ADBI Working Paper Series

HOW CAN PUBLIC EXPENDITURE IMPROVE HOUSEHOLDS' SANITATION BEHAVIOR? EXPERIENCE OF THE SWACHH BHARAT MISSION IN THE INDIAN STATES

Krishna Nair J., Pulak Mishra,
and Dil Bahadur Rahut

No. 1373
April 2023

Asian Development Bank Institute

Krishna Nair J. is a research scholar, and Pulak Mishra is a professor, both at the Department of Humanities and Social Sciences, Indian Institute of Technology, Kharagpur, India. Dil Bahadur Rahut is vice-chair of research, Asian Development Bank Institute, Tokyo, Japan.

Suggested citation:

Nair J., K., P. Mishra, and D. B. Rahut. 2023. How Can Public Expenditure Improve Households' Sanitation Behavior? Experience of the Swachh Bharat Mission in the Indian States. ADBI Working Paper 1373. Tokyo: Asian Development Bank Institute. Available: https://doi.org/10.56506/IKTC7428

Please contact the authors for information about this paper.

Email: krishnanairj@gmail.com, pmishra@hss.iitkgp.ac.in, drahut@adbi.org

This paper is based in part on the first author's ongoing PhD research. The authors are grateful for the valuable feedback and comments of the reviewers.

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Abstract

The social impact of sanitation is multifaceted. It has repercussions for health, education, and the local environment, as well as overall human development and economic growth. Unsafe sanitation poses environmental and health risks. In light of the health hazards, the Government of India has introduced the Swachh Bharat Mission (SBM) to improve sanitation conditions.

This paper investigates how the Swachh Bharat Mission (SBM), as a public-funded initiative of the Government of India, can improve the sanitation environment in different states. The paper also explores whether the SBM has been successful as a catalyst in improving the sanitation infrastructure and ensuring its long-term sustainability.

The paper employs state-level data from various secondary data sources from 2014–15 to 2018–19. The changes are also explored further using data from the National Family Health Survey (NFHS) (4th and 5th rounds) of the Government of India. The data were analyzed by estimating panel econometric models, and related diagnostic tests were carried out. In addition, descriptive analysis was also performed.

The results show that household latrine coverage has improved considerably with the initiation of the SBM in India. In addition, a higher literacy rate, a sex ratio favoring women in the family, more significant government expenditure on sanitation and water, and more per capita income result in an improved hygienic environment.

As a public-funded initiative, the SBM seems to have played the role of an important catalyst in making people aware of sanitation and creating a conducive environment by constructing latrines. One may expect such changes to encourage private expenditure on sanitation and lead to the establishment of a sustainable sanitation environment in the country. Community participation is also necessary in this regard to alter and improve sanitation and hygiene behavior.

Keywords: sanitation environment, public expenditure, Swachh Bharat Mission, India

JEL Classification: H4, H5, I1, I3, J18

Contents

1. INTRODUCTION

The impact of sanitation on society is multifaceted. It affects health, education, and the local environment, as well as overall human development and economic growth. Unsafe sanitation causes environmental and health-related hazards. More specifically, people in the lower strata are more vulnerable to unhygienic circumstances and sanitation-related intimidations. The situation was very alarming in India before 2014. More than 20% of people lived in places with open defecation (UN 2015), and around one-fifth of child deaths were caused by severe diarrhea. In particular, 52.1% and 7.5% of the rural and urban populations, respectively, practiced open defecation in 2015 (Swachhta Status Report 2016). The lack of sanitation facilities within household premises constitutes a major threat to hygiene requirements in rural India (Chaudhuri and Roy 2017).

Open defecation is a major barrier to achieving sustainable sanitation and a better quality of life. It is directly linked with problems like poverty, underdevelopment, and a poor standard of living. The practice of open defecation has made people more prone to various types of diseases (Spears 2013; Coffey et al. 2014a). Evidence shows that a lack of proper toilet facilities can cause major hindrances to school participation for children, especially pubescent girls from developing countries, leading to millions of girls being out of school (UNICEF 2018). In many cases, the remoteness of the areas and the lack of availability of sufficient water and access to construction materials for latrines have made open defecation more convenient for rural people (O'Reilly, Dhanju, and Goel 2017a). In particular, limited water availability is a major hindrance to the success of sanitation programs.[1] Hence, along with the construction of more latrines, the availability of other necessities, such as water and light, appears to be crucial for replacing open defecation with regular use of latrines.[2] The lack of adequate and proper sanitation facilities has led to a poor quality of life, increased poverty, and underdevelopment.

Other important aspects associated with open defecation are the beliefs and value systems that Indians possess. The "purity and pollution" concept associated with human excreta often restrains people from using common latrines (Coffey et al. 2017). Moreover, social barriers and cultural patterns also hinder the usage of sanitation facilities (Coffey et al. 2017). For example, a village dominated by Scheduled Tribe (ST) households practices open defecation more (IHDS 2012), primarily because of their socially disadvantaged position in the community. Similarly, in addition to the availability of land, water supply, etc., the caste system also forces the rural people of Tamil Nadu to practice open defecation (O'Reilly Dhanju, and Louis 2017b). Further, poor infrastructure, a lack of monitoring, and behavioral barriers have made open defecation-free programs less successful in many areas. Many other studies (e.g., Doron and Jeffrey 2014; Mohan 2017; Bharat, Dkhar, and Abraham 2020) have also recognized how culture, caste structure, behavioral changes, water supply, geography, education, etc. can influence sanitation.

[1] This is a critical issue considering that only 56% of people in rural areas use safe drinking water (World Bank 2017).

[2] This essentially suggests that taking the local conditions into consideration is essential to ensure the success of the sanitation programs. Otherwise, it may be very difficult to motivate people to replace open defecation with latrines, leading to the failure of the SBM. Through a case study conducted in the Coastal Odisha of India, Routray et al. (2015) also call for an approach that suits local needs for attaining the targets on sanitation.

Against this backdrop, all the United Nations member countries adopted 17 Sustainable Development Goals (SDGs) in 2015; one among them (the 6th one) focuses on ensuring the availability and sustainable management of water and sanitation for all. The SDGs were introduced as a further improvement to the then-existing Millennium Development Goals. Given the vast population, India had to find sustainable ways to achieve sanitation targets to provide its citizens with a better quality of life. In this context, the Government of India initiated the Swachh Bharat Mission (SBM) in 2014 to achieve zero defecation status by 2019, and nearly 100% latrine coverage was declared in all the states subsequently (SBM 2019). However, some recent studies cast doubts on that latrine coverage and its effective use (Abraham et al. 2018; Jain et al. 2020). Despite the existence of toilets, open defecation persists in several parts of rural India (NARSS 2019). It is argued that merely constructing latrines is unlikely to result in attaining the targets under the Mission, as the provision of toilets does not necessarily drive people to stop the practice of defecating in open spaces (Panchang 2020). In addition to the provision of latrines, the quality of construction, socioeconomic circumstances, the behavioral pattern of households, and the availability of other infrastructure facilities are also crucial (Routray et al. 2015).

The provision of a latrine is a precondition for ensuring better sanitation. The experiences in this regard vary across the states, particularly regarding changes in the coverage of households with individual latrines. Assessing the role of government spending in creating a sanitation environment is crucial, as it involves a considerable amount of expenditure. This is a critical issue as there are constraints to public spending on universal welfare programs in developing countries. Further, ensuring efficiency and achieving the desired impacts are also imperative to rationalize public expenditure for social development. While subsidies can play a vital role in constructing toilets, regular use of the same requires some additional measures. The majority of poor households in developing countries need a “smart subsidy”[3] for the toilets, so a small subsidy to a larger group can produce more efficient results (Guiteras, Levinsohn, and Mobarak 2015. This is particularly so because neighbors’ sanitation arrangements also affect the decision by a household to construct a latrine through a “demonstration effect.”

Sanitation can act as both a public and private good (Andres et al. 2017 and provide many benefits, including health, socioeconomic conditions, human rights, and environmental aspects. Poor households generally prefer to spend on other essential services like healthcare and education, and sanitation seems less important (Mulumba et al. 2014; Sy, Warner, and Jamieson 2014). Financial constraints along with a cultural stigma associated with toilets often hinder people from spending on sanitation. Hence, public expenditure covers the costs of constructing toilets and thus reduces the burden on households (Ginneken, Netterstrom, and Bennet 2011). However, creating awareness, bringing in behavioral changes, and ensuring quality can generate an environment that motivates people to use sanitation services without hesitation, thus bringing in private expenditure. In this context, one may expect that the spillover and dissemination benefits of public-funded initiatives such as the SBM may increase households’ willingness to spend on better sanitation leading to *crowding in* private expenditure. When this is the case, sanitation facilities will become an *economic good* for households, ensuring its efficient and sustainable use in the long run. Thus, the success of public-funded programs such as the SBM should be seen not merely in

[3] Providing subsidies to multiple households is expected to be most effective if the policies are from the community perspective. This will ensure implementation of a cost-effective strategy by incorporating a large section of the community. The concept of "smart subsidy" here entails this kind of policy.

terms of coverage of households (i.e., the number of beneficiaries) but also in terms of creating a sanitation environment that will ensure better usage.[4]

This paper explores such possibilities. The existing studies mainly focused on understanding the state of sanitation facilities in India. However, it is equally important to identify the underlying factors that act as constraints on sanitation, as well as to explore the role of public spending in this regard. This is particularly so because the sanitation programs, in general, are publicly funded, making the facilities *free goods* and thus limiting the success in respect of efficiency and sustainability. Hence, it is vital to explore whether the publicly funded initiatives can act as a catalyst for sanitation programs and their success in the long run. On the other hand, the paper examines the changes in the coverage of households with individual latrines in Indian states and the role of public spending on the same in Indian states. The insights of this paper have special significance for enhancing the efficiency and impact of public expenditure, fine-tuning the policies and institutional arrangements toward crowding in private expenditure for sustainable improvement in the quality of life, and achieving the objectives of the commitment under the SDGs.

The paper has five sections. The next section discusses the conceptual framework, econometric model specifications, data sources, and estimation techniques used in the paper. The third section presents and analyzes the results of the econometric models. The fourth section discusses the main findings, and the last section summarizes the findings and concludes the paper.

2. CONCEPTUAL FRAMEWORK, DATA, AND METHODOLOGY

Here, the role of public expenditure in creating a sanitation environment is examined through econometric modeling. Based on the literature review, it is assumed that the sanitation situation is influenced by factors relating to socioeconomic conditions, cultural and behavioral aspects, technologies, geographical conditions, policies, and institutions. Significantly, these factors influence the sanitation environment and are also interlinked, with each being either a substitute, complementary, or supplementary.

This paper is based on the conceptual framework as envisaged in Figure 1. Here, it is assumed that household-level latrines/toilets and a proper water supply are prerequisites for sustainable sanitation behavior. Public expenditure delivery plays an important role, as many households are financially incapable of constructing latrines by themselves. However, the mere construction of toilets is not sufficient as often people are hesitant to use toilets. Community awareness programs are also essential to ensure the success of sanitation-related initiatives. Further, given that open defecation can cause a wide range of problems, ranging from hygiene-related issues to sexual assault on women, the construction of toilets guarantees better health and hygiene, enhanced safety and empowerment for women, and a better quality of life. Such an improvement in the quality of life has spillover effects and is expected to encourage people to spend more on sanitation and water. Hence, public expenditure on water

[4] Often the success of various public funded programs is seen in terms of the amount of expenditure, creation of facilities, number of beneficiaries, etc. While these are the preconditions, focusing only on them and not on efficiency in public expenditure, actual use of the facilities, and changes in beneficiaries' behavior would result in misleading conclusions. Hence, focusing on the impact of the SBM in creating a sanitation environment is expected to provide better insights into its success. This is very important considering that people started using toilets constructed under government schemes for storage and other multi-purposes (Jadhav 2016).

and sanitation with community participation may *crowd in* private expenditure in the long run.

It is assumed that, in addition to creating the necessary facilities and facilitating the spillover and dissemination of the benefits during the initial period, publicly funded sanitation programs such as the SBM will eventually result in an efficient and sustainable sanitation environment by crowding in private expenditure for the same. This can be seen in the typical utility-maximizing behavior of a household. Let us consider the following utility function of a representative household:

$$u = x^{\alpha} y^{\beta}$$

Here, *x* and *y* represent the household's use of sanitation and other services, respectively. Further, α and β are the utility elasticity with respect to sanitation and other services, respectively, $\alpha, \beta > 0$. One might expect that creating a publicly funded sanitation program and facilitating the spillover and dissemination of the benefits would increase α (i.e., people will realize more utility from *x*).

Now, if the household aims to maximize $u = x^{\alpha} y^{\beta}$ subject to the budget constraint $m = p_x x + p_y y$; $m, p_x, p_y > 0$, the corresponding demand function for *x* will be:

$$x = \frac{\alpha m}{(\alpha + \beta) p_x}$$

Differencing this demand function with respect to α we get,

$$\frac{dx}{d\alpha} = \frac{\beta m}{(\alpha + \beta)^2 p_x} > 0$$

Thus, if publicly funded initiatives are successful in increasing α, there will be crowding in private expenditure for sanitation. From this perspective, one can see the SBM as an initiative to create a sanitation environment that would eventually crowd in private expenditure. Further, the lack of privacy and risk elements of open defecation and their adverse impact on the well-being of people (Sclar et al. 2018)[5] can increase the marginal utility of private expenditure for sanitation facilities or services. Moreover, the dissemination of health-related benefits from proper sanitation facilities can also motivate households to spend.

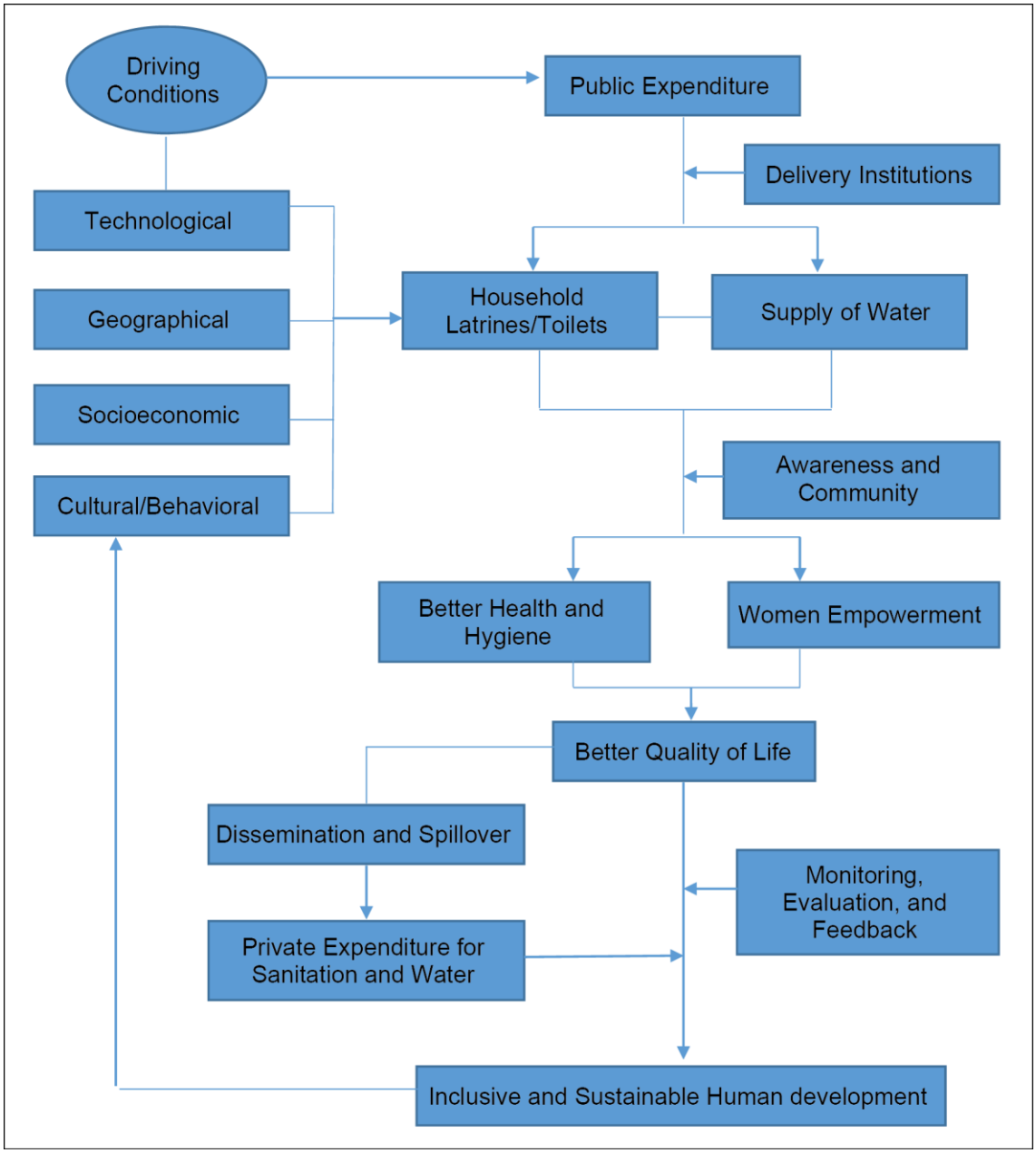
Although public expenditure plays a significant role in achieving a clean and tidy environment, the construction and usage of household latrines are affected by several factors, such as technological, geographical, cultural, and behavioral aspects as well as the socioeconomic conditions of the households (Guiteras, Levinsohn, and Mobarak 2015; O'Reilly, Dhanju, and Goel 2017a). Moreover, the efficiency of public expenditure is affected by the quality and capability of delivery of institutions' functioning (Mishra, Behera, and Nayak 2010).

Further, the dropping out of girls from schools, shame, disease, sexual harassment during open defecation, etc. are some of the common problems women face because of a lack of toilet facilities (Doron and Jeffrey 2014; World Toilet Day Advocacy Report 2014). Hence, proper sanitation facilities can facilitate women's empowerment along with good health and quality of life. However, interlinked decision-making in connection with the construction of toilets is necessary for more significant spillover effects and

[5] In particular, women are highly vulnerable to safety and privacy issues relating to sanitation (WHO 2013).

bringing in private expenditure for sanitation (Guiteras, Levinsohn, and Mobarak 2015. This, coupled with proper monitoring and evaluation mechanisms, is expected to fulfill international commitments regarding the SDGs.

Figure 1: Conceptual Framework on Public-Private Expenditure for Sanitation Environment



Source: Designed by the authors based on literature review.

2.1 Details of the Variables

The details on the measurement of the variables and their respective sources are depicted in Table 1. Here, all the variables are measured on a natural logarithmic scale to control for the scale effect and the potential heteroskedasticity problem.

Table 1: Details on the Variables

Variables	Definition/Measurement	Data Source	Justification
Dependent variable			
1. IHHL Coverage	Natural logarithm of the percentage of Individual Household Latrine Coverage.	Swachh Bharat Mission website	
Independent variables			
2. PCNSDP	Natural logarithm of PCNSDP at the constant price (2011–12).	RBI	Per capita income shows the ability of households to afford proper sanitation facilities (Tiwari, Tirumala, and Shukla2022)
3. Literacy Rate	Natural logarithm of the percentage of literate persons in a given population.	NSSO	Controls for the sociodemographic condition of the households (Routray et al. 2015
4. Sex Ratio	Natural logarithm of number females per 1000 males at birth based on registered events.	Annual report on vital statistics of India based on CRS	
6. GSVA	Natural logarithm of the ratio of gross value added from industry and services to that from agriculture.	RBI	Captures the exposure, awareness level, and behavioral pattern in nonfarm activities (O'Reilly, Dhanju, and Goel 2017a).
7. WSS/RE	Natural logarithm of the percentage share of expenditure on WSS to revenue expenditure.	RBI	Public expenditure plays a crucial role in improving the sanitation situation of households (Dhar, Kakkar, and Roy 2018).
8. WSS/SSE	Natural logarithm of the percentage share of expenditure on WSS to social sector expenditure.	RBI	

2.2 Data Sources

This paper uses only secondary data gathered from various government sources, and the variables are measured annually. It uses a panel dataset for all the Indian states from 2014–15 to 2018–19. Estimating panel data models helps capture the variations in the availability of sanitation facilities across the states and their changes over time.

2.3 Analytical Strategies

Based on the conceptual framework (Figure 1) and the subsequent discussions, the following functional relationships are specified for the econometric modeling:

IHHL Coverage = f (Lagged PCNSDP, Literacy Rate, Sex Ratio, GSVA, WSS/RE)

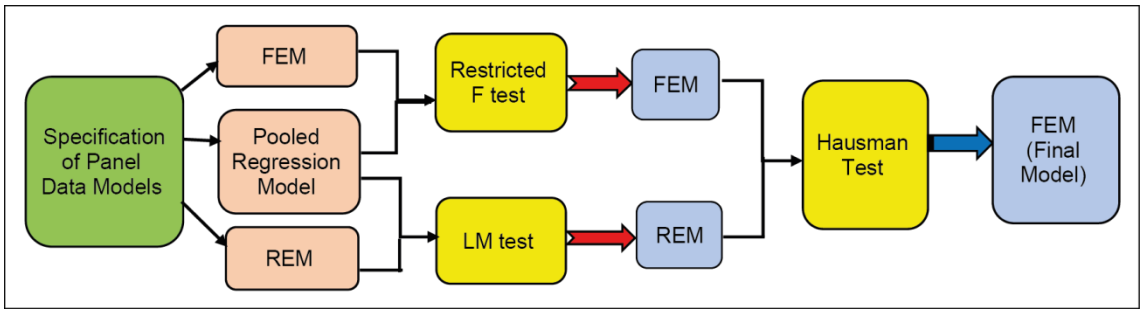
IHHL Coverage = f (Lagged PCNSDP, Literacy Rate, Sex Ratio, GSVA, WSS/SSE)

Household-level latrine coverage depends on the social, demographic, and economic conditions of households and society. Hence, the percentage of households with IHHL is the dependent variable. The set of independent variables includes per capita net state domestic product (PCNSDP), literacy rate, sex ratio, the ratio of gross value added from industry and services to that from agriculture (GSVA), percentage share of expenditure on water supply and sanitation (WSS) to revenue expenditure on (WSS/RE), and percentage share of expenditure on WSS to social sector expenditure

(WSS/SSE). The variables WSS/RE and WSS/SSE are proxies for public expenditure, whereas PCNSDP captures households' ability to afford sanitation. Furthermore, sex ratio and literacy rate control the sociodemographic situation, whereas GSVA is expected to capture the exposure, awareness level, and behavioral patterns through engagement in nonfarm activities. It is assumed that a higher concentration in nonfarm sectors gives the workforce greater exposure to improved sanitation facilities and their benefits and higher affordability.[6] However, due to the nonavailability of systematic data at the state level over time, technological, geographic, and institutional factors could not be included here. Nonetheless, this leaves a vital scope for deeper scrutiny.

Three alternative models, viz., a pooled model, fixed effects model (FEM), and random effects model (REM), are estimated using the panel dataset. The appropriate models are selected based on the statistical tests. While the choice between the pooled model and the FEM is made using the restricted F-test, the Breusch-Pagan Lagrange Multiplier (LM) test helps select the pooled model and the REM. Since the pooled model is discarded in either case, the Hausman test is applied for the final selection between the FEM and REM. Furthermore, the variance inflation factor (VIF) is used to examine whether the estimated models suffer from a severe multicollinearity problem.[7]

Figure 2: Estimation Process of Estimated Econometric Model



Source: Designed by the authors based on Paria et al. (2021).

3. RESULTS FROM ECONOMETRIC MODELS

Table 2 summarizes the variables, whereas Table 4 shows the econometric results for the FEM. The restricted F-test suggests the FEM vis-à-vis the pooled model, whereas the Hausman test supports the FEM over the REM. It should be noted that, in addition to the pooled regression model and the FEM, the REM was also estimated, and the LM test was carried out. The LM test suggests choosing the pooled model over the REM. Hence, the regression results of the FEM are considered here for further analysis.

[6] There is around a 67% lower chance of using latrines when the mother is occupied in farming activities compared to unemployed mothers in Ethiopia (Yimam, Gelaye, and Chercos 2014), indicating a strong association between employment and open defecation (Yogananth and Bhatnagar 2018). A study on rural coastal Odisha indicates that the daily routine of men is not suitable for latrine usage (Routray et al. 2015), particularly for those who are involved in farming activities.

[7] Different aspects of the panel data estimation techniques are summarized in Paria et al. (2021).

Table 2: Summary Statistics of Variables

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Independent Variables					
Lagged PCNSDP	166	11.26	00.52	10.00	12.68
Literacy Rate	168	04.33	00.10	04.12	04.56
Sex Ratio	168	06.80	00.06	06.52	06.98
GSVA	168	02.11	00.57	00.88	03.89
WSS/RE	168	00.37	00.80	–02.46	01.81
WSS/SSE	168	00.05	00.34	00.00	00.16
Dependent Variable					
IHHL Coverage	140	04.24	00.40	02.72	04.60

Note: Here, all the variables are measured on a natural logarithmic scale.

Table 3 presents the changes in individual household latrine (IHHL) coverage in Indian states from 2014–15 to 2018–19, i.e., after the initiation of the SBM. It is found that in many of the states, including Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, and Rajasthan, only around a third of the households, or even less than that, had individual latrines in 2014–15, and the situation improved significantly after that with the initiation of the SBM. These states recorded significant changes in IHHL coverage (measured in terms of change in percentage points of IHHL coverage) from 2014–15 to 2018–19. Furthermore, the lower coefficient of variation suggests that the inter-state variations in IHHL coverage also declined considerably during this period.

Table 3: Changes in IHHL Coverage in the Major Indian States, 2014–15 to 2018–19[a]

	IHHL Coverage (%)		
State Name	**2014–15**	**2018–19**	**Change (in Percentage Points)**
Andhra Pradesh + Telangana	39.0	93.8	54.9
Bihar	27.1	97.3	70.2
Chhattisgarh	32.7	100.0	67.3
Goa	81.7	89.3	7.5
Gujarat	42.6	99.4	56.8
Haryana	78.6	100.0	21.4
Jharkhand	18.0	100.0	82.0
Karnataka	51.5	99.9	48.5
Kerala	95.6	100.0	4.4
Madhya Pradesh	33.9	100.0	66.1
Maharashtra	52.7	99.2	46.4
Odisha	15.2	87.1	71.9
Punjab	86.8	97.5	10.7
Rajasthan	33.6	100.0	66.4
Tamil Nadu	51.9	99.6	47.7
Uttar Pradesh	34.8	99.6	64.8
West Bengal	59.8	99.9	40.1
Average	49.1	97.8	48.6
Coefficient of Variation	0.49	0.04	0.49

[a] Excluding northeastern and hilly Indian states.

Source: SBM, Government of India.

Thus, there was an improvement in sanitation facilities (particularly in IHHL facilities) after the initiation of the SBM, though the level varied to some extent across states. Furthermore, while many socioeconomic and institutional factors may have contributed to such changes, the initiation of the SBM seems to have played a crucial role. Nevertheless, examining the role of public expenditure in such initiatives is necessary to understand its efficiency and contribution to social welfare.

Table 4 presents the regression results of the estimated fixed effect models 1 and 2. Model 2 takes the same set of independent variables as Model 1 except for WSS/SSE in place of WSS/RE. The estimated models are statistically significant with a reasonably high explanatory power, whereas low VIF values suggest that the estimated model is unlikely to suffer from severe multicollinearity problems.[8] As mentioned above, all the variables are measured on a natural logarithmic scale to reduce the possibility of a heteroskedasticity problem. Further, in both cases, lagged per capita net state domestic product (PCNSDP), literacy rate, sex ratio, and public expenditure on WSS have significant positive coefficients. Notably, GSVA has no considerable impact on IIHL coverage.

Table 4: Regression Results for the Estimated Fixed Effects

	Model 1[a]			Model 2[b]		
Variables	**Coefficient**	**t-Statistic**	**VIF**	**Coefficient**	**t-Statistic**	**VIF**
Lagged PCNSDP	1.36	3.16**	2.24	1.40	3.47**	2.25
Literacy Rate	2.96	3.04**	1.69	3.00	3.09**	1.72
Sex Ratio	1.36	1.82*	1.17	1.51	1.96*	1.17
GSVA	0.35	1.36	1.95	0.31	1.25	1.96
WSS/RE	0.14	2.61*	1.12	–	–	–
WSS/SSE	–	–	–	0.26	5.68**	1.15
Intercept	–34.1	–4.98		–35.9	–5.25	
R^2-Between		00.50			00.50	
R^2-Within		00.56			00.59	
R^2-Overall		00.30			00.30	
F-stat		14.43**			19.00**	
Restricted F-Test		04.90**			05.52**	
Hausman Test		103.35**			119.67**	
Number of Observations		138			138	

[a] and [b]: Similar models with the same set of variables without logarithmic transformation were also estimated. The signs and statistical significance of the coefficients turned out to be consistent in both cases. Thus, log transformation of the variables does not alter the econometric results other than controlling for the scale effects and heteroskedasticity.

Here, PCNSDP stands for per capita net state domestic product; GSVA for the ratio of gross value added from industry and services to that from agriculture; WSS/RE for the percentage share of expenditure on water supply and sanitation (WSS) to revenue expenditure; and WSS/SSE for the percentage share of expenditure on WSS to social sector expenditure.

Notes: *statistically significant at 10%; **statistically significant at 5%; errors are adjusted for robustness.

[8] A typical symptom of multicollinearity is a very high R^2 with only a few or no individual coefficients being significant (Gujarati et al. 2012). However, in the present case, the R^2 value is not very high and only a few individual coefficients are statistically significant. In fact, the coefficients of four out of seven independent variables are statistically significant in the estimated models, implying that they are unlikely to suffer from a multicollinearity problem.

Thus, lagged per capita net state domestic product and literacy rates have a significant and positive influence on IHHL coverage. Such a positive impact of household income and education level on latrine coverage and sanitation facilities is consistent with the findings of Ghosh and Cairncross (2014) and De (2018). The significance of education level in IHHL coverage has to be considered in line with the positive association between school sanitation facilities and the school enrollment ratio (Gillani 2021). While larger per capita income raises households' ability to afford and willingness to construct latrines and other sanitation facilities, a higher literacy rate enhances their awareness and willingness to use these services.

Moreover, the sex ratio and public expenditure also positively impact IHHL coverage. In rural Indian households, managing basic amenities, including water and sanitation, is considered women's primary responsibility.[9] Hence, a positive and significant coefficient of sex ratio with IHHL coverage is very likely. Public expenditure acts as a catalyst[10] for the construction of more toilets, thereby increasing the coverage. In contrast, the lack of necessary funds adversely affects the performance of the states in achieving sanitation-related targets (Mehta 2018). However, the mere construction of toilets is not what the nation requires. The government should also focus on information, education, and communication (IEC) strategies, which can considerably impact the behavioral aspects of people regarding using toilets (Ray 2018). Given that the coefficient of the ratio of gross value added from industry and services to that from agriculture (GSVA) is not statistically significant, one may argue that the household latrine coverage does not depend on the nature of the economic activity. This is possible because, whatever the source of livelihood, people defecate in the open primarily because of their culture and behavior associated with toilet usage (Coffey et al. 2014b).

Unlike the WSS/RE in Model 1, Model 2 uses WSS/SSE to proxy public spending on sanitation. However, the statistical significance and sign of the coefficients of these variables are consistent across the two alternative models. The statistical significance of the individual coefficients and their sign are summarized in Table 5.

Table 5: Summary Findings of the Fixed Effect Model

Variable	Regression Result
Lagged PCNSDP	Significant and Positive
Literacy Rate	Significant and Positive
Sex Ratio	Significant and Positive
GSVA	Not Significant
WSS/RE	Significant and Positive
WSS/SSE	Significant and Positive

Note: Here, PCNSDP stands for per capita net state domestic product; GSVA for the ratio of gross value added from industry and services to that from agriculture; WSS/RE for the percentage share of expenditure on water supply and sanitation (WSS) to revenue expenditure; and WSS/SSE for the percentage share of expenditure on WSS to social sector expenditure.

[9] The efficiency and success of sanitation-related initiatives are positively associated with women's participation (World Bank 2010; Routray et al. 2017). The involvement of women in sanitation programs makes them 6%–7% more effective (Singh and Singh 2020).

[10] Public expenditure on sanitation, education, and healthcare has a strong association with social welfare (Gomanee, Girma, and Morrissey 2005).

The paper finds that both WSS/RE and WSS/SSE coefficients are statistically significant and positive. This means that greater expenditure on sanitation does have a statistically significant impact on IHHL coverage. Hence, public expenditure plays a crucial role in improving sanitation (Ghosh, Hossain, and Alam2022, and the states with higher expenditure perform better in this regard. Similar findings are reported by (Dhar, Kakkar, and Roye 2018). Similarly, the IHHL coverage does depend on the sex ratio too, as the coefficient is statistically significant and positive. This adds evidence to the existing literature that shows a positive relation to women's participation in sanitation-related initiatives (World Bank 2010; Routray et al. 2017).

Nevertheless, as a mission, one may feel that the SBM has played a crucial role in not merely providing latrines to Indian households initially, but also in making people aware of different aspects of sanitation facilities (Curtis 2019). The inclusion of IEC in the SBM indicates the importance of creating awareness among people. In particular, the SBM initiative greatly improved IHHL coverage in Indian states and rendered a healthy sanitation environment and quality of life for the citizens. On the other hand, the provision of latrines and sanitation campaigns under the SBM has created spillovers on households leading to *crowding in* of private expenditure for the same. This is visible from the positive impact of per capita income on household latrine coverage. However, a more robust conclusion in this regard requires further deeper investigation at the household level, with alternative public expenditure measures and behavioral aspects.

4. DISCUSSION

This study examines whether latrine coverage in Indian states has changed over time and how public initiatives can improve sanitation facilities. Accordingly, an attempt has been made here to understand how sanitation facilities have improved in Indian states following the initiation of the SBM and the impact of various social, economic, and demographic aspects. The paper finds that household latrine coverage has improved considerably with the initiation of the SBM. The IHHL coverage has been positively influenced by the literacy rate, lagged per capita income, sex ratio, and public expenditure on sanitation. In contrast, the relatively high growth of gross value added from industry and services vis-à-vis that from agriculture has no significant impact. Thus, education level, the sex ratio favoring women in the family, government expenditure on sanitation, and per capita income influence people to move towards a hygienic environment.

The findings of the present paper suggest that promoting socially inclusive and sustainable sanitation facilities requires improvement in households' ability to afford through higher per capita income. It is also essential to improve literacy levels, public expenditures, and the involvement of women in the initiatives in order to create awareness and willingness to pay for and use latrines. Further, addressing socioeconomic and demographic aspects is necessary while fine-tuning the existing programs and their implementation and designing future ones.

The paper takes a different approach to existing studies. Studies often focus on how sanitation services are hindered by certain factors ranging from a lack of latrines or faulty construction to deep-rooted cultural taboos (Doron and Jeffrey 2014; Coffey et al. 2017; Hathi, Spears, and Coffey. 2016; O'Reilly, Dhanju, and Louis. 2017b; Bharat, Dkhar, and Abraham 2020; Exum et al. 2020). Poor households generally prefer to spend on other essential services like healthcare and education, and sanitation seems to be less of a priority (Mulumba et al. 2014; Sy, Warner, and Jamieson 2014). Financial constraints along with cultural stigma associated with toilets often hinder

people from spending on sanitation. Hence, public expenditure covers the costs of constructing toilets and thus reduces the burden on households (Ginneken, Netterstrom, and Bennet 2011). Insights from the paper suggest that it is crucial to fine-tune policies and institutional arrangements so that private expenditure is able to crowd in to ensure a sustainable sanitation environment. It is also crucial to increase awareness of the importance of sanitation for well-being. Nevertheless, a more robust conclusion on changes in sanitation behavior following the initiation of the SBM requires a deeper understanding of the qualitative aspects, such as the behavioral patterns of the households. This is beyond the scope of this paper, but it leaves an important area for further research.

5. CONCLUSION AND POLICY IMPLICATIONS

Publicly funded initiatives like the SBM can play an important role as the catalyst in improving the sanitation environment and construction of latrines. However, it is not sufficient to construct latrines to resolve the problem of open defecation. The paper finds that the IHHL coverage is positively correlated with the household per capita income as well as the government expenditure on sanitation. Thus, one may expect that the SBM's provision of latrines and sanitation campaigns will result in *crowding in* of private spending. However, creating awareness is crucial in this regard. Therefore, the possibility of public-private partnerships for expanding sanitation facilities should be explored instead of relying only on government spending (Van Dijk 2008).

In the Indian context, although government programs successfully construct latrines, there is a lack of proper use and maintenance (Harris 2014; Jain and Subramanian 2018; Gupta et al. 2020).[11] Private investment in water and sanitation is still very limited in India (Wu, Schuyler House, and Peri 2016), and this can potentially limit the use of the facilities. Hence, there is a need for an emphasis on developing supporting facilities such as water supply, electrification, etc. in rural areas. Further, in order to solve the issues and constraints associated with governmental programs on sanitation, it is often suggested to engage community-based organizations and NGOs towards creating awareness, particularly amongst women, sensitizing the community, and providing other supports.

The demonstration effect can potentially be an effective way to encourage people to adopt better sanitation practices. When people observe their community members practicing good sanitation habits, they may be more likely to adopt those behaviors themselves. It is, therefore, imperative for sanitation and hygiene programs to include more participation by people. When community members are involved in the planning, implementation, and monitoring of sanitation programs, they become more aware of the importance of proper sanitation practices. They are more likely to adopt and sustain them. A community-driven approach to public policy will increase its effectiveness by ensuring that it is tailored to local needs and circumstances (Rashid and Pandit 2017; Davis, Javernick-Will, and Cook 2019). Therefore, community participation is a critical component of any successful sanitation program.

[11] However, in the haste of cost reduction, sometimes the private sector may compromise on the quality of service (Hart, Shleifer, and Vishny 1997).

The Sulabh International Social Service Organization is a successful case in the Indian context (Goyal and Gupta 2009) that partners with local government bodies to extend sanitation services in urban areas. The local government bears the capital expenditure, whereas the day-to-day maintenance, including staff, is provided by the NGO (Chary, Narender, and Rao 2003). Similar models can be explored in a rural context, with the local panchayat having a crucial role in monitoring and facilitating the activities.

The success story of the Sulabh International Social Service Organization shows that a public-private initiative in providing sanitation services can be more successful vis-à-vis publicly funded initiatives. Individual involvement, community participation, and social audits can also solve the free-rider problem associated with free goods. In addition, the construction of latrines at the household level is linked with the neighborhood sanitation arrangements. Thus, community participation in sanitation initiatives is also crucial for resolving cultural constraints and bringing in more private expenditure on sanitation. Therefore, future policy measures should ensure greater participation by the community and individuals.

REFERENCES

Abraham, M. et al. 2018. Using immersive research to understand rural sanitation: lessons from the Swachh Bharat Mission in India. *41st WEDC International Conference*. Egerton University, Kenya. https://hdl.handle.net/2134/35479.

Andres, L., B. Briceño, C. Chase, and J. A. Echenique. 2017. Sanitation and Externalities: Evidence from Early Childhood Health in Rural India. *Journal of Water, Sanitation and Hygiene for Development* 7(2): 272–289.

Bharat, G. K., N. B. Dkhar, and M. Abraham. 2020. *Aligning India's Sanitation Policies with the Sustainable Development Goals (SDGs)*. TERI Discussion Paper. https://www.teriin.org/sites/default/files/2020-01/aligning-Indias-sanitation-policy-with-the-SDGs.pdf.

Chary, V. S., A. Narender, and K. R. Rao. 2003, March. Serving the Poor with Sanitation: The Sulabh Approach. *Third World Water Forum, Osaka.*

Chaudhuri, S., and M. Roy. 2017. Rural-urban spatial inequality in water and sanitation facilities in India: A cross-sectional study from household to national level. *Applied Geography 85 (2017)*: 27–38.

Coffey, D. et al. 2014a. Open defecation: evidence from a new survey in rural north India. *Economic and Political Weekly.* 49(38): 43–55.

Coffey, D., A. Gupta, P. Hathi, D. Spears, N. Srivastav, and S. Vyas. 2017. Understanding Open Defecation in Rural India: Untouchability, Pollution, and Latrine Pits. *Economic and Political Weekly* 52(1): 59–66.

Coffey, D., A. Gupta, P. Hathi, N. Khurana, D. Spears, N. Srivastav, and S. Vyas. 2014b. Revealed Preference for Open Defecation. *Economic and Political Weekly* 49(38): 43.

Coffey, D., R. Khera, and D. Spears. 2016. "Intergenerational Effects of Women's Status: Evidence from Joint Indian Households." Working Paper, Research Institute for Compassionate Economics.

Curtis, V. 2019. Explaining the outcomes of the 'Clean India 'campaign: institutional behavior and sanitation transformation in India. *BMJ global health*. *4*(5): e001892.

Davis, A., A. Javernick-Will, and S. M. Cook. 2019. The Use of Qualitative Comparative Analysis to Identify Pathways to Successful and Failed Sanitation Systems. *Science of the Total Environment* 663: 507–517.

De, I. 2018. Determinants of Rural Sanitation in India and Implications for Public Policy. *Journal of Water, Sanitation and Hygiene for Development* 8(4): 650–659.

Desai, S., R. Vanneman, and National Council of Applied Economic Research. 2012. *India Human Development Survey-II (IHDS-II), 2011-12*. Inter-university Consortium for Political and Social Research. https://doi.org/10.3886/ICPSR36151.v6.

Dhar, R., A. Kakkar, and C. Roy. 2018. Sanitation Programmes in India: An Evaluation Study with Special Reference to Health and Growth. In *Reflecting on India's Development,* edited by A. Mitra. Singapore: Springer, pp. 311–346.

Doron, A., and R. Jeffrey, 2014. Open Defecation in India. *Economic and Political Weekly 49(49):* 72–78.

Exum, N. G., E. M. Gorin, G. Sadhu, A. Khanna, and K. J. Schwab. 2020. Evaluating the Declarations of Open Defecation Free Status under the Swachh Bharat 'Clean India' Mission: Repeated Cross–sectional Surveys in Rajasthan, India. *BMJ Global Health* 5(3): e002277.

Ghosh, A., and S. Cairncross. 2014. The Uneven Progress of Sanitation in India. *Journal of Water, Sanitation and Hygiene for Development* 4(1): 15–22.

Ghosh, P., M. Hossain, and A. Alam. 2022. Water, Sanitation, and Hygiene (WASH) poverty in India: A district-level geospatial assessment. *Regional Science Policy & Practice*. *14*(2): 396–416.

Gillani, A. A. 2021. The Association Between the Presence of Sanitation Facilities and School Enrolment in Pakistan. *World Development Perspectives* 21: 100289.

Ginneken, M. V., U. Netterstrom, and A. Bennett. 2011. *More, better, or different spending? Trends in public expenditure on water and sanitation in Sub-Saharan Africa*. World Bank. https://openknowledge.worldbank.org/server/api/core/bitstreams/840c0e39-6063-50d9-bb80-b17d6e9ab6dd/content.

Gomanee, K., S. Girma, and O. Morrissey. 2005. Aid, public spending and human welfare: Evidence from quantile regressions. *Journal of International Development*. *17*(3): 299–309.

Goyal, S., and V. Gupta. 2009. Sulabh International–Social Transformation through Sanitation. *Vikalpa* 34(1): 89–106.

Guiteras, R., J. Levinsohn, and A. M. Mobarak. 2015. Encouraging Sanitation Investment in the Developing World: A Cluster–randomized Trial. *Science* 348(6237): 903–906.

Gujarati, D. N., D. C. Porter, and S. Gunasekar. 2012. *Basic Econometrics*. Tata McGraw–Hill Education, New Delhi.

Gupta, A. et al. 2020. Revisiting Open Defecation: Evidence from a Panel Survey of Rural north India. *Economic and Political Weekly* 55(21): 55.

Harris, G. (2014). *Poor sanitation in India may afflict well-fed children with malnutrition.* New York Times. https://www.nytimes.com/2014/07/15/world/asia/poor-sanitation-in-india-may-afflict-well-fed-children-with-malnutrition.html#:~:text=Now%2C%20an%20emerging%20body%20of,of%20food%20than%20poor%20sanitation.&text=Residents%20perform%20chores%20in%20Maldahiyya,of%20Dalits%2C%20the%20untouchable%20caste.

Hart, O., A. Shleifer, and R. W. Vishny. 1997. The proper scope of government: theory and an application to prisons. *The quarterly journal of economics*. *112*(4): 1127–1161.

Hathi, P., D. Spears, and D. Coffey. 2016. Can Collective Action Strategies Motivate Behaviour Change To Reduce Open Defecation in Rural India? *Waterlines 35(2):* 118–135.

International Institute for Population Sciences. 2015. *National Family Health Survey NFHS–4, 20014–015: India*. International Institute for Population Sciences.

Jadhav, R. 2016. In rural areas, newly-built toilets 'too pretty' to use. *Times of India.* https://timesofindia.indiatimes.com/city/pune/in-rural-areas-newly-built-toilets-too-pretty-to-use/articleshow/53472232.cms.

Jain, A., A. Wagner, C. Snell–Rood, and I. Ray. 2020. Understanding Open Defecation in the Age of Swachh Bharat Abhiyan: Agency, Accountability, and Anger in Rural Bihar. *International Journal of Environmental Research and Public Health* 17(4): 1384.

Jain, A., and S. V. Subramanian. 2018. Intrinsic and Instrumental Perspectives to Sanitation. *SSM–Population Health* 5: 267–269.

Lee, Y. J. 2017. Informing women and improving sanitation: Evidence from rural India. *Journal of Rural Studies*, *55*, 203–215.

Mehta, M. 2018. Public Finance at Scale for Rural Sanitation–A Case of Swachh Bharat Mission, India. *Journal of Water, Sanitation and Hygiene for Development* 8(3): 359–373.

Ministry of Drinking Water and Sanitation, GOI. 2012. *Guidelines of Nirmal Bharat Abhiyan.* http://mdm.nic.in/mdm_website/Files/WASH/Final%20Guidelines%20English.pdf.

———. 2014. *Guidelines for Swachh Bharat Abhiyan Gramin.* https://swachhbharatmission.gov.in/SBMCMS/guidelines.htm.

———. 2019. *National Annual Rural Sanitation Survey 2018–19.* https://jalshakti–ddws.gov.in/publication/national–annual–rural–sanitation–survey–narss–2018–19–report.

———. 2019. *Swachh Bharat Mission.* https://sbmarchive.ddws.gov.in/sbmreport/Report/Physical/SBM_TargetVsAchievementWithout1314.aspx.

Ministry of Finance, GOI. 2018. *Economic Survey 2018-19.* https://www.indiabudget.gov.in/budget2019-20/economicsurvey/.

Ministry of Statistics and Programme Implementation, GOI. 2016. Swachhta Status Report. http://mospi.nic.in/sites/default/files/publication_reports/Swachhta_Status_Report%202016_17apr17.pdf.

Mishra, P., B. Behera, and N. C. Nayak. 2010. A Development Delivery Institution for the Tribal Communities: Experience of the National Rural Employment Guarantee Scheme in India. *Development Policy Review* 28(4): 457–479.

Mohan, R. R. 2017. Swachh Bharat Mission Gramin Bottlenecks and Remedies. *Economic and Political Weekly* 52(20): 15–17.

Mulumba, J. N., C. Nothomb, A. Potter, and M. Snel, 2014. Striking the Balance: What Is the Role of the Public Sector in Sanitation as a Service and as a Business? *Waterlines*, 33(3): 195–210.

O'Reilly, K., R. Dhanju, and A. Goel. 2017a. Exploring "the Remote" and "the Rural": Open Defecation and Latrine Use in Uttarakhand, India. *World Development* 93: 193–205.

O'Reilly, K., R. Dhanju, and E. Louis, 2017b. Subjected to Sanitation: Caste Relations and Sanitation Adoption in Rural Tamil Nadu. *The Journal of Development Studies* 53(11): 1915–1928.

Panchang, S. V. 2020. Swachh Bharat Mission and Vulnerable Populations. *Economic and Political Weekly* 55(48): 17–21.

Paria, B., A. Pani, P. Mishra, and B. Behera. 2021. Irrigation–based Agricultural Intensification and Future Groundwater Potentiality: Experience of Indian States. *SN Applied Science*, 3(4): 1–22.

Rashid, M., and D. Pandit. 2017. Determination of Appropriate Service Quality Attributes for Household Toilets in Rural Settlements of India Based on User Perception. *Environment, Development, and Sustainability* 19(4): 1381–1406.

Ray, M. 2018. Swachha Bharat Gramin: A Budget Analysis of India's Sanitation Program, Odisha State. *Parikalpana: KIIT Journal of Management* 14(1): 172–186.

Reserve Bank of India. 2019. *Handbook Statistics on Indian States.* https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20States.

———. 2019. *State Finances: A Study of Budgets.* https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=State%20Finances%20:%20A%20Study%20of%20Budgets.

Routray, P., B. Torondel, T. Clasen, and W. P. Schmidt. 2017. Women's Role in Sanitation Decision Making in Rural Coastal Odisha, India. *PLoS ONE* 12(5): e0178042.

Routray, P., W. P. Schmidt, S. Boisson, T. Clasen, and M. W. Jenkins. 2015. Socio–cultural and Behavioural Factors Constraining Latrine Adoption in Rural Coastal Odisha: An Exploratory Qualitative Study. *BMC Public Health* 15(1): 1–19.

Sclar, G. D. et al. 2018. Exploring the Relationship between Sanitation and Mental and Social Well–being: A Systematic Review and Qualitative Synthesis. *Social Science and Medicine* 217: 121–134.

Singh, R., and S. K. Singh, 2020. Jeevika Women Self–Help Groups Role in Improving Sanitation Status in Bihar. *Journal of Rural and Industrial Development* 8(1): 33.

Spears, D., A. Ghosh, and O. Cumming. 2013. Open defecation and childhood stunting in India: an ecological analysis of new data from 112 districts. *PloS one 8* (9): e73784.

Sy, J., R. Warner, and J. Jamieson. 2014. *Tapping the Markets: Opportunities for Domestic Investments in Water and Sanitation for the Poor*. World Bank. https://openknowledge.worldbank.org/handle/10986/16538?ref_site=ppiaf.

Tiwari, P., R. D. Tirumala, and J. Shukla, 2022. Household choices of sanitation infrastructure and impact on disease in India. *Environment and Planning B: Urban Analytics and City Science*. *49*(8): 2054–2071.

United Nations Children's Fund and World Health Organization. 2018. *Drinking water, sanitation and hygiene in schools: Global Baseline Report 2018. UNICEF and WHO. https://www.unicef.org/media/47671/file/JMP-WASH-in-Schools-ENG.pdf.*

Van Dijk, M. P. 2008. Public Private Partnerships in Basic Service Delivery: Impact on the Poor, Examples from the Water Sector in India. *International Journal of Water* 4(3–4): 216–234.

Van Ginneken, M., U. Netterstrom, and A. Bennett, 2011. *More, Better, or Different Spending? Trends in Public Expenditure on Water and Sanitation in Sub–Saharan Africa.* World Bank. https://openknowledge.worldbank.org/entities/publication/dab790dd-99c7-59c9-9d06-93f36d6871b2.

World Bank. 2010. *Mainstreaming Gender in Water and Sanitation*. World Bank. http://hdl.handle.net/10986/17274.

———. 2017. *Waterlife: Improving Access to Safe Drinking Water in India. World Bank.* https://documents1.worldbank.org/curated/en/586371495104964514/pdf/115133-WP-P152203-PUBLIC-17-5-2017-12-28-1-WaterlifeCaseApril.pdf.

World Health Organization. 2013. *Global and Regional Estimates of Violence Against Women: Prevalence and Health Effects of Intimate Partner Violence and Non–partner Sexual Violence*. World Health Organization. https://www.who.int/publications/i/item/9789241564625.

World Toilet Day Advocacy Report. 2014. We cannot wait, A report on Sanitation and Hygiene for girls. Unilever Domestos, WaterAid and the Water Supply & Sanitation Collaborative Council (WSSCC). https://washmatters.wateraid.org/publications/we-cant-wait-a-report-on-sanitation-and-hygiene-for-women-and-girls.

Wu, X., R. Schuyler House, and R. Peri. 2016. Public–Private Partnerships PPPs in Water and Sanitation in India: Lessons from China. *Water Policy* 18(S1): 153–176.

Yimam, T. Y., K. A. Gelaye, and D. H. Chercos. 2014. Latrine utilization and associated factors among people living in rural areas of Denbia district, Northwest Ethiopia, 2013, a cross-sectional study. *Pan African Medical Journal*. 18(334): 4206–4216.

Yogananth, N., and T. Bhatnagar. 2018. Prevalence of open defecation among households with toilets and associated factors in rural south India: an analytical cross-sectional study. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 112(7): 349–360.

APPENDIX

Sanitation Situation in the Indian States

Both the central and several state governments have taken numerous initiatives during the last few decades to improve the sanitation environment in the country. Some of these publicly funded programs are listed in Appendix Table 1. The first central-level program started with the Central Rural Sanitation Mission in 1986, which was subsequently restructured as the Total Sanitation Campaign in 1999. However, the Swachh Bharat Mission (SBM) launched in 2014 is considered a path-breaking initiative[1] of the Government of India, followed by the initiation of the 10-Year Rural Sanitation Strategy in 2019 to ensure the continuance of the targets achieved under the SBM.

Importantly, Appendix Table 1 shows that while the initial programs were publicly funded, the subsequent initiatives include private partnerships. For example, the National Policy on Fecal Sludge and Septage Management introduced in 2017 includes government funding and a private partnership. Over the years, the fund allotted for the SBM has increased from Rs28500 million (USD344.01 million) in 2014–15 to Rs144790 million (USD1747.72 million) in 2018–19.[2]

Further, over 95% of the funds allocated for the SBM have been utilized for various sanitation-related activities, with Rs12000 per household for latrine construction. The amount is being shared by central and state governments (Economic Survey 2018). One would expect that the involvement of people in the cost-bearing mechanism would lead to better results vis-à-vis providing it free. Notably, these central government initiatives have also been associated with similar other programs funded by different state governments.

Appendix Table 2 depicts some aspects of the basic amenities and health conditions of Indian households. The fourth round of the National Family Health Survey (NFHS) of the Government of India reports that most Indian states had more than 70% of children undergoing diarrhea treatment during 2015–16 (Appendix Table 2). Notably, states such as Bihar, Jharkhand, and Odisha, with less than 40% toilet facilities, had less than 70% of children going through diarrhea treatment. Further, Punjab stood first regarding the percentage of children undergoing diarrhea treatment, though it had a good record on drinking water and sanitation facilities. The northeastern states also performed well in this regard. With more than 90% of households having toilet facilities, most of these states had a lower percentage of children undergoing diarrhea treatment during this period. Thus, toilets and other related facilities are necessary but insufficient for better sanitation and health status. Ensuring regular use of the same is also crucial in this regard. The SBM stands distinct in this regard as it considers the initiative not only for providing latrines to households but also as a mission to improve the sanitation environment in the country.

[1] The program incorporates all possible components for a successful sanitation initiative, including Individual IHHL Coverage, Solid and Liquid Waste Management, IEC, Availability of Sanitary Material, Community Sanitary Complexes, etc. (SBM Guidelines 2014).

[2] The details are available at the Ministry of Drinking Water and Sanitation, Government of India (2019).

Appendix Table 1: Sanitation-Related Initiatives by the Central and State Governments

Centre/State	Policy/Program	Source of Institutional Funding
Central Level	Central Rural Sanitation Mission (1986)	Ministry of Rural Development, Govt. of India
Central level	Total Sanitation Campaign (1999)	Government of India
Central Level	Nirmal Bharat Abhiyan (2012)	Government of India
Central Level	Swachh Bharat Mission (2014)	Government of India
Central Level	National Policy on Fecal Sludge and Septage Management (2017)	Government of India, State Governments along with private partnership
Central Level	10-Year Rural Sanitation Strategy (2019)	Government of India
Uttar Pradesh	Swajal Project (1996)	Government of UP, World Bank, NGOs
Goa	The Goa Sewerage System and Sanitation Services Management Act (2008)	Government of Goa
Rajasthan	Rajasthan Rural Sanitation and Hygiene Policy (2011)	Government of Rajasthan
West Bengal	Mission Nirmal Bangla (2013)	GoI, Government of West Bengal
Jharkhand	Implementation of rural sanitation initiatives for Ganga rejuvenation in Jharkhand (2016)	GoI, Government of Jharkhand, UNDP, community organizations, and NGOs
Kerala	Nava Kerala Mission (2016)	Government of Kerala
Karnataka	Karnataka State Policy on Sanitation and Waste Management (2019)	Government of Karnataka, along with Gram Panchayats
Odisha	Odisha Rural Sanitation Policy (2020)	Government of Odisha

Source: Respective Ministries.

Appendix Table 2: Some Aspects of Basic Amenities and Health Conditions in the Major Indian States[a]

	NFHS 4 (2015–16)				NFHS 5 (2019–21)			
		Percentage of Households				Percentage of Households		
State Name	Children under 5yrs Having Diarrhea Treatment (%)	With Electricity[b]	With Basic Drinking Water Source	With Improved Toilet Facility[c]	Children under 5yrs Having Diarrhea Treatment (%)	With Electricity	With Basic Drinking Water Source	With Improved Toilet Facility
Andhra Pradesh and Telangana	73.4	98.5	75.3	76.8	72.7	99.0	92.2	80.0
Bihar	54.9	58.6	98.2	33.5	64.8	95.6	98.2	56.1
Chhattisgarh	71.3	95.6	91.1	41.3	73.9	98.3	89.9	81.3
Goa	Neg.	99.8	96.3	89.1	5.00	100	97.3	93.3
Gujarat	65.4	96.0	90.9	71.0	69.3	95.6	92.5	68.6
Haryana	77.3	98.8	91.6	89.8	78.3	99.4	91.3	95.4
Jharkhand	56.7	80.1	77.7	30.0	58.3	92.2	78.7	59.0
Karnataka	69.7	97.8	89.3	65.8	72.9	98.6	91.5	74.8
Kerala	76.3	99.2	94.3	99.2	84.1	99.2	92.9	99.6
MP	68.2	89.9	84.7	42.8	64.6	97.6	72.5	66.7
Maharashtra	77.6	92.5	91.5	71.2	71.6	96.0	84.4	77.1
Odisha	68.5	85.5	88.8	35.0	56.4	95.8	84.8	63.0
Punjab	87.2	99.6	99.1	92.9	74.8	99.5	97.8	96.3
Rajasthan	73.9	91.0	85.5	54.0	79.2	97.4	87.1	71.1
Tamil Nadu	73.2	98.8	90.6	61.7	58.9	98.6	93.1	66.1
Uttar Pradesh	66.6	70.9	96.4	45.8	69.1	87.2	97.8	71.0
West Bengal	74.7	93.7	94.6	74.9	74.3	96.0	94.0	83.7
Average	70.9	90.9	90.3	63.2	66.3	96.8	90.3	76.6
Coefficient of Variation	0.11	0.12	0.07	0.35	0.26	0.03	0.07	0.17

[a] Excluding northeastern and hilly Indian states.

[b] Electricity has a special significance when it comes to the usage of sanitation facilities during the dark hours. Access to electricity has a positive association with both latrine ownership and usage (Lee 2017). One may feel that a lack of basic amenities such as water supply and electricity may obstruct the usage of latrines. Hence, a comprehensive analysis of households' sanitation behavior would also require a deeper understanding of the availability of other related facilities such as water and electricity.

[c] Indicates the improvement to the existing sanitation facilities.

Note: *Neg. (or negligible) indicates a very low percentage due to only a few cases.

Source: National Family Health Survey (4th and 5th Round), Government of India.

The fifth round of the NFHS defines better sanitation facilities as a shift from “[f]lush to a piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit (VIP)/biogas latrine, pit latrine with slab, twin pit/composting toilet, which is not shared with any other household” (NFHS, 2019–21). Appendix Table 2 shows that households in different states have recorded an improvement in sanitation practices. India experienced an average increase of 10% in households with access to toilets between 2105–16 and 2019–21. Since the data in the fifth round of the NFHS comprise the post-SBM scenario, one may argue that the SBM has contributed significantly to this development. Available data also indicate that 90% of the households from almost all the Indian states could also use improved water sources more safely than their earlier source of drinking water.