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CASE STUDY

**A REVOLUTION IN LOW COST
SANITATION : SULABH INTERNATIONAL
NEW DELHI**

*This case study was undertaken in collaboration
with the UNDP/World Bank/Habitat
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SULABH SHAUCHALAYA
An Innovative Response to Urban Sanitation Needs

A Mega-Cities Case Study

National Institute of Urban Affairs
New Delhi, India
November, 1990

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PREFACE

CONTEXTUAL BACKGROUND ON DELHI

Of the three mega-cities in India, Delhi is undergoing the most rapid growth. In the decade between 1971 and 1981, the population of Delhi grew at an average annual rate of 4.5% and was subsequently assessed as the twenty-fourth largest city in the world during a 1984 United Nations study. According to current UN projections, Delhi's growing population will make it the eleventh largest city by the year 2000. Urban planners fear that the continued absorption of population growth will weaken the city's ability to maintain its image as the nation's capital.

The ancient walled city already faces massive traffic congestion, unhealthy environmental conditions, and seriously inadequate infrastructure. The area is plagued by a shortage of clean water, a failing sewer system and frequent power shortages. Delhi's planners forecast serious service failures unless a number of major infrastructure projects are completed according to schedule. They anticipate the need to triple or even quadruple the city's basic infrastructure by the year 2000 and to generate new jobs for approximately 3,000,000 persons. While housing is viewed as the sector with the most successful record, some 185,000 families were on waiting lists for public housing in 1985. Over 200,000 families were living in the city's 600 unauthorized colonies.

In response to these patterns, the 1962 Master Plan of Delhi was aimed at decentralizing urban spatial patterns. Specifically, the proposal sought to create a polycentric growth pattern through the dispersal of commercial and industrial zones, as well as accompanying residential areas. Along similar lines, plans were drafted to decentralize some of Delhi's employment opportunities to smaller cities in the National Capital Region. The past two decades, however, have clearly demonstrated that inward migration is a difficult tide to stem. Decentralization efforts have proceeded at a frustratingly slow pace, and employment has actually become more concentrated in the central city. Given the obvious and monumental challenges of the coming decades, planners have drafted a second major plan, one that accepts the fact that urban population growth and densification will continue well into the next century.

A. BRIEF DESCRIPTION OF THE INNOVATION

Sulabh Shauchalaya is a true success story in the field of low-cost sanitation, an idea for the provision of basic sanitation facilities to the urban poor which was conceived and widely implemented throughout India. In 1970, Dr. Bindeshwar Pathak, a sociology

graduate from Patna University, evolved a new, easily built latrine design and named it "Sulabh Shauchalaya," (The term translates literally as "easy access to sanitation.") In order to effectively disseminate the idea, Dr. Pathak created the organization "Sulabh Shauchalaya" in 1970, registered it with the government as an N.G.O., and declared its objective as the conversion of dry, household latrines into the hand flush waterseal latrines he had designed.

In the second phase, he promoted the idea of constructing "pay and use" public toilets based on the same technology, and subsequently received widespread recognition and support. Mr. A. Besa, Sanitary Engineer of the World Health Organization (WHO) certified that Sulabh Shauchalaya had truly made a significant achievement, and that there was ample scope for similar organizations to learn from the experience. "I am of the opinion that this type of method for the disposal of human excreta is quite helpful in bringing about desired sanitary conditions and should be encouraged elsewhere," Mr. Besa said.

The project soon drew the attention of the international media, including newspapers in the United States, and was followed by numerous requests from neighboring countries to take up similar construction works. The organization rechristened itself as "Sulabh International" following rapid expansion and demand for its technology both inside the country and abroad.

Sulabh International now has 68 complexes in operation in Delhi and another 61 in the final phases of construction. During its 20 year history, the "Sulabh" has built 660,000 private latrines and about 2,500 public latrine complexes in 584 towns in 18 states of India. In New Delhi, the 68 public complexes, which include bath cabins in addition to the toilets, presently cater to 290,000 men and women daily. When the 61 proposed complexes are built, the number of daily patrons will rise to 362,000.

B. PURPOSE/PROBLEM AREA ADDRESSED

As in other countries where mega-cities dominate population trends, higher job opportunities have driven rural Indians to urban centers at an alarming rate, and urban land has become scarce and costly. This one way migration and the resultant intensified land use has led to the high concentration of urban dwellers in "jhuggis," or slums, in 12 of India's metropolitan areas.

This is true, for example, in Delhi, where an estimated 40-45 per cent of the population currently lives in slums. Although conditions vary, most slums are characterized by scarcity, deprivation, and a total lack of basic, civic amenities. Among these missing services, the absence of

hygienic water supplies and sanitary latrines stand out as the most deadly combination, capable of causing fatal epidemics in the most crowded settlements.

Delhi has roughly 543 regularized colonies, 380 of which have access to piped water facilities. But only 135 of them have a sewerage system. Another 326 colonies are waiting in the hope that the government will provide drinking water per its commitment. Nearly one third of these colonies (106) are located in the eastern part of Delhi, where there are only sixteen colonies with potable water supplies. It was this area that became the centre of a disastrous cholera epidemic in 1988.

While conditions are severe in the regularized colonies, they are worse still in the squatter settlements, where there is almost a total absence of drainage. The government auditor reported that out of 251 of these settlements in East Delhi that were surveyed in December 1988, 250 had no drainage whatsoever. Of the 541 unauthorized and regularized shanties in the survey, 433 were without drainage.

These unsanitary conditions are continually worsening as urban migration accelerates. Newcomers arrive steadily from neighboring states and enter the informal sector for both housing and employment. They find homes on the pavement, in the marketplaces, and in slums and shanties. The original migrants are soon followed by family members, leading to the proliferation and expansion of slums. Devoid of any storm water drains or sewerage systems, the settlements grow filthy and unsanitary. Dirty water flows in and around the clusters of shacks, and people defecate in the streets and other open areas. In the absence of clean water supplies, residents dig hand pumps and drink contaminated water.

A 1980 article in the *Indian Express* elaborated on the health threats of indiscriminate defecation. Severe soil and water pollution are an immediate consequence, as are diarrheal diseases such as hook-worm, roundworm, and dysentery which kill close to 1.4 million children in India each year. Improperly designed and poorly maintained latrines become the breeding ground for flies and other disease-bearing insects. Ultimately, such conditions lead to cholera and gastro-enteritis, as well as long-term environmental degradation that affects the city at large. (*Indian Express*, September 24, 1980, p. 50)

Moreover, the few dry latrines that do exist depend upon scavenging, the inhuman practice of having poor residents physically carry the night soil away on their heads when pits are filled. "Socio-Economic Facilities to Slum Dwellers in Squatter Colonies," a study by Sinha and Ghosh, discovered that in the Bhumuihin slums, such scavengers were usually overworked, forced to clean chronically overused facilities, and generally speaking, unable to maintain sanitary standards. "The

administration depends on scavengers for its wash and clean and they are not regular." Irregardless of the scavengers' ability to do the job well, the vocation has been declared a demoralizing, undignified one by the national government.

Another study, "The Nature and Dimensions of Urban Poverty," indicated that when latrines are in short supply, they are less likely to be properly maintained and will consequently remain underutilized. About 51 per cent of the families in the slums use public latrines. As many as 41 per cent use open spaces. Moreover, those residents who use community latrines do not do so regularly. Reasons regularly cited for not using these latrines included over-crowding, dirtiness, lack of water, and long distances from houses. ("Nature and Dimensions of Urban Poverty," The National Institute of Urban Affairs.)

Yet another study, "Environmental Conditions in the Union of Delhi," which was sponsored by UNICEF, found that there was just one seat per 27 households (150 people) in the shanties surveyed, "which is a sharp pitfall from the norm of one seat for every twenty persons. The obvious consequence was large scale open air defecation." ("Environmental Conditions in the Union of Delhi, UNICEF)

C. DESCRIPTION OF INNOVATION

The Sulabh technology consists of a pan with a steep slope, and a trap with a 20 mm water seal which will need only 1.5 to 2 litres of water for flushing. The waste falls to a leach pit which absorbs water content and leaves the waste dry so that it may later be used as manure. Unlike previous similar technologies, the "sulabh" system includes a second leach pit, a significant improvement. When the first pit is filled, the second begins functioning. The excreta deposited in the first one remains without smell and may be used for farming.

Odor is controlled because, unlike in the septic tank system, gas is unable to pass backward through the waterseal. In the case of large, public latrines, the Sulabh has developed a technology, as yet unutilized in Delhi, for using bio-gas to fuel cooking stoves and power street lights. The operation is enjoying experimental success at Patna.

The percolation of liquid and dispersal of gas into the soil is another basic difference between the sulabh technology and the conventional septic tank system. With septic tanks, waste must be removed and transported to a sewerage treatment plant, whereas sulabh's technology allows the waste to gradually degenerate into manure once the pit is filled. Gas and liquid is slowly absorbed by the soil through uniform holes along the walls of the pit, and the waste is rendered totally odorless.

It requires 2 days to build a private, in-house latrine, and 5-6 months to construct a public latrine.

D. INNOVATION PROCESS

The genesis of this innovation has its origins in a national social movement. The year 1969 marked the birth centenary celebrations of Mahatma Gandhi, the great leader of India's independence. During his life, Gandhi had led and fought many battles against social evils, the most important of which was the effort to eradicate scavenging and untouchability. In commemoration of the event, the official celebration committee decided to revive his work on behalf of the scavengers as part of the year's activities. To this end, they recruited energetic young students to publicize and promote these endeavors. Among those enlisted was a passionate activist and sociology graduate named Bindeshwar Pathak.

When Mr. Pathak entered communities and organized information meetings, he discovered general resentment among the people. "They had a high regard for all that Mahatma Gandhi preached, but they demanded concrete, result-oriented action, and not mere sermons." Moved by what he had heard, Pathak went to Bihar, where the local government had made a commitment to converting dry latrines into hand-flush latrines, and to connect them to either sewer lines or leaching pits. The goal was a noble one, but Pathak quickly became disillusioned by the government's apparent inability to make a significant impact. Frustrated but determined, Pathak set out on his own.

He found inspiration in a book by Wagner and Lanoix of the WHO: "Excreta Disposal for Rural Areas." The book, according to Dr. Pathak, contained data on the merits and demerits of several designs for the proper disposal of night soil. The book had come to the conclusion that "out of the heterogenous mass of latrine designs produced all over the world, the pit privy is the most useful and applicable." Proceeding from this conclusion, Dr. Pathak worked with Mr. R.L. Das of Bihar towards the evolution of the design which became popular as "Sulabh Shauchalaya."

But Pathak recognized that his plan must have an additional dimension if it was to achieve deliberate social change. "I thought that mere availability of the appropriate technology will not solve the problem. For its wider application, one would have to go to the people to educate them about the technology, persuade them for its adoption and then keep a watch whether they are being properly used or not. Further, I thought that voluntary organizations should not be kept confined to the work of propagation and demonstration only; Rather, they should get themselves involved in practical work. Secondly, voluntary organizations should not remain dependent on the government grants or public donations, rather they should run it on a no-profit-no-loss basis so as to be fully self-reliant."

Mr. Pathak's efforts met with only limited success during the first three years. Nevertheless, he did succeed in building some private Sulabh latrines, and a pair of Sulabh complexes in Bihar, his home state. From these beginnings, Pathak was able to build more and more of the latrines, and by 1978, when Sulabh was eight years old, he had converted approximately ten thousand privies.

The World Health Organization became apprised of the project's success and after concluding that the process was a viable one, introduced the idea to a representative of India's national government. Impressed with the WHO's findings, the Government of India in turn asked the UNDP to prepare a feasibility study for the installation of inexpensive latrines in 110 towns scattered over seven of India's states. Since the study had been inspired by the success of the Sulabh in Bihar, the entire task was entrusted to the small organization, without any competition at all. With these projects successfully completed, Sulabh began its steady climb towards national and international acclaim.

But the individuals working with Sulabh were convinced that their innovation could be developed further, and that the excreta could be put to productive use. As an experiment, they constructed a 24-seat public latrine near the Reserve Bank of India on the Fraser Road in Patna, and later doubled its capacity. When its pits were filled, Sulabh dug out the excreta—totally dry and without smell and sold it off at the rate of three rupees per container (about 10 Kg. each). The manure proved to be a rich agriculture input and sold successfully.

About three km away from this point, it has also generated bio-gas and electricity for street lights in limited scale. In both of these cases, small-scale activities hold the potential for large-scale impact.

In Delhi's Mahavir Enclave, the Sulabh has set up its own industry to manufacture the latrine pans built specially to reduce water requirement for cleaning. In this way, pans were ideally suited for their use, and a considerable number of people found gainful employment in their production. The Sulabh, which had only one thousand employees in 1980, now has 20,000 workers carrying on the construction works. Contributions towards sanitation and social equity aside, Sulabh has provided significant employment opportunities.

E. GOALS

Generally speaking, Sulabh's short-term goals include the provision of accessible, affordable latrines and the means to maintain them. Its more profound long-term goal involves the stimulation of a major shift in the personal habits of the urban poor. For operational

purposes, Sulabh's directors have identified ten more specific aims to guide their activities.

1. To eliminate the inhuman practice of carrying human excreta as head load by the promotion and construction of Sulabh Shauchalayas toilets and by replacing bucket/dry latrines.
2. To operate and maintain community toilet complexes with baths and urinals on "pay and use" basis after constructing them or providing the technical assistance for their construction.
3. To construct or provide advice for construction of Sulabh Shauchalayas and urinals in schools and colleges to make the students and instructors aware of low-cost sanitary latrines and inculcate them in the habit of using them.
4. To produce bio-gas from human excreta and generate electricity as an alternative source of energy.
5. To train youths to promote low-cost sanitation in rural areas.
6. To involve women in the scavenging eradication program.
7. To propagate the need of Sulabh Shauchalayas and educate the people through demonstration units and audio-visual media for mass communication (including house-to-house contact, meetings, and the publication and distribution of literature) and holding seminars and workshops.
8. To conduct ongoing experimental research in the fields of sanitation, environmental impacts, bio-gas and applied social research related to hygiene and personal sanitation.
9. To provide consultancy services on low-cost sanitation.
10. To rehabilitate the scavengers freed from the demeaning task of handling human excreta by imparting training to them and their wards in alternative vocations and trades.

F. TARGET GROUP

The target group of this project are the impoverished residents of Delhi's slums and resettlement colonies, in particular those who have no access to sanitary latrines. Special attention is also given to the needs of women in these groups, as well as the scavengers who must carry away the human excreta from dry latrines.

Geographically, the target sites include locations throughout Delhi. Only seven of the 44 resettlement colonies have civic amenities and

running water lines provided. In most of them, especially in areas across the River Yamuna, no sewerage facility or proper drainage exist. Most of these colonies are located in low-lying areas about 10 to 12 feet lower than the Yamuna bed. Hand pumps are the only source of drinking water, and since they are not bored very deeply, they usually yield contaminated water.

These areas across the river are the priority targets for the latrine project. Study reports in the past have suggested that facilities can only be provided to the East Delhi resettlement areas at exorbitant cost, if such facilities are intended to include pumping and facility lines. And since the areas are inhabited by the most destitute of Delhi's residents, it is unlikely that they would ever be able to afford sewer line construction on their own. Nor does the Delhi Administration have funding earmarked for that purpose. Given this state of affairs, the only solution to the problem lies in low-cost sanitation techniques and people's readiness to accept and use them.

Most importantly, the communities targeted are those in which the local administrations have approached Sulabh Shauchalaya of their own volition. Like the households, it is up to these administrations to seek out the Sulabh and provide it with sites on which to build the complexes for public use. Such self-motivated community organizations are most likely to be prepared to receive the latrines, to find an accessible location for them, and to maintain them regularly.

G. PARTICIPATION

Although initiated by an NGO, the Sulabh Shauchalaya project has gained strength through its association with international aid agencies, most notably the World Health Organization, and various members of the local and international communications media. International aid organizations assisted by validating the effort through widespread honor and recognition, and by promoting the project among local and national authorities.

Impressed by its initial operations, the World Bank decided to fund five states, including Maharashtra, Karnataka, Andhra Pradesh, West Bengal and Uttar Pradesh to adopt the low-cost technology, improve living conditions, and liberate the scavengers engaged in carrying away the human excreta. With the support of UN funding, the latrine design, now slightly modified, was successfully constructed in 19 countries in Asia, Africa, and Latin America. The Sulabh was also consulted to prepare a feasibility study for replicating the project in Indonesia and Bangladesh. Most recently, as a result of this feasibility study, Sulabh has been formally invited by the Gonoshahijjo Sangstha (GSS) a leading development agency in Bangladesh, to begin work in Dhaka.

The communications media provided attention and moral support and helped to educate the public about the need for low-cost sanitation. Taking the cue from these media professionals, the Sulabh has also begun to pursue its own vigorous campaigns on more local levels. It has been approaching different educational institutions, asking them to include low cost sanitation, and the Sulabh method, in text books. Recently, the University of Delhi has expressed interest in including the Sulabh technology in their curriculum, and there is hope that the Tata Institute for Social Research in Bombay will do the same.

On the level of the slums, community participation has been central to Sulabh's success. Education programs have been used to create a general awareness of sanitation which will affect all areas of the slum dweller's lives. And more recently, video-cassettes have been produced as propaganda material for community centers equipped with televisions. At the heart, Sulabh is more of a social innovation than a technological one. It aims to permanently alter the values and hygiene habits of the urban poor, and to help them find a place for cleanliness and sanitation in their daily routines.

Believing that action and education can never be separated Sulabh also offers technological training programs so that people may become involved in the actual construction. One such training program was offered by the Sulabh at the unauthorized colony of Sangam Vihar, where 10,000 households huddle near Batra Hospital. The Sulabh held 25 latrine installation workshops, and has since been approached by 600 new households. Recognizing the impact potential of youths, some programs are targeted specifically at adolescents, training them in latrine construction and maintenance.

H. PROGRAM ACTIVITIES

There are seven primary activities, many of which involve supplementary activities. They are :

1. Sulabh, upon invitation, seeks out the best location for their latrines in a given community. Normal criteria involved in site selection include : availability of land (normally it is municipal park or open area under local government control), convenience and accessibility of the site for the users, viability of the project, and the particular degree of need in the community.

In the case of private household latrines, Sulabh goes door to door, providing information about how residents can take full advantage of the project. The resident fills out a set of application forms which Sulabh brings to the respective municipal offices where, after review, the grant and loan amounts are

sanctioned to the Sulabh on behalf of the home owners.

2. Sulabh constructs the metal pans in its workshops.
3. Sulabh constructs the latrines, simultaneously educating local youths about the construction process through participatory workshops. With private latrines, the resident is expected to guard construction materials at night and to fill out a form certifying that the work was satisfactorily completed. Senior Sulabh workers periodically undertake random inspections as a follow-up procedure.
4. Sulabh educates the community at large about the importance of sanitary facilities with regard to the personal health and the urban environment. Launching information campaigns for those who receive latrines will ensure maximum life-span for the facilities, and put the owners in a better position to promote the technology among neighbors and relations.
5. Sulabh installs a crew to maintain the latrines. In public complexes, there are separate rooms attached with the bath house for caretakers who will be solely responsible for holding accounts and for ensuring that the facilities are kept clean throughout the working period. Public latrines are maintained for a period of 30 years, enabling residents to gradually accept the presence of the sanitation facilities without waiting to adjust simultaneously to the burdens of maintenance.

For private latrines, repair services are guaranteed for five years through the issuance of a "guarantee card." The Sulabh provides free cleaning service of the pit for the first time. Subsequent cleanings may be done by the residents themselves or by Sulabh workers at a cost of 25 rupees per cleaning. This charge may ordinarily be recovered by selling the fertilizers.

6. Sulabh retrains scavengers in new vocations.
7. Sulabh maintains administrative offices in Defence Colony and the Greater Kailash area which plan project construction and investigate complaints of latrines that are not working.

I. IMPACTS

Sulabh Shauchalaya makes critical impacts in terms of reducing the environmental degradation in the slums. And since the poor of Delhi are likely to inhabit delicate riverfront areas, the potential environmental impacts of Sulabh are magnified.

The severe shortage of affordable, serviced land has forced more and

more of the poor to take refuge in low-lying areas, well below the water level of the Yamuna River. Given periodic inundations and fluctuations of the water table, these locations are particularly vulnerable to the contamination of soil and water by surface impurities in open gutters. And in a city where 24 main sewer lines already empty their pollutants directly into the river, reform is urgently needed. The availability of sanitary toilets dramatically reduces the threat of water-borne diseases and polluted aquifers, and increases the overall changes for environmental sustainability.

The Sulabh also contributes to the creation of a more socially equitable city. According to survey reports, there are about 6,000,000 dry bucket privies in the country, and 500,000 in Delhi alone. Delhi, then, gives employment to about 200,000 scavengers for removing the night soil despite the Government of India's optimistic declaration that the inhuman practice would be eradicated by the year 2000.

The Sulabh, by retraining scavengers to maintain the sanitary latrines, or by educating them for new vocations, has been the only organization to make significant strides toward this national goal. Even those scavengers who are retrained to clean the sanitary latrines find they are in a considerably more respectable and humane position. The organization also deliberately and consciously incorporates women in this re-education process, as both students and instructors.

Another of the Sulabh's widespread impacts on social equality in the city is the simple provision of clean toilets to people who formally had to subsist without them. Men and women faced the humiliation of defecating in open fields, and children, when they were fortunate enough to be entered into school systems, were too embarrassed to bring classmates home. Slowly, these conditions, and the unhealthy personal habits that spur them, are being reversed.

Lastly, by providing latrines to communities that have mobilized and made requests for them, the Sulabh is motivating and reinforcing community level involvement. On other levels, previously described, it implements educational programs about public health and training workshops for the dissemination of the Sulabh technology. This free distribution of knowledge is yet another opportunity for community-level participation.

In more physical and spatial terms, Sulabh Shauchalaya has impacted the availability of a basic urban amenity to specific urban slums, contributing to their viability as permanent, sustainable settlements.

J. RESOURCE UTILIZATION

Private household latrines cost less than \$100 to construct. Half of the

cost is subsidized by the state government, and the remaining half is provided for by a government loan. All of this financing is administered by the Sulabh to ensure that residents do not abandon the project in the face of unfamiliar beaurocracy.

Public latrines are paid for by the government at the cost of construction plus an additional 10% for Sulabh Shauchalaya's overhead expenditures. The latrines are situated on municipally-donated land. The cost of maintenance is completely recovered by collecting 25 paise (less than a penny) from users who can afford it. Soap costs an additional 25 paise, and women and the truly destitute may use the facilities free of charge.

K. ANALYSIS OF THE HELPING/HINDERING FACTORS

There are a number of "helping factors" which, when present, make the outlook for Sulabh Shauchalaya promising.

First of all, a general readiness on the part of the slum residents to receive and utilize the latrines is critical. Often, as Mr. Pathak accurately assessed, this helpful condition can be achieved through education.

Positive publicity and a general awareness among the public about the value of sanitation is of equal importance. The Centenary Celebration provided a "window of opportunity," and the attention it drew led to a better understanding of the plight of the urban poor, as well as financial and moral support from government and international development agencies. And where knowledge is able to filter down to the slum residents, this attention can lead to communities requesting the installation of the Sulabh in their homes or neighborhoods.

Sulabh prioritizes latrine construction in the communities from which the local administration has approached them. The cooperation and enthusiasm inherent in such locally-initiated relationships is one of the strongest "helping factors" available to the project directors, because it instills in the community leaders a certain measure of project "ownership."

Lastly, the unusual character traits of the program's founder were perhaps the most crucial "helping factor" of all. R.L. Das, who collaborated in the process of designing the latrine, considers Pathak a "sociological and psychological genius - he knows how to translate ideas into action and get people to act." In recent years, Pathak has become an articulate advocate of grassroots groups like his own, and the vital role they can play in larger development strategies. Believing that grassroots organizations should maintain maximum independence from the government, Mr. Pathak has travelled abroad frequently to advise grassroots organizations and to help them succeed.

Pathak is an extraordinarily committed individual, always searching for ways to modify Sulabh for greater success. He has also demonstrated an ability to maintain the enthusiasm of his employees, a formidable task in a field traditionally relegated to the lowest under class. He achieved this by providing relatively high wages as well as bonus incentives for projects completed on or ahead of schedule. The net result was an efficient and timely service delivery and an increased level of credibility.

Counteracting these "helping factors" are a number of obstacles which occasionally arise. The most notable has been public protest against the Sulabh, particularly that which has occurred in the eastern slums of Delhi. In Trilokpuri, for example, local residents feared that the construction of an 80-seat complex would only serve to further deteriorate the environment, pollute the water, and cause a stronger stench.

Through a concerted effort, Sulabh representatives succeeded in proving to the residents that their protests were not well founded, and that the design of the toilets differed substantially from the septic tanks they had seen before. After these discussions, residents withdrew their suspicions, and agreed to the installation of several complexes. In two years of operation, there has been no additional protest.

A second layer of resistance came from politicians who felt threatened by the unconventional nature of the solution. Legislators in the state of Bihar challenged Pathak's technology and accused him of financial irregularities. A dozen newspapers publicized the attacks, but formally apologized after Mr. Pathak defended the Sulabh in court. Despite threat and provocation, Mr. Pathak did not give in.

A third barrier to success and one which is not yet completely resolved, is the inability of the poorest residents to pay for the Sulabh latrines. Long-term loans and partial government subsidy made the project feasible for many. But in India, the experience has been that the cost of latrines is still out of the range of a great many urban poor. And in any case, sanitation carries a lower priority than water supply or shelter. To address this obstacle, Sulabh developed public latrines and freed the poorest from their obligation to pay.

L. REASONS FOR SUCCESS AND HOW THEY DIFFER FROM CONVENTIONAL GOVERNMENT RESPONSES

The success of this innovation derives from its unique qualities. These include :

1. Very little requirement of water for cleaning and flushing.
2. Low cost of construction; it costs only Rs. 1800;

3. The Guarantee of maintenance by the Sulabh itself (5 years for private latrines and 30 years for public conveniences);
4. Totally odorless excreta;
5. Very little space required for construction (6ft by 6ft area for construction inside a house)
6. No need of scavengers for removing waste. Once the pits are filled up, the excreta becomes manure.

The Sulabh differs from traditional government approaches in several ways. First, it accepts that slums should be upgraded rather than cleared away. In the Report of the Inquiry Commission Regarding Deaths Due To Cholera and Gastro-Enteritis, the authors recommended that the growth of shanties be curbed, and that the existing ones should be cleared immediately.

Conventional response also proceeded from the false assumption that traditional, costly infrastructure was the only acceptable solution. Modern septic tanks and sewer lines are not only more expensive, but occupy more space than is available and require specialized skills for their construction. In contrast, Sulabh can be installed by virtually anyone. From their unidimensional approach, leaders were unable to see the potential of more affordable technologies. Ironically, despite their predilection for higher technologies, decision-makers were unwilling to commit more than token financial provisions for public sanitation. In fact, even after the 1988 epidemic, the Delhi administration allocated only 5 million rupees for sewerage systems in the seventh plan.

Such minimal funding had two self-defeating consequences. First, and most obviously, it allowed for the construction of an insufficient number of drainage lines and latrines. But on a related level, such frugality failed to allow for the proper maintenance of those systems that were built. As they grew filthier, the toilets went unused. Even today, during the monsoon season existing public conveniences or lavatories built by the MCD or DDA are often found full of dirt, with no maintenance or regular cleaning. People are usually found nearby, defecating in the open air.

Above all, the success of Sulabh lies in its consistency of mission. It stands apart from conventional government responses which have collapsed due to contradictory policies and overlapping jurisdictions on the questions of sanitation. Since 1968, the charge of providing sanitation to the capital has shifted five times between the Delhi Development Authority and the Municipal Corporation of Delhi (MCD). The slum ownership has also repeatedly changed hands between the two bodies.

Initially, the slum clearance scheme in Delhi was the responsibility of the Municipal Corporation, and had only 18 colonies under its jurisdiction up to 1968. During that year, the implementation of the scheme was transferred to the Delhi Development Authority following a decision by the Delhi Administration. The Delhi Development Authority developed 26 more resettlement colonies bringing the total number to 44 spread all over Delhi. The DDA tried, and to a large extent, succeeded in relocating people from unauthorized colonies to new locations. Each family received a plot of 25 sq yards free of cost and were entitled to build houses on them. Approximately 197,000 plots were developed in this way. Since the buildings were constructed in a hasty and unplanned manner, none had a latrine built inside. Moreover, the density of the settlement patterns left virtually no space available outside. In short, sites had been provided without any consideration given to the essential services.

The responsibility for maintaining these resettlement colonies resided with the Municipal Corporation between April 1, 1978 and May 14, 1980 and the responsibility for development remained with the DDA. In this process, the development and basic amenities were delinked, and much of what was targeted remained far from realisation.

The maintenance work of these resettlement colonies was shifted back to the DDA on May 5, 1980. Five years later, the Government of India once again decided that the maintenance of the resettlement colonies should be given back to the Municipal Corporation. A battle over the transfer of equipment and maintenance funds became yet another reason for the ongoing tussle between the DDA and the MCD. In the process, Delhi's slums degenerated even further. The environment suffered gradual degradation and slum residents became particularly vulnerable to epidemics.

Against this backdrop, the Sulabh provided an opportunity for direct, unimpeded action which drew strength directly from public need and support.

M. POTENTIAL FOR REPLICABILITY

The technology is simple and straightforward and has already demonstrated its inherent replicability throughout South Asia, Africa, and Latin America. Moreover, the Sulabh has demonstrated its applicability to a variety of urban scenarios, three of which are described below, along with the varying indicators of their success :

Trilokpuri : Public Facilities for a Legitimate Settlement

In 1976, under the Delhi Administration's plan to beautify the capital, 600,000 families were relocated to resettlement colonies in a 1000 hectare site near the Yamuna River. Residents, while impoverished, were given legitimate occupancy rights in the hope that they would upgrade the area on their own.

The involvement of the DDA, however, consisted of little more than dividing the land into 197,000 plots. Houses were built with no provision for basic services, and most residents resorted to open air defecation. In 1980, the DDA made attempts to revisit the site and install public toilets and septic tanks. Regrettably, a lack of funds resulted in a mere six facilities being constructed, with virtually no attention given to maintenance.

After the 1988 outbreak of epidemics, Prime Minister Rajiv Gandhi intervened, requesting that the Municipal Corporation approach the Sulabh and remedy the situation. Sulabh built an 84-seat facility at Himmatpuri (block 27), as well as nine bath cabins. Additional facilities are currently opening, and the MCD facilities have been abandoned.

Surveys of the residents reveal that many would prefer private latrines, and the presence of television antennae in the area suggest that many families could probably afford it. The constraining factor reportedly is space. The homes and plots are too small to accommodate even the most compact Sulabh configuration. A local merchant estimated that about forty per cent of the residents would gladly construct private latrines if they had the room.

Some women interviewed at the facility claimed that they come to the Sulabh four or five times a day, since they are not required to pay. They regretted that many of their family members did not go at all. Many men were unable to afford the nominal fee, and many older individuals were too set in their ways, and didn't feel a latrine was necessary.

Caretakers at one facility claimed that attendance was relatively poor, compared to other Sulabh facilities, due to the inconvenient site donated by the Municipal Corporation. He claimed that only 200 men came each day; whereas, another facility, several blocks away drew 1000 people a day. Another caretaker attributed the relative failure to a lack of awareness and motivation.

Azadpur Subzi Mandi : A Facility for Transients

Azadpur Subzi Mandi is a wholesale vegetable market which attracts farmers from Haryana, West Uttar Pradesh, Rajasthan, Himachal

Pradesh, and even Punjab. They arrive each day in the early morning hours to sell their produce and spend much of the morning at work. During their stay, these trades people were formerly required to defecate in open areas. "This area used to be a stinking one five years ago," exclaims Rajpal Singh from Haryana.

Now Mr. Singh, as well as many other visiting farmers, utilize Sulabh's only double-storied public complex. Caretakers draw in between Rs. 6,000 and Rs. 7,000 each day, indicating an average of 30,000 to 35,000 users, and demonstrating that Sulabh can effectively service the non-resident users of a city.

Caretakers here remark that Sulabh's success in keeping the environment clean should not be measured by the number of seats it has or the number of people using it each day but by the unspoken answer to this simple question : "What would Azadpur Subzi Mandi be like if all of these 35,000 people were to defecate in the open air every day? Caretakers also note that the visiting farmers and vendors have clearly monopolized the facility. But it is exactly this group of outsiders, having little sense of responsibility for the location, that would be most likely to defecate freely and carelessly.

Sangam Vihar : Private latrines for an Unauthorized Settlement.

The challenge at Sangam Vihar was perhaps the greatest faced by the Sulabh - convincing tenureless residents of an unauthorised settlement to invest in the upgrading of their homes through latrine construction. Interestingly enough, Sulabh's presence in the slum was brought on not by the organization itself but by the request of a resident.

Mr. Om Prakash Bali, a resident of Sangam Vihar had heard about Sulabh from another voluntary organization and contacted a Sulabh representative about acquiring a latrine for his home. Mr. Bali's success motivated others to consider doing the same. Soon, the demand for private latrines outran Sulabh's ability to keep up, and they enlisted the aid of 15 local youths. After a two week training session, the youths were ready to begin work.

Residents of this slum, financially better off than other slum dwellers, were also motivated by a concern for their children's social acceptance. Many of the children were attending schools and concerned about the way their friends would view them if they had no toilets.

With the widespread success of the private latrines, Sulabh agreed to consider constructing a public facility. The "Sangam Vihar Welfare Association" had approached the Sulabh earlier, but Sulabh had refused, because the colony was an unauthorized one. Now, they were

convinced that the residents were committed to the sanitation effort, and prepared for the risks of physical investment in an illegal settlement.

From these experiences and others, one can isolate at least six conditions a practitioner should be aware of when he or she is considering the transfer of Sulabh technology to a new urban context.

1. Potential replicators must consider the general preparedness of society to accept lower physical and technological standards. This issue would be especially relevant in a developed or rapidly developing city where progress is directly linked to more sophisticated equipments.
2. The society would need to be receptive to the idea of an "unofficial provider," or grassroots organization, delivering the service. A bias against such initiatives was in all likelihood at the root of the criticism directed at the Sulabh from local politicians in Bihar.
3. Since public latrines are the most cost-effective and economically feasible for residents, there should ideally be a willingness among the slum dwellers to use shared facilities.
4. Successful replication will depend on the availability of suitable sites. Depending on the culture, it may be preferable to have the latrines centrally located, or in an area set apart from the dwellings. Wherever it is, the site must be convenient, and free from flooding. To keep the costs low, the land should be donated.
5. Governments and metropolitan agencies did not, of their own free will, approach the Sulabh. Potential replicators should recognize the vital intermediary role played by international aid agencies in popularizing the concept among local policymakers.
6. For a program like Sulabh to be a success, it is imperative to set up a suitable institution for strategic planning and effective implementation. The institutional base must be able to operate at reasonable cost and execute professional transactions with the residents, including proper approvals and follow-up inspections. The organization must also be capable of addressing necessary formalities such as estimates, plan approvals, and record keeping to ensure smooth cooperation with the government and financial institutions.

SPECIAL RELEVANCE OF THE SULABH TO MEGA-CITIES

The Sulabh is of particular interest to planners and practitioners in Mega-Cities for several reasons. First of all, mega-cities are predominantly characterized by a large portion of their population who are cut off from formal services. The Sulabh technology permits the provision of basic amenities to the truly disenfranchized. The opposite side of this point is that isolated populations are also less likely to feel any social responsibility for city-wide environmental conditions. Sulabh's educational efforts help to reserve that frame of mind, instilling a stronger communal awareness in its place.

Secondly, mega-cities are most likely to have public agencies that are paralyzed, fraught with beaurocracy, and financially unable to provide critically needed services. In response, Sulabh provides an opportunity for low cost and self-help development. The lesson here is that where financial resources are constrained in central administrations, functions can be effectively delegated to grassroots and community-level organizations.

Thirdly, mega-cities are defined by their rapid, even explosive growth rates. Urban planners can simply not keep up with the demand for services under these conditions, at least not with conventional standards for infrastructures. Again Sulabh provides an option for lowering standards to the point where they can be delivered quickly.

Lastly, the residents of mega-cities are increasingly forced to inhabit environmentally vulnerable areas. The Sulabh technology allows for the adaptation of lifestyles to accommodate the delicate and changing nature of waterfront land.