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SEARCH 078

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# CONVERSION OF BUCKET PRIVIES TO SANITARY WATER-SEAL LATRINES

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REPORT ON A NATIONAL SEMINAR  
CONVENED BY  
GOVERNMENT OF INDIA  
IN COLLABORATION WITH WHO AND UNICEF  
PATNA, BIHAR  
25-27 MAY 1978



WORLD HEALTH ORGANIZATION  
Regional Office for South-East Asia  
New Delhi.

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INTERNATIONAL INSTITUTE  
FOR COMMUNITY WATER SUPPLY

## REPORT AND RECOMMENDATIONS OF THE SEMINAR

1. The delegates to the seminar noted with satisfaction that the convening of the Seminar by the Government of India, in collaboration with WHO and UNICEF, has highlighted the importance and urgency of the subject and its rightful claim for priority attention in national development plans, because of its pervasive influence in improving personal hygiene, community health, social uplift and economic well being.
2. The delegates appreciated the unique opportunity the Seminar provided as a common forum for administrators, planners, engineers, scientists and sociologists with involvement and responsibilities in this area of activity, for a free and fruitful exchange of information, ideas and experiences on the different facets of the problem, with a view to identifying feasible solutions on which a realistic and progressive plan of action could be formulated and integrated with the Sixth Five Year plan now under preparation.
3. The participants felt honoured and encouraged by the presence and remarks of the Chief Minister, the Minister for Urban Development and the Minister of Agriculture, Government of Bihar, and the Minister of State for Works and Housing, Government of India, at the opening and concluding sessions of the Seminar, emphasizing the determination and policy commitment of the government to solve the problem of human excreta disposal with top priority under a timebound programme.
4. The Seminar took note of the comprehensive nature of the Background Paper prepared and presented by WHO, carrying a status survey and detailed problem analysis, and utilized the material to initiate discussions on the several subjects in the Agenda. It also welcomed the active participation of the representatives of WHO and UNICEF in the Seminar discussions signifying the importance attached to the subject and its relevance to similar problems in the neighbouring countries of the South-East Asia Region.
5. A review was made of the current situation in the country. It was noted that one third of all urban households currently has no latrines; another third has to put up with bucket service latrines; the remaining third is served by shared flush latrines for 21%, individual flush latrines for 7.2% and septic tank latrines for 5.2%. In effect 7 million households have bucket latrines which are to be replaced by water-seal latrines and another 7 million households without latrines require to be provided with new water-seal latrines.
6. By 1981, 90 million people will be in need of sewer systems; and by 2001 an additional population of 128 million would have joined the queue. If the provision of water-seal latrines were to await the completion of sewer systems, the objective could not be realized within a foreseeable time and the goal would become unrealistic. A continuance of the status quo on the other hand is fraught with serious public health hazards and intractable human problems.

7. Past efforts at latrine conversion by the Government were constrained by the concept that sewer systems were indispensable for installing flush latrines. The Seminar appreciated the more recent scheme of the Government of India for the conversion of dry latrines into sanitary ones and the development of demonstration projects for cheaper methods of disposal of human wastes, with a provision of Rs.4.4 crores in the V five year plan to cover a 100 per cent grant assistance to 30 selected town within the population range of 20000 to 50000. The operational part of the scheme however is confined to the laying of small sewer lines to be connected to a septic tank or other disposal arrangement with the conversion of the bucket latrines and their connexion to the sewer lines as the contribution of the State Government contingent to the Central Scheme. As this portion perforce cannot be taken up before the completion of the Central Scheme and the past experience in the conversion has been rather tardy and unsatisfactory, the Central Scheme needs modification to fulfil the basic objective of conversion of the bucket latrines fully. The primary aim of the Scheme should be the elimination of the conservancy system and the provision of water-seal latrines which should merit over-riding priority in our development plans.

8. The Seminar, therefore, urges strongly the need of a strategy and plan of action to achieve the following objectives:

- integration of house connexions as part of sewer systems planning and implementation in future;
- conversion of bucket privies into water-seal latrines and their connexion to the sewers in areas already sewerred to ensure full utilisation of the investment on the sewer system;
- conversion of bucket privies to water-seal latrines in all urban households in unsewered towns to be completed under a time-bound programme, by the end of VI Plan, independent of the pace of sewer system planning;
- provision of individual sanitary latrines in households where latrine facilities do not exist;
- provision of sanitary community latrines to meet the needs of the pavement dwellers and the households which cannot accommodate individual latrines, and
- rehabilitation of scavengers displaced by the elimination of the conservancy system.

9. The seminar considered the sociological and economic aspects of the problem. The urban householder with a bucket latrine looks upon it only as a necessary evil. Sociologically he is conditioned to prefer a water-seal latrine. The latrineless householder again

is handicapped by his economic limitations rather than any sociological inertia. When the housing area precludes the provision of an individual latrine, legal injunctions against open defecation become ineffective and punitive action unfeasible. If community latrines are the solution to such householders, the urban poor can be credited with a preference for the water-seal type than the bucket type.

10. The operation of a conservancy system is decidedly vulnerable. Its fatal weakness lies in the employment of human beings in such demeaning work, to which its very beneficiaries attach a social stigma. The stigma perpetuates a hereditary service by a poor, sullen and unwilling labour. Increasing wages, decreasing efficiency and mounting tensions constantly plague the service. Nevertheless the abolition of dry latrines may result in an economic disadvantage to the scavenger, arising out of a fear of loss of hereditary means of livelihood on an assured and permanent basis. The collection of night-soil is carried out by the municipal agency itself in the eastern states and in a large number of municipalities in some other states. But in Punjab, Rajasthan, Delhi, Uttar Pradesh, Madhya Pradesh and parts of Gujarat, the system of customary rights is prevalent.

11. The Seminar noted that unemployment due to conversion of dry latrines in Gujarat and Bihar, where scavenging service is municipalized, has been avoided by a policy of no retrenchment and gradual absorption of displaced scavengers in any other gainful employment. However the Seminar felt that a bolder and forward looking policy is needed on the part of State Governments and local bodies to include mass education, preferential appointment and promotions as appropriate and vocational training for other skills.

12. The Seminar considered the health, pollution and agricultural aspects of the problem. It would draw specific attention to the fact that human excreta are the reservoir of causative agents of enteric diseases and parasitic infestations, which are transmitted through water, food and soil. Proper disposal of human excreta is the only measure by which transmission of these diseases is cut at the root. The high incidence of enteric diseases and the appalling insanitary conditions in urban areas are primarily due to the fact that large sections of the urban population do not have a satisfactory arrangement for the segregation, collection, transport and disposal of human excreta. They have either an insanitary bucket privy or resort to indiscriminate defecation on the roadside and by-lanes resulting in wide-spread soil and water pollution, exposure of excreta to flies and a filthy environment. The most important single measure to improve the sanitation and health of the urban communities is the provision of sanitary water-seal latrines to the entire population.

13. The seminar examined in detail the pollutional aspects of the use of leaching pits connected to water-seal latrines and discussed the results available from extensive studies carried out in India and elsewhere. These studies have conclusively demonstrated that the extent of pollution flow arising out of the pit privies is very limited

and that the system can be safely adopted in most soil conditions provided certain minimum precautions are taken in regard to the location of the pit in relation to well water supplies and distribution pipes. It has also been observed by several workers that pathogenic bacteria do not find the soil a suitable environment for their survival and will die within a few days. A vast majority of soil conditions prevalent in the country would permit the pit to be located as close as 3 m from a drinking water source. However it is desirable to keep this distance as at least 8 m. Monitoring of ground water quality within the proximity of the leaching pits would help in evaluating the extent of possible ground water contamination.

14. The Seminar considered the agricultural aspects and noted that human excreta are a good source of organic matter, nitrogen and phosphorus which are essential manurial ingredients for soil. The digested sludge accumulated in the leaching pits provides these manurial ingredients in a safe form for use in agriculture. While it may not be worth while to utilise the manure independently from each household, arrangements can be made for collection of the manure from a number of pits and its utilisation on kitchen gardens, parks and other agricultural land.

The utilisation of biogas in association with individual household latrines is not feasible. Its possibility in the case of community latrines will depend on the number of users and other relevant factors.

15. The Seminar attached special importance to the engineering aspects of the problem and the several solutions applicable to meet varying conditions. Emphasis was laid on technology tailored to suit local needs and the choice of least cost solutions to meet a given set of conditions in unsewered pockets of sewerred areas as also the unsewered urban and semi-urban areas, which are set out in some detail in the background paper. The types of latrines and details of the leaching pits adopted should be based on a judicious choice from the alternatives appropriate to the case. It was felt that while standardisation of the design was an advantage in a mass construction programme, a diversification of the design to suit different conditions of soil, ground water level and user habits was nevertheless important in the interests of economy and utility. For instance, special studies of local conditions and possibilities would be necessary to decide on the most feasible and economical of alternatives for the conversion of terrace dry latrines in vogue in the towns of Punjab and elsewhere. Public health aspects and structural safeguards should govern the location of the latrines and siting of the leaching pits. The pollutional aspects called for informed judgement on local soil conditions in which the leaching pits will be located. The Seminar would stress the need for engineering competence to direct, guide, supervise and evaluate the programme both in its planning and implementation, and the need for establishing type designs for guidance of the states.

16. The Seminar went into the question of costs for the conversion of bucket privies into sanitary water-seal latrines as furnished in the background paper. It was recognised that there might be variations in the cost figures for different areas and conditions but the need to keep down the cost to the minimum was emphasised in view of the massive nature of the programme. The experience in Gujarat, Bihar and elsewhere indicated the cost of each conversion might vary between Rs.400-600.

17. The Seminar considered in depth the financial and management aspects as detailed in the Background Paper and concluded that latrine conversion is financially viable. Nevertheless, in view of the resistance and the varying nature of individual responses, the Seminar recommends that the element of subsidy should continue to the local body and the householder, although the cost-sharing pattern may be varied in accordance with the conditions of each State and local body. The programme deserves a generous measure of financial assistance from the Central Government for the added reason that it relates to the Harijan Welfare and Bhangi Mukti. Also, it provides a low cost interim solution for excreta disposal without waiting for the expensive centralised sewerage system. The compelling case for taking up latrine conversion as an integral but distinct part of the Minimum Needs Programme during the Sixth Five Year Plan is thus self-evident.

18. The Seminar would urge that the State Governments should move the Planning Commission to include this important programme in the VI Plan and give it a separate identity under the Minimum Needs Programme apart from the programme of environmental improvements for slum areas.

19. The Seminar would also emphasize that the management of the programme from the promotional, technical, financial and operational aspects should pose no serious problems. It is the kind of programme wherein the actual provision of the facility generates a snow-balling impact better and faster than a campaign of health education with audio-visual aids. The water-seal latrine once installed under competent supervision is easily maintained by the user without any recurrent expenditure.

20. The Seminar gave some thought to the implementation mechanism to be set up and the methodology to be followed. The inspiration for a regular programme of latrine conversion was provided through demonstrable achievements initially by a social organization in Gujarat and in Bihar. State Governments are now anxious to eliminate the conservancy service, and the urban dweller is ready and willing to use a water-seal latrine in preference to the bucket privy or open air defecation. What has been lacking hitherto was a credible programme which had been field tested for its feasibility. What is essential is to set up a suitable mechanism for programme planning and implementation oriented to the needs of each state, with an extension service component built into the mechanism.

21. To provide necessary administrative and financial support and promotional and technical guidance to the States as a coordinating agency at the central level, the Ministry of Works and Housing should establish

a special cell in the CPHEEO for the purpose. It is essential also to establish a proper liaison with the Ministry of Home Affairs, Ministry of Education and Social Welfare and Ministry of Health and the Planning Commission.

22. The Seminar considered that the structure of an organization to handle a similar programme in each state should provide for the following:

- a high level Authority/Committee/Board to lay down policy; enunciate programme; mobilise the necessary resources; guide, direct and supervise its implementation.
- a nucleus of technical and administrative staff to serve as the executive arm of the Authority, to help in programme planning, fund allocation, coordination of field activities to monitor the field work, provide programme intelligence and report to the Authority.
- legal frame.
- trained units of task forces at the local level to undertake preliminary survey and data collection, preparation of plans and documents, conform to procedures and formalities, organise and execute the conversion work and maintain follow-up service;
- regional training centres suitably located in the State to give necessary orientation training to social workers, supervisors, overseers, sanitary/health inspectors and training to masons, plumbers, fitters, etc. to develop the required skills needed for the programme.

23. The Seminar emphasised the need of providing adequate legal powers to the local bodies by amending the municipal act and by formulating separate bye-laws as has been done in Gujarat and Bihar for effective implementation of the programme of conversion as well as provision of water-seal latrines in houses irrespective of the availability of sewer systems.

24. The Seminar felt that the type of organization was a matter to be decided by the state concerned depending on the institutional and manpower resources already available at the State, district and local body levels. A view was expressed that it was premature to spell out the details of an organisational set up before the Government decides on its policy and commitment to a programme and its scope and content are defined. The seminar was in general agreement as to the type of implementation mechanism. There was a concensus in favour of setting up an independent cell or agency at the state level charged with overall guidance, programme planning and implementation.

25. The Seminar felt that irrespective of the organizational pattern for the Agency to be entrusted with the programme, the method of approach should follow certain basic criteria to ensure continuity of operations. With a commitment to complete the latrine conversion within a time limit, the sequence of operations will provide for identification of dry latrines

for conversion by wards, zones or other convenient areas; preliminary feasibility study and inspection for location of seat and leach pit and structural details for each case; form filling and documents completion for and on behalf of the owner; drawal of funds and approval for the work; organising and completing the work; post supervision of completed work and familiarisation of facility by the household; completion report and case details; and identification of emerging problems for research and development. The procedures for grant and loan disbursal, recovery of loans and residuary obligations by the householder, local body and the scavenger community should all be streamlined for quick and smooth despatch of work. Periodical evaluation of work and progress will form part of the programme for the benefit of the Government and any extra-budgetary sources of funds. Post construction duties will devolve on different agencies in varying degrees depending on whether the latrine conversion is in a sewerred area, or connected to a septic tank or collection pit for periodical emptying, or whether any of the other options has been adopted. The success of the latrine conversion should not be jeopardised by laxity in the operation and maintenance of the other parts of the entire system for which the local body is responsible.

26. The Seminar considered that in view of the dimension of the programme it was necessary that each state made an assessment of its manpower needs in respect of technical expertise and supervisory staff at the state and local levels for programme planning and implementation; social extension workers for motivation of the local households; and the peripheral staff of masons, plumbers and fitters etc. The strength of manpower of different categories and disciplines will have to be determined alongwith the contents and scheduling of the training programmes that call for proper pre-planning and organization.

27. The social, engineering and other aspects of the programme dictate the need for imparting special orientation training to the programme planning and direction personnel in promotional techniques, public relations, technology tailored to meet local needs and conditions, user habits and attitudes, financial and economic implications, funding methods and procedures and customer satisfaction. The field staff would require training on the types and designs and details of latrine parts and assembly, location of seat and leach pit, epidemiological and structural hazards in wrong siting of the units, precautions to be taken under varying conditions and the techniques of planning for materials, labour and construction in a continuing programme.

28. The establishment of the training centres with training aids, prototype models, manufacturing yards for parts and the development of a training faculty will form an important aspect of the training programme. As regards the agencies for training, the Seminar was of the view that the State Governments will have to take a decision in the light of local conditions and the availability of organizations or institutions such as the Harijan Sevak Sangh in Gujarat that could be entrusted with the task, or have its own set-up for training and orientation of the various categories and levels of staff.

29. The Seminar noted that the first step in formulation of a latrine conversion programme is to initiate a proper survey for data collection and status assessment in those states where information in this behalf is inadequate. Based on the information, a comprehensive programme of latrine conversion could be formulated. In addition, a well planned demonstration project should also be worked out as an integral part of the programme for each state. This project should not only serve as a demonstration unit but also help in establishing norms and finding solution to the various problems in implementation of the programme in the region.

30. The Seminar endorsed the view expressed by many participants that the states would welcome the assistance of the Central Government, WHO and UNICEF in the preparation of a statewide project with details of the several components in the manner required and the establishment of a demonstration unit as appropriate. The Seminar felt that the assistance/collaboration of WHO/UNICEF could be sought in preparing the project documents if so desired, as also in establishing and developing appropriate training centres, prototype models, training materials, and documentaries, including training of the faculty. Besides, the demonstration projects involve studies in several important aspects of the problem, of interest not only to India but also to other countries within and outside the Region facing similar problems. International agencies such as WHO, UNICEF, World Bank, UNEP and bilateral donor agencies such as IDRC may be willing and ready to assist and participate in the conduct of such studies, each in its own special sphere of interest. Their collaboration would be worth exploring. Loan assistance from the World Bank and funds from bilateral donor agencies for specific areas of the programme, may be sought against well prepared projects supported by the Government's capabilities in programme planning and implementation.

31. The programme claims recognition as a crucial phase of the International Drinking Water Supply and Sanitation Decade activity with safe excreta disposal as the main objective. The adaptability of the programme to cover the rural areas as a concurrent activity integrated with rural development, is an added factor in its favour. The subject has such a direct and vital bearing on the social advancement and economic productivity of the urban and rural communities that it will attract and retain international collaboration to match the needs of the member country.

32. The Seminar stressed the importance of adopting low-cost technology suited to the local needs and genius. This would imply a continuing research to seek refinements/improvements in the scope, content, methodology and implementation of the entire programme. An apex agency at the Centre and State level operating the programme should identify areas for research in the social, administrative, technical and operational phases and initiate measures for necessary investigation and research thereon, and also provide finances for such research work in coordination with the Ministries/Departments concerned.

33. In regard to information transfer the Seminar noted that there is an incredible lack of information flow and transfer of knowledge as between the several states on the problems faced or solutions pursued by each. It is therefore essential that the controlling agency in charge of the programme in each state identifies the areas for fruitful exchange of information and knowledge and establishes appropriate channels for proper liaison and data collection, appraisal, retrieval and exchange. Exchange of information and knowledge on a country wide basis and an invitation to external agencies to join in such a programme would be of mutual benefit.

34. The Seminar noted that even after the conversion of all bucket latrines into the water-seal type, about a third of the urban population would be left without the facility of water-seal sanitary latrines either at the home or at public location. This would still perpetuate the perils of urban insanitation and partly if not wholly nullify the efforts pursued under the latrine conversion programme. Provision of sanitary water-seal latrines for these pavement dwellers and latrineless households, either on individual or community basis should be an integral part of the total programme.

DETAILED PROGRAMME AND AGENDA

Thursday 25 May 1978

11-00 to 12-00

## INAUGURAL SESSION

National Anthem

Introductory Address: Dr N. Chaudhuri, Adviser  
(PHEE), Ministry of Works  
& Housing, Govt. of India

Inaugural Address: Shri Karpoori Thakur  
Chief Minister, Bihar

Messages from WHO &  
UNICEF

Chairman's Address: Mrs Sumitra Devi, Minister  
for Urban Development,  
Govt. of Bihar

Vote of Thanks: Shri K. Biswas, Director  
(U.D.) Union Ministry of  
Works & Housing

14-00 to 14-10

## ADOPTION OF AGENDA

(See Part III, Pages 24-50  
of Background paper for  
Agenda Notes)

14-10 to 18.30

## BUSINESS SESSION I

Chairman: Shri S.T. Khare,  
Chief Engineer, Environmental  
Engineering and Joint Secretary  
UD & PH Department, Government  
of Maharashtra

Presentation of  
Case Studies

- a) Latrine conversion work  
in Gujarat (including film  
show) by Shri Ishwarbhai  
Patel, Hony. Adviser to  
Government of Gujarat and  
Principal, Safai Vidyalaya,  
Ahmedabad
- b) Latrine conversion work in  
Bihar by Shri Bindeshwar  
Pathak, Secretary, Sulabh  
Shauchalaya Sansthan, Patna

Other states where similar  
Programmes are in Progress

Discussion of Agenda  
Items

1. The Problem in Perspective
2. Strategy
3. Sociological and Economic Aspects and Community Participation
4. Health, Pollution and Agricultural Aspects
5. Engineering Aspects

Friday 26 May 1978

6-30 to 8-30

FIELD SESSION

Field study by Participants of Programme in Patna under Implementation

9-30 to 13-30

BUSINESS SESSION II

Chairman: Shri P.H. Vaishnav, Joint Secretary, Planning Commission, Government of India

Discussion of Agenda  
Items (Contd.)

6. Financing and Management Aspects
7. Implementation Mechanism & Methodology
8. Manpower Training
9. Formulation of Demonstration Projects
10. International Collaboration
11. Appropriate Technology - Research - Information Transfer
12. Programme Monitoring and evaluation
13. Problem of latrineless households

Saturday 27 May 1978

8-30 to 10-00

BUSINESS SESSION III

Chairman: Shri S.K. Sinha, Principal Secretary, Urban Development Department, Govt. of Bihar

Adoption of Report and  
Recommendations

11-00 to 12-00

VALEDICTORY SESSION

Valedictory Address

Shri Ram Kinker  
Minister of State  
Ministry of Works & Housing  
Government of India

Chairman's Remarks

Shri Kapildeo Singh, Minister  
for Agriculture, Government  
of Bihar

Vote of thanks

Dr N. Chaudhuri, Adviser (PHEE)  
Ministry of Works & Housing  
Government of India

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WORLD HEALTH  
ORGANIZATION

REGIONAL OFFICE FOR  
SOUTH-EAST ASIA

BACKGROUND PAPER FOR  
NATIONAL SEMINAR  
ON  
CONVERSION OF BUCKET PRIVIES INTO SANITARY WATER-SEAL LATRINES

CONVENED BY

THE MINISTRY OF WORKS AND HOUSING  
GOVERNMENT OF INDIA  
(CENTRAL PUBLIC HEALTH AND ENVIRONMENTAL  
ENGINEERING ORGANIZATION)

IN COLLABORATION WITH WHO & UNICEF

PATNA, BIHAR  
25-27 MAY 1978

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## PART I

### 1. INTRODUCTION

1.1 History and culture ignored the lavatory in the architectural traditions of the Indian home. Returning human excreta direct on to the soil was a matter of habit and convenience before the advent of modern civilization. The phenomenon of rapid urbanization brought home the need for a house latrine. It was however, an evil genius who devised the bucket system in which groups of human beings make house to house collection of human excreta in buckets and baskets; carry them on the head, on the shoulder, or in the hand; deposit the night-soil in roadside dumps; reload it on trucks with shovels and baskets; deposit it in pits for trenching and composting; and remove the material for final disposal.

1.2 Even so, the household bucket privy is beyond the reach of the urban poor, - the pavement dwellers, those in slum areas and fringe area hutments, - the victims of unplanned industrialization. Open defecation by them, in roadside drains, along lanes, by-lanes and on the nearest accessible open land, has become a chronic feature of urban insanitation and a hazard to community health.

1.3 Urban sewerage as the final solution to the bucket system is unable to claim high priority in the national plans because of the heavy investment involved. Only about 200 out of the total number of some 3000 towns have sewerage systems but most of these are partial and serve not more than 10-50% of the design population. A parallel conservancy system has to serve the bucket privies in the unsewered pockets of such sewerred towns.

1.4 The operation of a conservancy system is decidedly vulnerable. Its fatal weakness lies in the employment of human beings in such demeaning work, to which its very beneficiaries attach a social stigma. The stigma perpetuates a hereditary service by a poor, sullen and unwilling labour. Increasing wages, decreasing efficiency, and mounting tensions constantly plague the service. In certain places, the scavengers are required to do their work between 10.00 p.m. and 4.00 a.m. so as not to wound the aesthetic susceptibilities of the citizens. There is no doubt that long familiarity with the scavenging service has atrophied the sensitivity of many to its human aspects.

1.5 Man's environment exerts a latent influence on his thoughts and habits. His social and cultural development will respond to the removal of environmental deterrents to personal hygiene and community health. The urban householder is unable to order proper priorities in the implementation of civic facilities. Merely to provide him with a water supply and continue the bucket latrine system is a socio-cultural distortion in planning and development. Between the elegant reception room and the primitive dry latrine in one and the same house there is a cultural gap of well nigh a century\*. One third of all urban households reportedly have no latrines, another third have to put up with bucket service latrines. The community is thus placed in a state of perpetual discomfort, is preoccupied with fighting disease, and lacking a sense of well being.

1.6 The elimination of the conservancy system and the provision of household water-seal latrines accordingly merits over-riding priority from all standpoints. The following status appraisal seeks to expose the different facets of the problem and indicate a strategy for its solution.

2. STATISTICAL DATA

2.1 Households with and without latrine facilities

Based on the survey of housing conditions conducted by the National Sample Survey (NSS) in 1973-74, the percentage distribution of households by availability of latrine facilities and by State is shown in Annex I. The percentage distribution of households by type of latrine and by the facility for its use is shown in Annex II. Annex III shows, as an illustration, the population, number of houses and households, and the number of waterborne, service and other types of latrines in respect of major cities in the five states of Punjab, Bihar, Madhya Pradesh, Orissa and Karnataka (census of India 1971 Part VI-A State Town Directories). The details reveal the following points of interest:

- a) 92.4% of the rural households had no latrines at all.
- b) one-third of the urban households had no latrines whatsoever; the percentage was higher, 40 or over, in nine of the major states and two Union Territories; it was lower, around 15, in West Bengal and Assam.
- c) another one third of the urban households had bucket service latrines.
- d) in the case of the remaining 34% of urban households, 7.2% had exclusive use of flush latrines (connected to sewers), about 21% shared household or community flush latrines, and 5.7% had exclusive use of septic tank latrines.
- e) the figures from Annex III reveal a preponderance of bucket service latrines. The number of water-borne latrines and service privies was 9033 and 66002 in Amritsar, 6255 and 48550 in Ludhiana, 1316 and 45000 in Jullundar, Punjab.

International Reference Centre  
for Community Water Supply

- f) the position is somewhat better in other States but service privies are the common type except in a few metropolitan and industrial cities.
- g) in effect, one third of the estimated urban population of 120 million, in 1973-74 i.e. 40 million, or roughly 7 million households are using service latrines which need conversion into water-seal latrines; while another 7 million households which have no latrines, remain to be provided with new sanitary latrines.
- h) The number of persons using bucket latrines in the country is increasing every year.

## 2.2 Housing space availability vs. latrine facilities

The absence of any latrine facility in a sizeable proportion (one-third of urban households) is explained by the figures shown in Annexures IV and V. According to the NSS for 1973-74, 53.2 percent of urban households had only one living room while 7.2 percent had some sort of accommodation but no living room as such. Also the expenditure level of 37.6 percent of urban households was at Rs.55 per capita per month, the criterion for poverty measurement at the then prevailing prices. Again, about 58.5 percent of the households (with 5.5 to 6 members each) had a monthly expenditure ranging from Rs.400 down to nil, spending not more than Rs.10/- per month as house rent. What proportion of such households can accommodate a sanitary house latrine and also afford to pay part of its cost as a one time investment is a matter for closer study in the context of varying local conditions. Nevertheless the provision of sanitary community latrines, suitably devised, may be the solution to a majority of such households. After all, toilet facilities at the house are inevitably constrained by the practical limitations of the housing problem as such.

### 2.3 Projections up to 2001

The projected growth of the urban population on the basis of a diminishing birth rate is as under:

Year	Total population (million)	Urban population (million)	Percent of growth rate on 1971	
			Rural	Urban
1931		33		
1961		79		
1971	548	109		
1981	668	150	18.1	37.6
1991	801	205	36.1	88.1
2001	945	278	52.3	155.0

Roughly 34% of the urban population (1975) was reportedly provided with a sewer system but the NSS revealed that only 7.2% households had flush latrines connected to sewers individually, and 12.5% jointly. By 1981 about 60% of 150 million or 90 million urban population will be in need of sewer systems. By 2001 an additional population of 128 million would have joined the queue. If the provision of water-seal latrines in urban households were to await the completion of sewer systems in the respective cities, the investment called for would be so heavy that the objective could not be realized within a foreseeable time and the goal will prove to be unrealistic. A continuance of the status quo on the other hand is fraught with serious public health hazards and intractable human problems. It is therefore imperative to devise a strategy by which the provision of sanitary water-seal latrines could be completed under a timebound programme, independent of the pace of the sewer system planning. This covers not only households with bucket privies but also households without any latrines at present. A programme of bucket privy conversion should also hopefully provide practical options to solve the problem of households without latrines as a concurrent reform.

### 3. REVIEW OF EFFORTS TO ELIMINATE BUCKET LATRINES

#### 3.1 Past Studies

3.1.1 The earlier concepts linked up water-seal toilets in urban households with the provision of urban sewerage systems, although the planning of such systems did

not provide for house connexions as a concurrent activity. Nevertheless the evolution of low-cost designs for suitable types of water-seal privies and latrine structure was directed towards rural sanitation in the past. The three Research-cum-Action (RCA) centres aided by the Ford Foundation in the fifties oriented their studies towards rural needs. Their application was limited, however, to a few rural areas only in the absence of a major field programme.

3.1.2 The Planning Research Action Institute (PRAI) Lucknow has also carried out studies on modified designs for latrine and other aspects of rural sanitation with WHO/UNICEF aid.

3.1.3 The All India Institute of Hygiene and Public Health (AIIPH) Calcutta, has carried out through the Singhur Centre, a number of useful experiments bearing on water-seal privies and disposal systems.

3.1.4 The Indian Council of Medical Research has supported investigations on the "safe distance" permissible in subsurface dispersion of septic tank effluents near drinking water wells.

3.1.5 A mass of useful data on different types of sanitary privies with spot disposal of excreta is given in WHO Monograph Series No. 39, 1958. Although conceived for rural areas and small communities, the details are applicable, with suitable adaptations, to urban households.

### 3.2 Efforts to promote Bhangi\* Welfare

3.2.1 The Report of the Backward classes Commission was brought to the attention of the State Governments by the Union Ministry of Home Affairs in their letter of October 1956, pointing out that:

- the condition of the Bhangis\* was extremely miserable and their betterment was a crying need.
- though their earnings when compared to the average income of the common people was not very low, their living conditions were deplorable.

\*Scavenger

- hand collection and head carriage of night soil should be obviated by mechanical cleaning of latrines, and provision of "sewers, drains etc. on a larger scale".
- training in cleanliness and hygiene and provision of better housing would improve their living standard and help their absorption in society.

3.2.2 The same approach marked the Malkani Committee Report which followed. The Committee recognised that "the best system for the disposal of night soil..... is the flush-out latrine but unfortunately ..... requires lot of funds and seems outside the scope of practicability in the foreseeable future".

3.2.3 The assumed inevitability of the bucket latrine in the absence of a sewer system motivated the pursuit of palliative measures. Earlier and subsequent attempts at reform had the welfare objective of "Bhangi Kasht Mukti\*\*" and sought to make the conservancy service a "cleaner" operation by providing the scavenger with gloves, gum boots, collection implements, covered buckets and wheel barrows for which government financial aid was provided through the sixties. The strategy, however, practically failed to have any impact. Essentially it was a treatment of the symptom rather than the disease.

### 3.3 Government's Initiative towards Bhangi Mukti\*\*

3.3.1 Emphasis was then shifted to total "Bhangi Mukti" with an impetus provided by the Gandhi Centenary. To promote speedy addition of house connexions to sewer systems the Government of India in an order dated 19 July 1967 (Annex VI) offered a 25% subsidy and 75% loan assistance recoverable in easy instalments on the cost of conversion of dry latrines into water-flushed latrines and their connexion to public sewers; individual house sewerlines from the public sewer up to property boundary were also permitted to be included as part of the sewerage system if agreeable to the local authority.

\* Amelioration of Scavenging service  
\*\*Emancipation of Scavengers

3.3.2 The matter received further emphasis in the Government of India's order of 10 June 1968 (Annex VII), to promote a special campaign for conversion of dry latrines into flush-out latrines. To "achieve maximum success" it was suggested that:

- no new building should be allowed without provision of flush-out latrines. (It was also pointed out that a flush-out latrine in a house does not involve heavy expenditure).
- compulsory connexions of house latrines to sewers should be legally enforced in sewered areas.
- a special drive should be launched in selected unsewered areas to convert dry latrines into water-seal latrines connected to septic tanks or leaching pits (A small brochure for cheap hand-flushed latrines was also furnished).

3.3.3 The above order urged municipalities to prepare schemes in this behalf and submit them to the State Government for sanction under the pattern of assistance referred to. However there has been no tangible progress through the past decade in most of the States presumably because there was no suitable mechanism to provide the initiative, guidance and direction necessary to plan and implement a programme of this nature.

3.3.4 The subject received more specific attention in 1975 under a centrally sponsored scheme with 100% grant assistance as set out in Government of India's order No. Q-11019/8/74-PHE of 22 March 1975 (Annex VIII). It envisaged a pilot project to cover 30 selected towns in the country, each having a population in the range of 20,000 to 50,000 and also a minimum water supply of 25 gals/- capita/day and provided for the following:

- a) 100% grant to the selected local body to provide septic tanks at convenient locations, each to serve 300-500

people; sewers to lead the septic effluents to collection wells or oxidation ponds; and a mobile vacuum van to empty the wells and transport the effluent to disposal sites.

- b) The State Government has to provide for:
  - i) 100% loan to householders with monthly income below Rs.350/- to cover the cost of latrine conversion and connexion to the sewer, recoverable with interest in five years.
  - ii) loan to cover up to 50% of such cost to householders whose monthly income exceeds Rs.350/-, to be recovered with interest in 2 years.
- c) a scavenging/sewage tax of not less than 1% of the rateable value of property to be levied by the local body to meet the maintenance of the system.

A symbolic provision of Rs. 4.4 crores was included in the Central Sector under the Fifth Five Year Plan for the pilot project. The scheme makes latrine conversion contingent on a sewer system to deal with all domestic liquid wastes; it helps the local body with a 100% grant and the houseowner with a loan of 50% or 100% of his expenses. Even should the project meet with success - partial or full - its replicability to all urban areas is doubtful. Storage and mechanised transport of the entire domestic liquid waste of the community (about 100 lpcd) may also pose practical problems.

### 3.4 Catalytic Efforts of Social Organisations

3.4.1 The pioneering work of the Harijan Sewak Sangh in Gujarat to promote Bhangi Mukti through the sixties, provided a catalytic influence and laid the foundation for a progressive latrine conversion programme being pursued by the State Government, the Gandhi Centenary providing the impetus. Government's activities in programme planning and implementation have been marked by promotional and socio-logical inputs by the voluntary organization in popularizing and consolidating the programme, at all stages. This success story provided by Gujarat is dealt with separately.

3.4.2 Bihar provides a similar instance of a more dynamic nature. The Bihar Gandhi Centenary Committee gave top priority in 1967 to the Bhangi Mukti programme and also identified latrine conversion as the quickest and most effective way of achieving the objective. Initial pioneering and demonstration work and the emergence of Sulabh Shauchalaya Sansthan with a nucleus of trained workers led to a dynamic programme of latrine conversion in Patna city and other municipalities from 1973. The details of the "Bihar Case Study" are discussed separately.

3.4.3 A scheme in Kerala was launched at about the same time. The State Government made it compulsory on the local bodies to get all bucket latrines converted. 15 out of the 25 municipalities and 3 corporations in the State had reportedly eliminated the scavenging service by the end of the Gandhi Centenary celebration year. The popularization of the household water-seal latrine had been gaining ground during the sixties in rural and semi-urban areas as well, thanks to the high level of literacy and personal hygiene of the communities, and the farmyard pattern of housing. To what extent the results are replicable elsewhere remains to be examined.

3.4.4 In Maharashtra the Gandhi Smarak Nidhi gave priority to rural sanitation and bucket latrines in urban areas continue to pose increasing problems.

3.4.5 Significantly enough, the problem of providing sanitary latrines to households without any latrines has not received any attention. For the Social and Voluntary Organizations the problem is not connected with Bhangi Mukti. For the Governments it has no relevance to the legal obligation on the local body to provide for household excreta disposal through a conservancy service.

3.5 Other Programmes proposed/in progress by State Governments

3.5.1 The RCA Project at Poonamalle Madras was implementing in 1974 a programme of conversion of dry latrines into water-seal sanitary latrines, in selected Panchayat areas in the Chingleput, Thanjavur, Madurai and Tirunelveli districts of Tamil Nadu, under an order of the State Government extending financial assistance. The conversion programme aimed at survey and selection of households, promotion work, engineering assistance, supply of parts and supervision of installations, with a government subsidy of Rs.145/- per installation. By October 1976, some 6000 latrines had been converted. These were however provided mostly in the semi-urban areas.

3.5.2 The Rajasthan Government has by an order dated September 1977, directed the municipalities to make provision in their own budgets to convert 106200 latrines each year at Rs.300 per latrine as follows:

Different categories of municipalities	Number	Amount to be provided by each Rs.	Total each year Rs.	Number of latrines to be converted
I	14	6,00,000	84,00,000	28,000
II	32	3,00,000	96,00,000	32,000
III	60	1,50,000	90,00,000	30,000
IV	81	60,000	48,60,000	16,000
Total	187		3,18,60,000	1,06,000

It is a laudable proposal based on a priority objective to be realized through a time-bound programme. The mechanics and working details of the programme are yet to be formulated for implementation. An area of concern is the doubtful ability of the municipalities to shoulder the financial burden on their own.

3.5.3 In 1974, the Calcutta Metropolitan Development Authority (CMDA) started, a programme of bucket latrine conversion of individual houses. This is in addition to provision of community latrines in the slum areas. About 40,000 conversions have been carried out since then. The cost per conversion is Rs.1,700/- which is high because, while carrying out the conversion, a new prefabricated room is provided for the toilet, replacing the old delapidated latrine chamber.

Only 25% of the cost is borne by the beneficiaries and the rest is given as a grant by the CMDA. It might not be possible for all local authorities to sustain this high subsidy.

PART II

4. AN APPRAISAL OF THE GUJARAT PROGRAMME

4.1 Initial Motivation

The urban areas of Gujarat include 4 Corporations, 51 Municipalities, 59 Nagar Panchayats and 46 Big Gram Panchayats. The total number of bucket latrines (excepting the Corporations) were 187,701 in 1964. About 5,000 scavengers (and 13,000 sweepers) were engaged in the nightsoil conservancy service.

4.2 The Safai Vidyalaya established by the Harijan Sevak Sangh at Gandhi Ashram Ahmedabad, under the charge of Shri Ishwarbhai Patel, had been doing pioneering work through the Sixties on Bhangi Kasht Mukti with special emphasis on the conversion of bucket latrines as the means to achieve Bhangi emancipation. It had prepared literature to popularise the different types of water flushed latrines, and installed prototypes within its compound as training aids. The initial impact achieved by the Safai Vidyalaya prompted the State Government to formulate a constructive programme for latrine conversion following a policy decision in this behalf. A beginning was made in 1963 to abolish the scavenging service and instructions were issued to all local bodies to convert existing dry latrines into water-seal latrines and to ban the construction of any new dry latrines.

4.3 Inputs by a Social Agency

An innovative step was taken by the Government to appoint the Principal of the Safai Vidyalaya as its Honourary Adviser with the Govt. Panchayat and Health Department, to ensure effective and speedy implementation of the latrine conversion programme by promotional work and liaison with the local bodies, and guiding and monitoring the programme activities. The close association and active involvement of a non-official social agency has added a special dimension to the programme and has helped to strengthen and supplement departmental activities in crucial areas

of programme implementation. The Adviser has played a strategic role in generating popular motivation and support and advising the Government on policy and procedures to suit the needs of the programme during its progress. He carries out inspection tours and is helped by 18 field supervisors, one in each district for extension and supervision. The Safai Vidyalaya is utilized as a training centre for sanitary inspectors, overseers, municipal workers and prospective construction contractors so that an increasing manpower strength is developed with the necessary skills for effective field work.

#### 4.4 Progress Achieved

In the initial preparatory period between 1964 and 1969, 23,224 dry latrines had been converted under this programme. The Government then gave it a special weightage during the Gandhi centenary. As a result 74,105 latrines were converted during the five year period 1969-1974 and another 26,612 up to end of 1976-77. The number of dry latrines remaining to be converted into water-seal latrines was 45,392 comprising 38,884 in municipal and 6,508 in panchayat areas.

#### 4.5 Cost sharing

In the earlier stages of the programme, the houseowner was granted a subsidy of Rs.50/- each by the Government and the local body towards the cost of the conversion. As from April 1972 however the subsidy has been raised to Rs.100/- each leaving the houseowner to meet the remaining share of Rs.200/- towards the cost, estimated at Rs.400. This latter figure has recently been increased to Rs.550/-. He has also to meet any excess over this estimated cost for the conversion. The subsidy is granted only to private latrine owners and not for

public latrines, nor for any dry latrines constructed after 31 March 1970. Local bodies are also given loans on request for 50 per cent of the total conversion cost of public latrines, and a 100 per cent loan to meet their subsidy to provide latrine owners for the conversion if the municipal funds cannot provide for the subsidy.

4.6 Government has also permitted municipalities to give their part of the subsidy in kind instead of cash, e.g., pans, traps, pipes, slabs, cement, etc., to private latrine owners if they so desire, and as a means to promote the programme. The essential commodity, e.g., cement, is also provided to municipalities on priority basis.

4.7 During the Five Year Plan period 1974-75 to 1978-79, the proposal is to convert all the remaining dry latrines into water-seal latrines and thereby put an end to the conservancy service as such. Until such a result is achieved, the municipalities will continue to receive financial aid from the Government for the purchase of various implements, wheel - barrows, handcarts, gumboots, buckets, scrapers, through the Social Welfare Department.

#### 4.8 Rehabilitation aspects

A special feature of the programme is the gradual rehabilitation of the uprooted scavengers into other fields of employment, and also training them for engaging in other skills. Where private scavenging was a hereditary right (with prescriptive rights over the collections from houses being bequeathed from father to son/daughter), compensation was to be paid to the dispossessed party in addition to providing employment opportunities.

#### 4.9 Bylaws and procedures

Under the relevant provisions contained in the Gujarat Municipal Act the State Government issued model bylaws for municipalities (Annex IX)

for conversion of basket type latrines into waterborne latrines, in 1963. Model additional bylaws were later issued in 1967 relating to construction of aqua-privies, water closets connected to septic tanks, bavla type latrines or PRAI type latrines. Some of the bylaws again were amended/replaced by new bylaws in 1972. At the end of 1977, there were 15 urban local bodies where the system of nightsoil carriage as a headload is still being continued. As a measure of speeding up the conversion programme, the State Government proposes to insert a provision in the Act which will legally compel the owners of dry latrines to convert such latrines failing which, it will be permitted to be carried out by the tenants or the local body at the risk and cost of the owners. However, while the 1963 Act provided for conversion of existing dry latrines, there is no statutory provision to enforce a latrine as such in the house.

#### 4.10 Areas of concern

The following points would merit consideration:

4.10.1 To what extent does the Programme in Gujarat owe its success to the supporting inputs from the non-official Adviser-Agency? Is this approach replicable elsewhere? Bearing in mind that the Harijan Sevak Sangh operates in every State, what are the factors which made latrine conversion the object of special attention in Gujarat and not elsewhere? (The case of Bihar is dealt with separately.) Concededly, the State Government was dedicated to the cause and committed to the programme; the non-official agency provided the catalytic influence, with its experience, expertise and voluntary involvement; the local bodies too were motivated and receptive to the programme; personal dedication and drive by the advisory agencies gave the necessary stimulus.

The programme made a good start and gathered momentum, with mutually complementary inputs by the different agencies involved. The training of the field task forces at the Safai Vidyalaya was an essential part of the planning.

4.10.2 The pace of the programme was constrained by the availability of technical staff at the local body level, and the procedure followed for preparation and submission of documents by the latrine owner and their approval prior to disbursement of subsidy by the local body. Apparently this part of the programme could be speeded up by the executing agency taking over the preparatory functions for and on behalf of the owner.

4.10.3 The latrine owner is given the onus of securing the construction agency, and the needed materials and ensuring the follow up activities. Could this be an impediment to quicker progress?

4.10.4 The programme would seem to suffer from lack of technical supervision, guidance and surveillance of the operations, except by the Honorary Adviser functioning as the Head of Department with 18 workers one for each district. The location of the latrine and leach pit, the size, depth and structure of the leach pit, proximity of handpump points and street water mains, are factors which call for a more discerning judgement than a rule of thumb approach. It is possible they do receive competent attention but certain questions may arise: why should the leach pit be 8-12 ft. deep; can the pan have a steeper slope and a smaller depth of water-seal; is a follow-up action possible to assess the extent and degree of subsurface dispersion; is there a coordinating technical unit to research and discover least cost solutions for different situations?.

4.11 Financial Aspects

Annex X shows the break-up of the estimated cost of a latrine conversion, and the incidence of the financial burden on the local body and the householder. Concededly the programme is financially viable and also profitable to the parties concerned.

5. AN APPRAISAL OF THE BIHAR PROGRAMME

Initial ground work by Social Agency

5.1 The pioneering activity of the Sulabh Shanchalaya Sansthan (SSS), a voluntary organization which was registered in Patna in 1970, provided the catalytic influence which eventually led to a Statewide Government programme of latrine conversion. The SSS was itself the product of the Gandhi Centenary Committee which had engaged a band of workers and trained them in the latrine conversion work. The first dry latrine converted by this agency was in September 1973 in Arrah, which was followed by the conversion of some 400 dry latrines in that municipality in 1973-74. The Bihar Government later issued an order in April 1974 to the effect that the SSS be entrusted with the work of conversion of dry latrines. It was followed by an ordinance banning the provision of new service latrines in the State, and circulars to local bodies to implement a vigorous programme of latrine conversion.

5.2 It would appear that municipalities in Bihar had spent about Rs.40 lakhs during the period 1961-1976 on the abolition of service latrines without any tangible results. It highlighted the need for formulating a realistic timebound programme for latrine conversion on well organized lines. The SSS had developed a standard design of a hand-flush latrine based on the RCA studies and recommendations. A special type of pan and water seal trap is connected to two pits each

3 ft. square and 4 or 5 ft deep. The top of the leaching pit is at or just below ground level. The latrine conversion cost is estimated at an average of Rs.400/- for each latrine. The SSS organised itself as a promotional and executing agency for the programme.

Programme Implementation Methodology

5.3 Sulabh Shanchalaya Sansthan carries out a house-to-house survey on dry latrines, and provides the motivation for the house owner to apply for his latrine conversion. The Government gives a grant of Rs.200/- and a loan of Rs.200/- to the house owner for such conversion, through the municipal committee of the area concerned, the loan being repayable in 15 instalments. The SSS takes over, for and on behalf of the applicant however, compliance with all the formalities to secure the grant and loan. It submits to the municipal committee an agreement in standard form signed by the house owner agreeing to repay the loan and an authorisation to the SSS to receive the grant and loan on his behalf. He also signs an agreement to entrust the work to the SSS. The SSS keeps close liaison with the local body to get the application processed, after individual verification of all such house owners, until the payment is received. The agency thereafter arranges to collect the necessary materials and carries out the conversion work through its own trained masons and labour. The house owner is given a work progress card specifying the dates of commencement and completion of the work and also a warrantee card, on completion, for troublefree service of the converted latrine for five years, any defects being rectified at the cost of the SSS. A close liaison is kept with him as a follow-up action.

5.4 The following conveys an idea of the physical performance achieved between 1973-74 and 1977-78:

- The State Government has given Rs.11.20 million to various local bodies between 1974-78 of which the SSS has received Rs.6.2 million for latrine conversion work, in addition to Rs.2.07 million from the local bodies from their own funds. Work for the remaining Rs.5.0 million is on hand and is likely to be completed by June 1978.
- Over 50,000 latrine conversions have been completed between 1974-1978, in various towns of Bihar, about 15,000 of which are in Patna city alone; another 33,180 dry latrines are expected to be completed by June 1978.
- The SSS has also completed 2,324 seats of Public latrines in municipal areas and Public Institutions at a total cost of Rs.2.174 million.
- 500 out of a total 950 scavengers in Patna city have been freed from conservancy service; some 200 out of 250 scavengers in Ranchi; and about 100 scavengers in other towns.

5.5 Public latrines under this programme have proved to be popular. A 20 seat latrine costs the local body about Rs.30,000/- including the superstructure. Baths are provided as an adjunct in strategic places. The SSS undertakes the maintenance of the Public latrines cum baths. A twenty-four hour attendant service is provided to ensure cleanliness of the latrines under use, to provide user assistance, and keep proper maintenance. A nominal fee of 5 paise is levied per user (excluding women and children) and another 5 paise for providing soap on request. The receipts and accounts in respect of the public latrines/baths are looked after by a committee of local citizens.

Community participation

5.6 The conversion of the dry latrine into a water-seal privy is a welcome relief to the house owner from all standpoints. It is not surprising therefore that the programme has been making good progress. The latrine owner was in need of a physical solution to his problems more than of any education in health or sociology on the hazards posed by his dry latrine. Likewise the open air latrine near the Gandhi Maidan in Patna had been a product of compulsive user in the absence of any alternative until the provision of a water-seal public latrine and bath transformed the place beyond recognition. The location of public conveniences near railway stations, bus stops, government offices, hospitals, markets, and places frequented by itinerant populations underwrites community participation if only because they meet felt needs. Their continued maintenance in a clean and sanitary condition ensures a growing popularity for their use. The tools with which community participation is attracted in this programme are the character and functional role of the executing agency, the inherent acceptability of the conversion, and the financial and procedural aid extended to the house owner.

Financial implications

5.7 The SSS maintains itself by taking 10% of the total cost of work executed by it on a no loss no profit basis. This is a reasonable fee for the multifarious services the house owner receives from the SSS.

The following financial analysis in respect of Ranchi municipality will be of interest:

- 250 scavengers, each paid a monthly salary of Rs.250/-, service a total of 10,000 bucket latrines, their annual pay bill alone amounting to Rs.7.5 lakhs.
- Mechanised transport and disposal charges are reported to be Rs.1 lakh per annum.
- The total investment on 10,000 latrines conversion is Rs.20 lakhs as grant and Rs.20 lakhs as loan.
- Other things being equal the grant can be retrieved in 2-1/2 years, and the loan in another 2-1/2 years.
- The rehabilitation and re-employment of the relieved scavengers will be a diminishing financial burden to the municipality. The conversion is of striking advantage to the local body from any standpoint.
- For the house owner the retirement of the loan of Rs.200/- would call for a yearly payment of about Rs.32/- over a 10 year period, at the high interest of 10%; with a lower rate say 6% the repayment burden will be reduced to about Rs.2/- only per month.

Spheres for critical study

5.8 Despite the encouraging progress made, programme implementation to date raises the following issues for consideration:

5.8.1 Within the budgetary allocations provided by the State Government and the local bodies, the momentum for the programme is generated by the SSS, without the involvement of any technical agency of the State or the local body at any stage of its field activities. The size, shape and

surface smoothness of the pan, the detail of the trap and waterseal, the location of the seat and the leaching pits within the house plinth, from the standpoint of structural hazards, juxtaposition of water sources (wells, filter points etc) and water mains with reference to the pollution zones from the leach pit (vertical and horizontal) efficiency of flushing, quality of the construction work, and related aspects, are all left to the judgement and competence of the executing agency. A critical evaluation of all these aspects has not been made a part of the programme. The top level of the effluent in the leach pit with respect to the level and proximity of the municipal water mains and house connexion pipes is a potential factor to cause any adventitious pollution of the water supply. The size and depth of the leach pits and the exit area for dispersion of effluent into the soil, again, are apparently based on rule of thumb assumptions. A degree of technical control, monitoring and guidance with provision for concurrent research on the functional performance of the units under varying local conditions would be necessary to ensure the soundness of the programme as a long-term measure.

5.8.2 The Bihar experiment carries greater dynamism in comparison with the Gujarat experience. The role of the SSS as a unitary agency to assume all the functions of the house-holder in processing, organizing and constructing the work is undoubtedly a major contributory factor. Is it possible and necessary to repeat this method elsewhere? Is it better to encourage more than one agency to share the work on a competitive basis? To what extent is the Bihar experiment replicable elsewhere?

PART III

6. PROBLEM ANALYSIS

6.1 The Problem in Perspective

The status appraisal of the problem under Parts I and II has brought into focus the following major issues for consideration.

6.1.1 One third of all urban households currently have no latrines; another third have to put up with bucket service latrines; the remaining third are served by shared flush latrines for 21%, individual flush latrines for 7.2% connected to sewers and 5.7% to septic tank latrines for 5.2%. In effect 7 million households have bucket latrines which are to be replaced by water-seal latrines and another 7 million households without latrines require to be provided with such facilities.

6.1.2 By 1981, 90 million people will be in need of sewer systems; and by 2001 an additional population of 128 million would have joined the queue. If the provision of water-seal latrines were to await the completion of sewer systems, the objective could not be realised within a foreseeable time and the goal will become unrealistic. A continuance of the status quo on the other hand is fraught with serious public health hazards and intractable human problems.

6.1.3 Past efforts at latrine conversion by the Government were constrained by the concept that sewer systems were indispensable for installing flush latrines. Even a centrally sponsored latrine conversion programme envisaged pilot projects in selected towns where local bodies were to provide sewers (to deal with all domestic liquid wastes) with 100% grant (from the Centre) but the houseowners were expected to construct their flush latrines with only a loan assistance.

6.1.4 About 58.5% of the households (with 5.5 to 6 members each) had a monthly expenditure ranging from Rs.400 down to nil, spending not more than Rs.10/- per month as house rent. What proportion of such households

can accommodate a sanitary latrine and also afford to pay part of its cost is a moot point.

## 6.2 Strategy

6.2.1 The elimination of the conservancy system and provision of household water-seal latrines concededly merits over-riding priority from all stand-points. It is imperative to devise a strategy and a plan of action. This strategy should contain provisions:

1. to convert all bucket privies into water-seal latrines in all urban households to be completed under a time-bound programme, independent of the pace of sewer system planning by:
  - a) connecting to an existing sewerage system where ever it is conveniently possible;
  - b) provision of a septic tank with soakage pits or leaching pits where sewerage does not exist, and
  - c) provision of individual sanitary latrines in households where toilet facilities do not exist.
2. to provide sanitary community latrines which will meet the needs of households which cannot accommodate individual latrines.
3. rehabilitate the scavengers displaced by the elimination of the conservancy system.

## 6.3 Sociological and Economic Aspects - Community Participation

6.3.1 The success of the programme will depend on its acceptance by an informed urban community and the degree of social emancipation and economic betterment it confers on the scavenger community. The urban householder with a bucket latrine looks upon it as only a necessary evil. Sociologically he is conditioned to prefer a water-seal privy, provided the cost of conversion does not become an economic deterrent by itself. Where the conservancy service is heavily subsidised by the municipality by paying each scavenger a monthly salary of Rs.250/- but recovering only Rs.50/- through service charges collected from the 30-40 households served by each scavenger, the local body itself is making the bucket latrine financially the more attractive. The fact that his subsidy of Rs.200/- per month per scavenger is met from the general revenues of the local body contri-

buted by the very houseowner as property tax and other levies is seldom realised. When the cost of conversion into a water-seal latrine is also subsidised, as in Gujarat and Bihar; the notional economic disadvantage in such conversion is removed and the programme has made spectacular headway.

6.3.2 The latrineless householder again is handicapped by his economic limitations rather than any sociological inertia. When the housing area precludes the provision of an individual latrine - be it bucket type or water-seal-legal injunctions against open defecation become ineffective and punitive action unfeasible. If community latrines are the solution to such householders, the urban poor can be credited with a preference for the water-seal type over the bucket type. The dramatic transformation of the Gandhi Maidan\* area from an open air latrine due to the installation of a popular flush out community latrine and bath reflects the measure of community participation in a programme where local felt needs are met by salutary / solutions.

6.3.3 In regard to the behavioural attitude of the scavenger community the social worker was confronted at the very outset with the question whether the scavengers themselves were willing to be emancipated. The resistance arose apparently from two factors: social and psychological, and economic. Scavenging has been a way of life for the family. A fatalistic attitude prevailed the whole outlook due to the lack of education and the absence of other openings for employment. The resistance to change was illustrated by the extremely slow progress towards the abolition of carrying night-soil as headloads. A strong movement for social reform and a series of measures of assistance and employment reservations have had some impact but the vast majority of sweepers and scavengers continue in the old state of backwardness.

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\*at Patna, Bihar

6.3.4 The main objection to the abolition of dry latrines has been economic, arising out of fear of loss of hereditary means of livelihood on an assured and permanent basis. The collection of night-soil is carried out by the municipal agency itself in the eastern states and in a large number of municipalities in some other states. In Patna for instance the municipal corporation employed 1000 scavengers to clean 35,000 latrines - an average of 35 to 40 latrines per head per day. But in a number of states such as Punjab, Rajasthan, Delhi, Uttar Pradesh, Madhya Pradesh and parts of Gujarat, there is prevalent a system of customary rights popularly known as 'Gharaki, jagirdari, jajmani' etc. which include:

- exclusive rights of certain scavenger families to clean latrines in specified households and localities, and
- the right to sell and dispose of night soil and other rubbish collected by the respective scavengers.

The\* Malkani Committee pointed out that "scavengers doing cleaning work in private households either on their own or under the employ of some other scavengers have come to possess these rights according to which they retain, sell or mortgage the rights in the same manner as one does with one's property". The Committee took note of some cases of these rights having been raised in courts of law in the states of Punjab, Uttar Pradesh and Gujarat. Although the customary rights are not enforceable in law as between the householder and the scavenger, the Committee recommended compensation for loss of customary rights either in cash, or by employment in the municipal services.

6.3.5 Unemployment due to conversion of dry latrines in Gujarat and Bihar where the cleaning of service latrines is taken up by municipalities, has been avoided by a policy of no retrenchment and gradual absorption in vacancies. In the case of two municipalities in Gujarat where 'Gharaki'

\*set up by Government of India in 1957.

system was in vogue it was possible to give compensation of Rs.3 to Rs.10 per latrine to the scavengers concerned or offering alternative employment in municipal service. However a bolder and forward looking policy is needed on the part of State Governments and local bodies to include mass education, preferential appointment and promotions as appropriate, and vocational training for other skills.

#### 6.4 Health, Pollution and Agricultural Aspects

6.4.1 It is common knowledge that human excreta is the reservoir of the causative agents of enteric diseases such as cholera, dysenteries, typhoid and paratyphoid fevers, infectious hepatitis, hook-worm, ascariasis and other infestations. The excreta of people suffering from these diseases and in some cases from the carriers with no symptoms of the disease contain large numbers of the disease germs. If the excreta are not properly segregated, collected and disposed of, they gain access to water supplies, contaminate food through flies and propagate hook-worm and other worms through soil pollution. Consumption of the polluted water and contaminated food and exposure of the population to polluted soil results in transmission of the disease germs from the sick and the carriers to the healthy in the community. One of the most effective measures for combating enteric diseases is to create a barrier to break the chain of events responsible for transmission of disease. Proper disposal of human excreta is the most important measure for the control of enteric diseases.

6.4.2 Excreta also contain readily putrescible materials which are responsible for bad odours and obnoxious conditions. Decomposing excreta also provide an ideal breeding ground for flies, an important vehicle for the transmission of enteric diseases. Proper disposal of human excreta is also important in protecting the aesthetics of the environment in which

people live and in preventing fly breeding. The high incidence of enteric diseases and the appalling sanitary conditions in urban areas are primarily due to the fact that large sections of the urban population do not have a satisfactory arrangement for the segregation, collection, transport and disposal of human excreta. They have either an insanitary bucket privy or resort to indiscriminate defecation on the roadside and by-lanes resulting in wide-spread soil and water pollution, exposure of excreta to flies and a filthy environment.

6.4.3 The bucket latrine is a potential hazard to health and hygiene. The latrine seat, squatting hole and the collection pit expose excreta to flies, and encourage profuse fly breeding in the locality. The flies carry particles of excreta with disease pathogens and deposit them on food. The contents of buckets are often spilled in the vicinity and all along the road during transport of the excreta to the disposal site. The bucket is sometimes left in the open without cleaning exposing it to flies.

6.4.4 Years ago, the problem in the urban areas had not reached such a desperate level as today. With a low population in the towns and cities and no dearth of scavengers who were available on very low wages, it was not difficult for the urban dwellers to keep their bucket privies clean with regular and timely removal of the wastes. The atmosphere in the narrow lanes and streets in the dense core areas of the towns was not made as unpleasant with obnoxious smells creating an unhealthy environment as it is today. With emphasis on social reforms, availability of better education facilities and a general awakening among the scavengers for improving their lot, and because of their desire to attain a respectable status in society, this class of workers is getting less in number as time passes. It is now difficult for the local authorities or the individual urban dwellers to recruit people to do the scavenging regularly on the wages which they can afford to pay. Thus privies remain uncleaned for days for lack of servicing, as a regular feature in urban communities. Conversion of the

bucket privy into the water-seal type is perhaps the most important single measure for the prevention of such a situation.

Pollution Aspects

6.4.5 The pit privy offers a satisfactory solution of the problem in many instances. The location of the pit in close proximity of ground water supplies and water distribution pipes has often raised doubts about the wisdom of encouraging such a system on account of the risk of pollution of the ground water supplies. The elaborate investigations carried out on this aspect of the problem have, however, allayed these doubts. These studies have conclusively demonstrated that the extent of pollution flow arising out of the pit privies is very limited and that the system can be safely adopted in most soil conditions provided certain minimum precautions are taken in regard to location of pit in relation to well water supplies and distribution pipes.

6.4.6 Except in rocky regions, chalk formations and soil strata where fissures extend over long distances, the soil around the pit acts in the same way as a filter bed in situ under the ground and the extent of pollution depends on the efficiency of the filtration process. The work carried out in California in 1954 has shown remarkable removal of bacteria from sewage effluents by percolation through 4 feet of fine sand loam. It has also been observed by several workers that the pathogenic bacteria do not find the soil a suitable environment for their survival and will die within a few days.

6.4.7 Extensive studies have been reported in different parts of the world on the extent of soil and ground water pollution from bore hole latrines. These studies provide a satisfactory basis for determining the extent of pollution flow from pit privies under different soil and ground water conditions. The results of these studies are briefly presented in Annex XI. The results show that in soils as in the Singur\* area with effective size of 0.2 mm and velocity

\*Demonstration field station near Calcutta of the All India Institute of Hygiene and Public Health, Calcutta.

of sub-soil water flow of 1 m/day, pollution did not travel beyond 3 m. Similar results were also obtained in studies carried out in the USA. It was also observed in these studies that chemical pollution extended to greater distances than the bacterial pollution. In the Wingard Experimental Station, Alabama where sand occurs at shallow depths followed by an impervious stratum at the bottom of the latrine leading to high velocity of subsoil water, pollution flow extended to longer distances. With velocities of flows of 2.5 m/4 m per day E. coli flowed upto 10 and 25 m respectively. It was also shown in these studies that in such situations ground water can be protected from pollution by the interposition of an envelope of fine sand around the latrine pit and reaching ground water.

6.4.8 It was observed in these studies that pollution flow takes place only during the first few months after commissioning of the latrine. When the latrine has been used for some time the interstices in the soil get filled and regression of pollution takes place due to effective filtration and bacterial die-off.

6.4.9 When the pit remains above the water table throughout the year, only the earth immediately surrounding the pit gets contaminated. Bacteria from this region may be transported horizontally or downwards by leaching liquids and rain water. Where the horizontal travel is limited and extends to less than 1 m., contamination tends to travel downwards to the ground water table and then flow across before it gradually disappears in a short distance. Many factors such as slope and level of ground water, velocity, soil characteristics and permeability affect the removal of bacteria in ground water. Although there can be no arbitrary rule governing the distance necessary for safety between the pit and source of water supply, generally a distance of 8 m is considered safe.

6.4.10 The available data on the pollution problem indicate that in homogeneous soils free from rocks, fissures, chalk formations, root channels and rodent holes the danger of drinking water pollution from pit latrines is indeed very limited. Where there is doubt an examination of the soil and observation of the ground water velocity and gradient

would be helpful in determining the safe distance and location of the pit. A few trial borings with the augur should be made to determine the nature of the soil strata penetrated by the pit. Examination of soil samples will serve as a guide to determine the extent of pollution flow. If the soil is composed of clay or sand with effective size 0.20 mm or less, the pit can be located as close as 3 m from a drinking water source. A vast majority of soil conditions prevalent in the country where the pit has to be located will fall within the category where the pit can be as close as 3 m from the drinking water source. However it is desirable that a distance of at least 8 m is kept between the pit and the drinking water source, as a measure of safety. In areas with very coarse sand and very high velocity of subsoil water an envelope of fine sand all around the latrine pit and 0.3 m below may be used to protect the ground water from contamination from the pit.

#### Agricultural Aspects

6.4.11 Human excreta is a good source of some of the essential manurial ingredients for soil. It contains significant amounts of the fertilizing elements nitrogen and phosphorous and the much needed organic matter for sustenance of soil fertility. But before excreta is applied on land, it is necessary to digest and store it for sufficient length of time to render it into an innocuous material free from disease germs, bad odour and easy to handle. The digestion and storage should be carried out without creating nuisance in the environment in which people live and exposure of the material to flies. The pit latrine as adopted in RCA\*, PRAI\*\* and similar systems provides an effective means of achieving these objectives. Here the digestion and storage are done in pits which are sealed out of contact with the outside environment and the digestion takes place under conditions which are most favourable for effective anaerobic digestion.

\*RCA Research Cum Action

\*\*PRAI Planning Research and Action Institute

6.4.12 The two pit system in which each pit has a capacity adequate for at least 3 years usage is quite satisfactory for the hygienic conversion of excreta into safe manure. The following procedure can be used in adopting the system. When one of the pits is full upto the level of the connected pipe, it is disconnected from the latrine and the other pit brought into commission. The slab over the pit is then taken out and a basket full of fresh garden soil is added in the pit to provide the seed for carrying out rapid digestion of the excreta. The contents of the pits are mixed with a stick and the slab is replaced in position. The pit contents undergo digestion and in the process most of the disease germs are destroyed and the putrescible matter present in excreta is converted to a well stabilized humus material. When the second pit is similarly full the contents of the first pit are removed for utilization as manure. After emptying the contents the pit is again brought into use. The second pit is now disconnected from the latrine and the contents of the pit allowed to undergo digestion as described earlier. This operation is repeated yielding a pit full of well digested manure once in three years.

6.4.13 Precise data on the quantity of manure generated by the population in adopting the above system is meagre. However assuming 100 gms dry matter available from faeces and urine per capita per day and 50 per cent reduction of volatile solids during digestion in the pit a family of eight persons will yield manure equivalent to 0.5 tons dry matter from a pit serving them for three years or about 1 ton of manure with an average moisture content of 50% once in three years. This will contain about 10 kg of nitrogen as N and about 5 kg of Phosphorous as  $P_2O_5$ . (See Annex XII). It may not be feasible or worth while to utilise the manure on an individual family basis. But arrangements can be made

for collecting the pit contents from a number of families on a regional basis and its utilisation as organic manure on agricultural land. It has been observed that no expenses have to be borne by the owner in emptying the pits as this will be done free of charge by the person taking the manure.

## 6.5 Engineering Aspects

### Options possible

The following may be considered as possible solution for the different types of situation usually met with.

#### 6.5.1 Unsewered pockets in sewer urban areas

- (i) Estimate cost of typical house latrine conversion/connexion to street sewer - make financial/economic analysis of current expenses on conservancy service - determine cost-sharing capacity of house owner and devise funding formula for the house connexion and sewer extensions - preplan and announce withdrawal of conservancy service by a target date - invoke enabling legal measures/bylaws/executive directions - provide for promotional guidance, technical help organise extension of branch/main sewers under incremental planning for staged implementation and progress evaluation.
- (ii) Crowded areas in the unsewered pockets where bucket latrines exist but without space for septic tanks or leaching pits can be provided with water-seal privies connected to a leaching pit located in the road margin abutting the property line of each house, or to a sewer line serving a number of houses and leading to a sump from where the liquid waste could be pumped, to a disposal point; or removed by a mobile tanker as necessary.
- (iii) For slum areas/crowded housing without space for individual privies, a possible option is the provision of constantly supervised public conveniences suitably located, with water-seal privies, and connected to a local sewer network - or to a temporary sump/pump well with a temporary pumping main connected to the nearest sewer. The limitations to the successful introduction of public conveniences however should be recognised.

(iv) For lean density areas with latrine space in the houses, compare cost of deferred sewer extension/vs/individual water-seal privy for each house with a leaching cesspit or septic tank - in high water table/impermeable soil areas, consider provision for cesspool/septic tank emptying service at desired frequency.

(v) For the unsewered fringe areas, consider individual house privy with water-seal and leaching pit/or septic tank with seakage pits or with periodical emptying (where soil absorption is not feasible) - and sewer network to serve crowded settlements with temporary pumping out of the sewage to an oxidation pond if feasible/or to the nearest sewer.

(vi) Leaching pits attached to toilets or soakage pits of septic tanks may not be located any nearer than about 8 meters to a domestic well.

(vii) Similarly water mains laid at a level higher than the influent level of the leaching pit can be considered to be safe from being contaminated. When septic tanks are connected to water-seal latrines the disposal of the septic tank effluent underground through dispersal trenches or soakage pits presents difficulties in many situations. Because of this, the effluent is often disposed of in open drains. This is a very dangerous practice and constitutes a serious health hazard to the population living in that area.

#### 6.5.2 Unsewered urban and semi-urban areas

(i) Make financial/economic analysis of current conservancy service expenses- consider (a) water-seal privies with leaching pits (either within or outside the property line) for individual houses in the dense localities where sewer network is not immediately feasible - provide water-seal privies over or connected to leaching pits for houses in the less dense areas and with septic tanks for the larger houses, institutions and public places - provide for cesspit/septic tank emptying services as may be necessary - derive cost-sharing capacity of the house-owner and potential funding capacity of the local authority - devise financial planning of the entire project for phased implementation, (b) alternatively incremental sewer planning for the town - sewer network for the denser areas

with the sewage pumped from temporary sump/pump wells to outlying oxidation ponds/sewage farm locations, through temporary.

(ii) In crowded localities of both urban and semi-urban areas, houses in narrow streets and lanes usually lack the space within the house to provide the leaching pits. To overcome this difficulty, the local authority has permitted in Gujarat, the location of the pit in the street or lane and abutting the house margin, with a suitable cover and earth cushion to stand the traffic. A nominal quite rent per year is collected from the houseowner for the use of the public land. This solution could be adopted whenever feasible.

(iii) Crowded tenements in lanes and bylanes, incapable of housing water-seal privies may have to be provided with communal latrines of the water-seal type suitably located and with a septic tank of adequate capacity or multiple cess-pools if the soil is impermeable with periodical emptying as required. The latrine seats could be allocated to individual houses (where possible) with the owner placed in charge of its proper use and maintenance. Semi-urban areas on the other hand generally have more space available to permit individual house privy (water-seal type) and leaching pits.

### 6.5.3 Types of latrines

The choice for water-seal privies may be one or the other of the following alternatives:

(i) The conventional septic tank type, where the privy with a water-seal trap is connected to the septic tank unit leading to the dispersion chamber/trench where soil absorption of the effluent is feasible; alternatively the effluent is to be removed by manual labour into mobile carts/into collecting tanker through vacuum pumps as local conditions may dictate.

(ii) A water-seal latrine connected to an independent leaching pit functioning as a storage/digestion and dispersion chamber. Several variations in this type are:

- (a) The PRAI type, with a 3/4" water-seal trap, and concrete connecting curved pipes precast in halves (to facilitate easy construction) for connection to a leaching pit usually of honeycomb brickwork, covered over with unreinforced domeshaped concrete shell and having arrangement to permit connection to second pit in future.
  - (b) The Singur RCA type, similar to the above but using full sized connecting pipes and a flat RCC over slab for the pit.
  - (c) The Poonamalle RCA Project type with a 3/4" water-seal and connecting pipe with a Y joint (to permit connection to a second chamber), and the leaching pit of 4-1/2" brick in mud with vertical joints open.
- (iii) A handflushed water-seal latrine located over the leaching pit itself. The pan bottom ends in a bowl shaped water-seal trap overhanging in the pit.
- (iv) An Aqua privy, where a down pipe from the latrine pan dips direct into the liquid below in the pit, there being no water-seal. This is not usually recommended.

#### 6.5.4 The leaching pit

The efficacy of the effluent disposal depends largely on the nature of the absorbing soil. A large dispersion area for the effluent through the body wall of the leaching pit, however, aids quick diffusion and absorption into the soil. A honey-comb brick lining is generally satisfactory in such cases. The leaching pit is usually 2 to 3 metres deep, about 1.0 metre dia, and has the lining for the whole depth generally, but is also restricted to the top 1/2 metre or so where the soil below is self supporting. It is advisable to provide it as a separate unit from the latrine seat and not below the latter; if space permits, the pit may be provided in pair

(for switching over to the second when the first is taken out of service).

#### 6.5.5 Estimate of Costs

The magnitude of the programme ahead makes it imperative that the cost of latrine conversion be kept down to the absolute minimum consistent with structural stability, and functional efficiency of the unit. With this end in view typical estimates are shown in Annex XIII and XIV for a hand flush water-seal privy connected to a twin leachpit, and connected to a sewer respectively. On an average the costs work out to Rs.375 and Rs.500 on 1977 prices. These costs would differ from State to State. The SSS (Sulabh Sauchalya Sansthan, Patna, Bihar) in Bihar operates on an overall inclusive cost of Rs.400 per latrine. Apparently the design may call for a deeper leaching pit with the top level kept lower than at present; it may also need a smoother glazed surface for the pan and trap. For the same reason, it is worthwhile to investigate if and to what extent a reduction in cost is possible in the case of Gujarat. The present figure of Rs.550/- can admit of a reduction by a judicious change in the design. It is also likely that individual homeowners in the high income range may desire refinements in the latrine parts and the structure. In such cases, the subsidy from the Government and the local body will be reckoned on the basis of the minimum cost of the conversion leaving the homeowner free to invest the extra money to suit his preferences.

#### 6.5.6 Diversified designs

For a mass construction programme, the standardisation of design is no doubt an advantage. But a diversification of the design to suit different conditions of soil latrine, ground water level and user habits is important in the interests of economy and utility. Low cost technology based on continuing research and application should underwrite the success of programme implementation.

## 6.6 Implementation Mechanism/Methodology

### 6.6.1 Springboard for action

The inspiration for a regular programme of latrine conversion was provided by the Gandhi Samarak Nidhi/Centenary Committee, through demonstrable achievements initially by the Safai Vidyalaya in Gujarat and SSS in Bihar. It is reasonable to assume that all State Governments are equally anxious to eliminate the conservancy service; and that the urban dweller is ready and willing to use a water-seal latrine in preference to the bucket privy or open air defecation. What has been lacking hitherto was a credible programme which had been field tested for its feasibility. The success stories of Gujarat and Bihar should provide this missing factor as a spring board for action. It is not necessary therefore that a similar programme in other states should be spearheaded by initial pioneering work by a social organization to carry conviction on its workability or acceptability. What is essential is to set up a suitable mechanism for programme planning and implementation oriented to the needs of each state, with a social component built into the mechanism as an extension service.

### 6.6.2 The Mechanism

Judging from the experience of Gujarat and Bihar, the structure of an organization to handle a similar programme in any other state should provide for the following:

- A high level Authority/Committee/Board to lay down policy; enunciate programme; mobilise the necessary resources; guide, direct and supervise its implementation.
- A nucleus of technical and administrative staff to serve as the executive arm of the authority, to help in programme planning,

fund allocation, coordination of field activities, and to monitor the field work, provide programme intelligence and report to the authority.

- Trained units of task forces at the local level to undertake preliminary survey and data collection, preparation of plans and documents, conform to procedures and formalities, organise and execute the conversion work and maintain follow-up service.
- Regional training centres suitably located in the State to give necessary orientation training to social workers, supervisors, overseers, sanitary/health inspectors and training to masons, plumbers, fitters, etc. to develop the required skills needed for the programme.

6.6.3 A major option would be to establish an autonomous latrine conversion Board or Corporation at the State level preferably under the Ministry of Local Government. This should be composed of the representatives from the concerned Ministries and social organisations, with a policy commitment and a time-bound programme. The Board Corporation will pool all financial allocations from the Government and local bodies, supplemented by additional resources raised from financial institutions on appropriate terms of interest and repayment, and from external agencies interested in different facets of the programme. It will have a technical wing to organise and implement the programme, laying down the procedures for initial data collection, selection of task forces/sub-contractors for construction and for financial and technical supervision of the field activities. It will arrange for a comprehensive training programme to develop different manpower skills through regional and State Training Centres suitably organised for the purpose. It will have the freedom to choose its field executing agencies from all available venues: the PH Engineering Department concerned for latrine conversion in sewered areas;

local municipal engineering agencies for latrine conversion in unsewered urban towns where feasible; trained subcontractor agencies in other areas under controlled supervision and guidance through the Boards Technical Agency; and by direct operation by the Board's agency itself where conditions warrant such a procedure. In all cases, promotional and social inputs will be assured by the employment of trained social workers oriented to the needs of the programme. An autonomous Board vested with such unitary functions will have a proper grip over the entire range of programme activities and will have the freedom and facility to modify and orient its approach to suit different localities and conditions. Above all it will ensure proper coordination of all activities, quick decision making continuous monitoring of the progress and informed evaluation and follow-up action. A major advantage again is the scope it provides for carrying out concurrent research on sociological, economic and technical problems emerging during programme implementation. The Board as a unitary agency in charge of the statewide programme will be in a position to demonstrate, on authentic data, the financial viability of the programme as long range investment and present a correct balance sheet of activities and results, properly evaluated.

6.6.4 A modification of the above proposal may offer another option. A State Authority set up by the Government as a high power committee may be considered instead of an autonomous Board. The Committee composed of officials of appropriate ranks and nominated non officials, will lay down the policy and procedure for the field programme. A Technical Wing with supporting staff, including a sociologist, will be in command of the field operations. A Training programme as under the option discussed in para 6.6.3 will provide

manpower skills which will supplement the manpower resources available with the field agencies i.e. the PH Eng. Dept. units, Municipal Engineering Staff, and sub-contractors staff who will be utilised by the Technical wing to execute the field work, the appropriate field agency being selected for each area. The handicaps under this option may be the bureaucratic flavour carried by the organizational set up, inadequate time and attention given for the programme by a Committee with other preoccupations, disabilities in resources mobilisation for the programme and a possibility that the programme may be allowed to drift without proper coordination, higher direction, drive and support.

6.6.5 It may not be expedient to replicate the Bihar set-up in a another State as the results will be contingent on the choice of a proper person to provide the inspiration for the programme and the element of dedication involved in personal leadership and input, as is true in all such cases. The Bihar example also carries the element of a dedicated personal input by a non-official agency for implementation of the programme.

#### 6.6.6 Methodology

Whatever be the organizational pattern for the Agency to be entrusted with the programme, the method of approach will follow certain basic criteria to ensure continuity of operations. With a commitment to complete the latrine conversion within a time limit, the sequence of operations will provide for identification of dry latrines for conversion by wards, zones or other convenient areas; preliminary feasibility study and inspection for location of seat and leach pit and structural details for each case; form

filling and documents completion for and on behalf of the owner, drawal of funds and approval for the work, organising and completing the work, post supervision of completed work and familiarisation of facility by the household; completion report and case details; identification of emerging problems for research and development. Work should be completed area by area and not by stray households selected on the basis of option by the houseowner. The procedures for grant and loan disbursal, recovery of loans and residuary obligations by the householder, local body and the scavenger community should all be streamlined for quick and smooth despatch of work. Periodical evaluation of work and progress will form part of the programme for the benefit of the Government and any extra budgetary sources of funds. Post construction duties will devolve on different agencies in varying degrees depending on whether the latrine conversion is in a sewerred area, or connected to a septic tank or collection pit for periodical emptying, or whether any of the other options discussed under para 6.4 has been adopted. The success of the latrine conversion should not be jeopardised by laxity in the operation and maintenance of the other parts of the entire system for which the local body is responsible.

#### 6.7 Financing and Management Aspects

6.7.1 On the basis of computations of expenses incurred and direct savings accruing as a result, latrine conversion is a financially viable programme. In order to retire a conversion cost of Rs.450/- as a total loan repayable over a 10 year period at the high rate of 10% interest, an annuity of Rs.75 will be needed. If half the cost is given as grant the annuity for retiring the loan will be but Rs.37.5. If the interest rate is reduced to 6% as is reasonable, the annuity will be only of the order of Rs.30/-. The householders current expenditure on his bucket latrine is reportedly varying from Rs.30/- to Rs.100/- or more per year. In many cases he can afford to

retire the conversion cost as a total loan. In all cases, his current expenses for the conservancy service can retire 50% of the conversion cost as loan when he gets a 50% grant. From the houseowner's standpoint therefore the conversion does not impose any additional financial burden. In fact, the recurring expenditure on the bucket latrine is perpetual while the annuity on the conversion is limited to the loan period. Apart from this direct and viable monetary benefit, the indirect and intangible benefits resulting from better environs, reduction in the family medical bill, and sense of well-being should add to the credit side of the proposed reform.

6.7.2 As far as the local body is concerned it has been shown that it incurs a net loss of Rs.2400 on each scavenger or Rs.75/- per latrine as subsidised service to which should be added another Rs.10/- per latrine for mechanised transport and disposal. The monetary saving of Rs.85 per latrine should be able to retire the conversion cost in about 6 to 7 years even if it is invested as an outright grant. When only 50% is given as a subsidy, the recovery of the subsidy is possible in the space of about 3 years. In addition, indirect savings to the local body from reduction in hospital cases, in preventive health services, and freedom from maintaining a thankless risk-prone conservancy service, will be a fairly significant addition to the municipal budget. To the extent to which the subsidy to the latrine owner is shared by the Government and the local body, the burden on the latter is appreciably reduced.

6.7.3 The obligation on the municipality to continue the scavenger on its pay roll until he is gainfully employed is apt to be magnified in respect of its financial import. In a generality of cases, the local bodies have been able to absorb the surplus scavengers on other duties for which they would have had to pay if outsiders had been recruited.

It is reasonable to assume that such residuary burden will taper off over a short period. The rehabilitation of the scavenger community, again, is also entitled to specific financial help from the social welfare ministries of the Government.

6.7.4 The programme admittedly is not an investment liability. Unlike a rural water supply which becomes a social service when supported by a grant partial or full, the latrine conversion pays for itself by savings in current expenses accruing to the houseowner, local body and the government. The programme is therefore entitled to priority for investment of the capital needed for it. It should be feasible to identify sources of funds for the programme, mobilise such resources from all national agencies and also attract international collaboration where appropriate.

6.7.5 The management of the programme from the promotional, technical, financial and operational aspects should pose no serious problems. It is the kind of programme where-in the actual provision of the facility generates a snow-balling impact better/faster than a campaign of health education with audiovisual aids. The water-seal latrine once installed under competent supervision is not in need of maintenance as other utility services. Except in the initial organization and execution of the work under a proper programme it does not involve any management concerns or problems. Its financial self sufficiency has not been given the importance and publicity it deserves.

## 6.8 Manpower Training

6.8.1 The social engineering and other aspects of the programme dictate the need for imparting special orientation training to the programme planning and direction personnel in promotional techniques, public relations, technology tailored to suit local needs, conditions and user habits and attitudes, financial and economic implications, funding methods

and procedures, and customer satisfaction. The field staff will require training on the types and details of latrine parts and assembly, location of seat and leach pit, epidemiological and structural hazards in wrong siting of the units, and the techniques of planning for materials, labour and construction in a continuing programme. The peripheral staff of masons, plumbers, fitters, etc. will require an initial training to develop the skills needed and in the mass manufacture transport and assembly of latrine parts. The strength of manpower needed, the different disciplines and the scheduling of the training programme will call for a proper pre-planning and organisation, depending on the agencies which will participate in the planning and construction phases of the programme. The establishment of the training centres with training aids, prototype models, manufacturing yard for parts and development of a training faculty will form an important aspect of the total training programme. The example of Gujarat and Bihar supplemented by additional facilities to suit the programme needs of each state will guide in establishing and developing training.

#### 6.9 Formulation of Demonstration Projects

6.9.1 The first essential step is to initiate a proper survey for data collection and status assessment in those States where information in this behalf is inadequate or incomplete.

6.9.2 Based on reliable statistical data and field details in respect of the several urban units when collected, details of a comprehensive programme of latrine conversion could be formulated for each State, bringing out its scope, content and magnitude, with an assessment of the financial, material, institutional and management aspects, and a feasibility study to cover an economic/financial appraisal of the programme.

6.9.3 For advance action however a demonstration project could be prepared as the First Phase. This will include a critical area or areas in selected problem States which will be taken up for immediate implementation, to spearhead an ongoing programme for the State. The First Phase will serve as a demonstration project to highlight:

- (a) problems of initial motivation for community involvement, and local body's commitment;
- (b) variants in engineering solutions to suit different site conditions, and alternative materials for cost reduction/cost benefit;
- (c) concurrent studies to assess extent of subsurface pollution travel, user habits, refinements in pan, trap and leaching devices;
- (d) cost sharing patterns applicable to different economic/social levels, and types of latrine conversion;
- (e) specific engineering options to deal with slum/squatter areas in unsewered towns and unsewered pockets of sewerred towns;
- (f) socio-economic aspects of displaced scavenger rehabilitation;
- (g) inter-linkage between household excreta disposal and wastewater disposal, and eventual link-up with a sewer system;
- (h) the institutional arrangement best suited to meet the immediate and long range needs of the programme;
- (i) techniques for periodical evaluation and appraisal of programme implementation.

#### 6.10 International Collaboration

6.10.1 The assistance/collaboration of WHO/UNICEF could be sought in preparing the project documents if so desired, as also in establishing and developing appropriate Training Centres, and prototype models, training material, and documentaries, including training of the faculty.

6.10.2 The First Phase project outlined in 6.8.3 above involves studies in several important aspects of the problem, of interest not only to India but also to other countries within and outside the Region facing similar problems. International agencies such as WHO, UNICEF, World Bank, UNEP and bilateral donor agencies such as IDRC may be willing and ready to assist and participate in the conduct of such studies, each in its own special sphere of interest. Their collaboration would be worth exploring.

6.10.3 External funds could be attracted to assist in the implementation of the on-going programmes as and when they are prepared. The financial viability of the programme, the possibility of its quick implementation, and the immediate health and social gains accruing, apart from its potential for financial recoupment are special factors in its favour. Loan assistance from the World Bank, and funds from bilateral donor agencies for specific areas of the programme, may be sought against well prepared projects supported by the Government's capabilities in programme planning and implementation.

6.10.4 The UN Second Development Decade Targets for achievement by 1980 envisage 35% of urban population to be provided with sewer connexions and 60% with household systems. The Mar Del Plata resolution recommends provision of water supply and excreta disposal facilities to all, if possible, by 1990 with realistic standards. Planning experience over the past three decades has highlighted the unfeasibility of providing sewerage systems to all the urban populations within a foreseeable future. The only promising and realistic option available now to remove the root cause of enteric diseases from urban areas is the provision of a water-seal sanitary latrine for each home and where this is not physically possible,

the provision of well maintained community water-seal latrines following the Patna example, with refinements as found necessary for each situation. The programme claims recognition as a crucial phase of the International Development Decade activity with safe excreta disposal as the main objective. The adaptability of the programme to cover the rural areas as a concurrent activity integrated with rural development, is an added factor in its favour. The subject has such a direct and vital bearing on the social advancement and economic productivity of the urban and rural communities that it will attract and retain international collaboration to match the needs of the member country.

#### 6.11 Appropriate Technology - Research - Information Transfer

6.11.1 The earlier discussions have brought out the importance of adopting low-cost technology suited to the local needs and genius, and of pursuing applied research in a continuing search for refinements/improvements in the scope, content, methodology and implementation of the entire programme. It is only a unitary agency operating the programme that can identify areas for research in the social, administrative, technical and operational phases and initiate measures for these at appropriate stages, in a constant endeavour to improve the programme quality.

6.11.2 There is an incredible lack of information flow and transfer of knowledge as between the several states on the problems faced or solutions pursued by each. This is an avoidable vacuum in the sphere of dissemination of knowledge and experience on this important area where innovations in approach, and methodology underscore the success of the programme.

6.11.3 It is essential that the controlling agency in charge of the programme in each state identifies the areas for fruitful exchange of information and knowledge and establishes appropriate channels for proper

liaison and data collection, appraisal, retrieval and exchange. Close collaboration between the States will also encourage mutually complementary activities in research and development and prevent duplication of labour and expenses on identical problems applicable to different states. The central Organizations, CPHEEO, NEERI, and other research agencies interested in different facets of the problem, can arrange for a common forum to share experiences, pool knowledge and identify areas for research by each, for the common benefit of all.

#### 6.12 Programme Monitoring - Evaluation

The programme is in pursuit of the minimum needs to secure community health by a single measure of safe excreta disposal. It is unconventional in the sense it forms a separate activity independent of the sewer system development in national planning. It is in this context that close monitoring of the programme and its evaluation at successive stages becomes important. It calls for a multi-pronged approach by a multi-discipline task force, where cooperation from the householder, from the administrative, technical and political wings of the local body, from the Government agencies concerned, and from the user public (in the case of community latrines) can be assumed but not always taken for granted. Vigilant monitoring of the activities to achieve successive objectives of the programme during its implementation, and a discerning evaluation of the results against expectations must be established on foolproof methods. Here again exchange of information and knowledge on a country wide basis and an invitation to external agencies to join in such a programme would be of mutual benefit.

#### 6.13 The Problem of latrineless households

6.13.1 This is a sensitive if not a vulnerable area of the programme. The conversion of bucket latrines ostensibly solves only a third of the

problem; another third is expected to be solved by sewer system connexions. But the remaining third, if left without the facility of water-seal sanitary latrines either at the home or at public location, would still perpetuate the perils of urban insanitation and partly if not wholly nullify the efforts pursued under the latrine conversion programme. Both in the crowded as well as in the comparatively open areas it would be possible in many instances to put up latrines for individual households. Economic consideration has been the primary constraint against their having their own latrines. Thus, along with the conversion programme of the bucket privies, it is desirable to provide water-seal latrines wherever space is available in order to improve the sanitation situation. This would however need considerable subsidy either from the local authorities or from the Government. So long as urban centres attract itinerant public and harbour pavement dwellers, it is indispensable to provide for them sanitary facilities for excreta disposal in the interests of the safety of the whole population. The evolution of community sanitary latrines calls for bold imagination and appreciation of mass behaviour in the use of such facilities. Payment of 5 P per head by the poor urban community in Patna for making use of the public toilet facilities, which are crowded during morning and evening hours, is a shining example of the communities participation in such a programme and its popularity. Success stories elsewhere may still need field testing in new locations and environs. If communal latrines are considered unfeasible and unsuitable for any given case on valid grounds, it is nevertheless incumbent on the decision-making body to devise a more satisfactory alternative solution, and not to ignore the problem itself. Communal latrines shared by different families with a rotating responsibility for proper maintenance, latrines allocated to specific families for their exclusive use, and similar arrangements have been tried. The programme must include effective solutions to solve this problem on the basis of local factors which may show variations between different areas.

**PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY  
AVAILABILITY OF LATRINES AND BY STATES**

State/Union Territory	Percentage of Households with no latrine	
	Urban	Rural
1. Andhra Pradesh	47.67	92.89
2. Assam	15.66	68.74
3. Bihar	46.16	94.74
4. Gujarat	27.52	93.70
5. Haryana	46.62	96.36
6. Himachal Pradesh	42.00	98.80
7. Jammu & Kashmir	-	79.23
8. Karnataka	37.07	96.26
9. Kerala	39.19	78.66
10. Madhya Pradesh	39.64	97.10
11. Maharashtra	26.48	88.66
12. Manipur	3.89	36.65
13. Meghalaya	7.71	87.65
14. Nagaland	23.79	-
15. Orissa	52.56	98.69
16. Punjab	32.23	96.49
17. Rajasthan	42.46	94.51
18. Tamil Nadu	39.62	97.21
19. Tripura	7.30	52.74
20. Uttar Pradesh	27.32	92.25
21. West Bengal	14.94	92.50
22. Chandigarh	11.86	-
23. Delhi	19.52	72.18
24. Goa, Daman & Diu	44.86	75.18
25. Pondicherry	62.01	96.23
<b>Total</b>	<b>32.82</b>	<b>92.40</b>

Source: 'Sarvekshana' Journal of the National Sample Survey Organization, Govt. of India, Vol. 1 No.2, October 1977.

**PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY TYPE  
OF LATRINE AND BY FACILITY OF LATRINE**

**URBAN**

Type of latrine	Facility of latrine					
	For exclusive use of the household	For community use	Shared with other households in the same building	Others	Not recorded	Total
1	2	3	4	5	6	7
Flush System	7.17	2.74	9.89	0.17	0.11	20.08
Septic tank system	5.66	1.60	6.36	0.20	0.10	13.92
Service	10.07	6.43	13.02	0.37	0.36	30.25
No latrine	-	-	-	-	33.01	33.01
Others	1.19	0.35	0.68	0.18	0.16	2.56
N.R.*	0.04	0.04	0.05	0.00	0.05	0.18
All	24.13	11.16	30.00	0.92	33.79	100.00

Source: 'Sarvekshana' Journal of the National Sample Survey Organization, Government of India, Vol. 1 No.2 October 1977.

\* Not recorded.

STATEMENT SHOWING NUMBER OF HOUSEHOLD AND LATRINES

City/Town	Population	No. of houses	No. of households	LATRINES			
				Water borne	Service	Other	Total
1	2	3	4	5	6	7	8
<b>PUNJAB</b>							
Amritsar	434,951	62384	85480	9033	66002	-	75035
Ludhiana	401,176	53346	78441	6255	48550	-	54805
Jullundhar	296,106	52079	54133	1316	45000	-	46316
Patiala	151,049	24615	30681	376	28000	13	28389
Pathankot	78,192	11289	14674	225	3	8000	8228
Batala	76,488	12300	13006	100	6550	2	6652
Bhatinda	65,318	10209	12886	92	6000	15	6107
Moga	61,625	8003	10296	20	7500	30	7550
Abohar	58,925	8144	10558	700	5000	1000	6700
Hoshiarpur	57,691	8941	11902	31	8000	10	8041
Phagwara	55,012	7924	10988	200	8800	-	9000
Ferozapur	51,090	7712	9192	-	8000	-	8000
Sangrur	34,015	6284	6711	25	2500	-	2525
Sunam	28,158	3923	4786	2	700	14	716
Patti	18,389	2494	3040	10	1950	2	1962
Sirhind	18,028	3016	3720	3	2100	3	2106
Nawashahr	17,527	2375	3156	60	2000	-	2060
Phillaur	11,543	1897	2115	20	500	100	620
Rahon	6,607	1080	1168	-	404	-	404

Average Households Size 5.31

Source: Town Directory Punjab Series 17 - Part VI-A - Census of India 1971.

City/Town	Population	No. of houses	No. of households	L A T R I N E S			
				Water borne	Service	Other	Total
1	2	3	4	5	6	7	8
<b><u>BIHAR</u></b>							
Patna	475,300	68230	79231	4259	38148	6639	49046
Jamshedpur	356,783	79885	92901	27098	3103	-	30201
Gaya	179,884	24424	29065	23007	15163	150	38320
Ranchi	175,934	44080	48514	14076	11271	2304	27651
Bhagalpur	172,202	23218	26733	150	12600	-	12750
Darbharpur	132,059	17658	20636	3549	15387	-	18936
Muzaffarpur	126,379	19587	21150	3000	14000	-	17055
Monghpur	102,474	14740	16928	920	7536	-	8456
Bihar	100,046	13256	14784	5000	1000	-	6000
Dhanbad	79,838	104177	106753	20624	10847	503	31974
Dinapur	42,694	8369	9383	163	4600	63	4826

Average Household Size - 5.44

Source - Town Directory Bihar Series 4 - Bihar Part VI A - Census of India 1971.

City/Town	Population	No. of houses	No. of households	LATRINES			
				Water borne	Service	Other	Total
1	2	3	4	5	6	7	8
<b>MADHYA PRADESH</b>							
Indore	543,381	72877	99352	4884	29476	1464	35824
Jabalpur	426,224	85425	95295	9512	38225	41603	89340
Gwalior	384,772	41756	68033	190	42	6	238
Bhopal	298,022	49033	74864	18493	4000	5	22498
Ujjain	203,278	28470	36698	10	51	-	61
Raipur	174,518	26004	34758	740	7456	-	8196
Bhilai Nagar	159,540	39560	41095	7595	-	-	7596
Sagar	118,574	23190	26349	4	29	18	41
Ratlam	106,666	19412	20153	52	N.A.	N.A.	52
Burhanpur	105,246	14576	15934	58	6312	-	6370
Bilaspur	98,410	16709	20419	1354	2235	218	3807
Khandawa	84,517	14782	15164	115	4689	-	6476
Durg	67,892	8991	13687	489	2020	175	2684

Average Households Size 5.16

Source - Town Directory - Series 10 Part VI-A - Census of India 1971

City/Towns	Population	No. of houses	No. of households	L A T R I N E S			
				Water borne	Service	Other	Total
1	2	3	4	5	6	7	8
<u>KATNATKA</u>							
Bangalore	1,540,741	262926	318857	8379	21685	924	30998
Hubli							
Dharwar	379,166	62055	67623	2144	2984	2873	8001
Mysore	355,685	48617	63221	2880	750	-	3630
Belgaum	192,427	31119	37495	N.A.	6161	-	6161
Mangalore	165,174	32276	34511	5448	3657	215	9320
Gulbarga	145,588	24247	26016	1897	1761	'65	3723
Bellary	125,183	21636	24579	456	6334	19	6809
Davanagere	121,110	19432	20608	1491	3571	379	5441
Bijapur	103,931	14015	18208	217	1300	-	1517
Shimoga	102,709	17850	19067	2853	3596	864	7313
Raichur	79,831	14274	15932	140	800	538	1478
Mandya	72,132	11479	14586	15	5	226	246
Tumkur	70,476	11803	12975	200	2500	6	2706
Hospet	65,196	11038	11884	321	2564	40	2925

Average Households Size - 5.45

Source - Town Directory Mysore, Series 14 - Part VI-A-Census of India 1971.

City/Town	Population	No. of houses	No. of households	LATRINES			
				Water borne	Service	Other	Total
1	2	3	4	5	6	7	8
<b>ORISSA</b>							
Cuttak city	194,068	29722	34792	3341	10344	-	13685
Rourkela Steel Township	125,426	29413	30923	19230	-	-	19230
Berhampur	117,662	21326	22736	618	11673	-	12291
Bhubaneswar	105,491	18467	21645	6500	2000	-	8500
Puri	72,674	12764	14519	962	8459	-	9421
Sambalpur	64,675	12042	13364	1665	5130	-	6795
Rourkela City Township	47,076	11026	11268	3192	1256	-	4448
Balasore	46,239	7067	8272	350	1691	350	2391

Average Households Size - 4.85

Source - Town Directory Orissa - Series 16 - Part VI-A-Census of India 1971.

HOUSING SPACE AVAILABILITYALL INDIA URBAN - NSS 28TH ROUND - 1973-74

Household room type	Percentage distribution of households	Average No. of persons per household	Living rooms satisfying NBO specification		Other room space	
			Average no. of rooms per household	Average area (in sq. meter per household)	Average no. of rooms per household	Average area (in sq. meter per household)
1. No living room	7.23	1.25	-	-	1.19	14.15
2. Only one living room below NBO specification	2.15	3.38	-	-	1.19	8.26
3. Two or more living rooms below NBO specification	0.29	5.52	-	-	2.86	21.32
4. Only one living room satisfying NBO specification	51.05	4.17	1.00	13.77	0.48	3.31
5. Two living rooms satisfying NBO specification	25.03	5.74	2.00	26.14	1.05	7.32
6. Three or more living rooms satisfying NBO specification	14.22	6.96	3.74	51.84	1.75	14.31
7. n.r.	0.03	1.99				
8. All	100.00	4.74	1.54	20.94	.87	6.82

Source: SARVEKSHAN - NSS Journal - Vol. 1 No. 2 - October, 1977.

EXPENDITURE LEVELS OF HOUSEHOLDSALL INDIA URBAN - NSS. 28TH ROUND - 1973-74

Monthly per capita Expenditure class (Rs.)	Percentage distribution of households in each class	Average Monthly Per capita consumer Expenditure	Per Capita Expenditure on rent in each class (Rs.)	Size of household
0 - 13	0.13	8.47	0.13	1.82
13 - 15	0.15	13.56	0.07	3.77
15 - 18	0.28	17.01	0.16	5.21
18 - 21	0.36	19.58	0.30	7.17
21 - 24	0.85	22.77	0.22	7.55
24 - 28	2.26	26.19	0.23	6.56
28 - 34	5.27	31.18	0.46	6.50
34 - 43	12.05	38.51	0.63	6.01
43 - 55	16.27	48.91	1.14	5.74
55 - 75	20.85	64.04	1.70	5.21
75 - 100	15.96	85.94	3.21	4.36
100 - 150	14.70	107.60	5.42	3.29
150 - 200	5.85	171.82	9.79	2.74
200 & above	5.02	287.82	16.05	2.40
Total	100.00	70.77	2.50	4.81

Source: SARVEKSHAN - NSS Journal - Vol. No.1 - July 1977

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NO. F.7-1/67-PHE  
GOVERNMENT OF INDIA  
MINISTRY OF HEALTH & FAMILY PLANNING  
(Department of Health)

ANNEX VI

MADRAS SEMINAR  
Paper No. I(3)

New Delhi-, Dated 19 July 1967

To

All State Governments,

Subject: Classification of Plan Schemes and pattern of Central Assistance to States in the Fourth Five Year Plan for Centrally sponsored and Centrally aid-schemes.

Sir,

I am directed to refer to the Planning Commission's letter No. PC (P)/4/2/66 dated the 9th June, 1967, and No. PC(P)4/2/66 dated the 30th June, 1967, on the subject mentioned above, addressed to the Planning and Finance Secretaries from which it will be observed that the pattern of Central assistance for Water Supply and Sewerage Schemes under the National Water Supply and Sanitation Programme during the IV Plan will be as under:

1. Urban Water Supply Schemes 100% loan
2. Sewerage Schemes 75% loan and 25% Subsidy to be shared equally by Centre and States in case of Schemes where sewerage is utilised for agricultural purposes.
3. The pattern of assistance for water supply and sewerage schemes would also cover assistance for conversion of dry latrines into flush latrines and their connection with the public sewers.
4. Rural Water Supply Schemes 50%  
(This assistance will be available for rural areas as well small towns having a population upto 20,000 according to 1961 Census).

The government of Madras etc., are requested to examine the various schemes in the light of the above instructions and intimate to the Government of India details of the estimated expenditure likely to be incurred on the various Scheme during 1967-68 and 1968-69 and also the Central assistance required by way of loan and grants. The information may kindly be given by the 31st August, 1967 to enable the Government of India to make the necessary provisions in the revised estimates for 1967-68 and budget estimates for 1968-69. The receipt of this letter may kindly acknowledged.

Yours faithfully,

Sd/- A.P. Mathur  
Under Secretary to the Govt. of India

No. F.7-1/67-PHE

Copy for similar action to: 1. Union Territories  
2. Planning Commission (Construction Division)  
3. Dte. G.H.S. (PHE)  
4. O.S.D.

Sd/- A.P. Mathur  
Under Secretary

COPY

IMMEDIATE

NO. F.5-7/UCD  
GOVERNMENT OF INDIA  
MINISTRY OF HEALTH, F.P. & URBAN DEVELOPMENT  
(DEPARTMENT OF HEALTH & U.D.)  
NIRMAN BHAWAN

New Delhi, the 10th June 1968

To

The Chairman/President  
Municipal Council/Board

To All (with population above 20,000)

Subject: Special Campaign for conversion of dry latrines into flush  
our latrines

Sir,

1. One of the most difficult problems that the urban local bodies have to face is the question of providing facilities for scavenging and removal and disposal of night soil. This question has been considered at various levels from time to time but has defied a complete solution. A special Committee, popularly known as Malkani Committee, studied the matter in detail and made a number of recommendations covering all aspects of amelioration of service and living conditions of scavengers. A number of recommendations of this Committee have received attention and several steps taken to improve the working conditions of Scavengers over the past few years. It is nevertheless a fact that the degrading practice of manual handling of the rubbish and night soil still persists in all the cities and towns. The only effective solution to this problem lies in the conversion of dry type latrines into water borne ones. It has been seen that even where sewers are laid, the house connections are not taken with the result that, on the one hand, the unclean practice of handling of night soil continues and on the other there we fail to make full use of the heavy investment in the sewerage schemes. This unhappy situation calls for immediate attention and resolute action by the authorities concerned with a view to ensure maximum utilisation of the facilities available. In case of non-sewered areas, however, different steps require to be taken, as indicated later in this letter.

2. This matter has assumed great importance in view of the fact that the country will be celebrating the Birth Centenary of Mahatma Gandhi on October 2, 1969. There can be no better and befitting tribute to his memory than to launch a concerted programme to achieve notable progress by way of getting existing dry type latrine converted into water borne ones in as large numbers as possible in all the urban areas by that date. Your municipality can take immediate action as suggested below to achieve maximum success:

- a. No new building should be allowed to be constructed without provision of flush out latrines. It may be pointed out that the provision of flushout latrines in a house does not involve heavy expenditure.

- (b) In areas where sewers have been laid, strict enforcement of law for compulsory connections of latrines in the existing houses to sewers should be launched.
- (c) Where sewers are not laid, a special drive should be launched for conversion of dry latrines into flush out latrines in selected areas by connecting them to local septic tank or leaching pits. For the guidance of the local bodies, a small brochure indicating the designs and techniques for cheap hand flushed latrines has been printed and a copy of the same is enclosed. The National Committee for Gandhi Centenary has also published some literature and circulated it to various towns, through and Harijan Sevak Sangh.

3. In this connection, a copy of letter No. F.7-1/67-PHE dated 19.7.1967 indicating the pattern of assistance available for both sewerage as well as non-sewered areas is enclosed. Your Municipality can immediately prepare schemes under the Urban Water Supply and Sanitation Programme and submit the same to the State Governments for sanction. The State Government have powers to sanction such schemes upto a certain limit without reference to the Government of India.

4. It is hoped that you will take personal interest in this important matter and initiate action immediately. This Ministry will be ready to render any assistance possible.

Please acknowledge receipt of this letter and let this Ministry know the action taken or proposed to be taken as early as possible.

Yours faithfully,

Sd/-  
Deva Raj  
Officer on Special Duty

No. F.5-7/UCD

Copy to the Secretary to the Government of all States & U.Ts.  
L.S.G. Deptt. \_\_\_\_\_ in continuation of this Ministry's  
letter No. F-6/68-PHE dated 18 May 1968.

Sd/-  
Officer on Special Duty

No. O.11019/8/74-PHE  
Government of India  
Ministry of Works and Housing

New Delhi, the 22nd March, '75

To

All State Governments/Union Territories

Subject: Conversion of dry latrines into sanitary  
latrines during Vth Five Year Plan

Sir,

I am directed to say that the Government of India has instituted a pilot scheme under Central Sector for conversion of dry latrines into sanitary latrines during the Vth Five Year Plan. The details of the scheme are given in the annexure. The salient points of the scheme drawn up are given below:

1. OBJECTIVES

- (i) Abolition of manual handling of night soil as head load.
- (ii) Demonstration of cheaper method of safe disposal of spent water and human wastes in lieu of complete under-ground sewerage system and treatment.
- (iii) Improvement of sanitation in the country.

2. CRITERION

The scheme is expected to be taken up in 30 selected towns in the country with the population range of 20,000 to 50,000 having a minimum of 25 gallons of water supply per capita per day.

3. METHODOLOGY

The scheme provides sewer for conveyance of waste water and septic tanks for collection and disposal. The septic tanks will be located at convenient points serving 300 to 500 population and effluent from the septic tank will be collected in a collecting well and will be removed therefrom periodically by a mobile vaccum van for safe disposal.

4. CENTRAL ASSISTANCE

During the Vth Five Year Plan an outlay of Rs.4.4 crores has been made in the Central Sector for this scheme. The Government of India will provide cent per cent grant assistance to each selected town towards the work of provision of laying sewers, construction of sewer appurtenant structures, septic tanks with the exception of the latrine construction and sewer connection. One mobile vaccum van will be provided for the periodical cleaning of collecting wells.

The cost of providing sewerage, septic tanks to a population of 10,000 will be about a Rs.13 lakhs. Cost of a vaccum van will be about Rs.75,000/-, the total cost for each town will come to about Rs.13.75 lakhs or say 14 lakhs for a population of 10,000 persons, the cost works out to Rs.140 per capita.

5. STATE GOVERNMENT'S LIABILITIES

Under this scheme the State Govt. will have the following liabilities:

(i) The Governments will provide advance to local bodies for giving loans to the needy house owners for meeting expenditure on latrine construction and sewer connection, recoverable in instalments with interest. The well-to-do class is likely to be interested to avail themselves of this facility by meeting expenditure for fitting the pan and sewer connections but the weaker section may not have resources to meet this expenditure in part even. To meet this difficulty it will be necessary that in the case of persons having income below Rs.350/- per month, the entire amount of expenditure on the latrine and sewer connections is given as loan recoverable in instalments in five years with interest. In case of persons having income more than Rs.350/- per month the loan may be given to the needy persons as an incentive but the loan should not be more than 50% of the estimated cost repayable in 2 years in instalments with interest.

(ii) The State Governments will lay down a procedure to ensure that the loan given by the local body is not diverted for any other purpose.

(iii) After the scheme is implemented, the responsibility for maintenance of the scheme will be of the local body. Therefore, it would be necessary that the resources of local body are argmented by raising a scavenging/sewage tax not less than 1% of the rateable value of the property to meet the maintenance expenditure. The scheme should be sanctioned only after the concerned local body adopts a resolution to this effect.

(iv) The State Government will have also to ensure and see that all the dry latrines in the selected areas are converted to sanitary latrines and connected on to the sewer by the individual house owner.

The guide-lines for the selection of the towns for implementation of the scheme are enclosed.

It is requested that the State Governments may while submitting their schemes should keep the above guide-lines in view.

Yours faithfully,  
Sd/- (Prakash Narain)  
Deputy Secretary to the Govt. of India

MODEL BYE-LAWS FOR MUNICIPALITIES  
FOR  
CONVERSION OF BASKET TYPE LATRINES TO WATER-BORNE LATRINES  
GUJARAT STATE

(Under the powers conferred upon it by Section 275 (4) of the Gujarat Municipal Act, the Government of Gujarat sanctioned in 1963 the enclosed Bye-laws on Septic Tanks and Privies notified by the Broach Municipal Committee)

PIT PRIVIES AND BASKET TYPE PRIVIES LATRINES

Byelaws No.1: No person shall construct any new pit privy or basket type latrine or bring into use any old dis-used Pit-privy or Basket type latrines, provided that the Chief Officer may, in the following cases, grant permission for a Basket type latrine:

- (1) Where on account of high level of subsoil water, Aqua Privy, Septic Tank latrine or P.R.A.I. Type latrine would not function effectively or where sufficient land area is not available for such latrine;
- (2) Any other reason which the Chief Officer considers sufficient to permit construction of a Basket privy.

Byelaws No.2: Every occupier and owner of premises on which there is a Pit Privy or a Basket type latrine shall within one month of the date on which these by-laws come into force either appear before the Chief Officer and give him information thereof or send him the information in writing.

Byelaws No.3: The Chief Officer/Health Officer shall on receipt of such information, forthwith issue a notice under section 168 of the Act to alter the privies (Pity Privy or Basket latrine) into either Aqua Privy or a W.C. connected to a septic tank or P.R.A.I. type latrine within 3 months from the date of service of notice. The period of 3 months may be extended by the Chief Officer at the request of owner or occupier if sufficient reasons justifying the grant of such request are shown, provided that the total period shall not exceed six months in aggregate from the date of issue of the notice.

Byelaws No.4: If the owner or the occupier of any premises against whom a notice under aforesaid by-law No.3 is issued fails to convert the Pity Privy or Basket type latrine within the time prescribed above he shall forthwith on the expiry of such time close the Pit Privy or the Basket Type latrine and shall not make use or allow others to the use of the same thereafter.

Byelaws No.5: Every owner or occupier of a building to whom a notice under by-law No.3 has been issued may request the Municipality for financial assistance for getting the Pit Privy or Basket type latrine converted into an Aqua Privy or a W.C. connected to septic tank or a P.R.A.I. type latrine and the Municipality, may, subject to the general conditions as may be prescribed from time to time by it, grant the cost of such conversion by way of 50% as subsidy and 50% as loan.

Bylaws No.6: Every person who shall construct a new Aqua Privy or a W.C. connected to a septic tank or P.R.A.I. type latrine shall construct it so as to satisfy the following conditions:

CONDITIONS FOR AQUA PRIVIES

1. No aqua privy will be allowed to be constructed unless the plans have been approved and permission given by the sanctioning authority (Chief Officer).
2. The following conditions must be satisfied before permission for construction is given:
  - (1) For every ten persons there should be one seated aqua privy. The tank below shall have 600 ft. capacity per seat.
  - (2) The aqua privy shall be located at the rear of the building at least 50 ft. from any well on the plot or any adjoining plot.
  - (3) The aqua privy should be built according to the type design approved by the Public Health Engineer to Government of Gujarat (A copy of the type design can be obtained from the Public Health Engineer to Government).
3. The digestion chamber, the aerobic chamber, the filter chamber and the inter connections between the various chambers shall be inspected by the Municipal Chief Officer/Health Officer or his representative and approved before permission is given to bring the installation into use.
4. In the case of defective working of the tank or nuisance arising therefrom, the sanctioning authority may require the owner to have the effluent analysed and if the result of the analysis is unsatisfactory, the sanctioning authority may further require the owner to make such alterations, repairs or additions (as they may be deemed necessary) or may require the owner to close the aqua privy.
5. The aqua privy shall be cleaned once in three years or earlier if it is found that sludge deposits have accumulated to more than 19 inches from bottom of digestion chambers.
6. The effluent should be utilised for a small patch of garden. This effluent has got excellent manual value. If this is not possible, it may be allowed to dry in a soakage pit which should not be less than 50 ft. from a well for disposal; a minimum open space of 9 sq. yards is necessary per seat.
7. Should the Municipality at any future date after the construction of the aqua privy provide sewers under any road adjoining the plot the owner will be required to connect the effluent from the aqua privy to the sewers at his entire cost.

CONDITIONS FOR W.C. CONNECTED TO A SEPTIC TANK

1. No septic tank will be allowed to be constructed unless the plans have been approved and permission given by the sanctioning authority (Chief Officer).
2. The following conditions must be satisfied before permission for construction is given:
  - (A) The provision of water supply to the House shall not be less than 15 gallons per head per day.
  - (B) The septic tank shall be located in the compound at the rear of the building at least 50 ft. away from any well on the plot or any adjoining plot from which water is taken for drinking and domestic purposes.
  - (C) The capacity of the tank shall be such as to hold all waste water and in no case should be less than 15 gallons per person (including servants) residing on the plot. The septic tank shall be constructed in two units, side by side.
  - (D) The septic tank shall be provided with (a) a grit chamber with an invert slope and having capacity for 15 to 30 minutes stay, (b) baffle walls, (c) inspection manholes for each unit, and (d) vent pipes.
  - (E) Hume pipe septic tanks should conform to rule (c) above as regards capacity and provision of 2 units.
  - (F) No storm water channel shall be permitted to be connected with the septic tank.
  - (G) Disposal of Effluent:
    - i) The effluent from septic tank may be disposed off in soakage pit of adequate size. Such soakage pits shall not be less than 50 ft. from a well. It will be the duty of the owner of the plot to see that the soakage pit is functioning at all times. He may be required to re-dig or clean up the soakage pit or to construct a new one, if the Municipality so directs.
    - ii) No part of the effluent shall be permitted to flow into an open roadside channel or drain.
3. The water closets, flushing apparatus, traps, drains and all other connection with the water closets and septic tank shall be inspected by the Chief Officer/Health Officer or any officer appointed by the Sanctioning Authority and approved before permission is given to bring installation into use.

4. In the case of defective working of the septic tank or nuisance arising therefrom, the sanctioning authority may require the owner to have the effluent analysed and if the result of the analysis is unsatisfactory, the sanctioning authority may further require the owner to make such alterations, repairs or additions, as may be deemed necessary, or may require the owner to close the septic tank.

5. The septic tank shall be cleaned once a year or earlier, if it is found that silt and sludge deposits have accumulated to over one third the depth of tank.

6. Should the Municipality at any future date after construction of the septic tank provide sewers under any road adjoining the plot, the owner will be required to connect the effluent from the septic tank to the sewer at his entire cost.

CONDITIONS FOR P.R.A.I. TYPE LATRINES

1. The design and dimensions of the essential parts of the latrine viz. (1) Pan, (2) Trough, (3) Lead-off pipe, (4) Plate or slab with foot rests and (5) Two pits or bore-holes shall be as under:

(a) Pan

Length 430 mm (17")

Width of front portion - 130 mm. (5") minimum

Width of the widest part - 200 mm. (8") minimum

Depth of front portion - 75 mm. (3") minimum so as to serve as a Urine splash guard.

The Pan shall have uniform slope from front to back at 25 degrees.

The lower Pan opening shall be 75 mm. (3") in diameter.

(b) Trap

70 to 75 mm (2-3/4" to 3") in diameter. However, the upper opening of the trap which is connected with the pan shall be 75 mm. (3").

Depth of water-seal 20 mm. (3) /4".

(c) Lead-off pipe

100 mm. (4") in diameter.

600 mm. (2 ft.) in length (minimum) with a bend at the end.

A "Y" type of connection with the lead-off pipe is useful.

(d) Pits or Bore holes

(1) 750 mm. (30") diameter or square.

(2) 2000 to 3000 mm. ( 6 to 9 ft.) deep.

(3) 80 centimeters from ground level to be of brick masonry and internally plastered.

(4) The pit to be covered with a R.C.C. slab or other stone of at least 6" thickness.

- (5) Such pit may be common between two latrines when so permitted or required by the Chief Officer. In such cases, the dimensions of the pit shall be as may be specially prescribed by the Chief Officer.
2. The owner or occupier of the building shall submit a plan of the proposed latrine indicating therein the site of the pits or bore-holes.
  3. There shall not be any well within 50 ft. of the latrine.
  4. The base and the walls of the latrines shall be plastered or tiled to a height of atleast one meter.
  5. The latrine shall have either ventilation holes communicating directly with the external air as near the top of the latrine as practicable and aggregating 60 sq. centimeters in area or ridge ventilation to the same extent.
  6. The pit shall be periodically and whenever required by the Municipality cleaned by the owner or occupier at his cost. The manure shall belong to the Municipality who shall make arrangements for removal from site.
  7. The superstructure of the latrine shall atleast be 1 Sq. meter in length and breadth and 2 meters in height.
  8. No water other than that of the privy or latrine shall be allowed into the pit and no flush tank shall be allowed.
  9. If the pits or bore holes are constructed under the street land, the owner or occupier shall pay to the Municipality rent @ Rs.6/- per year. If the latrine is construction during a year, such rent shall be proportionately levied for the remaining period of the year.

Bylaws No.7: Whenever any application for the construction of a privy or latrine is received by the Chief Officer, he shall publish a notice inviting objections, if any, from the neighbourers. Such notice shall be published for three days on the site where the privy or latrine is proposed to be constructed.

Bylaws No.8: Every privy or latrine shall be constructed as per the permission of the Chief Officer and no such privy or latrine shall be brought into use without the written permission of the Chief Officer.

Bylaws No.9: Any person committing breach of any of the above by-laws or conditions shall, on conviction be liable to a fine not exceeding Rs.500/-.

ESTIMATED COST OF LATRINE CONVERSION  
AND FINANCIAL IMPLICATIONS (GUJART)

FINANCIAL ASPECTS

- a) The estimated cost of a latrine conversion, based on current prices, may be itemized as under:

Cost of pan and trap (65 + 10)	Rs.75
Cost of S.W. pipe 4" dia. x 6 ft.	20
Cost of bricks (1200)	160
Cost of cement (3 bags)	70
Cost of sand, gravel	35
Cost of reinforcement steel for slab (5 kg)	25
Cost of excavation for leach pit (12' deep x 5' dia.)	60
Cost of labour for honeycomb well steining, pand and trap assembly, pipe connexions, slab fixing, etc.	125
	<hr/>
	Rs.570
	<hr/>

- b) Contractors trained at the Safai Vidyalaya, and employing workers trained for the job undertake the work for a L.S. of Rs.550.
- c) If the latrine superstructure is desired by the houseowner as an independent unit, the contractor undertakes to execute a 3 ft. x 3 ft. cubicle with 4" brick walling, a doorway, A.C. sheet roofing, etc., materials and labour inclusive, for Rs.550.
- d) An existing bucket latrine conversion will thus cost Rs.550. The addition of an independent superstructure unit if a new one is required will cost another Rs.550.

The financial burden imposed by the bucket latrine may be analysed as under:

- The local body pays each scavenger Rs.250 per month to service 30 to 40 bucket latrines.
- Each houseowner pays Rs.1.25/Rs.1.50 per month to the local body for the scavenging service.
- The local body is thus losing Rs.200 per month or Rs.2,400 per annum on each scavenger just to maintain the bucket service.
- In addition, the recurrent charges on mechanized transport of nightsoil is stated to be about Rs.10 per latrine per annum, or roughly Rs.350 on the 30/40 latrines serviced by each scavenger.

- Municipal and government subsidy of Rs.7,000 to covert 35 (average of 30-40) dry latrines will retrieve one scavenger from bucket service and save the local body Rs.2,750 per annum; thus the subsidy will have been recovered fully in 3 years.
- Against this relief, the local body has the obligation to retain and rehabilitate the scavenger until he is gainfully employed and ceases to be a liability.

From the houseowner's standpoint the following is relevant:

- The scavenging tax and service charges on his bucket latrine may be set at Rs.20/Rs.30 per annum as a minimum.
- This recurring expenditure will call for a capital outlay of Rs.350/Rs.500 in perpetuity at 6% interest.
- Investing this outlay on his latrine conversion involves no additional financial burden for him.

The programme is financially viable and profitable to the local body and the houseowner in the long run.

POLLUTION FLOW FROM BORE HOLE AND PIT  
LATRINES UNDER DIFFERENT SOIL CONDITIONS

Place of Experiment	Nature of soil		Ground water conditions		E. Coli flow ft.	
	Soil Strata around the latrine	Mechanical composition		Water table range ft.		Velocity flow ft./day
		Effective size mm	Uniformity coeff.			
Model Town, Lahore Punjab	Permeable soils under the latrine boring	0.10	..	..	1	5
Singur, Bengal	Permeable soils under the latrine boring	0.20	2.0	3-13	2-3	10
Cowington Country Alabama, USA	Permeable soils under the latrine boring	0.12	2.7	3-9	1-2	10
Wingard Exptl. Station, Alabama, USA	Impervious stratum closely underlying latrine boring	0.13	5.2	8-12	8	35
Wingard Exptl. Station, Alabama, USA	Impervious stratum closely underlying latrine boring	0.17	2.3	5-7	13	80

BASIS OF CALCULATION OF QUANTITY OF MANURE

100 gms dry solids

80% Volatile solids

50% reduction of Volatile

$$40 + 20 = 60$$

60 gms residue per capita/per day

$$60 \times 360 = 21.6$$

Say 21 Kg.

Assuming 40 - 60% moisture, weight of manure  
per capita per year

$$21 \times \frac{100}{50} = 42 \text{ Kg.}$$

For a family of 8 for 3 years

$$8 \times 42 \times 3 = 1008 \text{ Kg. Say 1 tonne}$$

About 1 tonne of good organic manure will be recovered for each pit.  
once in three years

Nitrogen content	)	
at 1-3% N on dry basis	)	about 10 Kg.
Phosphorous content	)	
at 1%	)	about 5 Kg.



ABSTRACT OF COST FOR HAND-FLUSH WATER SEAL PRIVY

S.No.	Description	Unit	Quantity	Total Qty.	Rate	Amount Rs.
1	2	3	4	5	6	7
1.	Excavation	M <sup>3</sup>				
	Toilet		2x1.5x.2x.2=.12			
	"		2x.8x.2x.2=.06			
	Pit		1x11x1.45 <sup>2</sup> x2.2=3.63			
	Pipe Line		Total 3.91			
			Say	4.00	2.65	10.60
2.	Brick work in foundation & superstructure upto plinth in 1:4 cement mortar	M <sup>3</sup>	2x1.5x.2x.2=.12 2x.8x.2x.2=.06 2x1.4x.1x.2=.06 2x.9x.1x.2=.04 1x11x1.35x.2x.2=.17 1x11x1.25x.2x.1=.08 0.53	0.53	160	84.80
3.	Cement plaster on superstructure upto plinth in 1:3 cement mortar	M <sup>2</sup>	2x1.4x.2=0.56 2x1.1x.2=0.44 1.00	1.00	7	7.00
4.	40mm thick PCC floor in 1:2:4 over base concrete of 1:6:12 on well rammed earth, surface finished with 3mm thick floating coat of cement	M <sup>2</sup>	1x1.2x.9=1.1 (-) 1x.5x.2=0.1 1.00	1.00	16	16.00
5.	Supply & fix W.C. Pan with footrest	No	1 x 1	1	50	50.00
6.	Supply & fix P trap	No.	1 x 1	1	15	15.00
7.	Supply, lay & joint SW pipe	Mtr	1 x 1.5	1.5	9	13.50
8.	Supply & fix plain bend	No	1 x 1	1	6.4	6.40
9.	PCC slab in 1:2:4	M <sup>3</sup>	1x11x1.35 <sup>2</sup> x.06=.085	.085	400	34.00
10.	RCC in beam in 1:2:4	M <sup>3</sup>	1x11(1.22 <sup>2</sup> -115 <sup>2</sup> ).075 =.01	.01	400	4.00
11.	MS Iron work for RCC	Kg		2	2.9	5.80
12.	Brick work in honey comb in 1:4 cement mortar	M <sup>3</sup>	1x11x1.25x.1x.8=.31	.31	106	33.00
13.	Extra for cleaning site		Lump sum			10.00
14.	Supervision of works					50.00
	Add supervision charge at the rate of 10%				Rs.	340.10 34.00 374.10
				Say	<u>Rs.375.00</u>	

Water-Seal Toilet connected to Sewer, Typical  
Sketch and Estimate

a) Supply of Materials

Supplying SW pipe 100 mm dia		
IC to MH .....	6.0 Mtr.	
Wastage 5%.....	<u>0.3 Mtr.</u>	
Breakage etc.	6.3 Mtr.	at the rate of
		Rs.6/- per Mtr.
		Rs.38.00

b) Construction Work

1. Excavation of trench in street or in open areas for sewer & manhole etc. depth not exceeding 3 Mtr.		
1x6x.9x1.2 = 6.50 cu M at the rate of		
	Rs.5.30 per m <sup>3</sup>	Rs.34.50
2. P.C.C. 1:6:12 under bed of sewer		
1x.3x6x.27 = .48 m <sup>3</sup> at the rate of		
	Rs.100/- per cum	Rs.48.00
3. Lowering SW pipes in trenches 100mm dia - 6 mtrs. at the rate of 0.7 per mtr.		Rs. 4.20
4. Jointing and fixing SW pipes 100md. 10 joints at the rate of 1.15 per joint		Rs.11.50
5. Cutting of SW pipes - 1 cut at the rate of 0.60		Rs. 0.60
		Rs.98.80
		+ Rs.38.00
		Rs.136.80
	Say	<u>Rs.140.00</u>

c) Providing fittings

1. Providing & fixing Indian pattern WC seat complete including foot-rest and P trap at the rate of Rs.50/- & Rs.15/-		Rs.65.00
2. Providing in position 100mm dia. SW pipes from WC to I.C. & SS to IC.....4.8 mtrs. at the rate of 6.00		Rs.28.80
3. Providing vent pipe 50mm dia PVC 4M long at the rate of 10.00		Rs.40.00
4. Providing & fixing specials for pipes:		
Head Rest bend	1 No.	Rs.8/-
Cowl	1 No.	Rs.6/-
Plain Bend	1 No.	Rs.6.40
		Rs.20.40

5.	Fixing pipes and specials with cement joints		
	Laying of pipes 4.8 mtr at the rate of 0.70 per mtr.		3.50
	Jointing & fixing pipes 8 joints at the rate of 1.15/joint		9.20
	Jointing & fixing specials & cowls 5 joints at the rate of 1.75 per joint		8.75
	Material for jointing of pipes 8 joints at the rate of 1.00 per joint		8.00
	Material for jointing of specials 5 joints at the rate of 1.50 per joint		7.50
6.	Providing & fixing MS clamp of vent pipe - 2 Nos. at 3.00 each		6.00
7.	Constructing masonry inspection chamber .45x45M upto 60 cm average depth 1: 6 : 12 live concrete benching 12 mm cement plaster 1 : 2, RCC slab 1 : 2 : 4 4" thick with .45x45M inside light pattern CI manhole cover and frame complete - 1 No.		<u>120.00</u>
			317.15
		Say	320.00
d)	<u>Flooring</u>		
1	Concrete floor 25 mm thick cc 1 : 2 : 4 on 100 mm C.C. 1 : 8 : 16 & 100 mm sand or stone filling 1.2x9 M size of Lat. = 1.1 m <sup>2</sup> at the rate of 16/-		<u>17.60</u>

Grand total: 140+320+17.60 = 477.60

Say.....Rs.500.00