective size is provided all round the leach pit and bottom of the pit is sealed to ensure the water safety (TAG-India 1985).

Septic tank needs sludge removal at regular intervals in accordance with its design and capacity. But mostly when a septic tank is filled beyond its holding capacity and overflows, the sludge removal is carried out. The overflow from septic tank enters into the nearest water sources, land surface, water bodies and pollutes them. This results in saturation of surface soil and water bodies with nutrient posing a threat of eutrophication to surface waters. The animals and human beings coming in contact with the polluted areas are

susceptible to infections. The groundwater gets polluted when sludge percolates near the water source (CSE 2011).

Managing small community water supplies, including those serving rural villages, is a concern worldwide in both developed and developing countries. Experience shows that small community water supplies are more at risk of breakdowns and contamination resulting in outbreaks of waterborne diseases and decrease in their functionality and service (WHO 2012). The present approaches to monitoring rural water supply focus on coverage measured in terms of the number of systems installed and population served. But many system breakdown within a few years of installation due to lack of proper operation and maintenance and population which was shown as served is left for want of reliable service (IRC 2011). The financial sustainability of community water system is a big challenge and rural habitations, which are dispersed and difficult to reach cannot afford to pay the cost of operation and maintenance of water supply system, and it is almost impossible for them to pay the capital costs (IFAD 2009).

The extensive literature review and field experiences reveal that improving quality and availability of drinking water at the household and community level for rural water supply systems is a major challenge. Therefore, a research was undertaken to assess the extent to which the drinking water safety was ensured at household and community level in Nirmal Gram Panchayats in Rajasthan.

MATERIALS AND METHODS

The following five key parameters of water safety were assessed through rapid assessment at household and community level in ten randomly selected Nirmal Gram Panchayats in 10 districts to find out the extent to which the drinking water safety was ensured in Nirmal Gram Panchayats in Rajasthan:

1. Toilet use: Toilet used by all family members of the household.
2. Toilet location: Safe distance (minimum 10 metres) between toilet pit and water source ensured.
3. Safe water at home: Drinking water free from bacteriological contamination at home.
4. Safe water source: Community water source free from bacteriological contamination.
5. Clean water source: No faecal waste accumulation around community water source.

The following research methods were utilized in undertaking rapid assessment of five parameters.

- Household survey questionnaire (in Hindi language) was utilized to collect information at household level. The questionnaire covered all the relevant questions regarding use of toilet by all the family members, proper collection, storage and handling of water, and distance between water source and toilet pit. The questionnaire was completed at each household through interaction with family members present at the time of survey. Face-to-face contact is important for engaging with the family members, building rapport and gaining their confidence which helps in informally assessing the validity of responses given by them (Denscombe 2014).
- Structured-observations were carried out to correlate and check the reliability of information collected through household survey questionnaire as well as to assess the extent to which the hygiene behaviours were practiced by all family members. The structured-observation was utilized as a tool which was best suited to the measurement of hygiene behaviours (Curtis et al. 1993). Observing water handling and storage practices and interviewing community members provided useful information on the actual causes of poor water quality (UNICEF 2008).
- Visual inspections and assessments of water and sanitation facilities were carried out at household and community level utilizing a checklist to assess the environment around water sources, toilet use and distance of toilet from water sources.
- H_2S (hydrogen sulphide) strip vials were utilized to test the bacteriological quality of drinking water source at community level and drinking water stored and used at the household level. The water was collected in H_2S strip vial directly from water source/storage tank/storage container and kept covered in vial for 48 hours. If the colour of water turned black, it indicated bacteriological contamination and if the colour of water in the vial remain unchanged after 48 hours the water was free from bacteriological contamination. The test is based on measuring bacteria that produce hydrogen sulphide. The test measures the presence of H_2S by its reaction with iron to form an insoluble black precipitate. The test is simple and affordable and used for drinking water management and health education in water and sanitation sectors (WHO 2002).

The rapid assessments were carried out for all the five parameters in 15 randomly selected households utilizing the above research methods in 10 randomly selected Nirmal Gram Panchayats in 10 districts- one each in each district. Each parameter was assigned a maximum score of 100 if it was fully met. The average actual scores of all the 15 households and randomly selected community water sources for each parameter in terms of percentage achievement indi-

cated the extent to which that parameter was achieved in that Nirmal Gram Panchayat. The average score of all the five parameters represent the district water safety index of that district. Equal weightage was given to all the five parameters of water safety because all of them are interrelated and equally impact the water safety at household and community level. The average of water safety indices of 10 districts represent the water safety index of Rajasthan State of India.

RESULTS AND DISCUSSION

District-wise scores of water safety parameters/index are given in Table 1. The State water safety index of Rajasthan State is 60.26 percent.

A bar chart showing percentage achievement for five parameters of water safety in ten districts and Rajasthan State is shown in Fig. 1. The district-wise water safety index for ten districts and state water safety index for Rajasthan State are presented in a spider diagram in Fig. 2.

In 69.7 percent households in Rajasthan all the family members use toilet and in the remaining 30.3 percent households one or more members of the family go for open defecation in fields, near water bodies, close to water sources posing threat to the contamination of water sources and water bodies. In 59.2 percent households toilet pits are rightly located and the minimum distance of 10 metres is maintained between the toilet pit and water source viz., underground water storage tank, rain water harvesting tank, open well, hand-pump etc. In remaining 40.8 percent households the minimum distance of 10 metres has not been maintained between the water source and toilet pit. The H_2S strip vial test reveals that in 54.9 percent households the drinking water was free from bacteriological contamination and in remaining 45.1 percent households the bacterial contamination was found in drinking water.

Sixty four percent water sources were found safe on testing with H_2S strip vials, and bacteriological contamination was found in 36 percent water sources. The environment around 53.5 percent community water sources was found clean and in the remaining 46.5 percent water sources accumulation of faecal waste and stagnant wastewater around water source was found. The results of rapid assessment reveal that drinking water safety has been ensured at 64 percent community water sources and at 54.9 percent households. The community water sources get contaminated from faecal waste accumulated around them due to open defecation, effluent from septic tanks, drains, leach pits, and improper disposal of solid and liquid waste. Drinking water gets contaminated at household level due to improper storage and handling of water and not maintaining safe distance between water source and toilet pit in the house.

The factors which contributed to low district water safety index in Churu, Hanumangarh and Karoli districts are as follows:

- The water storage tanks in Nirmal Gram Panchayat Somiasar (Churu district) do not get water from the safe water source, being the tail end village of the regional water supply scheme, due to which the villagers are compelled to fetch contaminated water in water tankers from the nearby polluted canal and store it in the water tanks at their houses for drinking and other uses. There is no other alternate source of safe water in the village. The safe water is available at a distance of 21 km from the village and fetching water in a tanker from that source costs Rs. 800 per trip due to which only 10 percent households are fetching water from that distant safe source and remaining 90 percent households are using contaminated water of canal without any home treatment to make it safe. Although the environment around 27 percent community water tanks was clean, but the safe water was not reaching to any of the

Table 1: District-wise scores of water safety parameters and water safety index.

S.No.	Name of district	Name of Nirmal Gram Panchayat	Toilet use	Right toilet location	Safe water at home	Safe water source	Clean water source	District water safety index
1	Ajmer	Jamola	33	73	87	87	67	69.4
2	Bundi	Basoli	67	53	85	60	90	71
3	Churu	Somiasar	73	53	10	27	10	34.6
4	Hanumangarh	Mulsisar	67	60	25	33	25	42
5	Jaipur	Mahlana	67	60	75	87	60	69.8
6	Jhunjhnu	Mohanbari	73	60	50	80	50	62.6
7	Karoli	Sakarwada	87	73	25	53	33	54.2
8	Pali	Jhoontha	83	40	67	73	75	67.6
9	Rajsamand	Piplantri	80	73	50	67	50	64
10	Sikar	Magloona	67	47	75	73	75	67.4
11	Whole Rajasthan		69.7	59.2	54.9	64	53.5	60.26

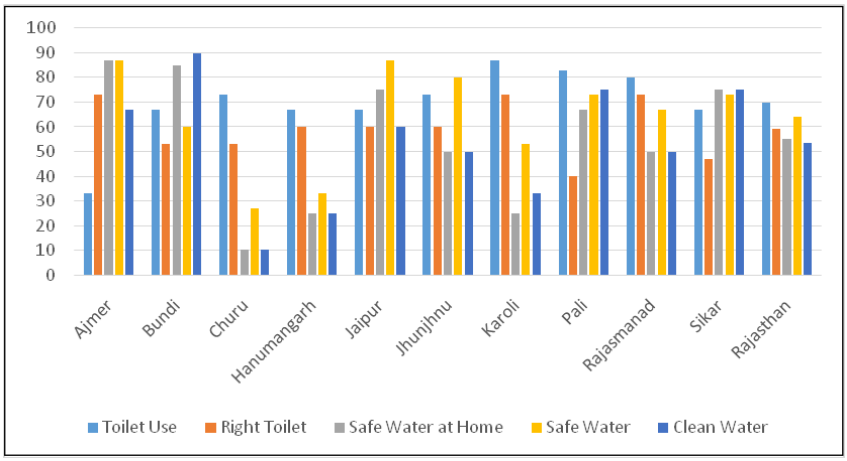

Fig. 1: Water safety parameters for ten districts and whole Rajasthan state.

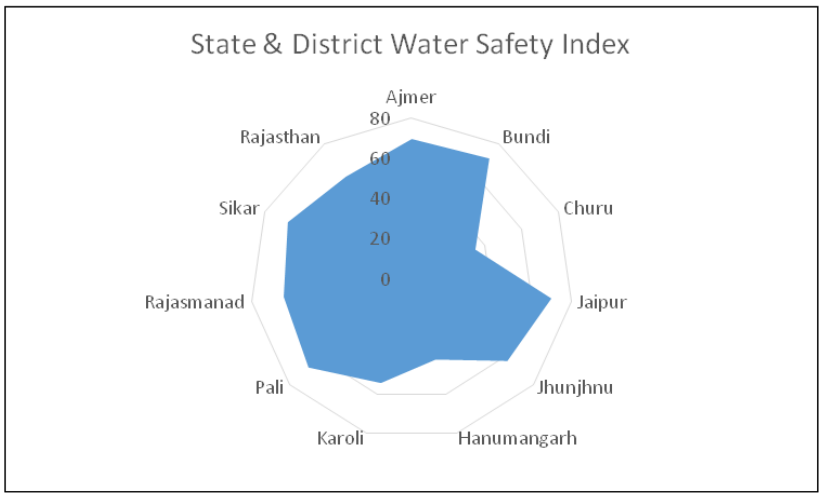

Fig. 2: Water safety index by district and whole Rajasthan state.

tanks from the regional scheme, and in remaining 73 percent water tanks neither the water was reaching from regional scheme nor the environment was clean around them.

- In Nirmal Gram Panchayat Mulsisar (Hanumangarh district) there are two diggies (open reservoirs) for supplying drinking water, but water in both the diggies is contaminated. Villagers fetch water from the contaminated diggies, store it in the water tanks/containers at their houses and use it for drinking and other purposes. The environment around both the diggies is not clean. There are two hand-pumps in the Gram Panchayat and households living close to those hand-pumps are taking water from the hand-pumps. The environment around one hand-pump was clean, but there was accumulation of faecal waste around other hand-pump. In a few households rain water collected in underground tanks during rainy season was used for drinking and cooking. The availability of safe water is ensured only in 25% households and the remaining 75% households are using contaminated water. Water is not treated at household level before use.
- In Sakarwada (Karoli district) at 25 percent households, water was found free from bacteriological contamination. The water is supplied for one hour in the morning through the piped water system from a government tube-well to only 25 percent households. Seventy five percent households get water from private tube-wells located in the fields through water connection and pay water charges to tube-well owners. The water is also supplied through public stand posts (PSPs) connected to private tube-wells/piped water system. The environment

around 33 percent public stand posts was clean and faecal waste and wastewater stagnation was found around 67 percent PSPs. In summer season, villagers do not get water from the piped connections and PSPs and fetch contaminated water from a pond about half kilometre from the Gram Panchayat for drinking and other uses.

There is an urgent need to upgrade/improve the water supply schemes in Churu, Hanumangarh and Karoli districts to enhance the score of district water safety index in these three districts.

CONCLUSION

The results of the research reveal that three out of five parameters scored between 50 and 60 percent and two parameters scored between 60 and 70 percent. Thus achieving hundred percent score of all the five key parameters to ensure water safety in Nirmal Gram Panchayats is a major challenge. The State water safety index of Rajasthan is 60.26 percent. The district water safety indices of Churu, Hanumangarh and Karoli districts are very low and less than the State water safety index. Nirmal Gram Panchayats in all the 28 districts need to develop, implement and monitor the water quality surveillance and monitoring plans of action with technical and financial support from the State Water and Sanitation Mission (SWSM) and in partnership with the community based organizations with active involvement of the community. All the Nirmal Gram Panchayats need to develop, implement and maintain the solid and liquid waste management systems with technical and financial support from SWSM. The District Water and Sanitation Missions (DWSMs) and SWSM need to review the effectiveness of water supply schemes in all the Nirmal Gram Panchayats and undertake the up-gradation/improvement of water supply schemes wherever necessary giving priority to Churu, Hanumangarh and Karoli districts to ensure the availability of 55 litres per person per day potable water for each inhabitant and the distance of safe water source from each and every household should not exceed more than 100 metres.

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Appendix 10

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Assessing and Ensuring Sustainability of Nirmal Gram Panchayats in Rajasthan, India

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ABSTRACT

The sustainability of *Nirmal Gram Panchayats* is a serious problem in all the states of India. The extensive literature review reveals that the key interrelated factors affecting the sustainability are; socio-economic, technical, environmental and institutional. A research was undertaken to assess the four factors and develop the State Sustainability Index to measure the sustainability of *Nirmal Gram Panchayats* in Rajasthan. Five parameters were included in each factor of sustainability and equal score was assigned to each of the twenty parameters. All the twenty parameters were assessed through rapid assessments utilizing survey questionnaire, visual inspection check lists, semi-structured interviews, focus group discussions, and water quality testing in ten randomly selected *Nirmal Gram Panchayats* in ten districts of Rajasthan. The district sustainability indices were derived for all the ten districts analyzing the scores assigned to five parameters included in each factor. The State Sustainability Index of Rajasthan was worked out as 46.52 % by averaging the scores of district sustainability indices of ten districts, which is categorized as low with high concern. The institutional factor having lowest sustainability score and the highest value of correlation coefficient with its variables and environmental factor having low score of sustainability and very high correlation coefficient needed highest and very high priority respectively for implementing remedial measures at the Gram Panchayat level. The technical factor having highest sustainability score and moderate value of correlation coefficient and socio-economic factor having moderate sustainability score and moderate correlation coefficient needed high and moderate priority respectively for implementing remedial measures at household level.

Keywords: *Sustainability, Nirmal Gram Panchayats, Total Sanitation Campaign, Open defecation free, Rapid Assessment, Panchayati Raj Institutions.*

INTRODUCTION

Government of India (GOI) initiated Total Sanitation Campaign (TSC) in the year 1999 in rural areas to eradicate the practice of open defecation. The TSC was evolved from the experience of the Central Rural Sanitation Program (CRSP), India's first nationwide program for rural sanitation launched in 1986 in the Ministry of Rural Development with the objective of improving the quality of life of rural people and to provide privacy and dignity to women [1].The key principles of TSC were enunciated as follows: low to no subsidy, focus on awareness generation, community centered and demand responsive approach, reliable supply chain, school sanitation and hygiene education and involvement of Panchayati Raj Institutions (PRIs) and Non-Governmental Organizations[2]. To add vigor to the TSC, in June 2003, Government of India (GOI) initiated an incentive scheme for *Nirmal Gram Panchayats* (fully sanitized and open defecation free Gram Panchayats) , Blocks and Districts called the '*Nirmal Gram Puraskar*'[1]. By 2013, 28590 Gram Panchayats (GPs) were awarded *Nirmal Gram Puraskar* (NGP) out of which 326 Gram Panchayats were from Rajasthan[3].While the NGP contributed in raising awareness about rural sanitation and community health, issues of sustainability in many awardees villages were noted in independent evaluations[2].The evaluation study on TSC by Planning Commission, GOI[4] in 156 *Nirmal Gram Panchayats* in 20 states including Rajasthan

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reveals that only 100 *Nirmal Gram Panchayats* were best performing. The findings of study carried out in 162 *Nirmal Gram Panchayats* in six states indicate that only 6 Gram Panchayats maintained the open defecation free status[5]. The assessment study of impact and sustainability of 664 *Nirmal Gram Panchayats* in 56 districts of 12 states reveals that provision of sustainable water supply, maintaining safe distance between toilet pits and nearest water source, and exposure of Panchayati Raj Institutions (PRIs) to various low cost options for sanitation are major technical challenges and disposal of solid and liquid waste is a major environmental challenge in achieving the sustainability [6]. A sanitation survey conducted by National Sample Survey Organization (NSSO) during May-June 2015 covering 73176 households in 3788 villages in 26 states of India [7] on the basis of households having toilets and using them, ranked Rajasthan at 20th rank. Well sustained and used water supply and sanitation facilities mean that for a period that covers the design life of technologies used to provide services each member of all households in the project area has a regular and dependable delivery of water-acceptable in terms of quality and quantity, practices safe disposal of waste 365 days per year [8]. A sanitation system that is sustainable, protects and promote human health, does not contribute to environmental degradation or depletion of resource base, is technically and institutionally appropriate, economically viable and socially acceptable [9].Sustained behaviors result from giving high priority and adequate resources to hygiene promotion[10]. The flush/pour flush toilets connected to pit latrine, septic tank, piped sewer system, ventilated improved pit latrine, pit latrine with slab, composting toilet come under the category of improved sanitation [11]. Long term sustainability of WASH (water, sanitation and hygiene) interventions is widely recognized as a complex and persistent challenge facing communities, governments and international development partners alike [12] .The sustainability index tool is made up of a number of frame works, each framework focuses on five factors of sustainability that have been established from an extensive review of literature and include: institutional, management, financial, technical and environmental factors [13].The WASSI (Water and Sanitation Sustainability Index) was developed and calculated for the city of Salta in northern Argentina as a single sustainability score for an entire city to disseminate the results to wider audiences and convey unambiguous messages to policy makers [14].The sustainability of *Nirmal Gram Panchayats* is a serious problem in all the states of India including Rajasthan. The extensive review of literature reveals that the key factors affecting the sustainability of *Nirmal Gram Panchayats* are: institutional, environmental, socio-economic and technical and there is a need to develop state sustainability index as a measure of sustainability, for the state of Rajasthan. Therefore the research has been undertaken to assess and analyze these four interrelated factors to develop and determine the state sustainability index for taking remedial measures for ensuring the sustainability of *Nirmal Gram Panchayats* in Rajasthan.

RESEARCH METHODOLOGY

The sustainability of a *Nirmal Gram Panchayat* is defined as continuous and satisfactory functioning as well as effective use of water and environmental sanitation facilities by all households throughout the year in th*at Nirmal Gram Panchayat*. The four key interrelated factors of sustainability are: socio-economic, technical, environmental and institutional. Each factor has five parameters which have been assessed through rapid assessments in ten randomly selected *Nirmal Gram Panchayats* one each in each district, covering total 10 out of 28 districts utilizing the following research methods:

- Household Questionnaire
- Visual inspection check lists
- Testing bacteriological quality of water utilizing H_2S strip vials
- Semi-structured interviews
- Focus Group Discussions

The parameters included under each of the four factors of sustainability are as follows:

Socio-economic parameters at household level; toilet used by all family members, proper storage and handling of water, proper collection and disposal of solid waste, hand-washing with soap/ash by all family members at critical times, proper disposal of waste water.

Technical parameters at household level; toilet structure in good condition and functional, toilet pit is at a safe distance (≥10 m) from water source, hand-washing facility is available, water is available within/near house, water is potable by testing using H_2S strip vial.

Environmental parameters at Gram Panchayat level; Well-maintained functional community/institutional toilet (s) in use by men and women, well maintained functional School/Anganwadi toilet(s) in use by girls and boys and clean school campus, potable community water source (s) with proper arrangement for collection and disposal of waste water and clean surroundings, proper arrangement for collection and disposal of solid waste, proper arrangement for disposal of waste water.

Institutional parameters; Functional and active village water and sanitation committee, community participation in planning and monitoring of water and sanitation facilities, availability of adequate funds for operation and maintenance of community/institutional water and sanitation facilities, availability of plans and funds for solid waste and waste water management systems, availability of technical and financial support from external support agencies in planning, implementation, operation and maintenance of water and sanitation facilities.

Every parameter under each factor is assigned a maximum score of 20 if it is fully met. The actual score is assigned to each parameter after assessment. The average score of all the five parameters under each factor is worked out as percentage of total maximum score of 100. In each of the ten Nirmal Gram Panchayat 15 randomly selected households were surveyed utilizing the pre-designed and field tested questionnaire, and visual inspection of household water and sanitation facilities was also carried out in each household utilizing the pre-designed and field tested check list. The bacteriological quality of water was checked by testing water utilizing H_2S strip vials. One or more randomly selected community/institutional water and sanitation facilities depending upon their total number in the Nirmal Gram Panchayat were visually inspected utilizing pre-designed and field tested check list and the score was assigned to relevant parameter under environmental factor. The focus group discussions and semi-structured interviews with various stake holders were conducted and score was assigned to relevant parameters under institutional and environmental factors. The district sustainability index was worked out as percentage of total scores of the four factors of sustainability assessed in the Nirmal Gram Panchayat in that district. The State Sustainability Index (SSI) of Rajasthan was worked out by averaging the scores of district sustainability indices of all the ten districts.

RESULT AND DISCUSSIONS

The district wise scores of all the four factors of sustainability in ten districts, district sustainability indices and state sustainability index of Rajasthan derived from the rapid assessments of ten *Nirmal Gram Panchayats* one each in each district are given at Table 1:

Table 1: District wise Scores of four Factors and District Sustainability Indices in ten districts

Name of District/State	Technical Factor (%)	Socio- economic Factor (%)	Environmental Factor (%)	Institutional Factor (%)	District/State Sustainability Index(%)
Ajmer	68	36	39	20	40.75
Bundi	68	63	41	30	50.50
Churu	60	64	28	20	43.00
Hanumangarh	64	33	30	20	36.75
Jaipur	76	39	40	25	45.00
Jhunjhnu	76	56	35	30	49.25
Karoli	70	60	25	20	43.75
Pali	64	57	40	25	46.52
Rajsamand	79	71	56	45	62.75
Sikar	70	70	28	20	47.00
Rajasthan	69.5	54.9	36.2	25.5	46.52
State Sustainability Index is 46.52					

Keeping in view the significance and utility of State Sustainability Index (SSI) it has been categorized in four categories as follows:

- SSI<50 Low- with High Concern
- SSI >50 and < 75 Medium- with medium concern
- SSI>75 and <100 High-with low concern
- SSI= 100 Highest- with no concern

The above categorization of SSI highlights its importance, expresses concern and draws attention of policy makers, implementers and elected representatives for taking timely remedial measures to achieve the highest score of sustainability index of *Nirmal Gram Panchayats* in Rajasthan.

The state sustainability index is 46.52% which falls under the category of low with high concern needing urgent attention to increase its value and ensure sustainability of Nirmal Gram Panchayats in Rajasthan. The scores of four factors of state sustainability index are; technical 69.50%, socio-economic 54.90%, environmental 36.20% and institutional 25.50%.The score of technical factor is the highest whereas the score of institutional factor is the lowest and the score of socio-economic factor is higher than the score of environmental factor of state sustainability index. The factor analysis of four factors in ten districts reveals that institutional factor has extremely high correlation with its variables and environmental factor has very high correlation with its variables whereas technical factor has high correlation with its variables and socio-economic factor has moderate correlation with its variables. Both institutional and environmental factors pertain to Gram Panchayat level and technical and socio-economic factors pertain to household level. The institutional factor having lowest sustainability score and highest value of correlation coefficient needs highest priority for implementing remedial measures at Gram Panchayat level. The environmental factor having low sustainability score and very high value of correlation coefficient needs very high priority for implementing remedial measures at Gram Panchayat level. The technical factor having highest score of sustainability and high value of correlation coefficient needs high priority for implementing remedial measures at household level. The socio-economic factor having moderate sustainability score and moderate value of correlation coefficient needs moderate priority for implementing remedial measures at household level. The priority needed for the four factors of sustainability is shown at Table 2:

Table 2: Factor wise priority needed for four factors of sustainability

Sl. No.	Factor of Sustainability	Sustainability Score	Correlation coefficient value	Level of priority needed	Action level
1.	Institutional	25.5	0.972	Highest	*Nirmal Gram Panchayat*
2.	Environment	36.2	0.878	Very High	*Nirmal Gram Panchayat*
3.	Technical	69.5	0.791	High	Households in Nirmal GP
4.	Socio-economic	54.9	0.412	Moderate	Households in Nirmal GP

In order to increase the value of state sustainability index the simultaneous remedial measures are needed both at Gram Panchayat and household levels in all the Nirmal Gram Panchayats of Rajasthan.

CONCLUSION

In order to ensure the sustainability of *Nirmal Gram Panchayats* in Rajasthan the following remedial measures are necessary at various levels in the order of priority for all the four factors of sustainability in all the *Nirmal Gram Panchayats*:

Institutional Sustainability: All the three tiers of Panchayati Raj Institutions viz. Gram Panchayat, Block Panchayat and District Panchayat should be strengthened by providing them with adequate funds and skilled functionaries and building their capacities in planning, implementation, operation & maintenance and monitoring of water and environmental sanitation interventions at *Nirmal Gram Panchayat* level.

Environmental Sustainability: The State Water and Sanitation Mission and the respective District Water and Sanitation Mission should provide technical support to all Nirmal Gram Panchayats in developing, implementing and managing solid and liquid waste management plans of actions to ensure proper solid and liquid waste management in each and every *Nirmal*

Gram Panchayat in Rajasthan. The Village Water and Sanitation Committee in each *Nirmal Gram Panchayat* should involve local communities in maintaining the clean environment around community/institutional water supply sources and community sanitation facilities as well as on the streets and in open spaces.

Technical Sustainability: The capacity of elected representatives, technical staff and local masons of all the *Nirmal Gram Panchayats* and the respective Block Panchayats should be built in all the aspects viz. design, construction, operation & maintenance and monitoring, of various technical options of household toilet, community toilet, School/Anganwadi toilet, hand-washing facility and hand pump/stand post platform and drains.

Socio-economic Sustainability: All the *Nirmal Gram Panchayats should* train and involve school teachers, anganwadi workers, health workers, village water and sanitation committee members, ward members, community based organizations and self-help groups for undertaking hygiene education programme through regular home visits covering all the households in their respective Nirmal Gram Panchayat.

Ethical Committee Clearance: Not Applicable

Source of Funding: Self financed

Conflict of Interest: Nil

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Appendix 11

Appendix 11

Bio-data of Research Scholar

Name: Satish Raj Mendiratta

Professional Qualifications

- Bachelor of Engineering, Civil Engineering Degree, Gold Medallist

  Faculty of Engineering, University of Jodhpur, Jodhpur, India

- Master of Science in Water & Environmental Management Degree,

  Water, Engineering and Development Centre (WEDC),

  Loughborough University, Leicestershire, UK

- Master of Arts in Sociology Degree,
  Annamalai University, Annamalainagar,
  Tamilnadu, India.

Fellowship/Membership

- Life fellow of Institution of Engineers (India), Calcutta, India
- Life Member of Indian Water Works Association, Mumbai, India

Professional Work Experience

Have more than forty years of professional work experience in planning, implementation, management, monitoring and evaluation of Water, Sanitation and Hygiene (WASH) programme/projects with various National and International Organizations in six states of India and Jamaica, West Indies.

International Conferences/Workshops/Training Attended

- Regional Training on Project Formulation and Appraisal in Water and Sanitation from 24.2.82 to 25.3.82 at Periyar Anna University of Technology, Chennai
- Regional Workshop on Water & Sanitation skills/Strategy from 10.10.93 to 15.10.93 at UNICEF Dhaka, Bangladesh

- Regional Training on Management for Sustainability in Water and Sanitation Programme from 21.8.95 to 8.9.1995 organized by IRC, The Netherlands and Sarvodaya Rural Technical Services at Kandy, Sri Lanka.
- 25th WEDC International Conference from 28 .8.99 to 4.9.99 at Addis Ababa, Ethiopia
- 26th WEDC International Conference from 4 to 9 Nov. 2000 at Dhaka, Bangladesh
- 27th WEDC International Conference from 20 to 24 August 2001 at Lusaka, Zambia
- International Symposium on School Sanitation and Hygiene Education from 8 to 10 June 2004 at Delft, the Netherlands
- International Conference from 8 to 10 October 2015 on Recent Trends in Business Finance and Economics organised by JNU, University of Jodhpur at Jodhpur
- International Conference on Environmental impact on Biodiversity, Sustainability and Quality of Life from 16 to 18 February 2017 organised by University of Rajasthan at Jaipur.

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- Satish Raj Mendiratta, Mahender Choudhary, Sudhir Kumar (2018). Sustainability of Hygiene Behaviours in Nirmal Gram Puraskar awarded Gram Panchayats in Rajasthan: A Big Challenge: India Journal of Public Health Research & Development Vol.9, No.3, pp281-285, March 2018
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