Diaspora Philanthropy in Action: An Evaluation of Modernization in Punjab Villages

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Diaspora action in modernisation of civic amenities brought remarkable improvement in the living environment of project villages. With universal connectivity to underground water supply, sewerage, sewerage treatment plant, cemented roads with solar lights, village parks, community centre, telephone lines and computer education, the project villages in the Indian Punjab resemble any modern village in the western world. The integrated sustainable top-down approach followed for this purpose has proved to be the most cost-effective, replicable, participatory, pro-poor and inclusive model of village modernisation. Completion of projects has led to better community relations and capacity building, substantially fall in water and sanitation borne diseases, and reduction in flies, mosquitoes, and foul smell in the project villages.

Punjab's remarkable achievement in modernisation of its rural economy notwithstanding, the quality of life in villages failed to match the rising aspiration for better living conditions fuelled by rising incomes. High quality of life visible in urban towns and revolutionary penetration of information technology and mass media in rural Punjab further stimulated their urge for similar facilities in their villages. However condition of civic amenities continues to be deplorable in rural Punjab (Dhesi, 2007b). Open drains, accumulated water in potholes and near the water sources, stinking village ponds, heaps of garbage and human excreta in periphery of villages is the environmental scenario in villages of Punjab. Unreached by public sector amenities, many well-to-do and health conscious households in villages make their own inadequate arrangements. Even the public provision of basic amenities like water supply, sanitation and hygiene infrastructure, whenever and wherever provided, follows a piecemeal approach. It is now well accepted that there is a critical minimum threshold level of coverage of water, sanitation and hygiene that has to be crossed before the intended impacts are felt (Wan, 1997). Probably this might be the reason that in spite of being the high income state with comparatively better infrastructure, Punjab is the second highest morbidity prone state in India (GOI, 2004). Available empirical literature conclusively suggests that inadequate water, sanitation and hygiene are among the 10 top contributors to overall worldwide burden of diseases (Murray and Lopez, 1997).

Realizing the gravity of the situation and exposed to high quality civic amenities in the western world, a number of Punjabi Non-Resident Indians (hereafter NRIs) embarked on a mission of developing integrated sustainable

development of modern civic amenities in their ancestral villages. Modernization of village Kharoudi in Hoshiarpur district by the two NRIs, Dr. Basi and Dr. Gill, begin to be cited as a role model for many others. The initial efforts of the two NRIs led to institutionalisation of village life improvement programme and establishment of the Village Life Improvement Foundation (VLIF). The VLIF is currently replicating the Kharoudi model of integrated development in many other villages in the state. The purpose of this paper is study the VLIF approach to village modernization and also to assess its impact on health, socio-economic and environmental aspects of the peoples living in the project villages.

The paper is organised as follows. The following section provides the status of water supply and sanitation scenario in the rural Punjab. Section 3 briefly describes the beginning and progress on the modernisation of civic amenities in the Punjab villages. Data and methodology is described in section 4. Empirical evidence on impact of projects on health, socio and overall village environment on the population in project villages is presented in section 5. A summary and recommendations based on analysis in earlier sections are presented in the concluding section 6.

Water Supply and Sanitation Scenario in Punjab: Status and Issues

(A) *Water Supply: Accessibility and Quality*

Unlike most other Indian states, accessibility to water is not that a major problem in Punjab. Plenty of water, both surface and underground is available. The 2003 Habitation Survey revealed that 27.8 per cent of the 13,724 rural habitations in Punjab were fully covered (by public water supply) in the sense that they had water supply level of 40 litres per capita per day (lpcd). Another 39.7 per cent on the habitations were partly covered with supply of 20-40 lpcd. Owing to the concentrated expansionary efforts by the state government under the 'Rajiv Gandhi National Drinking Water Mission', the proportion of the fully covered habitations under public sector rural water supply was 93 per cent as on April 1, 2006 (GOI, 2007). Thus only about 7 per cent of the habitations are yet to be reached in the state under the rural water supply mission. This extensive coverage notwithstanding, only 25 per cent of the households in these fully and partly covered villages draw water from the system.

Accessibility apart, quality of available shallow ground water in the state is another major concern of rural water supply in Punjab. Majority of the rural households still use shallow ground water lifted with own hand /power operated pumps. Estimates reveal that 54 per cent on the rural villages in the state have serious water quality problems due to presence of physical, biological and chemical contaminants (FTE, 2006). Even the habitation survey of 2003 indicates that 76 per cent of the not covered and 1 per cent of the partially covered villages under the (public) water supply schemes are affected by at least one of these contaminants (Table 1). Of these problematic rural habitations, 53 per cent suffer due to physical and biological contamination and 47 per cent

from the presence of some chemical like iron, arsenic, fluoride, nitrate, salinity, and sulphate beyond the safe limits accepted internationally. Presence of contaminants in majority of the villages, still not covered fully under the safe water supply, poses serious health hazards to the population. Therefore, availability of adequate water in these problematic villages notwithstanding, there is urgent need for provision of alternative safe drinking water source either through governmental investment or by encouraging philanthropic organizations like the 'Village Life Improvement Foundation' in this context.

Table 1: Water Supply and Sanitation Scenario: Status in Rural Punjab

Sr No	Type	Habitations	Number	% of Total
1	Water Supply [Habitation Survey, 2004]	Fully covered Partially covered Not covered Total	3813 5450 4461 13724	27.8 39.7 32.5 100.0
2	Water Quality Problem [Habitation Survey, 2004]	Partially covered Not covered Quality problem Habitations	50 3390 3440	0.9 76.0 34.7
3	Source of Quality Problem [Habitation Survey, 2004]	Type of contaminant Physical & Biological Chemical All	 1813 1627 3440	 52.7 47.3
4	Sanitation [Census of India, 2001]	Type of Latrine within the house • Pit latrine • Water closet • Other latrine • No latrine	% of rural households 26.4 6.4 8.2 59.1	
5	Drainage Connectivity For waste water outlet [Census of India, 2001]	• Closed drainage • Open drainage • No drainage	4.2 73.8 21.9	

(B) *Sanitation*

(i) Inadequate Defecation Facilities

According to the National Sample Survey Organisation (NSSO) 2002 survey, about a half of the rural households in Punjab have no sanitation facility (Table 1). Consequently, almost half of the rural population defecates in the open leading to degraded sanitation environment. The practice not only poses serious health hazard to defecators themselves but even to others having their own in-house latrines. The decaying human excreta in the village periphery pave way

for rapid multiplication of disease vectors and contamination of water sources. The situation becomes serious during the rainy season when it gets dissolved in rain water and enters into village streets, drinking water sources, water channels and village ponds. Even the underground water gets contaminated with bacteriological and nitrate with the run-off that seeps into the shallow aquifer.

(ii) Unsafe Disposal of Waste Water

Due to inadequate waste water disposal arrangements, effluent overflowing the septic tanks (of household latrines) finds its way into waste water channels/drains constructed in the village lanes and by-lanes. Waste water generated in the households' kitchen, bathrooms, and cattle sheds also flows into the water drains. Unlike in urban settlements, there is no formal drain cleaning system in the villages. Consequently, waste water and effluent overflows into potholes in lanes and by lanes, seeps into hand pumps and underground water. The stagnated water often clogged in open surface drains also becomes a fertile ground for flies, mosquitoes, and other disease vectors. As per the 2001 census, only 4.2 per cent of the rural households in Punjab have closed drainage connectivity whereas 73.8 per cent continue to dispose of their waste water into open drains. The continuous running water from community water supply connections (most of which are without any tap) further complicates the situation. The open drain system in villages poses a serious health hazard and contributes to poor living environment. The situation is really worse in the case of 21.9 per cent households having no drainage connectivity. The accumulated waste water, discharged by them, in open space in or around their premises exposes them to a big health risk.

(iii) Stinking Village Ponds

The village ponds that traditionally served a good source of water for animals and washing of clothes lost its importance with development of piped water supply and installation of individual household hand pumps. Presently, untreated waste water and sullage, overflow of effluent from septic tanks, run-off from cattle dung and bio-waste from dumps (*rudis*) ends up in these ponds. The highly polluted stinking stagnant water and growth of unwanted aquatic plants in these ponds contributes to growth of vector diseases, poses serious health hazard, and poor living environment. The village ponds need to be rehabilitated because besides being an important source of water, they also contribute towards the maintenance of ecological balance by acting as natural drainage, ground water recharger, providing habitation to the local flora and fauna.

(iv) Bio-waste

The solid household waste, agriculture bio-waste and animal dung are dumped traditionally in open space or pits (known as *rudis*). The waste dumps almost make a garland around the villages. Though waste is a good fertilizer source for agriculture purposes, but its vicinity to habitations, unscientific storage and management, foul smell and a source for multiplication of disease vectors, poses a serious environmental and health hazard to the villagers.

The overall scenario resulting from inadequate arrangements for safe water supply, poor sanitation owing to lack of proper households and community arrangements for defecation, disposal of waste water and bio-wastes, poor condition of lanes and by-lanes, unscientific management of animal dung and other waste dumped openly cry for attention of the policy makers, aid agencies and all those who are concerned with the well-being of Punjab.

Diaspora Philanthropy in Action: Beginning of the Village Modernisation Programme

A substantial number of expatriates from the *Doaba* region of Punjab are well settled in many parts of Europe and North America. Majority of them maintain strong ties with their land of origin and contribute substantially to its social and economic development. Many continue to send remittances, drastically transforming the lives of their family members back home, others invest in palatial houses, and many others contribute to religious charity (Dhesi, 2007a and Thandi, 2007). However, Dr. Raghbir Basi, Professor of Economics of International Development and Provost, Alaska Pacific University, Alaska, had something different in his mind. Appalled at the squalor and filth around his native village, ground littered with animal dung, muddy streets with no light and overflowing drains and waste piling up ankle deep, stinking village ponds, and abundance population of flies, mosquitoes and other disease vectors in the village, Dr. Basi thought of starting to improve all this (Basi, 2007). The idea was to initiate a holistic bottom-up process of integrated sustainable development with focus on the betterment of the 'left behind' village people. The process so conceived, was thought to begin with building up basic infrastructure facilities centred around water supply, sanitation, hygiene and computer education.

Armed with a vision and urge to contribute something unique to the village of his forefathers, Dr. Basi visited the village in 1999. He discussed his ideas first with village leaders and later on with whole village by calling a village assembly. With over-enthusiastic and unanimous response, it was resolved to construct underground water supply and sewerage system, cementing village streets, and make arrangement for improvement of education in the village primary school. Aware of the many bureaucratic roadblocks one encounters, Dr. Basi consulted Dr. Shamsher Singh Babra of the World Bank, who arranged his meeting with S. Parkash Singh Badal, the then Chief Minister of Punjab.

Impressed by the proposed programme, he promised a dollar-for-dollar assistance from the Government (Basi, 2007).

With commitments in hand, Dr. Basi consulted Dr Gurdev Gill, a retired Physician from Vancouver Canada and a compatriot from his native village Kharoudi. Dr. Gill had been working to enhance mutual understanding between Indo-Canadians and Canadians at large and to provide community services as needed through the 'India Canadian Friendship Society of British Columbia' (ICFS), of which he was the founder President. Dr. Gill not only agreed enthusiastically to become a partner of such a venture but also to provide leadership in the proposed rural development work. Both immediately agreed and set up the 'Village Lifestyle Improvement Board (VLIB)', in Kharoudi in December 1999 to handle the development work (Figure 1).

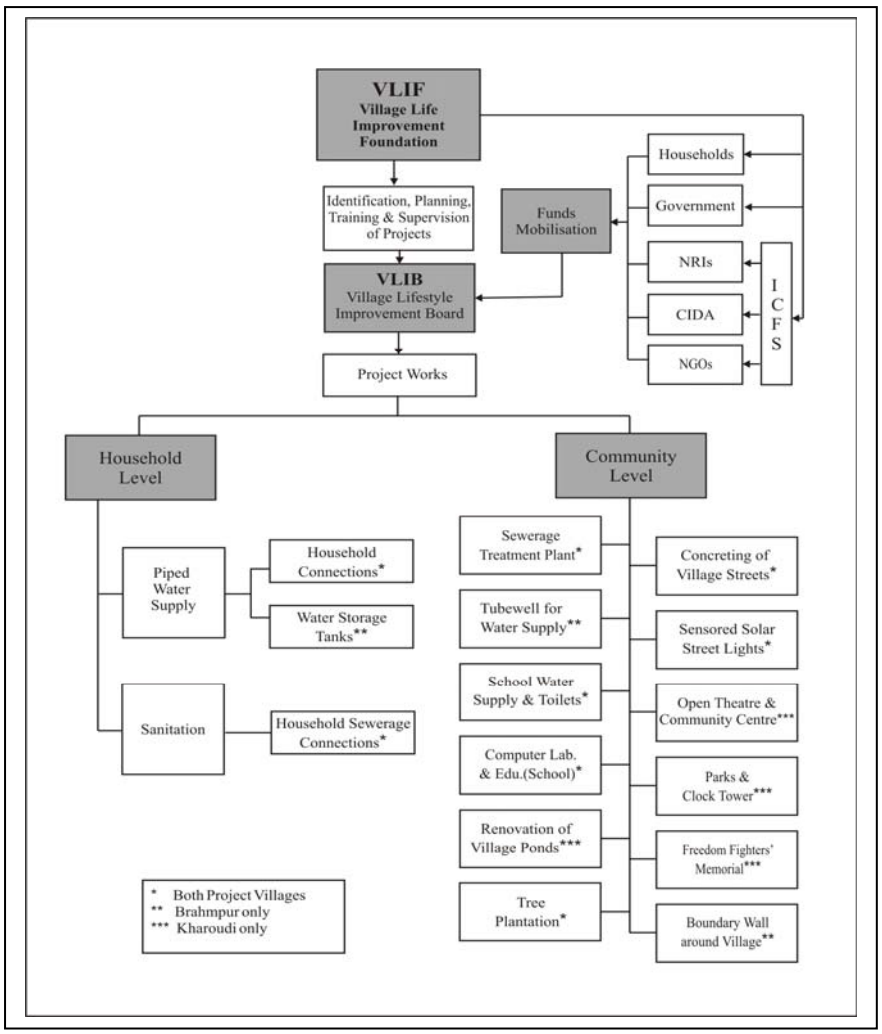
With a formal institution (VLIB) and a roadmap in hand, Drs Basi and Gill started with the most difficult task of mobilization of resources for execution of their plans. The idea of these two social entrepreneurs began taking definite shape with overwhelming support from fellow NRIs abroad (from village Kharoudi). Dr. Gill used the good offices and established reputation of ICFS and prevailed upon the Canadian International Development Agency (CIDA) and other NRIs for funding their proposed project. Soon they were able to mobilize enough resources for their dream project. Besides monetary contribution, the ICFS provided all technology to the VLIF and Dr. Gill imparted technical know-how and training to the VLIF contractor and practically handled most of the down to earth work. With enough money and active involvement of all stakeholders, these two visionaries soon developed modern civic amenities in their village. Kharoudi soon became a role model and a *Mecca* for all those concerned with provisions for modern civic amenities in the rural areas.

Today village Kharoudi has cemented concrete roads with solar street lights, underground piped water supply, underground sanitation opening into sewerage treatment plant, and with almost universal provision of water supply and sewer connection to every household. The VLIB also developed three parks in the village, and constructed a crematorium; a new room in the school for solar operated computer education (equipped with 5 PCs and a paid computer teacher); underground telephone cables for better connectivity; a community centre with guest house facilities, a specially created stone sculpture memorial adorned with inscription of 'In Honour of the Gaddarites.' in honour of the freedom fighters from the village, and trees around the village. The modernization has been widely acclaimed and the village attracted the attention of Dr. A.P.J. Abdul Kalam, Honourable President (of India), who paid a personal visit to the village and commended the contribution of VLIF.

Impressed by the remarkable change in village Kharoudi, many other resourceful NRIs from other villages of Punjab, also approached the VLIF to replicate the Kharoudi model in their ancestral villages. Brahmpur was the second such village adopted by the VLIF. The initiative here mainly came from Mr. Anant Pal Singh, a Canadian citizen and NRI from the village who alone

contributed CDN$ 58,000 for modernization of Brahmpur. The modernisation includes the installation of a deep tubewell for piped supply of safe drinking

Figure 1: VLIF Projects



water, construction of water facility in each household, beautification of village lanes by plantation of ornamental trees, painting all walls facing streets, and construction of about six feet high wall around the village to cover the unpleasant scene created by dumps of garbage and also to block the intrusion of disease vector originating from animal dung and bio-waste. The VLIB employed two sweepers to clean village streets every morning.

The VLIF aims to extend its domain by enabling Punjabi diaspora all over the globe to pool resources for modernization of their ancestral villages back home (Gill, 2007). Whosoever approaches them, the organization helps them in getting a village development proposal prepared, work out least cost estimates, contacting village NRIs abroad, providing names of experienced and approved (for funding) contractors, overseeing progress of work, contacting Government Officials in Punjab to obtain matching funds, and establishing local NGO/VLIB and helping to overcome other hurdles in the implementation of their village development project.

Methodology and Data

The paper follows descriptive and modelling methods to project evaluation. In the absence of any before-project information, we have chosen the case-control approach and compared the health, and socio-economic status of people in the project villages (case) with those in the non-project (control) villages. This approach tries to build a plausible explanation as to how the observed changes are accounted for by the project intervention. Quantification of benefits so generated yield data which can be understood easily by politicians and policymakers and other stakeholders. Following the widely accepted practice in the available literature on Water Sewerage and Sanitation (WSS) (Esray et.al. 1991 and Fawtrell et.al. 2004), we evaluated the health impact of VLIF projects by measuring the reduction in prevalence of diarrhoeal morbidity in the project villages. Besides health, we also examined the changes brought by projects on socio-economic and environmental aspects of the population in the project villages.

However, one must be aware of the implicit problems that can distort the conclusions based on case-control comparison of the quantitative information. Such distortions are unavoidable in case the ground realties in terms of population characteristics and civic amenities are not same in the case and control sets of villages. One way out is to use a regression model whereby the impact of such differential situations can be controlled by including the compounding variables in the model. In the present paper, besides quantification of benefits following on project implementation, we also employed the Logit Model to study the impact of water supply and sanitation on health status of the households in the project villages (Green, 2004). We hypothesize that both the household specific and environmental characters of individuals play crucial role as determinant of their health status and reduction in incidence of 'water supply and sanitation' related morbidity in the project villages.

The paper makes use of the following form of the Logit Model to examine the impact of VLIF projects on health of the population:

$$P_i = \frac{1}{1 + e^{-(\alpha + \sum \beta X_i + \sum \delta_i D_i + \varepsilon_i)}}$$

$$\text{Or} \quad Log\left[\frac{P_i}{1-P_i}\right] = \alpha + \sum \beta X_i + \sum \delta_j D_j + \varepsilon_i$$

Where P_i- is the probability of i-th suffering from diarrhoea

X_i – is the set of household characteristics of the i-th individual

D_j – is dummy variable (=1 for project villages and 0 for others)

α, β_i and δ_j are parameters of the model to be estimated.

ε_i - is the stochastic error term

To estimate the outcomes on health and socio-economic status of the population, we conducted a primary survey of the households in two project villages, Kharoudi and Brahmpur as case and three other villages, namely Digrian, Jian and Langeri as control villages. A sample of 360 households was selected from project and non-project villages. Information on sources of water supply, disposal of waste/grey water and related problems, garbage/bio-waste disposal, methods and hygiene practices followed in faeces disposal of the children, method of defecation and type of latrines, if any, and problems thereof, and provision of water supply and sanitation facilities to school going children was collected with a pre-tested structured questionnaire during May-June, 2006. Information on nature, duration, treatment, all direct and indirect medical expenditure incurred and losses suffered on ailment of any member from the household on this account were collected for the 15 days preceding the date of survey. Besides this, additional information on perception of the households on various aspects of the projects benefits was also collected from respondents in the project villages.

Impact Assessment

Water Supply and Sanitation Status: Project and Non-project Villages

Though the households have universal access to sources of drinking water, but 92.8 per cent of the households in project villages now have piped water supply on their premises (Table 3). Another 3.6 per cent of the households in this set use a hand pump as main source of drinking water. Only 3.6 per cent of the households have to fetch water from sources outside their premises. Compared to this, in the non-project villages, only 20.7 per cent of the households have piped water supply into their premises whereas 32 per cent have to fetch it from some outside premises source.

The most important impact of the project is almost universal usage of the sewerage system for disposal of grey/waste water from their premises. In fact only one sample household not availing this facility had constructed a dwelling recently and was planning to lay sewer pipes up to the nearest sewerage line. In non-project villages, waste water from household premises is discharged in the street channels that end into either into village pound or marshy common land.

Even 8.1 per cent of households lack access to street water channels and discharge their waste/grey water into open space in or outside their premises.

Table 3: Water Supply and Sanitation Facilities: Project and Non-project Villages

Sr No	Characteristics	Project villages	Non-project Villages
1	Main Source of Drinking Water (% hhds)		
	• Piped water in house	92.8	20.7
	• Handpump in household	3.6	47.3
	• Pipe / handpump outside Household premises	3.6	32.0
2	Disposal of Gray Water into (% hhds)		
	• Sewerage	99.3	0.0
	• Street water channel	0.0	91.9
	• Open space	0.7	8.1
3	Toilet Facilities (% households)		
	• Flush into sewer	90.6	0.0
	• Pour/Flush into pit	0.0	48.2
	• Open defecation	9.4	51.8

Besides the disposal of grey water, the sewerage system made a major impact on mode of defecation in the project villages. Laying sewerage system facilitated 90.6 per cent of the households in the project villages to construct flush latrines on their premises. Compared to this, almost half of the households in non-project villages use their flush/pit latrines whereas the remaining half defecate in open fields/crops/garbage pits in periphery of the villages. The irony of the matter is that 9.4 per cent of the households in project villages still defecate in open though almost everyone has a sewerage connection. Our inquiry revealed that most of them were from weaker segments of the villagers and they lack resources to construct flush toilets on their premises. In our recent visits to some poor households it was found that some of them constructed their own latrines very recently after getting financial assistance from the central government under the 'Total Sanitation Campaign' (TSC) programme. This suggests that mere provisioning of WSS facilities does not always guarantee their use by the targeted population. Much depends upon their capacity to pay user charges and to make complimentary investment to make use of the facility.

Choice of Technology and Replicability of the Model

Before analysing the impact assessment of the VLIF projects, the most crucial questions are: whether or not the technology adopted was most appropriate so far as the cost and suitability are concerned; whether or not the Kharoudi model of development can be replicated elsewhere; whether or not stakeholders were involved at each and every stage of the project implementation. In fact the first

two issues were raised by the President of India, Dr. A.P.J. Abdul Kalam to the Ministry of Rural Development, Government of India. A study conducted by Saxena (2005) on behalf of the Government of India of a comparative analysis of Kharoudi/Brahmpur technology vis-à-vis the technology adopted by the Government of Punjab in provision of sanitation facilities in Ulana village, reveals that the per capita cost of Brahmpur/Kharoudi technology is cheaper by about 30 per cent than that of Ulana technology. Therefore, the VLIF seems to have selected the most cost-effective sewer collection and treatment technology in its projects.

The second issue assumes importance as many success stories may have limited replicability elsewhere. The Kharoudi and Brahmpur model of modernising the quality of life in rural areas seems to fall in this category. The model can be successfully replicated in villages provided NRIs or locals are willing to contribute adequate financial resources. However the high cost involved in provision of modern sewerage system and upgradation of other services in villages may be beyond the capacity of locals. However there is a substantial number of Punjabi NRIs settled abroad from the four central districts, namely Jalandhar, Nawan Shahar, Hoshiarpur and Kapurthala. So, the Kharoudi model seems to have substantial scope of raplicability in many other villages in these four districts as well. Already, the VLIF has adopted a number of villages from these districts for replication of the Kharoudi model. However, due to lack of similar NRI support, the model seems to have limited application to rest of districts in Punjab. The VLIF is already aware of this problem. According to the VLIF replication of the Kharoudi model is not a problem as funds are plentiful but what is most crucial is the willingness of the villagers to act (Basi, 2007). The foundation is willing to facilitate the process in mobilisation of resources and actual implementation of the projects (Saxena, 2005 and Basi, 2007). Furthermore the task can only be accomplished provided the VLIF successfully involves international development agencies and donors from the developed world.

Health Impact of Projects

As mentioned earlier the core objective of the project investment was improvement in quality of life by providing modern water supply and sanitation facilities in villages. The fact that projects successfully realised their core objectives is well accepted. The ultimate gain to the people however is reflected though improvements in health status, economy, and overall living environment in the villages through various linkages discussed earlier. The available evidence suggests that improvement in water supply and sanitation make a significant reduction in many water borne diseases but the current empirical literature is mainly focused on measurement of reduction in prevalence of diarrhoeal diseases in the target population. Our estimates reveal that on the whole 4.5 percent of the sample population was found to be suffering from diarrhoea during the 15 days preceding the date of visit. This seems to be on the higher side compared with 0.9 percent diarrhoeal morbidity in rural Punjab

found in a recent survey conducted by the NSSO (GOI, 2004). Departure of our result from the well accepted field survey of NSSO may be due to the fact that we conducted the survey during the months of May-June, the peak season for diarrhoeal diseases. On the other hand, the NSSO survey was undertaken during the Jan-July period.

Separate estimates of diarrhoea in project and non-project villages show a much higher incidence in the non-project villages. Compared with 7.1 percent incidence in non-project villages, the incidence was just 0.8 percent in the project villages. Assuming other compounding determinants of diarrhoeal morbidity being same in the project and the non-project villages, the project intervention seems to have reduced the diarrhoeal morbidity by 90 percent. As pointed out earlier, the homogeneity assumption of the compounding determinants of diarrhoeal morbidity seems to be too strong. Therefore, the reduction of diarrhoeal morbidity may not be entirely due to project intervention. To estimate the real impact of project intervention on the diarrhoeal reduction among the project population, we estimated the logistic regression on the unit level data collected during the survey.

The estimate of the logistic regression of the impact of various compounding factors of diarrhoeal morbidity is detailed in Table 4. It may be seen that age of a person, caste background, availability of toilet facilities, project/non-project status of the village, type of dwelling unit, are the variables that significantly determined the occurrence of diarrhoeal morbidity. The other variables namely, sex status of an individual, source of drinking water, economic status of the household and ownership of television included in the regression does not significantly affect diarrhoeal diseases in the sample population. Our results reveal that children aged between 0-4 are most susceptible to the risk of diarrhoeal diseases. These are followed by children in the age group of 5-14 years. Results also reveals that persons from low caste background (Scheduled Castes) are more prone to diarrhoeal morbidity compared with others. Availability of toilet facility within premises considerably reduces the risk of diarrhoeal diseases. The prevalence of diarrhoea is significantly related with structure of the dwelling unit. Persons living in *katcha* or semi- *pucca* houses are more prone to risk of suffering from diarrhoeal diseases. Development of water supply, sanitary facilities and improved environment, as carried out in project villages, *ceteris paribus*, significantly reduce the risk of diarrhoeal morbidity.

The log-odds ratio of the dummy variable for the project villages indicate that, other things being same, the provision of water supply and sanitary facilities by the VLIB has reduced diarrhoeal morbidity by about 70 percent in the project villages - Kharoudi and Brahmpur. This validates our earlier hunch that the difference of 90 percent diarrhoral morbidity between the project and non-project villages may be due to non homogeneous population in two set of villages. Our results show that provision of facilities in the project villages led to 70 percent reduction in diarrhoeal diseases.

Table 4: Logistic Regression on Prevalence of Diarrhoea in Rural Punjab

S. No	Variables	Regression Coefficient (standard error)	Percent Change in odds ratio	Level of significance
1.	Age Dummy1 (=1 for 0-4 yrs., 0 otherwise)	3.592 (0.358)	3630.9	0.000
2.	Age Dummy2 (=1 for 5-14 yrs., 0 otherwise)	1.398 (0.321)	39.47	0.000
3.	Sex Dummy (=1 for males, 0 otherwise)	-0.363 (0.273)	30.5	0.184
4.	Caste Dummy (=1 for Scheduled Caste, 0 otherwise)	0.963 (0.338)	162.1	0.004
5.	Water Dummy (=1 for Piped water connection, 0 otherwise)	0.353 (0.367)	42.4	0.335
6.	Water Dummy (=1 for own Handpump, 0 otherwise)	-0.216 (0.323)	-19.4	0.504
7.	Toilet Dummy (=1 for on premises toilet facility, 0 otherwise)	-2.904 (0.947)	-94.5	0.002
8.	Status Dummy (=1 for high income group, 0 otherwise)	-0.637 (0.384)	-47.1	0.097
9.	Dwelling Dummy (=1 for *pucca* structure, 0 otherwise)	-1.129 (0.311)	-67.7	0.000
10.	Television Dummy (=1 for own television, 0 otherwise)	-0.289 (0.575)	-25.1	0.615
11.	Project Dummy (=1 if person from project village, 0 otherwise)	-1.189 (0.637)	-69.6	0.062
	Constant	-2.370 (0.696)		0.001
	-2 Log likelihood	439.75		
	Nagelkerke R square	0.35		
	No. of Observations	1729		

Findings of empirical studies undertaken in different environments and following varied methodology are not strictly comparable. However most of the empirical evidence on water supply and sanitation projects is focused on individual components - water supply or sanitation. Review of the available evidence based on the meta analysis of a large number of empirical studies (Esrey et.al., 1990 and 1991, Fawtrell and Colford 2004, Fawtrell et al 2004, and Klees et al, 1999) reveals that sanitation improvement is the single most

effective intervention in reducing the diarrhoeal morbidity by 36 per cent. The impact of developing other components of water supply, sanitation and hygiene individually leads to 15-36 per cent reduction in diarrhoeal morbidity. The studies examining the impact of multiple interventions in developing countries are few and complex. Moreover most of the available studies targeted young children with the exception of Hoque et al. (1996). A comprehensive review and meta-analysis of these studies by Fawtrell and Colford (2004) reveals that multiple interventions lead to 67 per cent reduction in diarrhoea. The 95 per cent confidence interval varies from 59.2 to 75.7 per cent. Thus our finding of 69.6 per cent reduction in diarrhoea in the VLIF projects is quite in line with this international evidence. Similarly, higher incidence of diarrhoea among children of younger age is also in line with the available evidence. The evidence of higher risk of diarrhoea among the Scheduled Castes may be due to their location in congested localities with poor in-house and out-house sanitation facilities.

Though the study only focused to analyse impact of projects on diarrhoeal morbidity, available empirical literature (Esrey et al. 1991) reveals that the impact on incidence of mortality reduction (65 per cent) due to water supply and hygiene improvements is much higher compared with reduction (22 per cent) in morbidity (Cairncross and Valdmanis, 2004). Besides reduction in diarrhoeal morbidity and mortality, empirical evidence also brings out that water supply and sanitation improvements leads to 78 per cent reduction in Dracunculiasis, 77 per cent reduction in Schistosomiasis, and 27 per cent reduction in trachoma incidence of morbidity (Esrey et al. 1990 and 1991).

Social Impact

In a state like Punjab, where access to water is not a major problem, social factors are high on the mind of stakeholders in choice of investment in water supply and sanitation projects. Enhanced social status, greater convenience, dignity, privacy and safety for women, emancipation of women from imprisonment of daylight and having to wait for darkness to defecate are some such social factors (Hunt, 2006 and Jenkins, 1999). However, unlike the health benefits, less direct evidence exists on this account (Hunt, 2006). Nevertheless, the issues involved in evaluation of the social impact of such projects includes: (i) inclusion, (ii) equity, (iii) ownership, accountability, and transparency, (iv) capacity building, and (v) changes in hygiene behaviour of the targeted population (World Bank, 1993). Our main focus here would be to examine (i) and (ii) from the point of view of benefits flowing to the weaker segment of the households and females.

In a heterogeneous social set up, based on strong traditional caste and class relations, it is generally alleged that most of the gains from a rural development strategy and allied policies and programmes are cornered by the high caste and rich peasant households (Bardhan, 1984). Therefore it is imperative to evaluate how the gains of VLIF projects are shared among the rural households in the project villages. To examine the issue, we estimated the access to water supply,

and sanitation facilities in the project villages among different caste group of the households. The sample households are divided into three social groups: Scheduled Castes (*dalits*), backward castes and others (upper castes). Information by the source of water supply and sanitation and castes group in project and non-project villages is detailed in Table 5.

Are VLIF Projects Inclusive and Equitable?

(a) *Water Supply*: There are considerable differences in access to the source of drinking water in the project and non-project villages (Table 5). The projects led to four-fold increase in access to piped water supply - a source considered to be the most convenient, adequate and safest quality wise. The weaker sections (dalits and other backwards caste households) seem to have benefited as much as the others (upper caste). However, there is considerable difference in access to piped water supply across the caste groups in project villages. Compared to almost universal (98.9 per cent) access to piped water connections to upper caste households, only about 80 per cent of the households in low caste groups have this facility. Does the evidence suggest exclusion of many weaker section households in the VLIF projects in provisioning of piped water supply? Ground realities do not support this argument. In fact the VLIF laid down underground water supply lines in both the villages. There was a provision for individual connection to every household in the village from the underground mainlines. The construction and operation of piped water supply in Brahmpur is entirely under the control of local VLIB. The local VLIB provided universal access to piped water supply in this village, irrespective of payment of the user charges by the villagers. However a public sector water supply scheme was already functioning at time of execution of the project in village Kharoudi. The local VLIB though made provision of piped water connection to every household but many households opted not to have the functional water supply due to their incapacity to pay security and water charges to the Government Water Supply Department. Proportion of such non-piped connection households is obviously higher among the weaker segments of the households owing to their low paying capacity. However they meet their safe water supply requirement either by having their own hand pumps or draw water from the common community public taps.

(b) *Sanitation-Toilet facilities*: Like water supply, information detailed in Table 5 indicates a remarkable improvement brought by the project in providing access to the sanitary facilities in the project villages. All social groups benefited from the underground sewerage facility and universal connections to sewerage were provided by the VLIB in project villages. Compared with more than a half of the households in non-project villages, the proportion of the households having no-toilet facilities and defecating in open is just 9.4 per cent in the project villages. This implies that provision of sewerage connection to every household by the VLIB encouraged the people in project village to construct flush latrines on their premises. The most remarkable improvement in

sanitation facilities has been achieved by the weaker section households. Compared with 71.8 per cent of the dalit households having no-toilet facilities in the non-project villages, the proportion of such households is just 25.6 per cent in the project villages.

Table 5: Access to Water Supply and Toilet Facilities by Types of Households in Project and Non-Project Villages

A. Water Supply

Household Social Group	Main Source of Drinking Water	% of Households	
		Project Villages	Non-Project Villages
Scheduled Caste	• Piped Water Supply connection in household	81.4	20.0
	• Handpump in household	9.3	44.7
	• Pipe/handpump outside Household premises	9.3	35.3
Other Backward Castes	• Piped Water Supply connection in household	80.0	16.3
	• Handpump in household	0.0	62.8
	• Pipe/handpump outside Household premises	20.0	20.9
Others	• Piped Water Supply connection in household	98.9	23.4
	• Handpump in household	1.1	42.6
	• Pipe/handpump outside Household premises	0.0	34.0

B. Toilets Facilities

Household Social Group	Toilet Facility	% of Households	
		Project Villages	Non-Project Villages
Scheduled Caste	Sewerage connection	74.4	0.0
	Some Facility	0.0	28.2
	No Facility (open defecation)	25.6	71.8
Other Backward Castes	Sewerage connection	80.0	0.0
	Some Facility	0.0	48.8
	No Facility (open defecation)	20.0	51.2
Others	Sewerage connection	98.9	0.0
	Some Facility	0.0	66.0
	No Facility (open defecation)	1.1	34.0

Comparatively, the other (upper caste) households benefited more from provision of sewerage facilities. Almost every household from these upper castes have a sewage connected toilet facility. However, the proportion of sewage connected toilet is 74.4 and 80.0 per cent respectively among the Scheduled Caste and Backward Caste households. The differences are mainly due to low capacity of the weaker segment households to construct latrines on their premises. The VLIB provided sewerage connections to every household free of cost but not invested in construction of private latrines. However, on our re-visit to Brahmpur village, we found that the village panchayat was extending assistance to weaker section households for construction of on premises toilet facilities under the Total Sanitation Campaign (TSC) - a Government of India Scheme for improvement of sanitation facilities in the country (GOI, 2006). Consequently, the weaker segment households would benefit more from the VLIF projects as their deprivation of access to toilet facilities was much more than the upper caste households before the project investment.

The evidence on access to safe water and sanitation facilities suggests that the VLIF projects are both inclusive and equitable. Contrary to most of government projects, the VLIF projects have implicit built-in bias towards weaker segments of society.

Are VLIF Projects Gender Biased?

The benefits of the projects also have an inbuilt gender bias towards the females. In fact, it is well accepted that women bear the main brunt of lack of adequate access to water supply and sanitation facilities. In the social milieu of the state, the burden of arrangement for drinking water and household sanitation falls on the women and young children. Arrangements for better water supply and better sanitation therefore tend to provide greater convenience, privacy, relief and safety for women and children.

Ownership, Participation and Capacity Building

As discussed earlier, though the need for provisioning quality of life infrastructure in the project villages was conceived by the VLIF it was ultimately deliberated and approved unanimously in the village assembly. The projects were implemented by the local VLIB with active participation of the residents. On completion, the ownership of the projects was passed on to the local board with functionaries cutting across all social segments of villagers including member of most vulnerable sections and functionaries of village level elected bodies (*Panchayat*). For instance, Sh. Ram Das, Vice-President of VLIB, Kharoudi, belongs to the dalit (weaker section) community. In our interaction with him and other community leaders, we found him to be most actively involved in planning, implementation, ownership, operation and maintenance of the all components of the VLIF project in village Kharoudi. He virtually attends to all outside visitors to the village; he is well-informed and

takes keen interest in the project's present functioning and future plans. There are many others like Ram Das in the project villages.

Besides household water supply and sanitation connections, members of the weaker section communities in the project villages benefited proportionally more than upper caste households on two other counts. During the survey it was found that most of the well-to-do households in the project villages send their school-age children to renowned English medium high quality education schools. So majority of the children left in the village schools are either from lower caste or economically deprived households. They are therefore the main beneficiaries from the provision of piped water supply and sewer connected flush latrines in the village school. The provision of these facilities in school not only reduces the risk of water and sanitation borne diseases but also improves school attendance, particularly of the girl students (Kelly, 2004). Consequently, it would lead to augmentation of their human capital formation. Similarly building of computer labs with 5 PCs to each village school along with payment to a computer teacher further augments the capacity building in the project villages. Same is more or less also true as for as development of 3 parks and donation of sewing machines and sewing training centre, and community centre in village Kharoudi is concerned as these have significant capacity building potential in the long run.

Environmental impact

As discussed earlier, the apathetic state of village environment was the main factor that motivated Drs. Basi and Gill to do something about the modernisation of their ancestral village Kharoudi. Drastic improvement in the project villages has been highly appreciated both in official and non-official circles and attracted the attention of policy makers from other areas as well as states. Cemented streets with underground water supply and sewer facilities, solar lights, and construction of boundary wall around village Brahmpur put these villages at par with ultra modern villages elsewhere in the world. Findings of a recent rural appraisal survey in project villages, discussed in the sub-section below, brings out what residents in the project villages themselves perceive of these changes.

Besides the health and social impacts, substantial direct and indirect economic benefits follow from the implementation of water supply and sanitation projects (Hutton & Haller, 2004 and WHO, 2001). The indirect benefits mainly follow through the productivity effect. These include gains related to reduced morbidity and mortality. The indirect economic benefits are mainly measured in terms of the value (opportunity cost) of gained productive days of patients and their care-takers and health-workers, and also value (of time) of the deaths avoided. In fact economic analysis in terms of benefit-cost ratio makes a very strong case for investment in these projects and empirical studies suggest that, depending upon the region, the benefits of the WSS projects exceeds 5-11 fold of their cost (Hutton and Haller, 2004).

What Villagers Think of the Projects: Perception of the Households

Besides canvassing a household questionnaire, some searching questions were also put to groups of people and also to selected individuals in the project villages in order to gain first hand information about their perception regarding the potential impact of the modernisation programme. Surprisingly responses from group discussions and individuals were almost the same. Information in this context is detailed in Table 6. Everybody in the project villages was appreciative of the water supply, sewerage, cementing and solar lighting of streets. Similarly reduction of flies, mosquitoes, and foul smell was universally recognised by the residents in the project villages irrespective of whether asked as a group or individually. Similar views were echoed unanimously regarding a better living environment. Everybody affirmed that the project led to better community relations as it eliminated petty disputes arising from dumping of sullage from waste water channels or household waste and stagnant water in the potholes.

Table 6: Project Benefits: Perceptions of Sampled Households

Sr No		**% of households responding**	
		Yes	**No/can't say**
1.	Are You Satisfied with Provisioning of		
	• Water Supply	100.0	0.0
	• Sewerage	100.0	0.0
	• Better Streets and Solar Lights	100.0	0.0
2	Do you thing that the Project has Reduced		
	• House Flies	100.0	0.0
	• Mosquitoes	100.0	0.0
	• Foul Smell	100.0	0.0
3	Do you thing that the Project Created Better Living Environment	100.0	0.0
4	Do you thing that the Project Reduced Faeces and Filth around the Village	90.6	9.4
5	Do you thing that the Project Improved Community Relation	100.0	0.0
6	Do you thing that the Project has Reduced the Prevalence of		
	• Malaria	97.1	2.9
	• Fever	97.1	2.9
	• Diarrhoea	94.2	5.8

Except for a miniscule proportion of rural households, the rest were unanimous of the view that the project successfully reduced faeces and filth around the village and led to substantial reduction in incidence of malaria, fever and diarrhoea. To further explore into the reason for their dissatification, we re-visited these households. We found that most of these households were located in out-skirts of the project villages and exposed to open dumps of animal dung and household wastes. However the VLIB Brahmpur village came out with a noble solution by constructing a 6 feet high wall with provision of entry gates to ward off foul smell, and the intrusion of disease vectors from open dumps of garbage and animal dung. However, similar arrangement is missing in Kharoudi. Mr. Ram Das, ex-*sarpanch* and functionary of VLIB Kharoudi informed us that they are planning to find a suitable place to shift the garbage dumps away from the residential areas. A synoptic view of the voices of the beneficiaries is provided in Box 1 below.

Box 1: Voices From the Project Villages

Modernization of village is dream come true. The NRIs has transformed our village beyond recognition.

Ram Das-Ex-Sarpanch of village Kharoudi

Our seven generations will not be in position to repay debt to Mr. Anant Pal Singh for his generiuosity and creating wonderful facilities for us. The project enhanced social capital and harmony among neighbours by eliminating petty disputes on account of blocked waste water channels or arising due to dumping of filth on the streets.

Krishan Chand –shopkeeper from village Brahmpur

Incidence of diarrhea and malaria has been drastically reduced in the village since modernization. Villagers benefited but it adversely affected our practice.

Davinder Singh - a RMP Doctor from village Brahmpur

Summary and Some Recommendations

The VLIF successfully achieved its objective of modernization of civic amenities in the project villages. Universal connectivity to piped water supply and sewerage to every household without any charges is the unique and unparalleled feature of the VLIF projects. Similarly, cementing of village streets with sensor operated solar streets lights, development of parks, sewerage treatment plants, computer education to primary school children and community centre with guest house facilities are dreams of villagers in developing countries like India. The VLIF puts the project villages at par with

any other model village in the western world and any other town in India. The projects brought remarkable change in the quality of life in villages. Incidence of water and sanitation borne diseases like diarrhoea has been reduced by 70 per cent in the project villages. The bottom-up approach followed by the VLIF proved to be the most cost-effective and has implicit pro-poor and pro-gender bias and is inclusive of the socially and economically deprived sections of the village communities. The project outcomes does not support the impressionistic assertion that 'NRI investment in developmental projects was for personal gains - so that roads…communication and water supply improved in the villages they were to visit on holidays' (Taylor et al, 2007:338). In fact, neither the VLIF trustees nor the main contributors to village modernisation of Kharoudi and Brahmpur stay in the project villages. On their visit to India, we found them staying in their own houses or family houses built in cities/town. On the contrary, the dalit community is the largest beneficiary of the project outcomes and they are quite satisfied with the projects. As mentioned earlier Sh. Ram Das, Vice-President of VLIB Kharoudi and the key person virtually handles everything to do with the project, belongs to the scheduled caste community.

The poor status of villages and enormous health, economic, social and environmental benefits offer strong rationale for modernization of basic civic amenities in remaining villages of Punjab. However, the village communities lack financial, technological and managerial capacity to kick-start any such programme. The VLIF handled all these constraints very successfully and built a world class infrastructure in highly cost-effective and inclusive way with active participation of the local communities. By encouraging the Punjabi Diaspora through formal institutions like VLIF, Punjab can carry forward this bottom-up approach and could modernise many other villages with the present level of resource allocation for rural development programmes. What is really required is pooling of NRI, community and government resources for this purpose. Rather than looking for mobilisation for additional resources, the government can contribute its matching grant by pooling allocations currently being made under various central and state government community and household welfare sectoral programmes.

However despite the impressive achievement on VLIF projects, two important caveats remain. First is that the VLIF withdraws quietly after building and handing over the projects to the local community (VLIB). However, institutional linkages and follow up support are equally important for sustainability of community owned projects. Presently there is hardly any provision for any corpse/reserve to cover future operation, maintenance and expansion of the completed projects. Realizing this shortcoming, the VLIB in Kharoudi is planning to build a corpus fund to ensure 100% coverage of future operation and maintenance costs. But no such planning by VLIBs in other project villages seems to be apparent. In village Brahmpur, Mr. Anant Pal Singh is still contributing to O&M costs as the user charge paid by the beneficiaries are too meagre to meet this cost. It is difficult to say how long this practice will continue. Besides contributions from the village community, the

VLIF should also approach the state government to offer a one-time endowment grant towards the proposed corpus for each modernized village. The corpus must be large enough so that the interest accrued from it would be enough to cover all future expenses.

Second, the hygiene awareness component is missing from the VLIF modernization projects. This must be made an integral part of all such projects in the future. Once the modules are developed, the negligible marginal cost in disseminating information would go a long way to the inculcate knowledge, attitude and practice (KAP) of better hygiene. In fact the KAP of good hygiene are essential to realise fully the potential benefits of water supply and sanitation projects. Similarly, future projects must include the rejuvenation of stinking village ponds. Again Kharoudi shows the way. The VLIB Kharoudi dealt with the problem successfully by converting one such pond into a storage tank for treated water discharged from sewerage treatment plant and others into beautiful parks.

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