FROM PROMISE TO PERFORMANCE:
ECOLOGICAL SANITATION AS A STEP TOWARD THE ELIMINATION OF MANUAL SCAVENGING IN INDIA

An Assessment of Sanitation and Human Rights in Paliyad. Submitted to Navsarjan, Gujarat, India.


Prof. Balakrishnan Rajagopal
Joel Campos Alvis
Jill Baumgartner
Daniel Berry
Amber Bradley
Mira Chokshi
Elizabeth Clay
Ya-Ting Liu
Topher McDougal
Rachel Peletz
Brian Robinson
Melissa Rosen
Francisco Ruiz
Alexis Schulman
# TABLE OF CONTENTS

## 06 Executive Summary

## 07 Part I: Systematic Failure of Manual Scavenging

- Introduction (1)
- Systematic Failure of the State to Eradicate Manual Scavenging (2)

## 11 Part II: Case Study of a Manual Scavenging Community

- Manual Scavenging and Sanitation in Paliyad (3)
  - Methods for Gathering Data on Manual Scavenging (3.1)
  - Limitations of the Study (3.2)
  - Scavenger Conditions (3.3)
  - Sanitation (3.4)
- Socio-Economic Dimensions of Manual Scavenging in Paliyad (4)
  - Demand for Toilets and Sanitation Services (4.1)
  - Livelihoods (4.2)
  - Livelihood Predictors (4.3)
- Health in Paliyad (5)
  - Sanitation and Public Health (5.1)
  - Gender Dimensions of Manual Scavenging (5.2)
  - Hygiene Practices (5.3)
  - Occupational Health (5.4)
  - Food Security (5.5)
  - Measures (5.6)
  - Health Recommendations (5.7)

## 26 Conclusion (6)

## 27 Part III: Prospects of Ecological Sanitation

- Ecosan as a Step Towards Safer Sanitation Practices (7)
  - Ecosan (7.1)
  - Critique of Conventional Sanitation Options (7.2)
Design Considerations (8)
  Design Goals (8.1)
  Ecosan Design Concept Options: Urine-Separation, Composting, and Biogas (8.2)
  Design Users: Public vs. Communal vs. Private (8.3)
  Spatial Considerations (8.4)
  Materials (8.5)
  Limitations of Ecosan (8.6)
  Paliyad Intervention to Date (8.7)

Business Model and Scalability (9)
  Social Cost-Benefit Analysis (9.1)
  Efficiency (9.2)
  Consumption (9.3)
  Valuation (9.4)

Recommendations for Organizational and Institutional Partnerships (10)
  Phased Approach for Implementation (10.1)
  Impact on Manual Scavengers (10.2)
  Other Local Actors/Partners (10.3)
  Further Institutional Recommendations (10.4)
  Long-term goals (10.5)

Potential Sources of Funding (11)

Recommendations (12)

Glossary of Terms

References
EXECUTIVE SUMMARY

Manual scavenging, the act of human removal of excreta from dry pit latrines, is detrimental to environmental, mental, and public health and is a gross violation of human rights. This practice is prevalent in Gujarat, India where water shortages have made the widespread use of public pour-flush toilets infeasible. Manual scavenging is often the sole economic opportunity for Dalit (also known as Untouchable) women, who are often considered the most ‘dehumanized’ members of Indian society. Dalits earn less than a dollar a day collecting and transporting untreated waste to dumping sites. Workers gather excreta without protective apparel and often use their bare hands and feet and a broom to perform their job. While scavengers are at elevated risks for contracting excreta related diseases, sludge from pit latrines threatens public health by contaminating water resources. The practice of human waste removal and the construction of dry pit latrines were outlawed 1993 with the passage of the Employment of Manual Scavengers and Construction of Dry Latrines Prohibition Act. However, despite this and other legal actions, laws are rarely enforced largely because other feasible sanitation alternatives have yet to be determined.

The objective of this project is to improve the living and working conditions of Dalits by designing a sustainable sanitation technology that removes the need for manual scavengers. The Massachusetts Institute of Technology and the Gujarat based non-governmental organization, Navsarjan, collaborated on the design of an ecological sanitation structure that makes sanitation safe from both a user’s and cleaner’s perspective. In addition, a baseline occupational health and socioeconomic assessment of manual scavengers was conducted in the 14,000 member village of Paliyad in June 2006. The number of people available for interviews during the research for this study was too few to be able to make generalizable statements that can be confidently applied to the general population. However, the whole scavenger community and a good numerical sample of the other communities were surveyed in Paliyad. This study found that manual scavengers in this community have limited access to water and sanitation, have a higher risk of occupational illness and injury, and experience more caste-based discrimination than other community members.

Ecological sanitation, or Ecosan, offers a potential solution to the human rights issue of manual scavenging. The Ecosan toilet designed for this population is an appropriate technology for this arid and economically depressed village because it requires neither water nor the laying of expensive piping for sewers. The latrine works by separating liquid from solid waste, which removes foul odors and encourages biodegradation. Desiccated waste and separated urine are safe to handle after a specific period of time and may be used as soil conditioner and fertilizer. Over time, Ecosan latrines are more sustainable and less resource-intensive than pour flush toilets if correctly operated. The implementation of this solution will require hygiene education and promotion, community involvement and, most importantly, the creation of an institutional mechanism to oversee the proper construction, maintenance, and operations of the enhanced sanitation system. The goal of ending manual scavenging will be more easily realizable with investment in sustainable eco-sanitation technology.
PART I: SYSTEMATIC FAILURE OF MANUAL SCAVENGING

1. Introduction

Manual scavenging, the manual cleaning, handling, and carrying of human excreta, is an inhuman yet pervasive practice in India which is performed solely by one Dalit sub-caste of scavengers who are known by different caste names. From a human rights perspective, manual scavenging constitutes one of the grossest and inhumane abuses that violate India’s domestic laws as well as international treaties and other legal commitments that apply to India. Over half a century ago, Mohandas K. Gandhi called it “the shame of the nation”, and yet manual scavenging continues to be a widespread practice throughout India. It is perpetuated and legitimated by the caste system which condemns them to this occupation, based solely on descent-based discrimination. Safai Karmacharis (manual scavengers) are a minority at the bottom of the section of the population that is outside the Varna (caste) system, namely Dalits, who constitute 160 million people in India. In Gujarat, it is estimated that there are between 50,000 to 60,000 manual scavengers.

This report details the results of an options assessment conducted by a team of graduate student researchers from MIT (joined by one member from Harvard University and one from Tufts University), led by Prof. Balakrishnan Rajagopal, MIT, as part of a two-year long collaboration with Navsarjan, one of India’s leading advocacy groups for Dalit rights. The report is based on an in-depth case study of ground conditions in Paliyad, a village in Gujarat, India, and rests on extensive academic preparation, field work, data collection and analysis. The team members consisted of a lawyer, urban planners, sanitation/civil engineers, economists, architects and public health experts.

The goal of this collaborative effort between MIT and Navsarjan was to help move the debate on manual scavenging from advocacy and legislation to enforcement, and was in turn based on two sub-goals: first, the elimination of manual scavenging, which is legally mandated in India; and second, the rehabilitation of scavengers so that they do not become worse off due to sanitation interventions. The goal in turn defined the objectives of this report. A first objective was to design a new technology that would offer a viable alternative to existing sanitation options, and offer a realistic and attractive way to achieve the human rights goals of the project. A second objective was to prepare a comprehensive assessment of sanitation practices in a sample community, and identify conditions under which a new technology intervention is likely to succeed – i.e., achieve the human rights goals of the project.

During the collaboration between MIT and Navsarjan over the last two years, it was realized that any technology design and its introduction needs to rest on a persuasive and clear documentation of the negative effects of manual scavenging on the scavengers themselves, as well as the potential benefits of the new design compared to existing models of sanitation options. As such, the team prepared for over three months during spring 2006 in Cambridge, MA, meeting regularly every week, reading and analyzing various background materials, and designing research tools. While in the field during June 2006, the team conducted an assessment of sanitation practices in Paliyad, through a baseline assessment of the health, socio-economic, financial and caste discrimination data, as it applies to manual scavengers relative to other members of the village. This was based on the realization that the introduction of a new technology needs to be assessed from multiple angles to compare it realistically to existing sanitation options. Based on this in-depth study, this report has conducted analyses of the various dimensions of the problem in Paliyad, and offers an Eco-san model sanitation technology as a viable option, with suitable recommendations about the institutional and other arrangements that are needed to make this technology address the goals of the project successfully.
The findings presented in this report indicate that a) manual scavenging continues to exist, in various forms in Paliyad; b) the current approaches to sanitation are not realistic or effective and do not address the human rights conditions of scavengers; c) the health and socio-economic conditions of the scavengers in Paliyad are grave, even relative to other Dalit sub-castes; and d) the Ecosan model designed by the MIT team can greatly reduce many of the negative aspects of manual scavenging, and potentially achieve the human rights goals of the project. Part I, this Section and Section 2, focus with an overview of governmental attempts to address manual scavenging in the past and the still-persistent practice of manual scavenging. Part II includes Sections 3, 4, 5, and 6 which look at the realities of manual scavenging through an in-depth case study of a 14,000-person village in Gujarat. The final sections look at ecological sanitation, or Ecosan, as an intervention which can address major issues surrounding manual scavenging. Section 8 details region-specific design considerations identified for Ecosan toilets, and Sections 9 and 10 explore the viability of Ecosan systems as a business and make recommendations for managing Ecosan on a large scale.

2. Systematic Failure of the State to Eradicate Manual Scavenging

Recent history has shown that the abolition of manual scavenging will require more than just legislation or court orders. The Indian State has put forth myriad legal instruments and institutional schemes to tackle this perverse system of exploitation and discrimination. Nevertheless, the continuing prevalence of manual scavenging and other discriminatory practices against Dalits points to gaps between legislation and enforcement on the ground. Several constitutional and legal provisions for the protection of Dalit rights are in place on paper. The Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 1989, the Protection of Civil Rights Act, 1955 and the special courts set up under Protection of Human Rights Act, 1993 have all failed to protect the life and dignity of Dalits.

The judiciary has also contributed with court rulings to have Indian states fulfill their constitutional obligation. The executive has created committees and commissions to directly address this problem. Nevertheless, enforcement has been poor at best and resources have often been lost due to lack of execution. The following is a brief account of both the main legal provisions made to eradicate manual scavenging and of the patchy demographic data available on manual scavengers.

Legislation has targeted the elimination of untouchability since the beginning of the Indian State. Article 17 of the Indian Constitution (passed in 1950) states that “Untouchability is abolished and its practice in any form is forbidden. The enforcement of any disability arising out of Untouchability shall be an offence punishable in accordance with law.”

In 1955, the Untouchability (Offences) Act, declared discrimination on the basis of untouchability as an offence and prescribed punishments. Nevertheless, the act was full of loopholes and its penal provisions were lenient. To correct these flaws, the Act was amended and renamed in 1976 as the Protection of Civil Rights Act. Under its new provisions, offenders could get fined and imprisoned and state governments were empowered to impose collective fines on the inhabitants of any area where discrimination was practiced. In 1993, the Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act was passed, requiring the demolition of dry latrines and, again, banning manual scavenging. This act, which is the principal legal instrument relevant to this report, also provided institutional mechanisms and allocated resources for the rehabilitation of scavengers. Research conducted by Navsarjan Trust found there were 28,613 dry latrines in urban Gujarat and 32,999 in the gram panchayats in the State. Official estimates place the number of scavengers in the country who are engaged in the manual handling of human waste at around 400,000 and 32,000 in the state of Gujarat. Navsarjan estimates the number of manual scavengers in the state to be higher, around 55,000.
In addition to legislation, the executive branch contributed several institutional schemes. The **National Scheme of Liberation and Rehabilitation of Scavengers** launched in 1992 was committed to eliminating manual scavenging by the end of the Eighth (VIII) National Plan period. The **National Safai Karamcharis Finance & Development Corporation** (NSKFDC) is responsible for providing financial assistance at a concessional rate of interest for income generating activities and loans to students pursuing professional and technical education. In 2003-04 the NSKFDC disbursed loans of RS.33.98 crores ($7.39 million USD) to cover 6870 beneficiaries in 10 States. The **National Commission for Safai Karamcharis** was established on August 12, 1994 under the provision of the **National Commission for Safai Karamcharis Act** to investigate specific grievances and monitor government programs and schemes aimed at improving the welfare of safai karamcharis. The Commission is required to be consulted regarding all major policy matters affecting safai karamcharis. The **National Human Rights Commission of India** was set up under the Human Rights Act, 1993. Though the Commission has conducted a comprehensive study of atrocities against Dalits, it has done little about manual scavenging which is a complex human rights issue. The Commission is also quite weak and lacks any enforcement power. A separate **National Commission for Scheduled Castes & Tribes** is responsible for investigating and monitoring all matters relating to safeguards provided for scheduled castes and tribes under Article 388 of the Constitution.

Despite these legal mechanisms, manual scavenging has remained a widespread practice throughout India. As recently reported in a leading Indian newspaper:

> As the hearing of a public interest petition filed by the Safai Karamchari Andolan and six other associate organizations and seven individual manual scavengers in the Supreme Court has revealed, the number of manual scavengers has increased from 5.88 lakhs in 1992 to 7.87 lakhs. Unofficial surveys estimate that there are over 12 lakh manual scavengers, of whom 95 per cent are Dalits who have the task thrust on them as a "traditional occupation". They are considered untouchables by the higher castes and are caught in a vortex of severe social and economic exploitation.

> The petition, filed in 2003, pointed out that the practice existed in many States and was being continued even in public sector undertakings such as the Indian Railways. The petitioners sought enforcement of their fundamental right guaranteed under Article 17 (right against untouchability) read with Articles 14, 19 and 21 guaranteeing equality, freedom, and protection of life and personal liberty respectively. They urged the Supreme Court to issue time-bound directions to the Union of India and the various States to take effective steps for the elimination of the practice of manual scavenging simultaneously with the formulation and implementation of comprehensive plans for rehabilitation of all persons employed as manual scavengers.1

In 1989, the National Planning Commission Taskforce estimated that there were approximately 600,000 scavengers in the country. By 1995-96, the Ministry of Welfare estimated that this number had increased to around 787,800. Today, there are more than 50,000 manual scavengers in Gujarat alone. Ironically, the State is the largest promoter of manual scavenging by employing Dalits in inhumane and illegal practices from cleaning vaada latrines in villages to maintaining centralized sewerage systems in cities.

The systematic failure of legislation, court rulings and bureaucratic schemes to offset manual scavenging and other discriminatory practices points to the complexity of the problem. Researchers and Dalit leaders have called for a radical socio-cultural and political change as the only solution. Surely, the gaps between the written law and reality on the ground show how deeply ingrained these practices are in Indian society, economy, culture and politics.

In short, macro- strategies at the national/state level have so far failed to improved conditions for manual scavengers on the ground. Resolving this problem at the community level will be a challenge requiring an integrated solution involving many stakeholders.

---

<table>
<thead>
<tr>
<th>Date</th>
<th>Intervention</th>
</tr>
</thead>
</table>
| 1949   | Constitution of India:  
|        | Article 17 (Abolition of Untouchability), “Untouchability is abolished and its practice in any form is forbidden.”  
|        | Article 21, Guarantees right to life with human dignity Constitution of India  
|        | Article 25 (Right against Exploitation) “Beggar and other similar forms of forced labor are prohibited and any contravention of this provision shall be an offence punishable in accordance with law.” |
| 1949   | Report of Scavengers’ Living Conditions Enquiry Committee formed in State of Bombay. “Carrying of night soil on head loads should be abolished.” |
| 1957   | Report of the Ministry of Home Affairs on Manual Scavenging:  
|        | Recommendation No. 209, “Sufficient water for drinking and washing must be supplied to scavengers.”  
|        | Recommendation No. 210, “Arrangement for supply of soap should be made at place of work.” |
| 1957   | Report of Scavenging Conditions Enquiry Committee formed by Ministry of Race Affairs. The practice of manual scavenging should be abolished “not later than end of the 3rd five year plan.” |
| 1968   | Report of National Commission of Labor:  
|        | No. 5.3, “Fair load of work should be fixed for a normal working day.”  
|        | No. 6.7, “Employment of children as sweepers and scavengers should be prohibited in municipal or private service.” |
| 1968   | Committee established by the National Commission on Labor to study the working and service conditions of sweepers and scavengers; 111 recommendations were made on how to eradicate the practice. |
| 1969   | On Gandhi’s Birth Centenary, the State of Gujarat announces ban on manual scavenging. |
| 1970   | Circular (i.e., a directive) to collectors and municipalities that grants will be cancelled if the practice is not put to an end in 2 months; 59 such circulars were made between 1970-71. |
| 1989   | Report of the Task Force for Tackling Problems of Scavengers and Suggesting Measures to Abolish Scavenging with Particular Emphasis on Their Rehabilitation by the National Planning Commission. “The practice of manual handling of human waste (should be) abolished within the next four years.” |
| 1991   | PM promises to ban scavenging and allocates 800 crores for rehabilitation. |
| 1993   | Abolition of Manual Scavenging Act enacted but no states adopt the act. |
| 1994   | On Gandhi’s 125th birthday, CM announces ban and promises rehabilitation to 32,000 families. |
| 1995   | On Dr. Ambedkar’s birth centenary, CM announces ban again. |
| 1996   | Establishment of National Scheme for Liberation & Rehabilitation of Scavengers  
|        | India 797,112 scavengers identified (23.6% rehabilitated, 9.3% trained)  
|        | Gujarat 62,000 scavengers identified (16% rehabilitated, 1% trained) |
PART II: SYSTEMATIC FAILURE OF MANUAL SCAVENGING

3. Manual Scavenging and Sanitation in Paliyad

This report involves an actual case study of manual scavenging in Paliyad, a village in the Botad Taluka, Bhavnagar district of the State of Gujarat. Paliyad is a village of 14,000 inhabitants, 100 kilometers southwest of the capital of Gujarat, Ahmedabad. Paliyad faces a serious sanitation deficit: open sewage runs through unpaved streets, few households enjoy private latrines and open defecation is customary. Conditions are worse in poorer areas of the village where open defecation is the only available solution; over 300 Dalit households have no access to sanitation facilities; under pressure from the manual scavenging community and Navsarjan, the Panchayat has closed the vaada latrines that served the women of the poorest sectors of the village. Construction of public pour-flush toilets is underway but maintenance and destination/treatment of wastewater produced by these new units remains an open question. The team was not presented with evidence of a plan to overcome the problems relating to the operation of these units, which typically arise from scarcity of water, design deficiencies and poor maintenance. The experience of similar projects in other cities has shown how these units can—under water shortage and poor maintenance—become de facto dry latrines of the worst hygienic conditions. Under these conditions, pour flush latrines are unlikely to achieve the human rights objectives of the elimination of manual scavenging and the rehabilitation of scavengers.

Figure 3.1: One of the poorer sections of Paliyad
3.1 Methods for Gathering Data on Manual Scavenging

MIT Research Team developed and refined the Manual Scavenging Health and Socioeconomic Baseline Assessment Survey during discussions with Navsarjan enumerators, who have prior experience in administering other surveys, and the Navsarjan Director, Manjula Pradeep. Navsarjan was responsible for conducting an enumerator training and translating the survey from English to Gujarati. The survey was implemented in the village of Paliyad. The survey teams were comprised of fourteen teams of two enumerators, each team consisting of one male and one female, and they conducted in-person interviews with subjects. Each team visited approximately ten households over the course of three days. Of the 77 households sampled, 17 were Dalit manual scavengers, 30 were non-scavenger Dalits and 30 were upper caste and Other Backward Castes (OBCs) which is a cluster of ‘low’ castes above Dalits. The principal sub-castes of Dalits in Paliyad consist of the weavers, the leather workers and the manual scavengers. The weavers are considered better-off than the other two sub-castes among Dalits, while the manual scavengers are considered the worst-off.

3.2 Limitations of the Study

There are some limitations to the data collection in our research. First, the statistical processing of the data is limited due to the small sample size (n=77). Similarly, there were only a small number of females in the sample (4 female manual scavengers and 6 female non-manual scavengers) which limited our information about the specific health issues among women in Paliyad. Second, there may be some variability in the socioeconomic status of the groups sampled by caste. In order to glean some information about manual scavengers as they compare to other castes in this community, simple tabulations will be presented. However, these results may not be generalizable to the larger population.

3.3 Scavenger Conditions

Discrimination

There are 17 scavenger families in Paliyad. They are the target of systematic discrimination, that puts them in a separate class, even when compared to other Dalit sub-castes. According to our survey, two out of three manual scavengers feel they are always denied access to village cultural, social or religious events (e.g. temples, holidays, and religious and cultural festivals).

Over 40% of manual scavengers are frequently or always denied access to the marketplace (buying/ selling goods and/or receiving services). It is worth noting that, within the Dalit community, the weavers are also victims of discrimination, especially in the marketplace. Nevertheless, it happens in a less systematic manner; there is a high prevalence of the ‘always’ answer among manual scavengers (red in the graphs).

Another troublesome practice is the denial of access to government institutions and services to Dalits, especially to manual scavengers. Due to beliefs of pollution and untouchability, manual scavengers are often denied healthcare and education. Forty percent of manual scavengers reported that they are always denied access to government institutions like primary health centers.

In sum, while Dalits and other backward castes (OBCs) report discrimination, the percentage of manual scavengers reporting discrimination is very high, thus showing that caste discrimination has a disproportionately negative impact on them.
Figure 3.3.1: Denial of access to social, cultural, or religious events

Figure 3.3.2: Denial of access to the marketplace

Figure 3.3.3: Denial of access to government institutions
**Manual Scavenging**

There are 33 manual scavengers employed as sanitation workers by the Panchayat (27 as daily wage earners and 6 as permanent employees). The sanitation budget is dependent on taxes collected such as water and property. They rely on the Talati (Panchayat secretary) every month for distribution of their wages. However, daily wage earners are not entitled to any benefits or protection afforded to permanent employees. As such, payments to manual scavengers are consistently delayed or withheld without due process or mechanisms for redress. For example, four female scavengers in Paliyad who petitioned against the Panchayat over inhumane work conditions were denied payments for their work by the Talati for 6 months.

### 3.4 Sanitation

In Paliyad, the majority of the middle and upper classes are served by private and communal dry latrines and pour-flush toilets, connected to septic tanks. Both the dry latrine pits and the tanks demand periodic waste and sludge removal, which is performed manually by members of Paliyad’s 17 manual scavenger households. However, the Dalits and other poor communities have little access to adequate sanitation. There is only one area in the village that contains public toilets, which is located adjacent to one of the Dalit communities. The toilet area is low-lying and thus is frequently flooded with surface run-off from the village, which contains trash and large amounts of human feces. To reach the toilets, villagers including their children, must cross through this stream of waste, often without any footwear. Historically, the primary public sanitation facility was the vaada, a walled, roofless space where open defecation took place, and which was cleaned by scavengers. However, in reaction to a law suit brought before the Supreme Court demanding the closure of dry latrines in Gujarat, Paliyad’s vaada was set to be destroyed and pour-flush latrines were to take its place. Currently, only part of the vaada’s outer wall has been destroyed, and demolition has been discontinued. Open defecation continues within the vaada, now with reduced privacy, which is particularly problematic for women. Headloading of human waste was visually observed during the site visit. The area is still manually cleaned, and the waste is dumped in neighboring trash heaps (the area around the vaada is also a trash dump.) The pour-flush facilities, initiated by the Sarpanch (the elected village chief), are half built and not yet functional. Thus, those without private or communal toilets must rely on open defecation, either in the vaada or in other parts of the village.

In an attempt to address Paliyad’s sanitation issues, the current Sarpanch has plans to develop an underground grid sewerage system; waste and runoff from private toilets and the streets will be piped to one of three large septic tanks. However, such a system faces many challenges to being a sustainable sanitation solution for Paliyad. For example, the region only receives between 600 and 800 mm of rain a year, the bulk of which falls within the three months of the monsoon season. In response to this scarcity, Paliyad’s public water supply is expected to become available only every three days, although villagers reported going up to 10 days without this public service. The grid system, as envisioned, requires a large and consistent supply of water and it is unclear how this can be supplied, or if this is a wise use of scarce water resources. Furthermore, the grid system does little to address the lack of adequate sanitation for Paliyad’s poorer families who will still lack toilets.

Lastly, as there are no plans to service the system with mechanical pumps, manual scavengers will still be relied upon to unlog pipes, fix leaks, and remove waste from the tanks. Experience from larger towns and cities in India shows that work conditions for manuals scavengers managing a piped system can be just as unsanitary or worse than those who work with less formal systems: when pipes become clogged or blocked and tools are not available to do the work, manual scavengers will often do the work by physically diving in the sewers. Thus, a piped system will not address the dangerous work conditions of manual scavengers and the discrimination that manual scavengers face due to their ‘dirty jobs.’ From a human rights perspective, the ability of a conventional system to the ability of a conventional system to address sanitary working conditions is questionable.
Figure 3.4: Open defecation area in Paliyad, child in foreground
4. Socio-Economic Dimensions of Manual Scavenging in Paliyad

The practice of manual scavenging has deep roots in the social and economic life of the Paliyad community. This section has two primary goals. First, it describes the nature of the demand for toilet maintenance and cleaning, arguing that this demand constitutes a primarily caste-based phenomenon. Second, this section seeks to assess the relative importance of various explanatory factors behind three key components of local economic livelihoods, namely expenses, income and asset ownership. Understanding the influence of such factors as caste, gender, and education will aid in maximizing the benefits of a given sanitation sector intervention and will help in foreseeing possible indirect effects.

4.1 Demand for Toilets and Sanitation Services

Caste is the most statistically significant determinant of whether a Paliyad resident will own a toilet or not, and what type of toilet s/he owns (see Figure 4.1). While no scavengers own a toilet, nearly 4,500 forward caste members (nearly one-third of the village inhabitants) have access to a household latrine. Non-scavenging Dalits and OBCs have predictably intermediate figures. Furthermore, the type of latrine in use is highly dependent upon caste, with higher castes typically choosing toilets with higher maintenance requirements that involve their periodic cleaning by Dalits. Among the forward castes, dry latrines account for the great bulk of latrines in use.

A demand curve was derived to describe generalized household willingness to pay for a toilet per person (see Appendix G). However, it should be noted that a demand curve functions quantitatively, and fails to distinguish social determinants of demand.

Figure 4.1: Personal access to latrines, by caste

02_ All results presented in this section are statistically significant however, the possibility of survey data entry errors does exist, and no comprehensive data quality verification process was undertaken. Data gathered at the household level and then imputed to individuals within each family can be vulnerable to data entry errors. Certain questions may also lend themselves more readily to misreporting, especially those regarding income and asset ownership.
4.2 Livelihoods

Expenses

The prevalence of pour-flush toilets as a percentage of all types of toilets, especially among OBCs, likely contributes to higher monthly water expenses among pour-flush owners (see Figure 4.2.3). Viewed in the context of income distribution, these data paint an interesting socio-economic portrait. Caste does not serve as a reliable predictor either for personal income, or per capita family income (see Figure 4.2.2). Income level in a rural town such as Paliyad may not determine livelihood as well as it might in an urban environment where alternative sources of food security, etc., may not play as central a role.\footnote{For instance, the total value of residents’ owned assets (including farmland and house) is highly tied to the caste system (see Figure 4.2.3). These trends may indicate that class privileges, whether they present in the form of assets or social entitlements, may effectively enhance or replace income, and should thus be considered as an integral part of rural livelihoods. For instance, forward castes may have lower monthly water expenses as a result of owning fewer flush toilets and relying on manual scavengers to clean their dry latrines instead, as noted above (see Figure 4.1).}

The measure of income here bears some attention. While this study chose to employ total personal income as a standard metric, this measure has certain limitations when compared to total family income per person. For instance, when looking at per capita family income, a family’s income level rises fairly predictably with each step up in social caste (with the exception of a reversal between the scavenger and other Dalits, much as the discrimination results demonstrated). The implication here is that high-caste families tend to have fewer dependents per income earner, and so have more disposable income.

Despite variations in mean personal income, all surveyed caste groups’ reported incomes were quite low by national standards. Mean incomes varied from 15.5% to 21.1% of the growth-adjusted World Bank figures for gross national income (GNI) per capita of around INR 38,000 ($827 USD) per year per person.

Figure 4.2.1: Monthly water expenses, by caste

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure4.2.1.png}
\caption{Monthly water expenses, by caste}
\end{figure}

\footnote{While the graph seems to show that scavenging Dalits have a relatively high income, this is not representative of the scavenging Dalit community. The families with whom we spoke were among the local Dalit leaders and were, therefore, somewhat more established. Additionally, our inspection of a Dalit household’s income was more detailed than that of other castes due to the nature of this study and we believe household incomes may be less complete or unintentionally underreported by other castes.}
Figure 4.2.2: Monthly personal income and claimed monthly total expenses, by caste

Figure 4.2.3: Value of owned assets by caste (see Appendix Table B.1)
4.3 Livelihood Predictors

From a statistical point of view (see Appendix Table B.2.), the combination of factors behind income with the greatest explanatory power (accounting for 66.5% of the variation in income) included, in descending order:

- Age
- Value of owned assets
- Gender
- Discrimination in the social realm
- Discrimination in government institutions
- Education

Age

Age is a factor that is positively associated with increased income up until a point, and then tends to produce a decrease in income for each successive year. This is a common pattern in most countries, and is often indicative of a slowing of one's professional growth and the onset of retirement. While the age at which this downturn takes place in the developed world tends to be in the late 40s, in Paliyad the age is 43.

Value of Assets

The value of owned assets is also a significant predictor of income. It is somewhat co-linear with caste (as explained above), and renders caste, house tenure, and land tenure, insignificant as predictors. This may be because “caste” in this analysis probably functions as a catch-all category for those variables highly associated with caste but not explicitly measured individually. It thus makes little sense to talk of the influence of caste while controlling for other, sometimes overlapping variables. For each additional rupee of assets owned, the owner’s income generally grows by around INR 0.21.

This finding appears contradictory to our earlier finding of Dalits’ relatively higher income levels. Skepticism is warranted both with this finding as with the above-mentioned interpretation, though it should be kept in mind that the previous explanation dealt with castes as amalgamated groups (e.g., as a group, scavengers tend to make higher incomes and have fewer assets than other groups), whereas the present analysis deals with predictors of income at the individual level (e.g., a specific person has more assets, and so can use them as collateral for loans in income generating investments).

Gender

Controlling for other significant factors, the fact of being female in Paliyad actually seems to increase one’s income by around INR 1,850 per month. This apparent increase in women’s income in Paliyad may be explained by the fact that the present analysis has held constant other significant factors, such as education and discrimination, which disproportionately affect women negatively. In other words, while women tend to be at a disadvantage in many respects, given a man and women equally discriminated against, equally well-endowed with assets, equally well-educated, etc., the woman appear to make more income. This could be seen as a positive element in favor of women’s capabilities. However, it must also be noted that this income is much lower than the national average income of around INR 3,150 per month, and is also probably the result of more women being in the wage sector, as a proportion relative to their population, compared to men who derive income from multiple sources including non-wage ones.
Discrimination in the Social Realm
Discrimination in the social realm negatively affects income. In each case, one study-defined increase in perceived discrimination (e.g., from "sometimes" discriminated to "always" discriminated) accompanies a roughly INR 750 drop in monthly income.

Discrimination in Government Institutions
Discrimination in government institutions negatively affects income. In each case, one study-defined increase in perceived discrimination (e.g., from "sometimes" discriminated to "always" discriminated) accompanies a roughly INR 857 drop in monthly income. This is greater than the drop caused by discrimination increases in the social realm, but represents a weaker correlation.

Education
Education is negatively correlated to personal income. This anomalous result should be viewed with skepticism, as education and income are both topics on which many respondents might feel inclined to misreport, by ascribing a higher educational status than is actually the case.

5.0 Health in Paliyad
In an effort to assess the health status of manual scavengers in relation to other members of the community, the MIT team included questions about occupational health, access to water and healthcare and hygiene practices in the household survey. Navsarjan implemented the survey and the data collected was analyzed by the MIT team. While the results were not uniformly statistically significant due to a small sample size, they strongly suggested that manual scavengers are worse off compared with other community members especially in terms of hygiene practices, occupational exposure to diseases and injuries. The elimination of the practice of manual scavenging is key to improving the disease and injury burden of manual scavengers in Paliyad and to improving the health of all community members.

5.1 Sanitation and Public Health
In the 1996 Global Burden of Disease (GBD) study, Murray and Lopez calculated that 5.3% of all deaths and nearly 7% of lost Disability Adjusted Life Years (DALYs) were attributable to diarrheal and selected parasitic infections as a consequence of inadequate access to clean water and sanitation (Murray, 1996). Such health outcomes often stem from exposure to a wide range of pathogenic agents such as bacteria, viruses, protozoa or helminthes. These agents can employ a number of different transmission routes to new agents including (i) human-to-human via the environment; (ii) human-to-human multiplying in the environment; (iii) human-to-animal-to-human via the environment; or (iv) animal-to-human via the environment (Curtis, 2000).

Manual scavengers confront a dual risk of exposure to harmful pathogens through their environment as well as their occupation. In addition to frequently residing in areas without safe water or adequate sanitation, scavengers are consistently exposed to both human and animal waste during the manual removal of solid waste and excreta from latrines, roads, septic tanks and open areas used for defecation. In spite of health risks associated with these practices, we found that scavenging occurs with minimal or no protective equipment such as masks, uniforms, gloves, shoes, appropriate buckets and mops.
Improvements in access to adequate sanitation is a key factor in decreasing childhood morbidity and mortality and, more broadly, improving public health by reducing population exposure to harmful pathogens. However, lessons from past sanitation campaigns elsewhere illustrate that centralized sewerage systems will not be a reality for all people in the short or even medium term. The infrastructure and human resources required for scaling-up these systems are often beyond the financing capacity or water availability of many low-resource countries, including areas such as Paliyad in Gujarat. Acknowledging these constraints, the 2002 World Health Report emphasizes the need to identify and implement low-resource demanding, decentralized water and sanitation interventions such as ecological sanitation, or Ecosan, as a more immediate solution for communities without sanitation (WHO, 2002).

5.2 Gender Dimensions of Manual Scavenging

Overwhelmingly women perform manual scavenging for private and communal latrines. Thus, women face the greatest risks to health, wellbeing, and dignity due to scavenging. Dalit women working as manual scavengers

Figure 5.2: Older manual scavenger in Paliyad
confront a threefold system of gender-, caste- and occupation-based oppressions. As described above, scavenging dramatically increases workers’ risk of exposure to harmful pathogens. Despite general awareness that scavenging is not a very safe, many female scavengers continue the practice because of their families’ need for the money or food received as payment. They also reported skepticism of the feasibility of alternative occupations due to factors such as training requirements and caste discrimination at work or in the market.

Navsarjan Trust continues to work on education, advocacy, and community organizing to address some of these factors. However, interviews with scavenger women in Paliyad indicate that, unless alternative occupations are proven as viable alternatives, scavengers will find it very hard to undertake the financial risk of a change in occupation.

Through interviews and survey data with female scavengers and Navsarjan staff members, the MIT team identified five areas where women scavengers and their female children are particularly vulnerable to negative health consequences:

• Women scavengers tend to perform their job alone and at night, which places them at an increased risk of gender-based violence.
• Women from non-scavenging (but hailing from the same sub-caste) families sometimes marry into scavenging families and then are forced into scavenging, while this is not the case for men. This denotes an even greater burden of limited occupational choice imposed on women.
• Scavenger women are generally required to continue their work throughout a pregnancy. Scavenging poses increased risks to the health of pregnant women because of the heavy head-loads, the bending posture during cleaning and exposure to pathogens.
• Women generally gather water, prepare food, and care for children. Therefore, impacts on women’s health are likely to affect the entire family—both through the spread of infections as well as through lost productivity on which families rely.
• Finally, as mothers tend to bring their female rather than male children with them while scavenging, girl may miss days of school or be taken out of school altogether. This further entrenches gender inequality and increases the likelihood that these girls will later be forced to rely on scavenging for their primary source of income.

5.3 Hygiene Practices

Our site visits to Paliyad revealed widespread open defecation as well as unsanitary conditions in public spaces. To gain a better understanding of knowledge, attitudes and practices around hygiene and health in Gujarat, we held meetings with Dr. Lata Shah, a physician and Director of the N.G.O. IDEAL, and S.R. Rao, the Principal Secretary of Health in Gujarat. According to Dr. Lata, a basic understanding and acceptance of germ theory is lacking throughout Gujarat. Many Gujaratis, she said, believe that illness stems from ayurvedic imbalances rather than germs. For instance, there is a common perception that imbalances from changes in physical location or water source will leave one more vulnerable to illness. There is also a general belief that feces do not contain harmful pathogens and therefore contact with fecal matter is not necessarily followed by use of soap in handwashing.

This suggests that residents of Paliyad may not have a clear understanding of the health risks posed by the unsanitary conditions in the village, particularly in the areas of Paliyad characterized by uncovered sewers and open defecation. It is essential that this gap in hygiene education be addressed in order for a sanitation program in Paliyad to be successful.

The practice of handwashing has been shown to be effective in reducing diarrheal and respiratory disease
incidence (Rabie et al., 2006; Lubin, 2006). While the rate of handwashing is similar for manual scavengers and non-manual scavengers (58% vs. 60% interviewed report washing their hands frequently or always after urination/defecation), access to soap and water in the household and workplace differ for the two groups. When compared with non-manual scavengers, manual scavengers have reduced access to soap both at home and at work. While 96.6% of non-scavenger subjects have soap in their home, the same is only true for 88.2% of scavengers. However, this difference is not significant ($\chi^2 = 1.86, p = 0.21$). At work, manual scavengers have significantly reduced access to soap and water for washing with only 23.5% of manual scavengers reporting ever having access to wash-water with compared to 89.8% of non-manual scavengers ($\chi^2 = 27.94, p<.001$) and only 5.9% of scavengers having soap, compared to 33.3% of non-manual scavengers surveyed ($\chi^2 = 4.90, p<.05$). The values for soap and water availability at work do not change and remain significant when comparing manual scavengers to other Dalits.

5.4 Occupational Health

Workplace injuries contribute significantly to the global burden of disease (Murray, 1996). Manual scavengers face a unique set of occupational health challenges including repetitive strain injuries from constant bending in order to sweep latrines and carrying heavy head loads of excreta and exposure to physical and biological hazards. Protective equipment such as brooms, facemasks and gloves can reduce the incidence of disease and injury for manual scavengers.

Anecdotal evidence from meetings with community organizers, and Navsarjan staff suggested that many scavengers prefer not using protective gear even if it were available. Protective gear may carry stigmas and/or may be uncomfortable to wear. Our study found that 70.6% of the 17 manual scavengers surveyed never use safety gear, but 88.2% stated that they would wear protective equipment if it were provided.

Although manual scavenging is illegal, the practice is still widespread. As an illegal practice, manual scavenging is not governed by any occupational regulations nor does any regulatory body exist that could, for example, oversee the provision and use of safety equipment. Some advocacy groups argue that provision of safety equipment would serve to legitimize manual scavenging. While this project aims to eliminate manual scavenging, rather than making it tolerable, this information may be transferable to other sanitation models. For example, toilets of any kind still need to be cleaned regularly. While some technologies will expose cleaners to significantly fewer levels of pathogens, all sanitation work carries some degree of health risk. If Dalits continue to be employed as cleaners of toilets, addressing any stigma associated with protective gear (such as gloves) may be of benefit.

5.5 Food Security

Food security is likely an issue within the Paliyad community. Our results showed that 9 of the 17 manual scavengers, 18 of the 30 non-scavenger Dalits and 17 out of the 30 OBCs/upper castes subjects surveyed have skipped a meal or decreased their food portions so that others in their family will have enough to eat. However, there were no significant differences between the groups.

Our analyses revealed that manual scavengers rely on different sources of food than non-scavengers, and that these differences are statistically significant (Mann Whitney $U= 341, p<.001$). Differences in food source also remain statistically significant within caste when manual scavengers are compared with other Dalits (Mann Whitney $U= 165, p<.005$). Interestingly, 35.3% of manual scavengers reported receiving leftover food from other families, whereas no non-scavengers reported receiving leftovers. While 3.3% of non-scavengers receive
food. However, none of the subjects receiving food from temples is Dalit (100% of non-scavenger Dalits cook their food at home). The large percentage of scavengers who report reliance on leftovers as a food source is due to cultural reasons related to the caste system and may also be due to scavengers' limited access to agricultural opportunities such as sharecropping or land-ownership, as noted in section 4.2 and 4.3 above. Increasing food security through land access- or other income sources- may be crucial for facilitating scavengers' shift to alternative occupations.

5.6 Measures

We examined several types of injuries and pain experienced by individuals in our sample population (n=77) performing various occupations. The statistical results of our analysis are presented in Appendix A. We found that manual scavengers experience high frequencies of both injury and pain in all of the categories measured. When compared to all other survey subjects, manual scavengers experienced significantly more back, knee, ankle and eye injuries. When compared to non-scavenging Dalits only, manual scavengers experienced significantly more knee injuries than did others in their caste. In addition, manual scavengers reported experiencing significantly more frequent pain in the neck as a result of their occupation when compared to non-scavenger Dalits.

We also looked at exposure to selected hazards across the various occupations performed by members of multiple castes. In general, scavengers reported more frequent exposure to every hazard measured with the single exception of noise. When compared to all others surveyed, manual scavengers experienced significantly more exposures to high temperatures, odor, garbage/waste, human and animal waste, and dead animals. However, when compared to just non-scavenger Dalits, exposures to dust, live animals and insects were also found to be significantly greater.

Given their high exposure level to human and animal waste, it is not surprising that manual scavengers experience diarrhea and fever more frequently than all others in the survey do. However, when compared to non-scavenger Dalits, only fever remains significant. This may be due to the generally poor state of health care available in Paliyad.

5.7 Health Recommendations

Health Awareness, Education and Information

Through discussions with government officials, NGO managers, physicians and community-based development workers, we identified an urgent need for health and hygiene education at the village level. We learned that local health centers tend to focus on primary care rather than prevention. While primary care is undoubtedly an important part of public health, populations without an understanding of the root causes of illness and disease will have less incentive to change their current sanitation and hygiene practices. This education, in turn, may likely have some impact on the demand for improved sanitation services at the community level.

The role of education in schools is crucial to changing perceptions and, eventually, behavior around sanitation and hygiene issues. Anecdotal evidence from veteran health educators in Gujarat suggests that health and hygiene information provided by schoolteachers is considered more trustworthy by both children and adults than that provided by government health workers (Shah, 2006). Yet to our knowledge there is not currently a formal hygiene education program in place within either the state education or health system. Navsarjan has already introduced a curriculum on Ecosan technology for schoolchildren in the three schools that they run. The program is geared towards primary school students and includes a hygiene component. In partnership with an Ecosan project in Paliyad, this curriculum could be formally documented and offered as a
model for adoption by local schools or health care centers.

**Access to Health Care Services**

In 2005, the Self-Employed Women’s Association (SEWA) in Ahmedabad collected information on access to hospital services among members of their health insurance scheme for poor women and their families. The primary barriers emerging from the study were a lack of funds, inconvenience caused to the family and distance from the hospital. Women, for instance, were reluctant to leave their household responsibilities and would instead “take some pills and continue with their work…” (Sinha, 2005).

Our study found no significant difference in the frequency with which scavengers versus non-scavengers seek health care when ill. However, this may be indicative of differences between groups about the concept of what it means to “be ill.” For example, Navsarjan staff has indicated that the term “ill” may be considered equivalent to missing work.

We also saw no overall significant difference in barriers to health care reported by the two groups. Although we determined no statistically significant differences, the data revealed two interesting patterns. The primary barriers to seeking health care reported by manual scavengers were “too expensive” (64.7%), “fear of discrimination” (11.8%), and “unable to take time away from work” (5.9%). In contrast, only 38.3% of non-scavengers reported that cost was a barrier to seeking health care. Moreover, no non-scavengers reported fear of discrimination as a reason for not seeking health care.

In line with the above findings, the majority of manual scavengers (76.5%) report traveling less than 1km to access health care, while only 45 percent of non-scavengers report traveling less than 1km. (This difference is marginally significant when equal variance is not assumed \( p=.046 \)). This result could be interpreted in two different ways; while it could indicate that scavengers tend to be closer to health care, alternatively it may indicate that scavengers do not perceive distant health centers as viable options, particularly when fear of discrimination is present.

We also examined how respondents paid for health care. While 41.7% of non-scavengers accessed government support for medical care, only 11.8% of scavengers reported receiving government aid for health care. This result could have various explanations; it could be indicative of a difference in the types of health care received, of discrimination against scavengers, or of less awareness by scavengers about available resources. We also found that not a single respondent reported utilizing health insurance to pay for health care received.

**Water Provision**

Water is the most important macronutrient and is critical for health and well-being. In Paliyad, manual scavengers travel greater distances to collect water and wait for longer periods of time at standposts than other Dalits in the community (Mann-Whitney U: 106, \( p<.001 \)). The water source for 47.1% of manual scavengers is a 30-minute or greater walk away from their homes. The majority of non-scavengers Dalits (73.3%) reported having only to travel for five minutes to collect water.

Distance to water collection points is relevant to health issues, economic productivity, and gender equality. Water scarcity is linked to several water-washed infections including amoebic dysentery, trachoma, and scabies (Esrey et al. 1985; Waterlines Technical Brief 52, 2004). Limited water supplies greatly increase the likelihood of death from diarrhea-related infections, particularly in young children (Waterlines Technical Brief 52, 2004; UNICEF/WHO 2004; WHO-UNICEF 2005; Asia Water Watch 2005). In Gujarat, amoebic dysentery is the eighth leading cause of death (Health & Family Welfare Department, 2002). Increased access to water reduces skin diseases as well as deaths from dehydration and diarrhea. Vulnerable populations such as children, the elderly and those infected with HIV, of which there appears to be a growing number in Gujarat have sensitive immune systems and require a sufficient amount of clean water for drinking and hygiene purposes in order
to minimize disease exposure. The 2002 United Nations Committee on Economic, Social and Cultural Rights’ General Comment No. 15 on the Right to Water suggests that indicators for monitoring water should address different components of adequate water including safety, acceptability and accessibility. Assuring the right to water for manual scavengers may be an area of advocacy appropriate for Navsarjan.

**Children’s Health**

In addition, shorter distances to water collection points are less burdensome to women and can provide more free time to pursue economically productive activities. The children of manual scavengers face unique health challenges. Interviews with Navsarjan staff members revealed that many parents bring female children to work with them. As the immune systems of children are not fully formed, these girls are at an elevated risk of morbidity and mortality from exposure to human and animal waste. In addition, children who are not brought to work may still be at risk as they may receive secondary exposures to disease from parents who practice poor hygiene behavior and unknowingly bring bacteria and viruses home with them from work. In our sample, we found that children accompany their parent to work in 23.5% of the scavenger households. However, problems stemming from data collection and entry of childhood mortality and anthropometric data (e.g. numerous missing values)

**Figure 5.7: Water provision in Paliyad**
make impossible to analyze the data accurately and leads us to surmise that the real occurrence of children accompanying parents is much higher than reported. This is clearly an area where future research would prove valuable.

6. Conclusion

Manual scavenger demographics, socio-economic status and health conditions point to the need for improved sanitation, confirm the negative impacts of manual scavenging on health, and underscore the need for improved access to water in Paliyad. Alternative sanitation technologies have the potential to address all three of these issues. Any such technology would need to eliminate the need to handle unsafe human waste, use minimal water, and ideally have a positive financial impact for those who maintain the facilities. Ecological sanitation, or Ecosan, has the potential to meet all these conditions. Part III of this report is dedicated to exploring Ecosan’s potential to make a lasting change in a community like Paliyad.
PART III: THE PROSPECTS OF ECOLOGICAL SANITATION

7. Ecosan as a Step Toward Safer Sanitation Practices

This section explores ecological sanitation (Ecosan) as a solution to address the unsafe practices of manual scavenging. The concept of Ecosan is described and compared with other sanitation options. More details on Ecosan design follow in Section 8.

7.1 Ecosan

Ecological sanitation, or Ecosan, refers to a variety of technologies that recover and recycle human waste. In Ecosan systems, excreta is collected and processed so that it does not pollute water systems, is safe for human handling, and can be utilized in ways that take advantage of its nutrient properties (Esrey, 1998; Esrey, 2001; GTZ, 2003). Three primary methods of ecological sanitation are 1) urine separation, where feces and urine are collected separately and the feces is processed through dehydration; 2) composting, where excrement is made safe through mimicking soil conditions in a collection chamber over many years, and 3) biogas production, where excrement is digested in a chamber that harvests methane and produces an agriculturally valuable sludge byproduct.

Ecosan eliminates much of the health risk associated with handling human waste and preserves the dignity of those that maintain these toilets. By processing the human excrement on-site, the fecal material becomes safe for human handling. Additionally, the byproduct that is removed from the Ecosan toilet is technically no longer human waste, but an agriculturally valuable resource—a much more respectable product for harvesting. It looks and smells very different from the raw waste. Thus Ecosan addresses manual scavenging primarily by making its byproducts safe for handling and creating a more dignified product to collect. As an added benefit, the material is agriculturally valuable and mitigates environmental damages from nutrient pollution and public health risks from open wastewater drainage.

Figure 7.1: The closed loop of ecological sanitation (adapted from Esrey, 2004)

1. Human feces: collected, dehydrated and used as organic fertilizer
2. Fertilizer absorbed into soil / agricultural use
3. Plants consumed by animals and humans, cycle repeats

04. The documentary Lesser Humans (directed by Stalin K.) gives graphic insight into these work conditions.
7.2 Critique of Conventional Sanitation Options

The majority of Gujarat is water scarce, receiving nearly all of its rainfall during the 3-month monsoonal period. Promoting water-based sanitation systems not only taxes the region’s limited water resources, but also exacerbates the problem of manual scavenging. Sewerage systems which pipe wastewater to centralized treatment facilities are often cleaned and serviced by manual scavengers, usually without access to appropriate tools and equipment. This job often requires diving (full submersion of the body) into sewer systems to unclog large pipes. This dangerous practice often results in death or serious injury, a calamity that scavengers can ill-afford due to their poverty. Flush toilets with septic systems are often serviced by manual scavengers who must clean out septic tanks without a mechanized pump or truck, necessitating getting into the septic system to remove the sludge. Furthermore, flush toilets in Gujarat often lack an adequate water supply, and therefore become clogged with feces that manual scavengers must clean. Ecosan offers an alternative that provides adequate sanitation especially in rural areas and addresses manual scavenging.

Although latrines other than water-sealed latrines are illegal under the 1993 law, in our view, this will not apply to Ecosan toilets. Under the purposive approach to statutory interpretation, the 1993 law’s purpose is to ban manual scavenging, and not to ban particular toilets. Indeed, under this interpretation, which seems consistent with its legislative history, a water-sealed latrine may well become illegal if it lacks any water and therefore leads to manual scavenging, as has been documented in this report in previous sections. Ecosan toilets do not require manual scavenging, but instead call for a compost management practice that bears no relationship to manual scavenging banned by the 1993 law.

8. Design Considerations

The Ecosan design considerations are explored in detail in this section including different design options, user considerations, spatial availability and constraints, and materials. The limitations of Ecosan and the applicability to Paliyad conclude this section.

8.1 Design Goals

To address the indignity and health risks of manual scavenging, and to reach large populations, Ecosan units should be designed with the following goals:

- Prevention of human contact with unsafe feces
- Minimal required maintenance, including infrequent removal of waste product
- Low cost
- Ease of use for all intended users (considering males, females, elderly, and children when appropriate)
- Comfort of use (no odors, no insects, etc.)
- Simple design for ease of replication
- Longevity of structure (design for a 10-year minimum lifetime)
- Proximity to vegetation/farmland for end-product reuse
8.2 Ecosan Design Concept Options: Urine-separation, Composting, and Biogas

There are three different underlying concepts for designing Ecosan units: desiccation, composting, and biogas. Each of these concepts uses a different method to destroy the harmful pathogens in human waste, and all concepts produce beneficial end products that can be used as agricultural soil conditioners or fertilizer. Of the three types of Ecosan designed above, urine-separation is most appropriate given Gujarat’s hot and dry climate, its low cost, low maintenance, and its relative ease of replication.

Figure 8.2: Urine-diverting squat pan design

8.3 Design Users: Public vs. Communal vs. Private

For community implementation, sanitation facilities can be public (openly available to the entire community), communal (shared between a few households), or private (used by a single household). Compared to communal or private toilets, management and maintenance of public toilets becomes more complex, involving outside institutions instead of the users of the facilities. Because Ecosan requires proper usage and maintenance to function effectively, communal or private toilets are recommended for initial adoption in Paliyad. Public facilities could be considered by a community or an institution that has past experience with Ecosan systems. Cost is another consideration when choosing public, communal, or private units since private facilities may be more expensive on a per-unit basis. Additionally, separate units for males and females may be necessary, particularly for female privacy and safety, and this should be discussed with the potential users during the design process.

8.4 Spatial Considerations

The location of the Ecosan unit within a community is essential for proper functionality. The facility should be in the proximity of the user household(s). The location should maximize ability of the community to the use of the beneficial end-products, with access to farmlands for easy application of agricultural soil conditioner or fertilizer. At the unit, there should be an area for washwater drainage or application. Additionally, the overall
drainage network of the community should be considered, and the unit should be situated to avoid water intrusion into the sanitation facility. A water source should be accessible to allow users to obtain water for sanitary washing and hand washing.

8.5 Materials

The construction materials of the Ecosan structure should be chosen based on the user’s budget and aesthetic preferences, considering material cost, local availability, and durability. Some potential materials for the superstructure include cement concrete, stone, brick, plywood, and plastic (such as PVC). Materials also need to be determined for the piping and containment of liquids, doors of the unit, ventilation pipe, fly screen, and other details of the design (see Appendix C). For urine separation systems, a special squat plate is required, which can be purchased from ARIES (Bhopal) or, if the design parameters are known, cast-molded with concrete. For urine separation and composting systems, a dry organic material (such as ash, sawdust, or lime) needs to be available for addition to the feces after each use. Furthermore, the contact of urine with concrete should be avoided since urine degrades concrete and its odor can be absorbed in concrete.

Three sets of materials options are included below (see Appendix D for more detail):

<table>
<thead>
<tr>
<th>Description</th>
<th>Superstructure Materials</th>
<th>Cost of materials (INR)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower cost, less durable</td>
<td>Woven reed matting</td>
<td>2,700</td>
</tr>
<tr>
<td>Mid-cost</td>
<td>Corrugated cement sheets</td>
<td>3,700</td>
</tr>
<tr>
<td>High cost, very durable</td>
<td>Masonry</td>
<td>6,400</td>
</tr>
</tbody>
</table>

* The cost of labor may vary depending on masonry, other materials, and labor contributed by the toilet owner, but should total about INR 3,000 ($65.30 US).

8.6 Limitations of Ecosan

When compared to other technologies, such as the flush latrine, the main limitations of the Ecosan toilet model are its operation and maintenance requirements. To work effectively, the Ecosan model demands more of its users than to simply “flush and forget”. Urine, if not drained off, must be collected regularly in buckets, while the feces and compost must be raked and removed, generally on a bi-annual basis. Furthermore, the system must be used properly, or the outputs may be contaminated. Proper use of the three-hole system (for urine, feces, and wash-water) is vital and requires user education and training, particularly in communal arrangements. Regular addition of ash, lime, or other absorbent materials to the compost pit is integral to preventing smells and flies.

8.7 Paliyad Intervention to Date

Another potential drawback to the Ecosan model is that certain segments of the user population may find it difficult to use. For example, in some Ecosan models, the feces hole is somewhat large and children may be unable to squat over it. Some elderly may also find it hard to shift positions for urination, defecation, and washing. While the literature provides little data on whether these difficulties are common, the concerns merit further
examination. Fortunately, slight design changes, such as adding grip bars on the walls, are likely to remedy such problems when they arise.

The MIT team has performed a survey and options assessment in the community of Paliyad in order to evaluate manual scavenging practices and the potential for Ecosan implementation. Of the three methods of Ecosan, the urine separation system was determined to be most appropriate for this community based on the simplicity of the concept, straightforward design, and potential for scalability. Because of the management concerns for public facilities, the Ecosan units for Paliyad should initially be private or communal. During a Panchayat meeting in Paliyad on June 16, 2006, the MIT team presented an Ecosan model constructed of plexi-glass to introduce Ecosan to a small group of community members, and then on June 21 in a larger community-wide meeting (Gram Sabha).

The community easily understood the concept of an Ecosan system, and community leaders publicly pledged support for the system. Flyers (see Appendix F) that explained the Ecosan concept and benefits, designed by the MIT team in English and Gujarati, were passed out at the meeting. Units were made in the weeks following the meeting to the Panchayat head. Ecosan implementation has the potential to improve sanitation conditions and address manual scavenging in the community of Paliyad; however, the management structure of a large-scale system must be well designed for this project to succeed.

Fig. 8.7: Paliyad community members discuss the mechanics of an Ecosan toilet
9.0 Business Model and Scalability

This section will first summarize the results of the social cost-benefit analysis. It will then explore some dimensions of structuring a sanitation intervention as a business or NGO. While these two areas overlap—indeed many of the results of the first section will depend on choices discussed in the second—for simplicity, they are here treated separately.

9.1 Social Cost-Benefit Analysis

A social cost-benefit analysis (SCBA) attempts to quantify the costs and benefits accruing to society as a result of a large-scale intervention, typically by government. The SCBA is premised on the idea that, particularly in the developing world, 1) markets do not always accurately reflect social values, and 2) the distribution of economic gains matters. As such, financial and even economic analysis falls short.

This report starts with the assumption that an intervention in the sanitation sector is desirable, and seeks only to assess the differential costs and benefits between traditional pour-flush toilets and the Ecosan model designed by MIT. The reasons for this are two-fold: first, this study considers how best to eliminate manual scavenging, a practice that the status quo (i.e., dry latrines and open defecation) perpetuates. We believe there is inherent moral value in the eradication of manual scavenging from a human rights perspective and that this may be overlooked with traditional economic analyses. Second, the health benefits in the form of fewer sick days and out-of-pocket medical expenses are difficult to predict without more in-depth epidemiological research (see Section 5). While we may have a baseline for morbidity rates in Paliyad, we do not know the extent to which sick days due to diarrheal disease will be reduced by a given sanitation intervention (in the absence, e.g., of a concomitant drinking water intervention). However, given a similar deployment of pour-flush versus Ecosan latrines, we expect similar health benefits, as both, if properly used, eliminate contact with pathogen-rich excreta. Thus the health benefits, while critical for comparisons against the status quo, are not so critical for comparisons between sanitation interventions.

There are three major components to a social cost-benefit analysis that are added together to form the net result (see Figure 9.1). The first of these is the net change in efficiency as a result of the intervention. This represents not only the benefits and costs of the project from a financial or business point of view, but also those effects external to the bottom line as well as health benefits associated with any expected reduction in morbidity rates. The latter might include lower yearly out-of-pocket expenses and increased productivity stemming from fewer sick days in the work force.

The second and third components are both based on a measure of the level of consumption as a result of the project. This number will account for any changes in wage that result from the introduction of a new technology, as well as the projected numbers of jobs gained or lost. The second component of the social cost-benefit analysis is the private consumption induced, expressed as a negative number. The negativity of the number reflects the fact that any consumption induced will translate into a reduction in the total savings of the population. Presumably, savings is a boon for any population, both for use as collateral on credit and as a buffer against shocks.

The third component is the consumption multiplied by a coefficient representing both inter-generational and intra-generational investment considerations. In other words, the term as a whole recognizes that consumption also brings benefits in the form of goods or services. The term’s coefficient attempts to account for the balancing acts implicit in consumption. The first balance to strike is that between consumption among the rich versus among the poor. Heightened consumption among the poor is considered more socially beneficial than that among the rich. The second balance to strike is that between consumption today versus consumption in the
future. This can be analogized to an interest rate, and is called the social discount rate.

Figure 9.1: Socioeconomic value of sanitation projects

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs (-)</td>
<td>Savings Loss (-)</td>
</tr>
<tr>
<td>Fertilizer (+)</td>
<td>Consumption (-) * Real Price Coefficient</td>
</tr>
<tr>
<td>Water Needs (-)</td>
<td>Economic Output (+)</td>
</tr>
<tr>
<td>Health Benefits (+)</td>
<td>Consumption (-) * Distributive Effect / Investment Effect</td>
</tr>
</tbody>
</table>

9.2 Efficiency

The quantifiable benefits of Ecosan deployment over pour-flush unit installation have been discounted over a presumed 10-year lifespan. They will include reduced initial capital outlays, sale of compost as fertilizer, savings in water requirements in an arid region, and, importantly, reduced health costs associated with sick days and out-of-pocket expenses (though the latter are not accounted for here). The extent of these benefits will depend on a number of factors, the most crucial of which will be the size and nature of the institutional mechanism implementing this intervention, if any. This is because of many factors: a large-scale operation will benefit from economies of scale; an umbrella institution could obtain much better interest rates for its clients than individuals could on their own; and some benefits (especially those in the public health domain) will be maximized on a per capita basis only when large-scale adoption occurs. Accordingly, all net present value estimates herein are given a range based on the level of institutional support, from none to total.

Cost

The first major advantage of an adapted Ecosan unit from a financial point of view is its construction price. The MIT-estimated price of construction materials ranges from about INR 3,000 to 10,000, with a low-end estimate for labor being around INR 1,500. This analysis uses only the low-end figure, as it represents a functional equivalent to the high-end. In reality, however, diversification in offered models may boost economic performance by cutting down on deadweight costs (i.e., consumer surplus). Duncan Mara’s (2005) estimate of INR 4,200 for total Ecosan construction in the Indian context is almost exactly in step with the low-end number when inflation is taken into account.\(^5\) Unlike Mara, though, this study does not compare costs between Ecosan and VIP latrines, but rather between Ecosan and pour-flush latrines.

It should be noted that, while this study examines a macro-level investment in the sanitation sector, and therefore includes the upfront costs of building the toilet itself, a business or managing NGO would not likely incur the construction costs, but rather they would facilitate clients’ self-financing.

Fertilizer

The second advantage of the Ecosan option is that the separation of liquid and solid waste enables the sale of - or replacement of currently used commercial - compost and, more valuable, urine as fertilizer. Using regionally diet-

---

\(^5\) Mara’s article was published in April of 2005. This study was written in July 2006, 15 months later. Using an inflation rate of 5%: INR 4200 x (1.05^((15/12))) = INR 4,464
appropriate estimates for expected annual nutrient loads in feces and urine, as well as local market prices for government-subsidized fertilizer (around INR 250 for 50 Kg of Urea (local fertilizer), depending on nutrient content) the MIT team conservatively values the annual fertilizer production of a single family’s Ecosan unit at around INR 150. Duncan Mara’s India-specific example postulates a per capita fertilizer value generation at INR 300 per year. At the high-end, Jonsson et al. (2005) foresee a possible per capita generation valued at INR 750 yearly.

Figure 9.2: Interior of a “pour-flush” latrine in Kadi
Water

Pour-flush toilets in Gujarat often transmute effectively into dry latrines (see Figure 9.2), as water scarcity in the region does not permit sufficient quantities for flushing. The question of whether there is enough water for all to flush is a critical one. Certainly, were a large-scale pour-flush campaign to take place in the sanitation sector, one could at least expect demand for water to rise sharply, bringing the price with it due to its scarcity.

Leaving this question aside and using current prices for water, Ecosan can be said to save a significant amount of flushing water over pour-flush toilets. Both toilets will entail wash-water being used—probably anywhere from zero to INR 52 to INR 104 per capita per year, depending on whether the family fetches or buys the water, and how much wash-water is used. This report has chosen to omit wash-water (but not flushing water) from its calculations, as even the existing widespread practice of open defecation entails the use of wash-water. Assuming that a toilet takes at least 5 liters to flush and that a person flushes once per day, a family of 5 will use over 9,000 liters per year to flush a pour-flush toilet. Even if half of this water is recycled from dishwashing, laundering, etc., - which is unknown in the area - at the rate paid for tanker water in Paliyad (INR 40 per 700 liters), a family will spend INR 260/year.

Valuation

Discounting all benefits and costs over a ten-year period, Ecosan toilets cover a wide range of net present values (NPVs), depending on assumed parameters. The parameters include sale price of fertilizer generated, the construction cost itself, the cost of water used for washing and flushing, and the collection costs of the urine and feces. Low-, mid-, and high-range assumptions are described in Table 9.1. Many of these parameters shift according to the level of institutional support received via a business, NGO, or governmental body. Low institutional support will typically raise transaction costs for individuals attempting to install Ecosan units in a decentralized and uncoordinated fashion. All Ecosan NPVs exceed those of pour-flush units when taking into account the value of water consumed (see Figure 9.2). While many health benefits from Ecosan are theoretically quantifiable, such as reduction of sick days (multiplied by daily wage) and fewer out-of-pocket medical

Table 9.2.1: Ecosan toilet / assumptions for 10-year NPV options calculations

<table>
<thead>
<tr>
<th>Level of Support (Interest Rate)</th>
<th>Fertilizer</th>
<th>Construction</th>
<th>Water Savings</th>
<th>Collection Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No institutional support (100%)</td>
<td>Uses MIT-generated conservative estimate of INR 150.</td>
<td>Assumes average per unit construction cost of INR 3,000</td>
<td>Assumes 1 liter per person per day for wash water, tanker-supplied at INR 40/700 liter.</td>
<td>Assumes inflation-adjusted 1997 minimum wage for collector spending 8 hours per month.</td>
</tr>
<tr>
<td>Some institutional support (20%)</td>
<td>Uses Duncan Mara’s (2005) number of yearly production at INR 300.</td>
<td>Assumes average per unit construction cost of INR 1,500</td>
<td>Assumes 0.5 liter per person per day for wash water, tanker-supplied at INR 40/700 liters.</td>
<td>Assumes inflation-adjusted 1997 minimum wage for collector spending 2 hours per month.</td>
</tr>
<tr>
<td>Total institutional support (8%)</td>
<td>Uses Jonsson et al’s (2005) number of yearly production at INR 750.</td>
<td>Assumes labor costs are nullified using volunteer labor.</td>
<td>Assumes no cost (i.e., standpost-supplied).</td>
<td>Assumes inflation-adjusted 1997 minimum wage for collector spending 1 hour per month.</td>
</tr>
</tbody>
</table>
expenses, difficulties in predicting such benefits preclude a reliable accounting. Ironically, the most vulnerable sub-populations in Paliyad tend to take the fewest sick days off from work and visit the doctor less frequently as discussed in the previous section on health, so that an effective sanitation intervention may potentially constitute an unprogressive shift in current income generation. Even so, as long as no one is negatively impacted, the intervention can be deemed Pareto efficient. Furthermore, lower castes tend to pay for their doctor visits out of

Figure 9.2. Comparison of Ecosan vs. pour-flush toilets

<table>
<thead>
<tr>
<th>Level of Support</th>
<th>Fertilizer</th>
<th>Construction</th>
<th>Water Savings</th>
<th>Collection Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No institutional support (Interest Rate: 100%)</td>
<td>N/A</td>
<td>Includes toilet, housing, septic tank, and grid connection.</td>
<td>Assumes that each use requires 5 liters to flush, tanker-supplied at INR 40 per 700 liters, and that each person in a family of 5 flushes once per day.</td>
<td>Assumes pro rata inflation-adjusted 1997 minimum wage for a manual scavenger servicing 50 toilets.</td>
</tr>
<tr>
<td>Some Institutional Support (Interest Rate: 20%)</td>
<td>N/A</td>
<td>Assumes an average of the high and low estimates.</td>
<td>Assumes the above, but that half of the water is recaptured from prior uses.</td>
<td>Assumes pro rata inflation-adjusted 1997 minimum wage for a manual scavenger servicing 50 toilets.</td>
</tr>
<tr>
<td>Total Institutional Support (Interest Rate: 8%)</td>
<td>N/A</td>
<td>Only includes the toilet and housing, but no septic tank or grid hook-up.</td>
<td>Assumes all water used for washing and flushing is recaptured or otherwise free.</td>
<td>Assumes pro rata inflation-adjusted 1997 minimum wage for a manual scavenger servicing 50 toilets.</td>
</tr>
</tbody>
</table>
pocket more frequently than higher castes (see Section 5).

9.3 Consumption

Increased consumption is defined as the range of estimated collection and maintenance costs. This analysis assumes that organized collection can boost efficiency of collection by five times over an individual farmer (the mid-range Ecosan option presented in Appendix E), and that overhead costs will consume 15% of the compost fertilizer’s generated profits (see Table 9.3). This produces a total change in output of the economy over the project’s 10-year life of INR 1,385,000. This number is derived from Table 9.2 as the 10-year total difference in output between the Ecosan and pour-flush scenarios, discounted at a rate of 20%. The average annual income for post-Ecosan intervention sanitation workers (who would the scavengers from pre-project phase) is derived from inflation-adjusted minimum wage figures contemplated by a 2000 state legislation (as reported by Navsarijan, 2000). All estimates below would increase dramatically, though, if the implementing organization were also to provide financing or construction design services, as well.

Increased consumption is predicted by the number of jobs gained and the level of the wages. This in turn is dictated by the efficiency of compost collection and, consequently, the type and organization of the implementing institution. Consumption would also include the total amount spent on the toilets by purchasers, though for the purposes of the analysis, we treat this as a development project, i.e., funded by an external entity or the government. Although this might be unrealistic depending on the scale of the initial implementation phase, we leave out this variable for the more long-term analysis here.

Table 9.3: Income by sanitation profession before and after the sanitation intervention

<table>
<thead>
<tr>
<th>Profession</th>
<th>Before</th>
<th>After (Ecosan)</th>
<th>After (Pour-Flush)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (INR)</td>
<td>Number (INR)</td>
<td>Number (INR)</td>
</tr>
<tr>
<td>Scavengers</td>
<td>16 19,200</td>
<td>16 19,200</td>
<td>0 0</td>
</tr>
<tr>
<td>Sanitation Workers</td>
<td>0 0</td>
<td>17 35,000</td>
<td>0 0</td>
</tr>
</tbody>
</table>

9.4 Valuation

The Ecosan option clearly demonstrates a much higher socioeconomic value than the pour-flush (see Table 9.4). As noted already, the two greatest benefits of Ecosan are not even included here, namely the abolishment of the practice of manual scavenging and the health benefits associated with it. Even so, the range of Ecosan value from the social perspective straddles the break-even point, heading into positive territory as greater institutional support is presumed. The addition of the discounted health benefits over the study’s 10-year period to the SCBA range would make the numbers absolute and allow them to stand on their own against the status quo.
Table 9.4: Ranges for socio-economic values of sanitation intervention (INR)

<table>
<thead>
<tr>
<th></th>
<th>Ecosan (assumes 2500 toilets)</th>
<th>Pour-flush (assumes 2168 toilets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-range</td>
<td>-12,000,000</td>
<td>-30,352,000</td>
</tr>
<tr>
<td>Mid-range</td>
<td>-9,500,000</td>
<td>-29,918,400</td>
</tr>
<tr>
<td>High-range</td>
<td>6,250,000</td>
<td>-21,246,400</td>
</tr>
</tbody>
</table>

For a sense of the possible health benefits, we may calculate a benefit ceiling for the potential benefits of reduced sick days (acknowledging that the likely outcome would probably fall well below the ceiling). Since 38% of Paliyad residents have a reported occupation, our best estimate of the number of working people in Paliyad is:

Total Population * 0.38 = 14,000 * 0.38 = 5,320

The average number of days missed per year due to illness or injury is 5.7, and the average income among wage-earners is INR 1,940 per month, or INR 65 per day. Therefore, the total wages lost per year can be expressed:

5,320 people * (5.7 days/year) * (INR 65)/person -day = INR 1,971,060

10. Recommendations for Organizational and Institutional Partnerships

10.1 Phased Approach for Implementation

First and foremost, an institution needs to be identified or created to take ownership over the management of building the Ecosan units and setting maintenance structures in place. As is clear from the foregoing SCBA, the keys to profitability for any such endeavor would lie in efficiency of service delivery, sale-ability, and cost of fertilizer. The mid-range estimates for financial feasibility are promising, but are optimistic by the MIT team’s more conservative estimates. For this reason, we think that an NGO model is more realistic as the lead implementation mechanism at first, but a business model with strong external support may also work.

There are a few existing organizations that have the capacity and institutional knowledge to undertake such a task. We leave the assignment of this entity to Navsarjan. However, major features of a phased approach for implementing a large-scale Ecosan program can be laid out irrespective of the managing entity.

Phase I: Pilot Demonstration

This phase consists of carrying out the construction of Ecosan units in Paliyad including the initial orders for the 75-80 Ecosan toilets already requested by the villagers, and honing the organizing institutional set-up and management of the facilities. The sanitation coverage offered during this phase should approach 100% and the elimination of manual scavenging should be 100%. The technology would also need to be evaluated during this phase of the program adjustment and should be implemented iteratively depending on user feedback. The time frame for Phase I should be on the order of 2-3 years.
Phase II: Scale Up
Scale-up should move the program from the village-level in Paliyad to the multi-village-level and introduce a target coverage level or target areas where manual scavenging is practiced. The target coverage and a scale-up/growth strategy should be planned during Phase I. Financial means for scale-up towards a state-wide elimination of manual scavenging in Phase III should be planned during phase II.

Phase III: State-Wide Elimination of Manual Scavenging
State-wide elimination of manual scavenging should be achieved as the goal when planning Phase II, and should directly follow from its success. This may require other sanitation technology intervention beyond Ecosan – such as the full professionalization and modernization of large-scale waste handling in cities with corresponding changes in the wages, benefits and alternative career opportunities for manual scavengers. This latter set of activities should be planned with lead government agencies at the local and state levels. Inspired by a potential ‘Gujarat success story’, national elimination of manual scavenging should be the ultimate goal. However, an organization started in Gujarat would most likely be better at dealing with local conditions. The implementing organization could act as a facilitator for a network of organizations with similar goals, or give provide consultation services to other states who also wish to eradicate the practice of manual scavenging through a change in sanitation technology.

Organizational Role
Initial leadership in an implementing organization could come from established local NGOs with a focus on sanitation and a demonstrated commitment to human rights, fair labor practices and economic justice. Interested local manual scavengers should participate in the creation of the formal management structure, but a membership-based organization might provide the greatest option for target community ownership. The level of partnership with local government might depend on current political conditions, but greater cooperation would more likely result in a conducive work environment.

This raises another issue of whether the considered organization should be involved in other aspects of the sanitation sector, namely design and construction, and financing of the Ecosan units. More research is required to assess the viability of these other potential roles. Some considerations needing further attention include:

(i) **Alternative materials.** Researching alternative materials and technologies to further reduce the price and increase accessibility.

(ii) **Bundling costs.** The extent to which an organization could bundle construction loans and obtain lower interest rates for clients who wish to borrow.

(iii) **Cross-subsidization to boost affordability for the lowest castes.** This might also be done under the guise of product differentiation, also reducing consumer surplus at the upper ends of the income scale. After Gujarat’s Total Sanitation Initiative (a Government program funded by the Department of Health) sanitation subsidy of INR 1,200 per unit, the derived demand curve predicts 410 toilets desired (based on families of five members each). As mentioned in Section 4, the demand curve may shift up with the introduction of Ecosan technology, which this model does not account for. Additionally, a cross-subsidy could be employed to direct the toilets toward specific subsections of the population (e.g., the 250 Dalit households in Paliyad). This could be accomplished by modeling a few different Ecosan models at varying prices (see Appendix G: The Demand Curve), perhaps with caste-based quotas attached, which are legal in India. Profits from the more expensive might then subsidize the less expensive. Using the derived
demand curve for sanitation, it is possible to create a conservative estimated range of private consumption. These depend on how many models are marketed. The consumption potential for 1-, 2-, and 3-price scenarios are presented in Appendix G, Table G.2.

(iv) **Minimization of collection costs.** The cost associated with collection may vary widely depending on the collection body and the volume of waste. A conservative MIT estimate is that 1,500 units will be required to make collection financially viable, though this figure assumes few economies of scale associated with collection time per unit.

(v) **Training costs for managers and other employees.** To undertake the complex tasks of sales, construction, maintenance, transportation and packaging of toilets and fertilizer various skills and competencies within the NGO or business entity would be required, some of which are not yet available among the scavenger community in the village. The NGO should hire experienced community organizers with local relationships, as well as professional staff and consult with business experts and engineers to ensure efficient processes.

(vi) **The shift of the demand curve—and the potential broadening of the market—with the introduction of a new product.** The demand curve modeled for this study does not reflect economic demand for Ecosan, but rather for currently available toilets. Ecosan units do not entail the same operations and maintenance arrangements that have evolved around dry and pour-flush latrines, and may thus be more attractive to lower castes. By enlarging the client market, more toilets can be built and more employees hired to service them.

As one of the most experienced organizations with a commitment to manual scavenging, we recommend Navsarjan play a major role as an advisor to a managing entity, with the primary role as ensuring that the new organization makes choices that improve the economic and social well-being for manual scavengers. This role could be exercised through deployment of staff or a seat on the board of said organization.

### 10.2 Impact on Manual Scavengers

As discussed earlier in Section II of this report, the practice of manual scavenging persists despite clear anti-scavenging legislation and multiple government schemes aimed to eliminate the practice and rehabilitate the workers. The traditional human rights advocacy intervention that aims to protect rights through judiciary and legislative channels alone has failed thus far. To address the practice as it exists on the ground, and bypass the gaps in enforcement and political will, a local, structured human rights intervention that changes these conditions and replaces a degrading practice with a progressive and environmentally sound one is recommended. Deploying Ecosan units throughout a community is likely to reduce and eventually eliminate manual scavenging. This type of intervention, in addition to continued advocacy at the state and national levels, has several advantages.

**Provide Scavengers with Fruits of Improved Technology**

The change in technology alone could have two undesirable effects, one would be to change the tasks and tools but not the nature of the work and keep scavengers making meager wages and doing dangerous work (as occurred with the move to a water-based sewerage systems), while another would be to eliminate the jobs
altogether and bring in new workers to take on the more financially lucrative and safer replacement jobs. Using an NGO or business entity led by the former manual scavenger community would ensure that these workers benefit from the economic and health benefits of the changed industry.

**Address the Problem Locally**
The legal mandates and government schemes to end the practice have come from the central government and been scuttled by political apathy before reaching local sanitation offices in India’s villages. This intervention begins where the problem exists and does not require transmission between multiple layers of government.

**Scavenger’s Economic Considerations**
Since this study does not entertain the possibility of paying employees below the inflation-adjusted minimum wage, it is important that near-total coverage of the village (around 95%) would be necessary to employ all present manual scavengers as Eco-sanitation workers (see Table 9.3 above). If this coverage target is not met, 1) not all manual scavengers can be offered jobs, and 2) there will still exist some degree of economic demand for manual scavenging in the village. We suggest commencing in a single village with toilets for private households and groups of households to ensure proper product adoption and maintenance and aim for comprehensive coverage. In addition, a systematic and well-thought out scheme for rehabilitation training should be considered. It should not be taken for granted that every one of the 16 full-time manual scavengers would, given the choice, opt to remain in the sanitation sector.

It should be noted that this study considers whether fertilizer sales can offset collection and maintenance costs, not construction costs for the units themselves (as Mara and Jönsson et al. discuss). It is presumed that construction cost would be covered by a combination of government funds and subsidies, development grants and consumer capital.

**10.3 Other Local Actors/Partners**
The deployment of Eco-San toilets in Paliyad should be a multi-stakeholder process with the NGO/Business as the lead agency, set up with the advise of Navsarjan. Other Paliyad and Gujarat-based institutions, including government agencies, can provide legitimacy, financial resources, land, and technical assistance to the effort. In addition, Dalit Shakti Kendra, Navsarjan’s partner organization as well as others may be able to assist with the training or rehabilitation of former scavengers to new jobs. The following non-governmental actors could help start the NGO and provide continued expertise and guidance to its members.

*The Environmental Sanitation Institute in Ahmedabad* is a research and educational organization that investigates topics related to water resource management, sanitation, and public health. They have a renowned expertise in low-cost sanitary technology and have constructed a new training and education center for sanitation. The site will be used not only for current training and capacity building programs, but will also expand to providing training, workshops, and research opportunities for professionals, NGO representatives, university and post-graduate level students.

*Indian Institute of Management-Ahmedabad* is the premier educational institution for management in the country. In addition to producing leader-managers for the Indian and global private sectors, one of IIMAs missions is to improve the management of strategic priority sectors for India’s development including public services. Their National Innovation Foundation is committed to supporting and incubating new ideas and
technologies for the common good.

Centre for Environmental Planning and Technology (CEPT) is a leading Gujarat State University offering undergraduate and postgraduate degrees in the areas of the Natural and Built Environment including Infrastructure, Urban Planning and Construction Technology. CEPT aspires not only to train competent technocrats but also to increase student’s awareness of the social, emotional and cultural impacts of their profession.

Saath, meaning “together” in Gujarati, was founded in 1989 with a mission to make human settlements equitable living environments where all residents and vulnerable people have access to health, education, essential infrastructure services and livelihood options, irrespective of their economic and social status. The NGO undertakes community organization and mobilization in the urban slum and village communities in which it works.

Janvikas is a twenty-year old Training and Development Support Organization that provides support and training to various individuals, voluntary organizations and public institutions in the development field in Gujarat and Maharashtra. Through their various initiatives, they seek to effect change against the unjust, exploitative and oppressive parts of society primarily through the law and judiciary, but also through other social channels.

PRAV AH is a network of organizations mobilizing action towards sustainable, access to safe and adequate water, sanitation and hygiene for all. As a coalition, it primarily provides infrastructure for networking, capacity building, advocacy and documentation and research to member organizations across Gujarat.

Government institutions can provide support by granting land, providing subsidies to households or the NGO for toilet distribution, training and loans for former scavengers for rehabilitation. The Government can also take over the expansion of the Paliyad model to other villages, as described in Phases II and III, with the assistance of Navsarjan. Specifically, the village Panchayat has authority over local governance including sanitation and ownership of public land. The Gujarat Safai Kamdar Vikas Nigam (GSKVN) is the implementing agency for Central and State Government safai kamdars' schemes. Its three objectives are: 1) Rehabilitation of safai kamdars and their dependents from the occupation of manual scavenging through provision of loans, 2) Promotion of self-employment and other economic activities for safai kamdars, and 3) Examination of problems of safai kamdars and solution generation. They administer five schemes which could be taken advantage of. The Departments of Health, Social Justice and Education could play a vital role in this project as well, through the subsidy for sanitation described earlier in this report (Total Sanitation Initiative), health education campaigns, primary and secondary school level training in caste discrimination and its ill-effects and illegality, as well as the basics of hygiene and sanitation options.

10.4 Further Institutional Recommendations

Navsarjan can advocate vigorously for the promotion and adoption of Eco-San at various levels of government as a component of ongoing anti-manual scavenging advocacy.

- Local: Promote its use in Paliyad Panchayat and other Panchayats across Gujarat.
- State: Inform officials at the Department of Health and Family Welfare, Department of Health, Department of Social Justice and Empowerment, Gujarat Safai Kamdar Vikas Nigam (GSKVN) about the innovation and how they can support its deployment with subsidies and training of former scavengers.
- Central: Present Eco-sanitation technology to the Planning Commission and Jawaharlal Nehru National
Urban Renewal Mission to encourage them to promote its use in future sanitation spending.

- Promote plan among civil society organizations.
- Engage in a state-wide media campaign in Gujarati and English.
- Encourage them to manage Eco-San for-profit or non-profit business enterprise.
- Raise awareness among international development and donor community active in Gujarat including Oxfam, CARE and ActionAid.
- Follow-up on commitments by water and sanitation NGOs, especially PRAVAAH, to hire two people each from scavenger community per year.
- Help in establishing the link between sanitation as a human right and the human rights of manual scavengers.

10.5 Long-term Goals

The long-term goals of developing a local NGO or business to deploy and sell Eco-San toilets and the compost project are two-fold. The first and most direct goal is for the current manual scavengers of Paliyad to stop the practice of manual scavenging and enjoy a healthier occupation and secure, higher wages. The second goal is to have broader impact on sanitation and manual scavenging across Gujarat and India by providing a viable alternative to dry latrines (and pour-flush toilets in many areas) and a better and safe livelihood for former scavengers through a supportive institution.

To reach the second goal, the technical (Ecosan) and institutional (NGO structure) must be replicable, scalable, sustainable and flexible to suit multiple local contexts. Conversely, the second goal might be reached by convincing various governments (through direct lobbying and/or citizen awareness campaigns) to adopt this technology widely. While this might have the effect of eliminating manual scavenging, the labor consequences could be unknown if the local government retains total control over the technology and sanitation maintenance. In addition, relying on the government to deliver this new technology may run into obstacles that are inherent to the political process including political party receptivity, bureaucratic support (or the lack of it), and the political economy of the scavenging community itself. Further, it may also raise serious issues of governance and transparency, if there is evidence of waste, incompetence or corruption. The MIT team visited communal bathrooms which had been constructed in the main Dalit area of Paliyad, by the former Sarpanch, and found the structure to be structurally deficient, and not in use. We were informed that there had been serious issues of corruption in its construction. If past is any prelude, leaving the enforcement of this project solely to the local government, may not yield the results that Navsarjan expects. It may also make the adoption of the Ecosan model and the new model of implementation outlined here very unpredictable in other states.

11. Potential Sources of Funding

Donors are important to the growth of the NGO or business because they provide the funds required for service delivery and program development. The project could plan to make a portion of the ongoing program and service delivery financially sustainable – e.g., through fees – which will partially cover the costs of service delivery. Any additional capital required for subsidies and development, however, needs to be sought from either existing government programs, such as the Total Sanitation Campaign, the 25% subsidy of the cost of construction that the current Sarpanch offered during the Gram Sabha meeting to individual households or other external grants from donors. It could seek external donors such as the following:
12. Further Recommendations

Other significant recommendations to further the eradication of manual scavenging come out of this research. These recommendations are directed toward the Government of India, NGOs, and research centers that have sanitation, human rights, public health, or equality on their agenda.

Verify and Refine Ecosan Technology for Scavenging
Ecosan as presented in this report is a proven technology. However, its advantages and disadvantages are context-dependent, like any technology. A large scale pilot project should be implemented in Paliyad in which Ecosan is promoted as the sanitation facility of choice. The design should be refined and best management practices for waste handling and maintenance should be documented.

Explore Organizational Issues Related to Operation and Maintenance of Ecosan Units
This report has identified that a key to implementing large scale Ecosan-style sanitation will be very dependant on the sustainability of an organization that can support the operations and maintenance of such a system.

Ensure that Manual Scavengers’ Conditions are Improving
Scavenger work conditions should be monitored before and after program implementation to better understand such a program’s effect on the population that is the focus of the initiative. Manual scavengers in the community should be involved in the program’s design and operational structure. Eradication of manual scavenging is the ultimate goal; any program should be designed so that steps are being taken toward that goal.
# Glossary of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayurvedic</td>
<td>Traditional medical practice in India that places equal emphasis on the body, mind and spirit, and it strives to restore the innate harmony of the individual. Diet and herbal remedies are used to prevent and cure diseases.</td>
</tr>
<tr>
<td>Andolan</td>
<td>Protest</td>
</tr>
<tr>
<td>CM</td>
<td>Chief Minister, the elected Head of Government of a state of India.</td>
</tr>
<tr>
<td>Crore</td>
<td>1 Crore equals 10 Million</td>
</tr>
<tr>
<td>Gram Sabha</td>
<td>Village meeting headed by the members of the Panchayat.</td>
</tr>
<tr>
<td>INR</td>
<td>Indian Rupee</td>
</tr>
<tr>
<td>Lakh</td>
<td>1 Lakh equals 100,000</td>
</tr>
<tr>
<td>OBC</td>
<td>Other Backward Castes refers to a group of castes that are neither Scheduled Castes (aka Dalits), nor Forward Castes. This government classification is used for political and education reservations and is not uniform across India.</td>
</tr>
<tr>
<td>Octroi</td>
<td>Local tax collected on various articles brought into a district for consumption.</td>
</tr>
<tr>
<td>Panchayat</td>
<td>A council of elders representing a village or caste, consisting of five or more representative members. Traditionally the Panchayat served as a local court.</td>
</tr>
<tr>
<td>PM</td>
<td>Prime Minister of India</td>
</tr>
<tr>
<td>Safai Karamcharis</td>
<td>Sanitation workers, performing the task of manual scavenging in Gujarat.</td>
</tr>
<tr>
<td>Sarpanch</td>
<td>The leader of the Panchayat</td>
</tr>
<tr>
<td>Talati</td>
<td>Panchayat secretary</td>
</tr>
<tr>
<td>Taluka</td>
<td>A sub-district administrative classification. Gujarat has 25 districts and 225 Talukas.</td>
</tr>
<tr>
<td>TSI</td>
<td>Total Sanitation Initiative, a program run by the Government that provides subsidies for building toilets.</td>
</tr>
<tr>
<td>Vaada</td>
<td>A large walled in space for people to defecate on the ground, typically in rural settings. They are not legal sanitation systems and many have been demolished, though some remain.</td>
</tr>
<tr>
<td>Varna</td>
<td>The Hindu caste system in which the society is divided into four classes or castes.</td>
</tr>
</tbody>
</table>
REFERENCES


