New Information Technologies in the Old Political Economy: An Exploration of a Community-based GIS for Improving Basic Services for the Poor in New Delhi, India.

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ABSTRACT

Rapid urbanization, limited neighborhood-level data, and the multiplicity of overlapping agencies in mega-cities in the developing world are creating a significant gap between citizens, particularly the poor, and government. Rising poverty rates have led NGOs and government actors to explore the role of community-based geographic information systems (GIS) in improving service provision to the poor. These participatory GIS applications focus on collecting neighborhood-level information directly from residents and providing this information to government for more need-based planning and policy-making. This thesis examines the development of three such applications in New Delhi, India, that illustrate the potential of participatory GIS production and implementation processes in strengthening communities and creating organizational change within government. However, these three projects also suggest that a stronger understanding of the political economy of information gathering and policy-making is needed if the use of resident perceptions and other types of local knowledge is to be institutionalized in government resource allocation and policy-making processes.

Findings suggest, first, that, contrary to the popular belief that government lacks sufficient knowledge about the needs of the poor and that the role of participatory GIS is simply to inform "government," frontline workers have much information on the poor, and it is the higher-level officials who lack the knowledge. This knowledge differential highlights the need to deconstruct the state and consider the political economy issues that prevent information sharing between different levels of government. Second, due to differences in ideology between NGOs and government, these two actors collect data on the poor for very different reasons. These differences may act as major impediments to GIS co-production unless special processes are set up and intermediaries are brought in to help generate common motivations between the two groups. Third, the NGOs' participatory approach to gathering local knowledge, which is deeply rooted in the flexible nature of NGOs, contrasts sharply with the standardized data collection methods that government officials and policy-makers value. This contrast, coupled with the fact that policy-making processes are often structured in ways that prevent easy incorporation of local knowledge, presents a challenge for NGOs and governments who seek to work together to create more need-based planning and policy-making.

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1. INTRODUCTION

There is a growing movement to transform current, nineteen-century-based institutional forms of liberal democracy (representative democracy plus techno-bureaucratic administration) into a new form of direct political representation in an effort to reduce the gap that currently exists between the state and society. As polities become larger and more heterogeneous, there is an increased need for more direct participation of the citizenry in public processes. This is especially true in the mega cities of the developing world, where rapid urbanization, the lack of neighborhood-level data, and the presence of multiple, overlapping government agencies are making it increasingly difficult for the state to provide basic services that citizens recognize as meeting their needs. In recent years, participatory democracy advocates have been experimenting a many different methods to bridge the gap between the state and citizens, particularly those who are marginalized from the mainstream economy. One such method is the use of public participation information technology.

In this thesis I examine one particular type of public participation information technology that is being used by participatory development practitioners in developing countries to empower communities to more effectively influence public processes that affect their lives.[1] This technology represents an interesting union between low-tech participatory mapping methods used in the developing world and the high-tech, geo-spatial technologies developed in industrialized countries (GIS, GPS, remote sensing, etc.). This thesis critically examines the development of three such systems in New, Delhi India in order to extract lessons that will guide

[1] Empowerment in this case refers both to (1) the processes through which the poor might become empowered (the means to the end), and (2) the end itself (i.e., the actual ability to exercise power).

future projects in this area. These three cases illustrate the potential of participatory-based production and implementation processes in creating change at the community level and within government. However, they also bring to light the challenges associated with the development of such systems, which often make the benefits of these systems modest and short-lived. These challenges include not only technical and methodological issues related to the participatory methods themselves (and their effectiveness in capturing and representing local knowledge) and the use of GIS to represent local knowledge, but also issues related to the political economy of information gathering and policy-making.

In this chapter I, first, briefly describe some of the major factors that led to the emergence of participatory development, as well as the main characteristics of the approach. Next, I introduce the concept of GIS and describe the technological and philosophical developments that have, in recent years, led to the use of GIS in participatory planning processes. Thirdly, I describe some of the motivations behind the merger between participatory methods and GIS, as well as the reservations that participatory development practitioners and certain GIS specialists have about this particular application of GIS. I then end the chapter with a brief introduction to the projects under examination and a description of my research methodology.

1.1 Participatory Development and PLA

Participatory development, generally speaking, emerged as a direct response to the limitations of top-down development in the developing world. The shortcomings of expert-led and externally-imposed planning and policy-making in meeting the needs of the poor became increasingly apparent in the 1980s, which led development organizations and international donor agencies, and – more recently – local governments, to adopt participatory research and planning

methods. These participatory methods aim "to increase the involvement of socially and economically marginalized peoples in decision-making over their own lives" (Guijt 1998).

Proponents of participatory development claim that participation constitutes a "new paradigm" of development (Chambers 1997, quoted in Cleaver 2001). The discourse associated with this "new paradigm" consists of four major themes (see Henkel and Stirrat 2001): (1) a stress on 'bottom-up' rather than 'top-down' approaches; (2) a stress on empowering the marginal (such as women, the poor, ethnic minorities, or any other group of people who are considered to be marginal to mainstream society); (3) an emphasis on self-help strategies and the private sector (suggesting a general distrust of the state); and (4) a celebration of local or indigenous knowledge. These four themes or pillars of participatory development are regarded as intrinsically good, and therefore are rarely questioned – at least not explicitly.

This discourse has been accompanied by an intense focus on developing participatory methods and techniques, referred to today as Participatory Learning and Action (PLA) techniques, to promote bottom-up development, the empowerment of marginalized people, and the use of local knowledge over external technical knowledge.[2] The term PLA refers to the "family of approaches, methods and behaviors that enable people to express and analyze the

[2] One can trace the origin of PLA back to the emergence of Rapid Rural Appraisals (RRA) in rural development work during the 1980s. Robert Chambers (1983) and other critics of the traditional top-down approach to project design, particularly in rural areas, began to explore the use of RRA for purposes of conducting needs assessments with the participation of residents in order to design more need-based interventions in rural areas. Although these rapid appraisals helped development workers obtain a quick understanding of the needs of rural communities, concerns about the extractive nature of these information collection processes eventually led researchers to explore the potential for incorporating an *action* component into the participatory information collection activities. The idea was that rather than simply extracting information from the community, these processes had to empower communities to help themselves through their own action. These action-oriented participatory techniques became known as Participatory Rapid Appraisals (PRA). In the 1990s, these methods began to be adapted to urban settings, and became known as Participatory Learning and Action techniques (PLA). Today, the terms PRA and PLA are used interchangeably. In this thesis, I refer to these action-oriented techniques as PLA rather than PRA because of the urban setting of the project under study.

realities of their lives and conditions, to plan themselves what action to take, and to monitor and evaluate the results."[3] PLA is best characterized by the behavior and attitudes of those who facilitate it, and the methods used to articulate and share information, and to stimulate discussion and analysis. The behavior and attitudes of facilitators are based on a reversal of roles: local people are seen as the experts, while facilitators act as conveners. Many of the methods used are visually based, such as maps, flow diagrams, seasonal calendars, and priority matrices to enable illiterate people or those with low levels of education to participate.

Participatory practitioners claim that the learning and actions that occur during the PLA process have helped the most vulnerable people take control over their lives and improve the conditions in which they live. Although there is empirical evidence that suggests that this may be the case at the micro level, there are concerns about the limitations of PLA in helping community residents exert influence at levels beyond the household or the neighborhood, such as resource allocation or policy-making at the city or region level. Participatory development advocates consider these limitations to be the result of difficulties associated with scaling up participatory approaches and presenting local knowledge in a form that policy-makers consider to be "legitimate" (Abbot et al. 1998). In an effort to overcome these limitations and thus improve the effectiveness of participatory techniques beyond the micro level, practitioners and researchers have begun to explore the role of high-tech tools such as geographic information systems (GIS) in participatory development.

1.2 What is GIS?

GIS can be defined in a variety of ways, depending on the discipline or perspective. "Some focus on the map connection, some stress the database or the software tool kit, and others

[3] IDS policy briefing 13; Issue 7, August 1996.

emphasize the applications such as decision support" (Chrisman 1997, Maguire 1991). The following is an example of a general definition that was developed by a group of approximately 30 specialists:

> Geographic Information System – A system of hardware, software, data, people, organizations, and institutional arrangements for collecting, storing, analyzing, and disseminating information about areas of the earth (Duerker and Kjerne 1989: 7-8; quoted in Chrisman 1997).

The word *system* in this definition implies not only the computer software and hardware, but also the human organizations and activities that make data collection, analysis and dissemination for a particular purpose possible. For a GIS, an example of a purpose could be decisions related to the placement of new education facilities throughout a city.

GIS technology consists of four components: data inputting; data storage and retrieval; data manipulation and analysis; and data reporting. The data input component enables users to import data from a variety of sources, such as remote sensing, or printed or digital maps, into the GIS. The data storage and retrieval component organizes the data in ways that facilitate data retrieval, updating and editing. Data manipulation and analysis enables users to bring together selected themes or layers of data to conduct spatial analyses. This component can be used to aggregate and disaggregate data, perform modeling functions and estimate parameters. Lastly, the reporting component displays all or part of the database and analyses in tabular, graphic or map form, which can be printed for dissemination purposes (Demers 2003). This reporting function can be particularly

powerful since it helps visualize relationships between variables that would otherwise not be apparent.[4]

1.3 The Origins and Critiques of GIS

When GIS first emerged 40 years ago, it was a very expensive and complex technology, which was firmly grounded on scientific measurement models and ideas of "objectivity" and "replicability" (Craig et al.2002: xix). The main users of the technology at that time were involved in the physical and natural sciences. Various developments over the years, including the massive reductions in cost of hardware, more intuitive user interfaces, and the information technology (IT) revolution of the 1990s, have made the technology more accessible and easy to use (Craig *et al.* 2002, p. xx-xxi).

These advances have triggered a rapid diffusion of GIS across businesses, academia, and government agencies. GIS has expanded to include non-land related applications in the social, economic, transportation, and political realms, such as census information or political redistricting. This proliferation of GIS applications into realms beyond the natural and physical sciences has, for the most part, taken place "in a climate ranging from unquestioning acceptance to a celebration about its technological capabilities and positive social impacts" (Harris and Weiner 1998: 68).

[4] Perhaps the most classic example of the power of visual representation, particularly through maps, is Dr. John Snow's famous dot map of the location of cholera deaths and the water pumps in central London in 1854 (reprinted in Tufte's *Visualizing Explanations: Images and Quantities, Evidence and Narrative*). Snow's map enabled him to observe that the incidences of cholera deaths were concentrated around the Broadstreet water pump, which led him to hypothesize that there was a link between the pump and the disease. Based on this theory and his map, he convinced the authorities to remove the handle of the pump from the suspected well and the cholera epidemic ceased.

In the late 1980s and early 1990s, however, critics from within the discipline of geography such as Chrisman (1987), Taylor and Overton (1991), and Pickles (1991) began to reject the value-free notion of GIS and to engage in a social theory critique of the hegemonic power relations embedded in the GIS, and their detrimental effects on democracy (Harris and Weiner 1998: 69).[5] Critics argued that, despite the technological advances that have made GIS more user-friendly and less costly, the technology continues to be inaccessible to the laity and, thus, elitist (Craig et al. 2002: xxi). In today's knowledge-based economy, those with access to information, and thus knowledge, tend to have more power than those without it. Hence, critics regard complicated and costly information technology such as GIS to be undemocratic in nature.

These criticisms led to the emergence of a public participation GIS (PPGIS) movement, which aims to promote the development of alternative GIS applications that democratize the use of the technology and spatial information. The main drive of this movement is to involve all stakeholders in the decision-making processes that make use of GIS (Jordan 1998, Obermeyer 1998; Han and Peng 2003).

PPGIS researchers and practitioners have undertaken many different types of PPGIS projects in recent years. Some organizations, referred to as data intermediaries, have focused on using *conventional* GIS platforms to democratize government-generated data (i.e., collecting, disaggregating and disseminating demographic, administrative, environmental, or other local-area data to the public). Examples of these are Census Bureaus that make census data available

[5] These critiques of GIS marked the origins of what later became known as the "GIS and Society" debate, which focuses on the social implications of GIS production and use. This debate emerged as a result of a workshop that the National Center for Geographic Information and Analysis (NCGIA) sponsored on "Geographic Information and Society" in Friday Harbor, Washington State, in 1993. It was during this workshop that the GIS and Society research agenda was formally established (Craig et al. 2002). This research agenda, again sponsored by NCGIA, became known as "Initiative #19: GIS and Society – The Social Implications of How People, Space, and the Environment are Represented in GIS." See http://www.geo.wvu.edu/i19/ for more information.

to the public in a form that is useful for them. By contrast, skeptics about the empowerment capabilities of conventional, top-down GIS are attempting to develop *alternative*, bottom-up GIS technologies and applications that focus less on the dissemination of administrative data and more on the methods for capturing and representing local knowledge, or on integrating local knowledge with expert or administrative data. These alternative GIS may also include "multimedia GIS, the design of collaborative decision support systems, and the use of non-hierarchical systems of information flow" (Leitner *et al.*, 2002: 37).[6] Figure 1.1 below presents the aforementioned typology for conventional GIS and PPGIS.

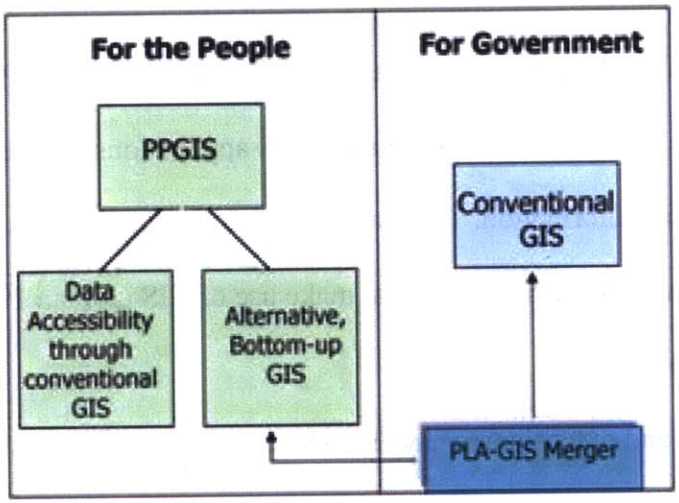

Figure 1.1: GIS Typology Diagram

The two types of PPGIS depicted in Figure 1.1 above are being undertaken in both the developed and developing worlds (referred to as the "North" and the "South," respectively). Thus, as Rambaldi and Weiner (2004) state, "the transfer of knowledge and competences about PPGIS are not necessarily North—South in direction. Learning, is, of course, reciprocal in nature."[7] The PPGIS projects from the developing world that have attracted the most attention

[6] See Al-Kodmany (1998), Macnab (1998), Weiner et al. (1995), and Talen (1999, 2000).
[7] This statement was made during the Track on International Perspectives at the 3rd International Conference on Public Participation GIS (2004).

from PPGIS researchers are those that merge participatory methods (such as PLA) with GIS.[8] Although many PLA-GIS mergers fall under the *alternative,* bottom-up PPGIS type, the projects that form the basis for this study are unique in the sense that they are hybrid between the bottom-up PPGIS and the conventional GIS (see Figure 1.1). This hybrid system thus is one that is created "by the people for government," rather than "by the people for the people," the typical slogan for PPGIS. The aim of this system is consistent with those articulated in the PPGIS literature, however, which is to help the citizenry, particularly the marginalized, to influence decisions that affect their lives.

1.4 Opportunities and Constraints of Merging PLA with GIS?

Perhaps, the most salient feature of a PLA-GIS merger is that the GIS is used as a tool to overcome the difficulties that PLA-based participatory approaches encounter in influencing policy at levels beyond the locality. Abbot et al. (1998) explain that

> An advantage of GIS information is that it can be presented to policy-makers in a form and at a scale which they find credible and usable. In contrast, they may have difficulty with the richness of local detail generated through [PLA]. The challenge is to combine the realities and detail expressed locally through [PLA] with the precision and scale of GIS.

But there are also concerns that GIS may unintentionally foster top-down planning models among the implementing agencies. Ghose, who has observed these types of PPGIS effects on community organizations in the United States, warns that the

> ...positivist assumptions of the rational planning model can be counterproductive to the goals of PPGIS since such a model encourages concepts of analytical and technical objectivity, value neutrality, subject-object dualism, expert knowledge,

[8] For example, in the 3rd International Conference on Public Participation GIS held in July 2004, leaders of the International Track state that "in the most poor regions with low levels of technology, PPGIS is a spontaneous merger of participatory development methods with geo-spatial technologies" (Rambaldi and Weiner 2004). Other types of PPGIS, such as the Census of India's Interactive Website (http://www.censusindiamaps.net/), are conspicuously absent.

> quantitative data. Such assumptions undermine the importance of bottom-up planning, local knowledge and qualitative data, which are important goals of PPGIS.[9]

Thus, the question is: What are the opportunities and constraints that a merger of low-tech PLA tools with GIS pose for rescaling political action beyond the locality? To what extent does GIS strengthen or limit participatory development?

To explore the opportunities and constraints of a PLA-GIS merger, it is necessary to identify the areas of commonality and complementarity between PLA and GIS. Abbot et al. (1998) state

> An area of commonality between a map generated through GIS and a [PLA] diagram is that they both provide visual information in a way that is intuitive to the people who have created them. The challenge of integrating them is whether common ground can be found, such that each group can first understand and secondly develop in a meaningful way the data generated by the other group."

If this can be achieved, GIS thus has the potential to complement PLA in three ways:

- Scaling up from the neighborhood level to the city-wide level
- Legitimization of community data
- Integration of local and expert knowledge

These areas of complementarity are important since scale, legitimacy and integration constraints may be important barriers for rescaling political action beyond the locality.

It is important to note, however, that the above characteristics, which are considered to be barriers to influencing city-level policy-making, are also considered to be strengths for promoting localized, pluralistic community development (which helps improve the lives of individuals and families within target neighborhoods). For example, while the collection of detailed household and community data with residents themselves help communities better

[9] Short paper, titled "Critical Perspectives on Public Participation GIS," is available online at the time of writing at http://www.giscience.org/GIScience2000/posters/108-Ghose.pdf.

understand their problems and develop self-help strategies for alleviating those problems, the lack of scale of these data and their form may make it difficult for policy makers to use the data. By contrast, the opportunities that GIS presents for influencing more macro-level policy, may also limit empowerment of communities at the local level. For example, while GIS "puts [poor] people on the map," which may make government more accountable or responsive to the needs of the poor, the very act of making data about the conditions of the poor public or more readily accessible may disempower the poor since the data could be used by outsiders in ways that could negatively impact the poor.

Table 2.2 below summarizes the strengths and limitations of PLA in terms of the three aforementioned areas (scale, legitimacy and integration), and the opportunities and constraints that GIS may pose for efforts to influence macro policy-making.

Table 1.1: PLA and GIS comparison of strengths and weaknesses

	PLA – localized, pluralistic (micro)		GIS – better integrated (macro)	
	Strength	Limitation	Opportunity	Constraint
Scale	PLA helps capture local knowledge at the household, block, and neighborhood level. This *scale* is very useful for understanding problems and guiding action at a micro-level.	The information collected is at a *scale* that is less useful for planning or policy-making beyond the neighborhood level.	GIS helps scale up PLA data through its capacity to store, aggregate, and analyze large amounts of data.	Certain types of local knowledge may be in a format that cannot be integrated into the GIS (i.e., qualitative versus quantitative data).
Legitimization	Local knowledge is collected and represented in a *form* that community members can understand (e.g., residents' own mental maps of their community).	The *form* of local knowledge representation that is easy for residents to grasp may not be a form that outsiders understand or value.	Legitimizes local knowledge by putting it in a form and scale that is useful for policy makers.	May legitimize bad data.
Integration with other types of knowledge	A lot of emphasis is placed on helping residents convert their tacit knowledge into explicit knowledge – but minimal emphasis on combining this knowledge with outsider knowledge.	Integration with outsider expert knowledge is limited because the focus in more on the community than outsiders.	Potential for integrating local and expert knowledge.	May place greater value on expert knowledge and quantitative knowledge than local knowledge because of difficulties in integration (much easier to integrate the expert knowledge than the local).

The above framework is helpful for analyzing the potential of PLA-GIS mergers; however, it is not enough since it is necessary to also examine issues related to the political economy of information gathering and policy-making. This is an area on which the PPGIS and participatory development literature covers little ground. While some attention has been placed on to the role of community-level power differentials and heterogeneity in local knowledge gathering processes, there is little discussion in the PPGIS and participatory development literature about the role of differences in motivations between the participatory development practitioners who are attempting to build the systems and the policy-makers/government officials who are the intended users of the system. One of my aims in writing this thesis thus is to bring to

light some of the larger political economy issues that also need to be considered when undertaking these types of projects.

1.5 Case Studies

To explore the opportunities and constraints of merging PLA with GIS for purposes of promoting policies that are more responsive to the needs of the poor, as expressed by the poor themselves, I examine three projects that were undertaken in consecutive order over a seven-year period under the leadership of Dr. Renu Khosla, a poverty alleviation expert and participatory development advocate in New Delhi, India.

Although the projects were undertaken separately and in different time periods, they can also be regarded as one extended attempt by Dr. Khosla (and the many people who worked with her) to develop a GIS that would consist of resident-generated data that policy-makers and government officials could use to improve services in a more need-based manner. Much can be learned from this experience, and this thesis uncovers some of these lessons. What conditions led Dr. Khosla to incorporate GIS into her PLA-based work? Once GIS was incorporated, how was it used and what were its impacts? Did the GIS impact the ways in which PLA techniques were used to collect data from residents? Did the GIS transform local knowledge into a scale and form that policy makers found useful for guiding decisions? In other words, were policy makers able to incorporate the perceptions and preferences expressed by low-income people into their decisions? If not, what are some of the factors that explain why policy-makers did not use the local knowledge to inform their decisions.

The first project, which took place between 1998 and 2001, applied PLA and community mobilization techniques for improving enrollment and retention levels in primary schools in 300 settlements in Delhi. It was during this project that Dr. Khosla discovered GIS and the role that it

could play in her efforts to make primary education accessible to all poor urban children. Between 2002 and 2004, Dr. Khosla expanded her focus beyond education. She and her team became involved in a project that sought to work with poor communities on any basic service or issue that the residents considered to be their priority, such as sanitation, water and employment. Again, Dr. Khosla tried to continue to integrate all of the data that her team of facilitators was collecting from residents into a GIS that she hoped government could use for planning service delivery to the poor. But the broad focus of the program made it difficult for Dr. Khosla to tailor the GIS to meet the needs of government. Thus, she decided to focus on only one service sector for purposes of establishing a partnership with a single government agency. She chose the water and sewerage services and, by July 2004, had secured a partnership with the Delhi Water Board. Between August 2004 and March 2005, Dr. Khosla worked with the Delhi Water Board to develop a community-based GIS that would promote more need-based water service delivery to the poor.

1.6 Methodology

This study is based on my direct involvement in two of the abovementioned projects, as well as numerous interviews and my review of project documents. My first fieldwork visit to Delhi took place between January and May 2003. During this time, I worked with Dr. Khosla on the production of the community-based GIS that focused on all basic services. My second fieldwork visit took place between June and August 2004, during which time I worked with Dr. Khosla on the production of the community-based GIS for water service delivery sector. As a result, one of my primary research methods was participant observation, which enabled me to learn first-hand about the values, dynamics, internal relationships, structures, and conflicts within

the data collection teams (by this I mean facilitators, as well as office staff, the Director and contractors), one community, one government agency and one donor agency.

My findings also draw from a review of literature of participatory development, PLA, public participation GIS, physical infrastructure provision, social movements, organizational change, policy reform implementation, and knowledge management.

I chose to study Dr. Khosla's PPGIS development efforts in Delhi because the projects aim to promote participation in the planning of different types of basic services in an urban environment. To date, most of the PPGIS projects from the developing world that have been documented in the PPGIS literature relate to rural areas or environmental management issues (for example: Jordan 2002; Kyem 2002). Dr. Khosla's work provides an opportunity to learn more about the production and use of participatory GIS in urban settings (which was an area of research suggested by Abbot et al. 1998). Furthermore, because Dr. Khosla's work spans across different types of service sectors, this study sheds light on the degree to which participatory GIS can be used for promoting participation for different types of services. Finally, the three projects under study, particularly the third one, are unique because they constitute an example of a bottom-up GIS that is developed for use by government -- not residents.

Following a brief overview of the context in Delhi in Chapter 2, I present each of the projects in Chapters 3, 4 and 5, starting with the initial PLA-GIS merger and ending with the partnership with the water company. Chapter 6 synthesizes the combined experiences of the three projects. I then end with Chapter 7 where I present three key areas that present major challenges in participatory GIS projects that aim to promote the use of local knowledge by government officials and policy-makers.

CHAPTER 2.- Delhi Context

2.1. Introduction

For the purpose of providing the reader about the context in which the three projects under study are situated, this chapter provides an overview of the Delhi's demographic trends, geographic delineations, and government structure, as it relates to the provision of urban basic services.

2.2. Population Trends

Rural-urban migration in India during the past few decades has led to massive growth of urban settlements throughout the country. No city exemplifies this rapid growth better than Delhi. At present Delhi is growing at a rate of 4.3 percent per year, which amounts to nearly half a million people. Roughly 300,000 of this annual population increase is due to natural growth, primarily in low-income areas, and 200,000 constitutes in-migration (Chakrabarti 2002). With merely 1.7 million people in 1951, the city's population is now estimated to have surpassed 14 million, and is expected to reach

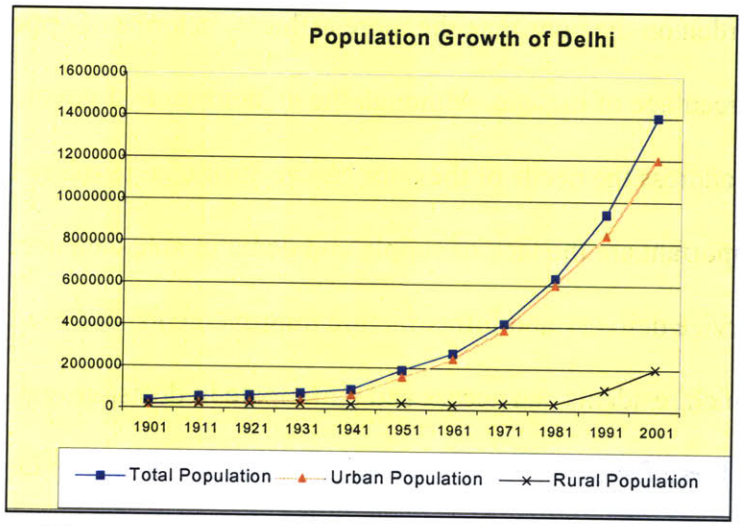

Figure 2.1: Delhi Population Growth Rate
Source: Delhi Development Authority

22 million by the year 2021 (see Figure 2.1).[10] Currently roughly 4 million people or one third of the city's population live in slums or slum-like conditions.[11]

This situation of rapid population growth, which is exacerbated by the proliferation of low-income communities, is placing a great strain on urban infrastructure and service delivery, particularly water and sanitation. The people who have been the most negatively affected are the poor. Services to low-income settlements tend to be of lower quality than those provided to more affluent neighborhoods due to a variety of reasons such as technical constraints posed by the neighborhoods' physical layout, or legal restrictions. Also, the coping costs associated with deficient services impose a larger burden on the poor than the more affluent, in terms of opportunity costs of time and percentage of income. Although the difficulties that governments encounter when trying to address the needs of the poor can be attributed to many factors, two of the most important are the lack of supply and demand-side data needed to inform planning of service delivery and infrastructure improvements, and the limited mechanisms through which residents can access and participate in decision-making on an ongoing basis. Both of these factors propagate top-down decision-making in Delhi despite the trend in the international development field, particularly in the water and sanitation sector, to move away from supply-side planning towards a more demand-driven and inclusive planning model.

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[10] Delhi Development Authority, *Master Plan for Delhi – 2021,* 2001.

[11] Chakrabarti.(2002) explain that Delhi's staggering growth rate has been outdone only by the growth of its informal sector as a proportion of the city's total population. Statistics published by the Society for Development Studies show that the growth rate of the squatter population in Delhi (natural growth of existing squatter population plus new in-migration) was four and a half times larger than the non-squatter population.

2.3. Georgraphic Delineations and Urban Basic Services

The National Capital Territory (NCT) of Delhi covers an area of 1486 Km^2 out of which 525 Km^2 is urban . Three local governmental agencies administer the NCT: the Municipal Corporation of Delhi (MCD); the New Delhi Municipal Corporation (NDMC); the Delhi Cantonment Board (DCB). The MCD covers about 94% of the total area while the NDMC and the DCB about 3% each.

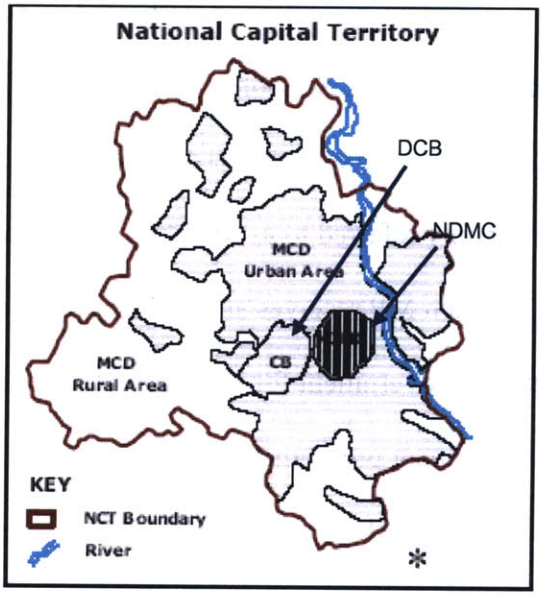

Figure 2.2: MCD, DCB and NDMC Geographic Areas

The major actors involved in the provision of urban basic services in NCT consist of both elected representatives at the federal, state and local level (as they all have annual budgets for welfare and service improvement programs), as well as key government agencies primarily at the local and state levels. Residents of Delhi may obtain service improvements in their neighborhoods either by submitting requests directly to government agencies, or by approaching their various elected representatives. Elected representatives can respond to citizen requests by funding upgrading programs directly from their annual budgets or by exerting influence over government agencies. If changes in policies or regulations are needed, elected representatives engage policy makers at the local, state and central government levels.

2.4. Elected Representatives

Federally, Delhi is represented by seven members in the Lok Sabha and three in the Rajya Sabha.[12] The seven members in the Lok Sabha are commonly referred to as Members of Parliament or MPs. Each MP receives an annual budget from the national government for welfare and service improvement programs to be implemented in his/her district/zone (there are 7 MP zones).

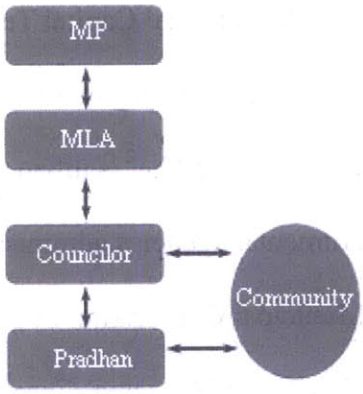

Figure 2.3: Political Structure in Theory
Source: Smith & Phillips (2003)

Due to its special status as the capital of India, the NCT is also one of India's 29 states with nine political districts. The state government Legislative Assembly consists of 70 elected members (referred to as Members of Legislative Assembly or MLAs) and a seven-member Council of Ministers, headed by a Chief Minister.[13] The Chief Minister, currently Mrs. Sheila Dikshit, has executive power over all matters in Delhi except land and law and order.[14]

MLAs are elected every five years by the people in their respective zones. There are 70 MLA constituency areas in Delhi, one for each MLA. The MLAs receive an annual budget from the state government for the provision of basic services and facilities in their constituency areas. Constituency areas tend to consist of 2 to 3 wards. Each ward,

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[12] In India there are two chambers of Parliament. The lower house is referred to as Lok Sabha (House of People) and the upper house is known as the Rajya Sabha (Council of States). The Lok Sabha consists of 545 members and elections are held every five years, unless the government calls an election earlier.
[13] Each member of the Council of Ministers overseas a specific Ministry, which consists of one or more departments. Each department is decentralized to the district level, rather than the MLA or ward levels.
[14] Unlike other states, land and law and order are under the control of the national government in Delhi. In addition, while other states have governors who are appointed by the president, Delhi has a lieutenant governor whose duties are mostly ceremonial.

in turn, has a Councilor (a local government elected representative) who, like the MPs and the MLAs, also have annual budgets from which to draw funds for basic service improvements.

At the neighborhood levels, community-level leaders, referred to as *Pradhans,* play an important role in maintaining a communication flow between residents and their various elected representatives (see Figure 2.2). If Pradhan's are ineffective at engaging the attention of elected representatives (due to political party differences or personality conflicts), however, the clean political structure depicted in Figure 2.2 can become quite convoluted. It is common for residents to find other means to obtain service improvements, either by relying on former (rather than current) Pradhans, or by establishing direct contact with elected representatives or service providers.

To prevent duplication of efforts and inefficient use of resources, substantial coordination and communication is needed between the ward Councilors, MLAs and MPs. However, if these various representatives belong to opposing political parties, cooperation is often minimal.

2.5. Government Agencies

In Delhi, MCD is the major provider of urban service provision in Delhi, given that the geographic area under its purview constitutes 94 percent of the total area of the NCT. The MCD is organized into many departments, each of which is charged with the delivery and maintenance of a certain type of basic service or infrastructure such as waste, sanitation, roads, education, healthcare, etc. All departments are decentralized to the ward level (i.e., there is a local official to each ward for each department). MCD is

responsible for the provision of all basic services except water, electricity, and to some degree, education.

Due to Delhi's rapid growth, the responsibilities associated with the provision of water and electricity have been transferred to separate independent bodies: the Delhi *Jal* (Water) Board (DJB) and the Delhi Electricity Board. Both institutions are decentralized to the ward level. The Delhi Electricity Board was partially privatized in June 2002. With regards to education, the responsibility of primary schooling is shared both by the MCD and the state government, while high school education is under the purview of the state government.

CHAPTER 3 - CBIS for Education: An Accidental Discovery

3.1 Introduction

The concept of a community-based information system (CBIS) as a tool for improving educational and other services in Delhi was accidentally discovered by the National Institute of Urban Affairs (NIUA), an urban public policy research and training institute,[15] during its involvement in a UNICEF-funded primary education enhancement project.[16] I describe the discovery of the CBIS as "accidental" because the director of the educational project did not originally plan to incorporate technology into the project. Yet, having to gather, store, and analyze large amounts of neighborhood-level data led NIUA to develop a community-based, geographic information system. It was only after the information system was built and used for internal project monitoring purposes that its potential power for fostering a more participatory planning process for necessary services was discovered. This chapter tells the story of this first CBIS project, its impact and its lessons.

3.2 Background

In 1998, the NIUA began its work on UNICEF's project to enhance primary education in Delhi. The objective of the Primary Education Enhancement Program, funded by UNICEF, was to "achieve universal enrollment and retention in the formal

[15] NIUA, established in 1976 as an autonomous body under the societies Registration Act, is a research and training institute that specializes in urban development and management issues. The institute is financially supported by the Ministry of Urban Affairs and Employment, Government of India, State Governments, urban and regional development authorities and other agencies concerned with urban issues (see www.niua.org for more information).

[16] Project funds that UNICEF channeled to NIUA were provided by AUSAid.

education system through quality teaching and improved school infrastructure."[17] At the time the project was started, there were approximately 1,200 squatter settlements with an estimated total population of between 3 to 5 million people throughout the city. Of this total population, approximately 1 million were school age children, and it is estimated that approximately one-third of these children were not enrolled in school.[18] To increase enrollment in schools and to keep these children in schools, UNICEF contracted NIUA to initiate community-building processes and government capacity building in all slum settlements, starting small and scaling up gradually. NIUA ended up working in approximately 300 of the 1,200 squatter settlements in Delhi between 1998 and 2001. Although NIUA was supposed to work with both communities and public education providers in Delhi, NIUA focused mostly on community mobilization rather than government capacity building due to negative working relationships with the government agencies involved in the project.[19] At first, NIUA worked in 120 settlements in two districts in East Delhi in which the majority of NIUA's target settlements were originally located. Later, however, non-governmental organizations (NGOs) became involved in the project, which enabled the program to expand to an additional 180 settlements located throughout the city.

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[17] NIUA, "Urban Poor Communities Manage Education for Children: Primary Education Enhancement Programme," Delhi, 2002.
[18] *Ibid.*
[19] These problematic relationships between the NIUA and partner public education agencies are described in greater detail in the "Results" section of this chapter. It is important to note, however, that these descriptions are based only on interviews with the NIUA project director and NIUA project documents and, thus, do not adequately portray the points of view of the public education agencies, UNICEF or other actors such as the partner NGOs.

3.3 Project Goals

In order to achieve universal enrollment and retention in the formal education system, NIUA proposed to "organize communities into neighborhood committees and enhance their participation in the delivery and management of education, and build an interface between the community and education administrators."[20] Major project goals included:

Empower people and build self-reliance in the communities by motivating them to seek and implement solutions to their own problems;[21]

- Work with private sector to improve the education facilities and programs (such as the addition of computer aided learning);[22]
- Create a community database of indicators related to child education level, school enrollment status, and people's perceptions of quality of education processes. NIUA began to promote the new technology as "a valuable/dynamic tool for better management of education systems." [23]

This last goal was key because NIUA believed that many underserved settlements suffer from inadequate services either because governments do not know that the settlements exist or they do not have adequate information with which to plan service delivery (in addition to the service restrictions that governments may place on certain types of settlements based on land tenure or other criteria). Data, including location, boundaries and demographic information, are thus needed to make the presence of the poor known and promote more informed decision-making. Khosla and Marwaha state that data collection is a way to

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[20] NIUA, "Urban Poor Communities Manage Education for Children: Primary Education Enhancement Programme," Delhi, 2002.
[21] *Ibid.*
[22] *Ibid.*
[23] This goal was not part of the original project goals because the CBIS had not yet been discovered yet. However, once NIUA discovered the potential power of GIS, NIUA adopted this as a goal.

> ...acknowledge the presence of the poor and the informal nature of their existence (irrespective of their right to the land they occupy) and to understand the many-sided dimensions to their poverty and their inter-connectivity. City maps that locate all poor settlements are basic to this process of affirmation. Mapping locations of settlements on city land use maps not only records their presence but also helps to examine their access to city services.[24]

According to NIUA, the CBIS would:

- Improve governance of education intervention and make it more efficient and client centered;
- Improve targeting of urban poor/disadvantaged children for education;
- Improve the flow of information between community, policy planners and education administrators by creating a feedback loop and making planning processes poor-friendly and transparent; and
- Create an understanding of issues of access and availability using spatial information on urban poor communities and services.[25]

3.4 Actors and Their Roles

The major actors of the education enhancement program in order of importance for purposes of this study were: UNICEF; state and local government (including the schools and teachers); NIUA; a coalition of approximately 15 NGOs; community-based organizations; and national government.[26] The sections below provide a brief overview of these actors' roles based on my discussions with Dr. Khosla from NIUA.[27] A diagram of

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[24] Khosla R. and Marwaha, R. "Social Mapping: A Tool to Build Cities." Cities without Slums. Building Materials News, BMTPC, October 2001, New Delhi.

[25] NIUA, "Geographical Information System: A Tool for Improving Governance of Education Programmes" 2002. http://www.niua.org/newniuaorg/peep_gis.htm. The above statements describe NIUA's long-term vision for the technology. This vision, particularly the goal related to improving communication between the community, policy makers and education administrators, is in line with the aspirations of the public participation GIS movement described in the Background section of Chapter 2.

[26] The 15 NGOs were Action India, Amar Jyoti, Ankur, ASHA, Dr. A V Baliga Memorial, CAST Delhi, Deepalaya, Delhi Brotherhood – DBS, FORCES, IND CARE, Mobile Creches, Navjyoti, Nav Srishti, Prayatna and Samarth.

[27] Note that this section provides the roles of actors as perceived by NIUA because I was not able to interview the other actors involved or access non-NIUA project documents during my field research in Delhi.

these actors and their interrelationships is provided in Figure 3.2. Table 3.1 provides a summary of their roles.

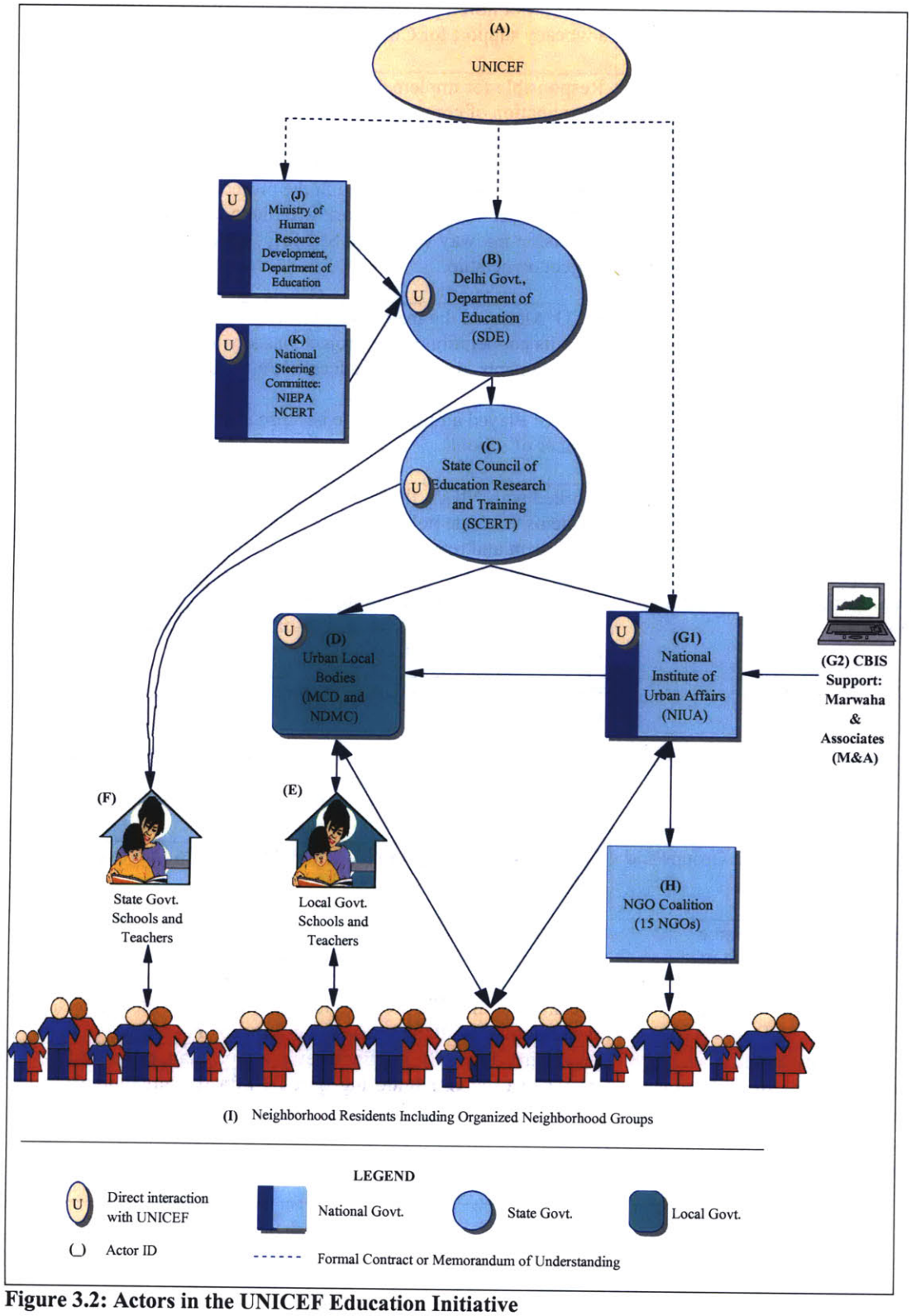

Figure 3.2: Actors in the UNICEF Education Initiative

Table 3.1: Major Actors in CBIS for Education Project[1]

Major Actors	Roles
(A) UNICEF	Donor; Monitored project interventions; Provided resource and advocacy support for CBIS.
(B) State Department of Education (SDE)	Responsible for implementing policy needed to enhance the participation of communities' in education. Managed a handful of primary schools in the city.
(C) Delhi State Government State Council for Education Research and Training (SCERT)	Responsible for coordinating the activities of the various government agencies involved in the project. Its role was also to build teachers' capacity to work with the poor. Change of leadership midway weakened SCERT's vision and sense of project ownership.
(D) Local government: • Municipal Corporation of Delhi (MCD) • New Delhi Municipal Corporation (NDMC)	MCD: Managed the majority of primary schools in the city. Thus its cooperation in the project was key to achieving improvements in quality of education/infrastructure in schools. NDMC: Played a minimal role because it managed a very small number of schools.
(E) Local government schools and teachers **(F)** State government schools and teachers	Worked with NIUA, the NGOs and neighborhood groups and residents to create policies and programs that foster school enrollment and retention
(G1) National Institute of Urban Affairs (NIUA)	Mobilized communities to improve enrollment levels in East Delhi and coordinated community-organizing efforts of NGO coalition; Created CBIS.
(G2) Marwaha & Associates	Provided support to NIUA in the data digitization process for CBIS production.
(H) Coalition of NGOs (Indradhanush)	Trained by NIUA to mobilize communities throughout Delhi for increasing school enrollment. Contributed to the building of CBIS database by collecting data for approximately 180 settlements.
(I) Organized Neighborhood Groups and Residents	Formed with the help of NIUA and the NGOs to improve school enrollment levels in their neighborhoods.
(J) Ministry of Human Resource Development, Department of Education	Department of Education: Played a limited role. Recognized education as a right and designed India's Universal Elementary Education program (Sarva Shiksha Abhiyan), which later became the umbrella program for many different pilot projects, including the UNICEF education enhancement program.
(K) Steering Committee: • National Council for Education Research and Training (NCERT) • National Institute of Educational Planning and Administration (NIEPA)	Gave direction to the program; reviewed program progress; designed a school monitoring system (infrastructure, output (in terms of student enrollment, number of classrooms, etc.)

3.4.1 UNICEF

UNICEF received funding from AUSAid to implement a the primary school education enhancement program in Delhi (see A in Figure 3.2 above). UNICEF's major role as the donor agency in the project was to monitor the work of the government agencies, schools, NIUA and NGOs to ensure that school enrollment and retention levels were being improved.

3.4.2 State Government (Including Schools and Teachers)

As shown on Figure 3.2, two state government agencies were part of this education enhancement project: Delhi State Government's Department of Education (SDE) and State Council for Education Research and Training (SCERT) (see B and C, respectively). UNICEF had established a memorandum of understanding with the SDE, whose primary responsibility in Delhi is policy formulation, implementation and monitoring of education. The SDE selected SCERT, a state government agency that specializes in education research and teacher training, to be the main coordinating agency of the program. In addition to project management, SCERT's role was to improve the quality of classroom processes by strengthening the capacity of teachers to better meet the needs of poor children.

As the lead agency, SCERT held formal meetings with UNICEF, NIUA, MCD, NDMC (occasionally) and the Director of the Department of Education to coordinate the work and discuss progress made. Although these formal meetings took place semi-annually, more informal meetings with NIUA and the NGOs were called as the need arose. These informal meetings were held on a monthly basis on average.

Both SDE and SCERT could exert control over the administration and policies of the few schools that were under the purview of the state government (F in Figure 3.2). Some control could be exerted over local government schools, but to a much less degree.

3.4.3 Local Government (Including Schools and Teachers)

The Municipal Corporation of Delhi (MCD) and the New Delhi Municipal Corporation (NDMC) were the two agencies that were in charge of local government schools (see D and E in Figure 3.2).[28], the MCD's role in the project was vital because it administered the majority of primary schools targeted under UNICEF's education initiative.[29] The role of the NDMC, on the other hand, was limited because it manages a very small percentage of the schools in Delhi. Both the MCD and NDMC were supposed to work closely with SCERT to better understand the needs of the poor and establish more transparent policies in order to facilitate school enrollment.

3.4.4 NIUA

NIUA's main roles in the program related to community organizing and development, coordination of the NGO coalition, sensitization of government on community concerns, and the development of a community-based database containing all the information it was collecting from the communities (see G1 in Figure 3.2).[30] As the community organizer, NIUA engaged in a variety of activities to help improve

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[28] Both the MCD and NDMC were the local government actor. However, the NDMC's role was minimal (particularly if compared to the MCD) because it manages a very small percentage of the schools in Delhi.
[29] In Delhi, primary education is under the purview of local government, while secondary education is under the responsibility of the Delhi State Government.
[30] Dr. Khosla's team at NIUA consisted of 1 project associate, 1 field supervisor and a variety of field facilitator contractors to engage in the community organizing project. There were two project associates who joined at separate times during the 5 year duration of the program, whose urban planning background and commitment to communities were instrumental to their efforts in project management and the eventual discovery of GIS' role in the project.

enrollment levels and access to education.[31] First, NIUA organized communities into groups at the block or lane levels as well as the neighborhood wide level (see Section 3.5.4 below for more information). These groups became major actors in NIUA's efforts (see I in Figure 3.2). For example, while the MCD organizes enrollment campaigns once a year by sending teachers into the neighborhoods to urge parents to enroll their children in school, NIUA organized regular enrollment campaigns through the neighborhood groups. Rather than have teachers or authority figures visit parents, fellow-residents would visit each other to spread the word about the importance of enrolling children in school. Neighborhood groups would prepare detailed lists of all of the children in their neighborhoods and their enrollment status in order to know who they needed to target. NIUA also worked closely with parent-teacher associations (PTAs) to help them develop clearer mandates and strategies. Lastly, NIUA helped establish over 100 *Sahayak Shiksha Kendras* (SSK) community centers to support the after-school learning needs of children within each settlement. These centers are particularly important for children who are first-generation learners because their parents lack the skills necessary to assist their children with homework assignments. They also discussed arrangements to address constraints to school participation such as traveling to school and the need for birth certificates for enrollment.

[31] Interestingly, however, involvement in grassroots community development is rare for NIUA, a national level institution that is known for its urban policy research (often econometric-based) and local government training workshops. Why then did NIUA get involved in grassroots organizing? It was the conviction and mounting frustration of one researcher at the NIUA. This researcher, Dr. Renu Khosla, had considerable experience in policy evaluation studies which depicted a large gap between poverty alleviation policies and the needs of the poor. In an effort to explore ways to reduce this gap, Dr. Khosla decided to engage directly with communities as an NGO would, rather than observe from afar as research urban policy and government training institutes usually do.

When the program was scaled up from approximately 120 settlements to 300, NIUA assumed the responsibility of training and coordinating the approximately 15 NGOs that were brought in to help implement the scale-up process. NIUA trained NGOs in the use of its community organizing techniques as well as various data collection techniques to better understand the problems that led to low enrollment levels. The data collection techniques were Planning, Learning and Action (PLA) tools, a set of participatory processes such as community visioning, mapping and other exercises which are discussed in great detail in section 3.5.2. [32] The purpose of using these techniques was to enable people to express and analyze the realities of their lives and conditions, to identify the types of actions that they could take, and to monitor and evaluate the results.

NIUA was also supposed to work with government at both the local and state levels to improve government's capacity to deliver education services in low-income neighborhoods. Dr. Khosla defined capacity building in this project as "sensitizing government agencies to better understand the needs of poor children."[33] NIUA facilitators played a key role in this regard by uncovering inconsistencies between policy and practice within the MCD and educating community members about the gaps. For example, prior to the project's implementation, MCD officials were turning many

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[32] Both Dr. Khosla and the lead facilitators were trained by a protégé of Robert Chambers on the use of these PLA tools. PLA techniques are a form of Participatory Rural Appraisal (PRA) methods that have been adapted to the urban context. One of the most prominent features of PLA is its emphasis on "action," rather than just information collection. Development practitioners began to use rapid rural appraisal in the 1970s and 1980s in an attempt to make development work in rural areas more responsive to the needs of local communities. Although these appraisals were originally applied in rural areas as needs assessments for the benefit of project implementation teams, these data collection and analysis techniques have evolved to include a strong community capacity building component. They also have successfully expanded to a variety of settings and purposes. Robert Chambers from the Institute for Development Studies at Sussex University is regarded as one of the first proponents of RRA and PRA (http://www.ids.ac.uk/ids/bookshop/briefs/brief7.html).

[33] NIUA, "Urban Poor Communities Manage Education for Children: Primary Education Enhancement Programme," Delhi, 2002.

children away from school because the children did not have birth certificates. NIUA, upon closer inspection of MCD policies, found that parents are allowed six months to submit a birth certificate to certify the age of the children who have been registered. Informing community members about this policy enabled many neighborhood groups to enroll children that otherwise would have been turned away.

Finally, NIUA became intimately involved with the development of the CBIS for Education, a community-based GIS that consisted of data generated by residents themselves. As explained above, the CBIS was an accidental discovery that resulted from NIUA's work with the NGOs. The data that NIUA facilitators and NGOs collected were digitized by Marwaha & Associates (M&A), an outside agency with whom NIUA contracted (see G2 in Figure 3.2). Despite the involvement of M&A, NIUA staff faced a steep learning curve in terms of GIS and its analytical capabilities. NIUA staff eventually learned to use the fledgling CBIS not only for initial monitoring of NGO activities, but also as part of attempts to influence government planning of education services. For example, through the CBIS, NIUA was able to prepare a list for the MCD and the SDE of proposed sites for new schools, particularly in newly created resettlement areas. Community groups, with the help of NIUA facilitators, also submitted applications for new schools to the SDE, which provided the number of children willing to enroll in each specific area for which an application was being filed. The result of some of these applications was the installation of provisional, tented schools that would meet the demand until permanent facilities could be built.

3.4.5 NGO Coalition

Initially, NIUA attempted to establish partnerships with approximately 40 NGOs throughout the city. However, in the end, only 15 NGOs actually contributed to the project due to coordination difficulties. These 15 NGOs formed part of a coalition, referred to as Indradhanush (see H in Figure 3.2). NIUA contracted with these 15 NGOs to scale up its community mobilization and data collection efforts from approximately 120 to 300 settlements. The NGOs were trained by NIUA in the use of PLA tools for data collection and community mobilization. They worked closely with communities (I in Figure 3.2 above) to increase enrollment levels, much like NIUA did.

3.4.6 National Government

At the national level, UNICEF established a Memorandum of Understanding (MOU) with the Department of Education under the Ministry of Urban Development, Government of India (see J in Figure 3.2). This memorandum was adopted to obtain support for innovative urban projects, of which the CBIS project was one. Although the Government of India's involvement was minimal, it did impact the project through its recognition of education as a right for all children, even those born in squatter settlements, and its design of India's Universal Elementary Education program (Sarva Shiksha Abhiyan (SSA)) which later became the umbrella program for many different pilot projects, including the UNICEF education initiative.[34]

In addition, there was a National Steering Committee that consisted of representatives from two government agencies: the National Council for Education

[34] According to NIUA, the Government of India never became convinced of the utility of a CBIS for education management. This position of the Government of India is described in Section 3.6.2 below.

Research and Training (NCERT)[35] and the National Institute of Educational Planning and Administration (NIEPA).[36] The purpose of this steering committee was to provide direction to the program and review program progress (see K is Figure 3.2).

3.5 NIUA Interventions in Settlements and CBIS Production

It is important to note that because the CBIS was accidentally discovered more than mid-way through the project, the community building and information collection strategies outlined below are strategies that need not be part of a CBIS production process. In fact, these types of information collection activities are quite common in India and other developing countries. What is uncommon is the addition of GIS technology to the information collection process. While GIS technology may be superfluous in small scale, localized projects, its data storage and analysis capabilities can be quite useful for projects of larger scale.

[35] NCERT was set up by the Government of India, to provide academic and technical support to the Central and State Governments for improving school education in India.

[36] NIEPA is a national research and training institute in education policy, planning and management. It is an autonomous organization registered under the Societies Registration Act of 1860, which is fully funded and sponsored by the Government of India. http://www.niepa.org/#

3.5.1 Rapport Building with the Community

Prior to beginning organizing efforts, NIUA facilitators would build their credibility in a neighborhood and raise awareness around the issue of education. To build rapport, NIUA facilitators would organize rallies and slogan shouting, campaigns, wall writing, and street plays (see Figure 3.3). According to NIUA, "besides creating awareness regarding the importance of education, such campaigns help to win community trust and confidence."[37] These campaigns would increase trust between residents and facilitators because they provided a venue through which residents could get to know facilitators and understand that the facilitators were there to help.

Figure 3.3: Example of Wall Writing
Source: NIUA

3.5.2 Information Collection

Once sufficient rapport with the community was established, facilitators would move on to hosting workshops with the community to help people understand their problems with regard to schools. This effort was driven by the idea that providing access to schools is not enough:

> Merely providing schools could not solve problems of low enrollment and participation of poor children in schools. It needed an understanding of the many reasons behind their not going to school and addressing these issues in a comprehensive manner.[38]

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[37] "Latest on PEEP" on NIUA website as of the time of writing http://www.niua.org/newniuaorg/projectindex.htm

The reasons for low enrollment levels alluded to above tend to arise from the various challenges that lower-income households face on a daily basis such as parents' need for children to help supplement household income, provide support in self-employment activities or assist in accessing basic services. For example, parents often rely on children to supplement household income through jobs or panhandling activities. Other times, mothers need children to stay at home to help watch younger siblings while they are at work, or to help fetch water, an activity that can be quite time consuming in certain settlements where supply is limited or nonexistent. Parents who are self-employed often keep their children out of school so that they can help with their business activities.

Sometimes, children are kept out of school due to social conflicts caused by caste, state of origin or other ethnic or cultural differences. For example, in one of the resettlement areas where I worked in the northern fringes of Delhi close to the Haryana border, a Bihari woman told me that she did not send her daughter to the nearby school because most of the children in that school were from the state of Haryana. She said that people from Haryana speak very harshly compared to people from her home state and that she did not want her daughter to acquire their accent or customs. "What will my family from Bihar say when they see her?" she exclaimed with a tense tone in her voice. Other times, children are not enrolled in school because parents do not value education enough to keep them in school beyond a certain age.

Consequently, in an effort to understand the intricacies behind the reasons for low enrollment and help mobilize residents to overcome the constraints, facilitators from NIUA and partner NGOs used PLA techniques during their workshops with communities

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[38] NIUA, "Urban Poor Communities Manage Education of Children: Primary Education Enhancement

to gather neighborhood data from the community, including information regarding the community's needs and goals.[39] The data were gathered through a variety of PLA techniques such as visioning/prioritization, mapping and focus group discussions. Examples of these are below.

Data Selection Process and Type of Data

The question that naturally follows is who decided what type of information to collect? PLA techniques have to be adapted to the context in which they are being employed. In this case part of the context is the fact that the project focused on education. Hence, NIUA adapted PLA techniques to education and chose indicators associated with the issue of education. Dr. Khosla generally undertook this task in consultation with field supervisors and UNICEF (see Table 3.2).[40]

Facilitators, who were trained by NIUA over a period of one to two months, collected three major categories of information: Data on Children at the Household Level; General Household Level Data; and Settlement Level Data. The Children at the Household Level data category included the number of children per household, their level of education, school enrollment status, age, gender, and occupation (in the case of working children). The General Household Level Data category consisted of information about other aspects of the household that could be used to better understand the reasons for the documented school enrollment status and performance of the children in the

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Programme in Delhi." 2002.

[39] Note that no data was collected through formal surveys.

[40] There was no formal, systematic process for identifying indicators or type of data to be collected. Also, there was no systematic process through which input from outside experts could be sought. Based on my observations during my involvement in the development of the CBIS for water, merely asking people to comment on a list of indicators generates minimal input. This suggests that a more formal process for input gathering may be necessary.

household. This information included details such as whether or not the women in the household were employed, immunization and health practices, household assets, income profiles and access to basic services such as toilets and water taps. Finally, the Settlement Level data category consisted of information that would be useful for understanding the average status of school enrollment and retention levels for children in the settlement as a whole. This category consisted of information on the issues and priorities of women with regards to child-care services, the extent of alcoholism, domestic violence or child abuse in the community, children in need of special protection, and the presence of NGOs in the community, and people's perceptions of quality of education processes were identified through focus group discussions.[41] Also, both the location and boundaries of the settlements were mapped. Table 3.2 provides a summary of these data collected.[42]

[41] NIUA, "Geographical Information System: A Tool for Improving Governance of Education Programmes" 2002. http://www.niua.org/newniuaorg/peep_gis.htm

[42] In addition to these data, NIUA sometimes collected detailed household and settlement data for other sectors such as safety or water when they were of greater interest to certain communities than education.

Table 3.2: Type of Data Collected for Education Enhancement Program

Level of Aggregation	Data Types
Children at the Household Level	Number of children per household Level of education School enrollment status Age and gender Occupation (in cases of working children) Type of disability (if applicable)
Household Level	Details about working women Immunization and health practices Household assets Income profiles Access to basic services such as toilets and water taps
Settlement Level	Location and boundaries Issues and priorities of women with regards to child-care services Extent of alcoholism Domestic violence or child abuse in the community Children in need of special protection Presence of NGOs in the community Perceptions of quality of education

Techniques for Information Collection

As discussed above, NIUA facilitators used PLA tools to help communities (1) identify their priority issues with regards to education, (2) gather relevant household and settlement information, and (3) prepare action plans to achieve the neighborhood priorities. PLA tools used by NIUA consisted of transect walks, *Chapatti* analyses[43] (identification of priority community issues), rankings matrices (prioritization of issues), community resource mapping, household mapping, trends analysis, timeline or historical diagramming, semi-structured interviewing, and focus group discussions.[44] These tools

[43] A *Chapatti* is a round, flat-shaped bread that is a basic stable for all Indian families regardless of education or income. A "*chapatti*" in PLA is, hence, another word for "priority." A Chapatti analysis is the process through which community members identify their top community priority issues.
[44] For more information on PLA techniques used by NIUA, please refer to http://www.niua.org/newniuaorg/cbis/pla.htm.

relied on the use of symbols and animation exercises in order to ensure participation of all people, including children, youth and those adults who are illiterate or have low levels of education. Due to the cultural tendency for women to be marginalized, special emphasis tended to be placed on ensuring the participation of women.

Some examples of priority issues identified as obstacles to school enrollment during the *Chapatti* analyses were distance or cost of transportation to school, complicated procedures for enrollment, or childcare needs (in order to prevent children from having to stay home to take care of younger siblings when parents were at work). As shown in Figure 3.4, community residents identified their priority issues through focus group discussions that were facilitated by NIUA or NGO facilitators. If residents could not reach consensus about the rankings or order of importance of their priorities, the facilitators would help communities prioritize the issues through the use of rank matrices and other techniques (see Figure 3.5 below). The goal of the *chapatti* analyses and rank matrices were to provide a venue for community members to discuss their problems and build consensus about neighborhood-wide priorities. This was considered to be a first step for generating a sense of interdependence among community members, which facilitators considered key for encouraging community residents to mobilize towards a common goal.

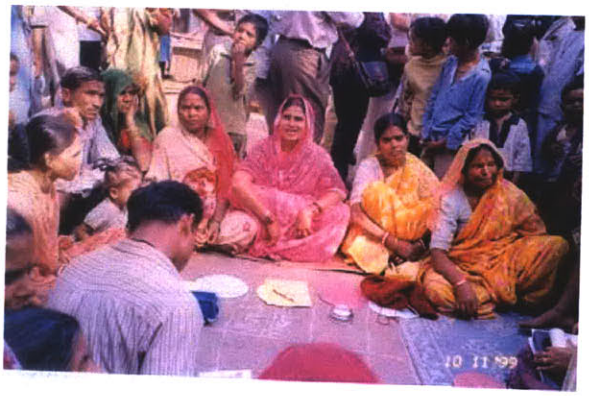

Figure 3.4: Example of Chapatti Workshop
Symbols of priorities were drawn directly on circular shaped papers which resembled chapattis. The size of the chapattis represented the priority's rank relative to the other priorities.

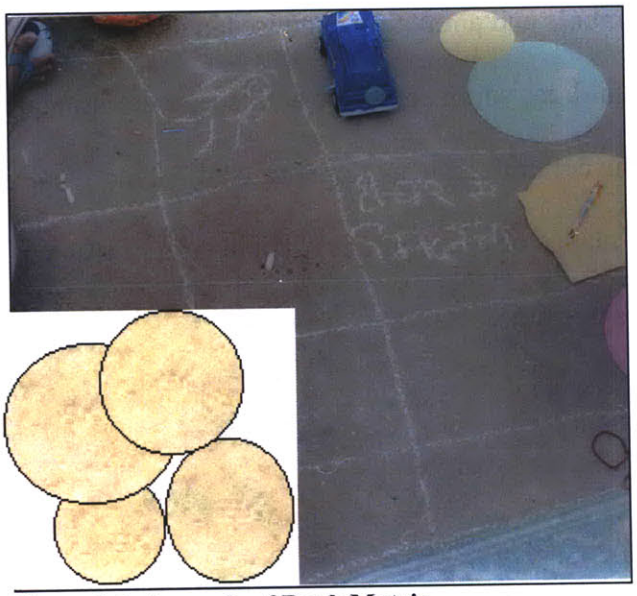

Figure 3.5: Example of Rank Matrix
The size of the chapattis represented the priority's rank relative to the other priorities.
Source: NIUA PLA Online Manual (www.niua.org)

Next, facilitators used community mapping tools such as resource or household mapping for encouraging communication and knowledge sharing among residents about their priority issues. NIUA considered these techniques to be useful not only for collecting demographic and other data about the communities, but also for stimulating discussion and enthusiasm among large groups of people. As shown on Figure 3.6 below, chalk was used to draw maps of communities on the ground, a tactic that enabled large numbers of people to gather around and participate or watch. Residents would place sticks, leaves and pebbles directly on the maps to symbolize information needed to better understand the level of school enrollment in the community. For example, leaves could symbolize primary school age children who were enrolled in school while sticks could symbolize children in the same age category who were not enrolled in school. During a household mapping exercise, for example, a mother could place two leaves on her mapped household to indicate that she had two primary school age children who were

enrolled in school. NIUA considered these types of mapping exercises to be rapid data collection techniques.

Figure 3.6: Example of Household Mapping Workshop
Photo by Chun Tirapas

While community maps were used to identify the demography and resources of a community, trends, timeline and seasonal matrices were undertaken to reveal community changes and trends throughout a single year or over several years. For example, to identify some of the changes in the community that may have contributed to a decrease in enrollment levels in a community over the last two years, facilitators would ask residents to describe their communities five years ago and compare that to the community's description of their current reality (trends analysis). This analysis would be recorded through diagram drawings.

Settlement Location and Boundaries

NIUA sent a group of students from the School of Planning and Architecture to map the location and boundaries of the 1,190 slums that NIUA had identified city-wide. The students did transect walks through the community to note key landmarks and meet with residents to identify the boundaries of the settlements. The students would record the boundaries directly on paper maps.

3.5.3 Presentation of Data to the Community

There is no doubt that the residents who participated directly in the community mapping exercises and other PLA gathering learned a lot about themselves and their neighbors by being part of the process. However, could the learning be disseminated throughout the neighborhood to the other residents who may not have participated? NIUA claimed yes. To this end, NIUA would create Chapatti posters indicating the priorities that had been identified. These posters would be put up in major public spaces such as community centers or medical dispensaries. Furthermore, NIUA facilitators along with numerous community volunteers would transfer the community maps that had been drawn on the ground onto paper. These paper maps would then be shared with other members in the community in order to educate them on the issues that had been discussed (See Figure 3.7 below).

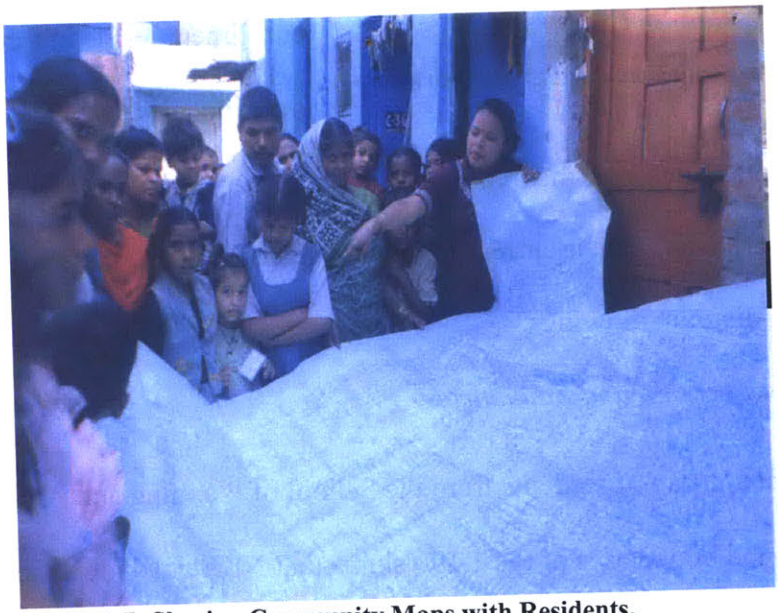

Figure 3.7: Sharing Community Maps with Residents.
Photo facilitator sharing a detailed household map back to the community. Photo by Leena Kapoor

3.5.4 Community Organizing and Leadership Building

These efforts included the formation and/or strengthening of leadership structures. NIUA created Neighborhood Groups that consisted of households located in the same lane or block.[45] The members of these neighborhood groups would then choose one or two representatives from among themselves to serve as a representative in the neighborhood-wide *Bastee* EducationCommittees.[46] Although this was never implemented, NIUA envisioned the next organizational level to consist of a zonal coalition of *Bastee* Committee representatives (Zonal *Bastee* Committees). Figure 3.8 provides an illustration of the organizational hierarchy of these collective community groups.[47]

[45] Each neighborhood group consisted of 40 to 200 households.

[46] This community organizing model is based on the model outlined in the guidelines of the Golden Jubilee Employment Program (known as Swarna Jayanti Shahari Rozgar Yojana (SJSRY)), a national program administered by the Ministry of Urban Affairs and Employment, Department of Urban Employment and Poverty Alleviation (SJSRY Guidelines). Although there may be benefits associated with this form of organizing due to its consistency across neighborhoods, NIUA's experience shows that it is difficult to establish associations or task forces beyond the individual settlement level (e.g., zonal level neighborhood groups). This community organizing model has also been heavily criticized for failing to recognize the legitimacy of existing leadership structures in the community. These critiques say that it may be better for organizing activities to work within existing leadership structures rather than impose an outside structure on a neighborhood.

[47] Prior to the education initiative, UNICEF had worked with NIUA as part of the Urban Basic Services Program. The community organizing approach that NIUA used in the education initiative is based on the model that it developed under the urban basic services program.

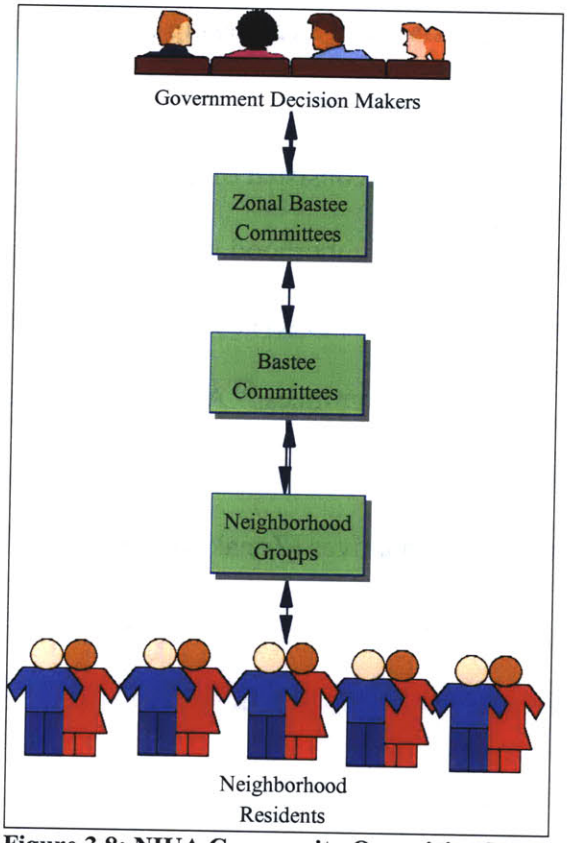

Figure 3.8: NIUA Community Organizing Model

3.5.5 System Development

CBIS Discovery

While NIUA worked directly in 120 communities, 180 of the communities were organized and mobilized by the NGOs. In an effort to manage and analyze the information that was being gathered by the NGOs in the community visioning (*Chapatti* analyses) and mapping workshops, NIUA compiled and digitized the data. [48] The digitization process, which converts physical representations, such as paper maps, into digital data, is described in greater detail in Section 4.5.5 of Chapter 4.

[48] As a result, the CBIS for Education contained data for only 180 of the 300 settlements. Data for those settlements in which NIUA was working directly were never digitized.

Data Analysis

The unintended result of these digitization efforts was the creation of a geographic information system and Access database that contained the neighborhood-level data discussed above. Much of these data consisted of people's perceptions and preferences about education and other services, which was provided directly by the residents who participated in the workshops. It was only after NIUA began to use this information system for monitoring the work of the NGOs and assisting with their community action planning efforts that its potential power for community development and local governance was discovered. Figures 3.9 to 3.12 below depict some of the types of information that can be viewed through a CBIS. Figure 3.7 provides details on location, boundaries and demographic data of settlements. Figure 3.8 consists of a detailed map illustrating the physical layout of the roads and houses of a settlement. Finally, Figures 3.9 and 3.10 provide examples of some types of queries that a user can conduct at the settlement and household level.

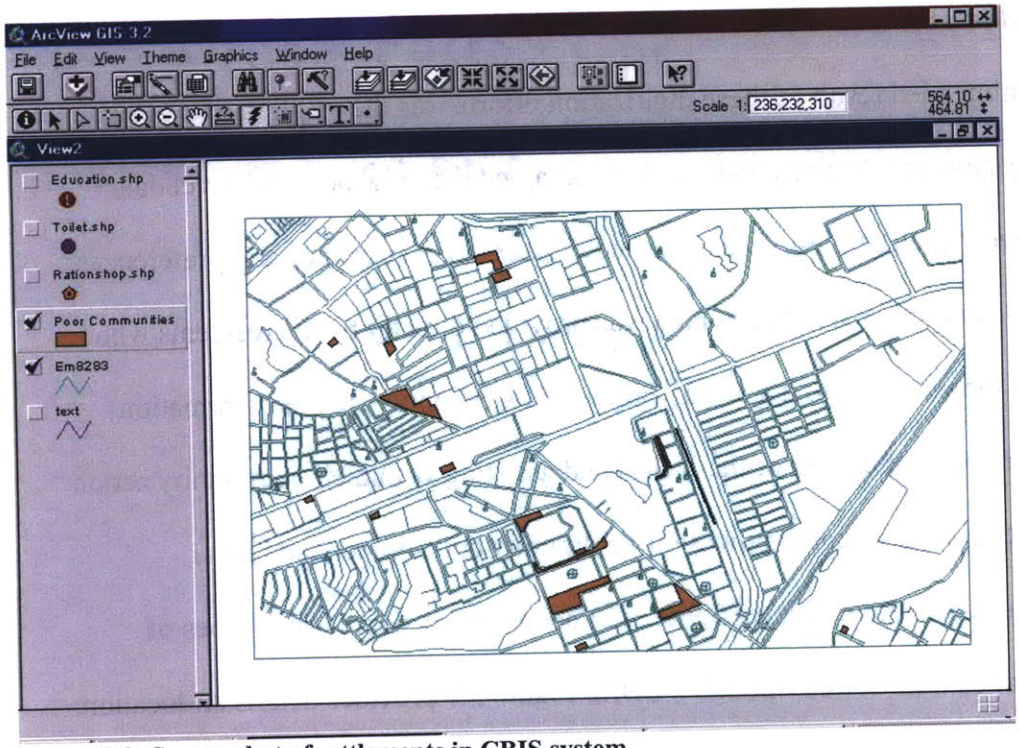

Figure 3.9: Screen shot of settlements in CBIS system.
Clicking on a settlement (brown area) brings up a list of aggregated household data (total households, total number of girls under three years of age (GO_3), total number of boys under three years of age (BO_3), etc.).
Source: NIUA CBIS for Education

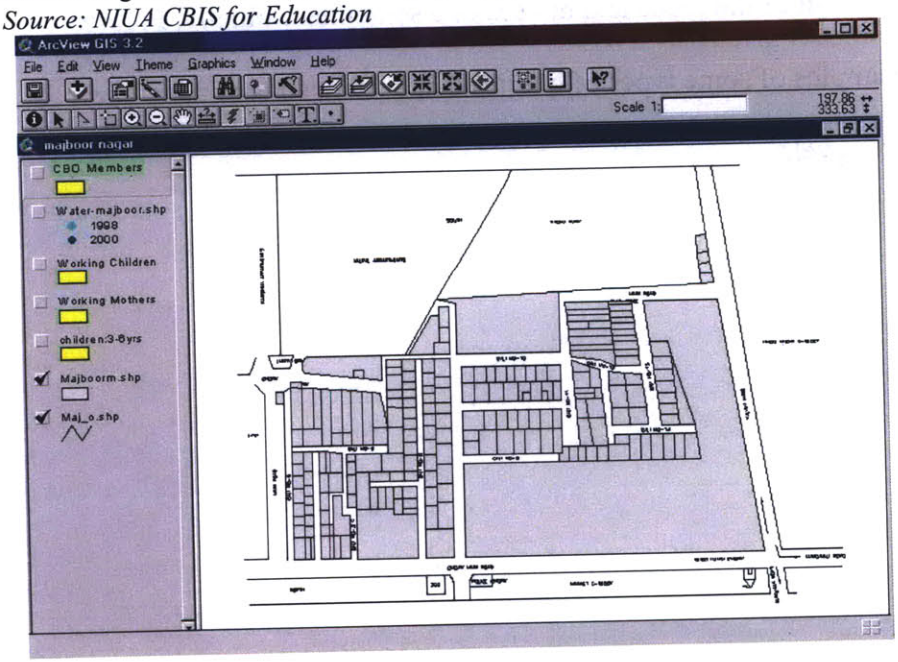

Figure 3.10: Detailed Settlement Map.
Zoom of a single settlement (one of the brown areas in Figure 3.7).

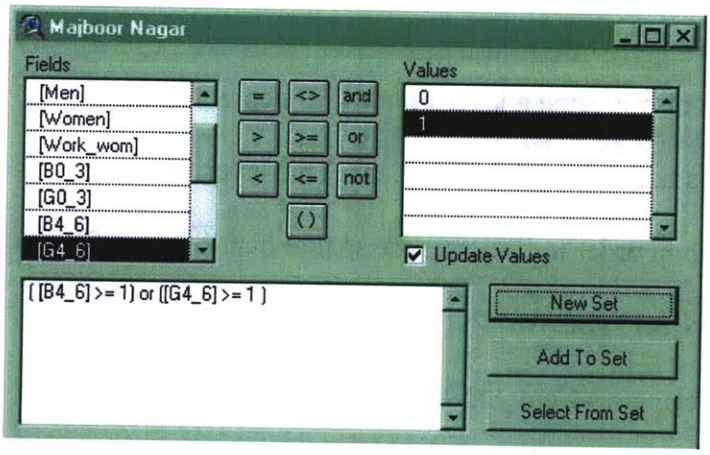

Figure 3.11: Query dialogue box for a settlement.
Allows user to enter search criteria. In this case, the formula is queering the database for all households in which at least one boy or girl 6 years of age or older lives.
Source: NIUA CBIS for Education

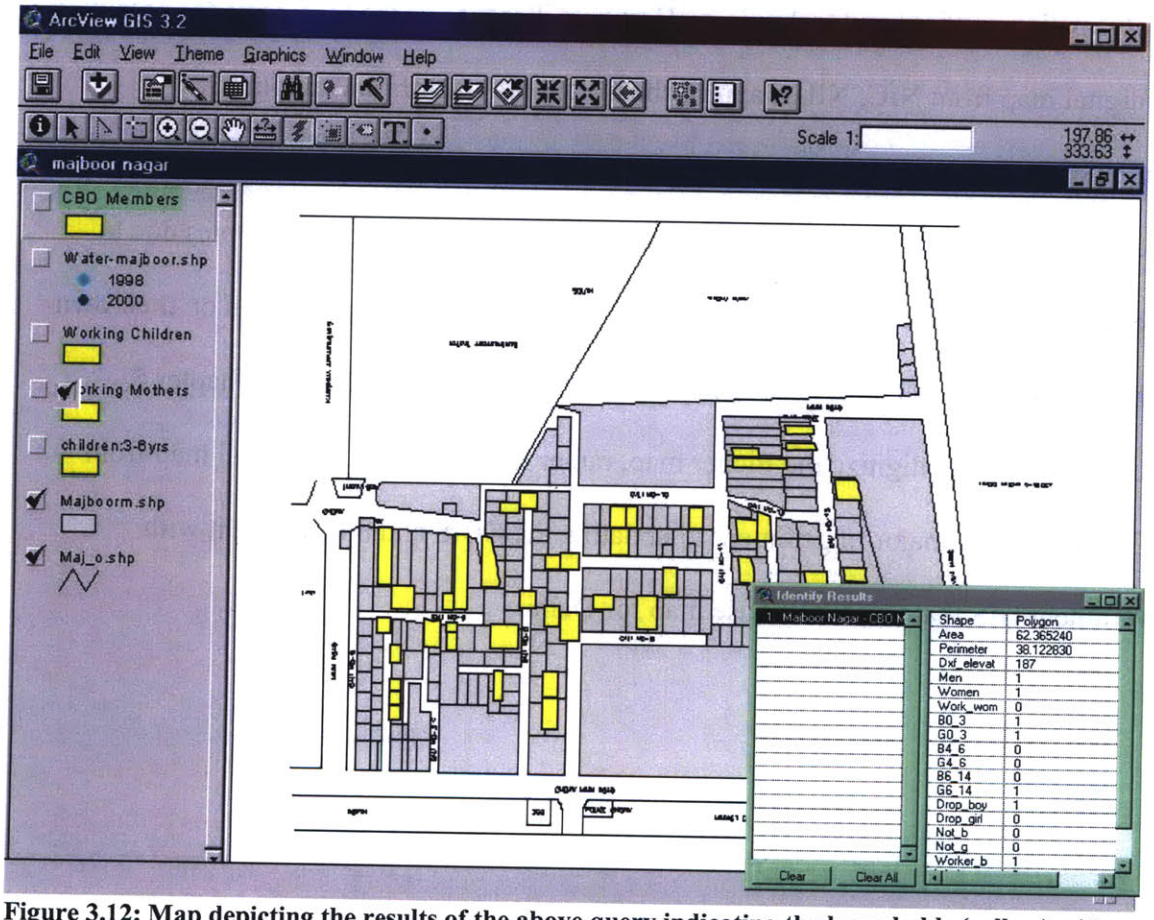

Figure 3.12: Map depicting the results of the above query indicating the households (yellow) with children 6 years of age or older. Small chart to the right provides demographic data for a single household (activated when you click on a household).
Source: NIUA CBIS for Education

Settlement Boundaries

The project associate at NIUA also created a layer on the GIS depicting the settlement boundaries that the students had drawn on paper maps. This layer was superimposed onto the Delhi base map in order to illustrate the spatial distribution of slum settlements in the city (see Figure 3.13) below.[49] NIUA had attempted to acquire the Delhi base map from the National Informatics Centre (NIC), a national agency in charge of information services and technology. However, because of the high costs for obtaining the digital map from NIC, NIUA approached Eicher (a tractors and automotive component company that entered the mapping business in 1996) for a digital copy of its base map. At the time, however, Eicher was unable to provide digitized copies due to defense restrictions[50] so NIUA staff digitized an Eicher paper map of Delhi on their own with permission to use it for academic purposes. As will be discussed in Chapter 5, NIUA's decision to digitize the Eicher map, rather than purchase the digital map from NIC, resulted in a major impediment to updating the CBIS and integrating it with government GIS that use NIC's base map for Delhi.

[49] With time, NIUA hoped to also map key government facilities such as schools or healthcare centers in order to determine which settlements were in spatial proximity to these facilities and which were not. It is important to note that NIUA was the first (and only entity as of March 2004) in Delhi to map the boundaries of Delhi's slum settlements on GIS.

[50] In Nov 2000, however, Eicher obtained the required clearance from the Ministry of Defense for the sale of digital data for Delhi. http://www.gisdevelopment.net/technology/gis/techgi0033pf.htm

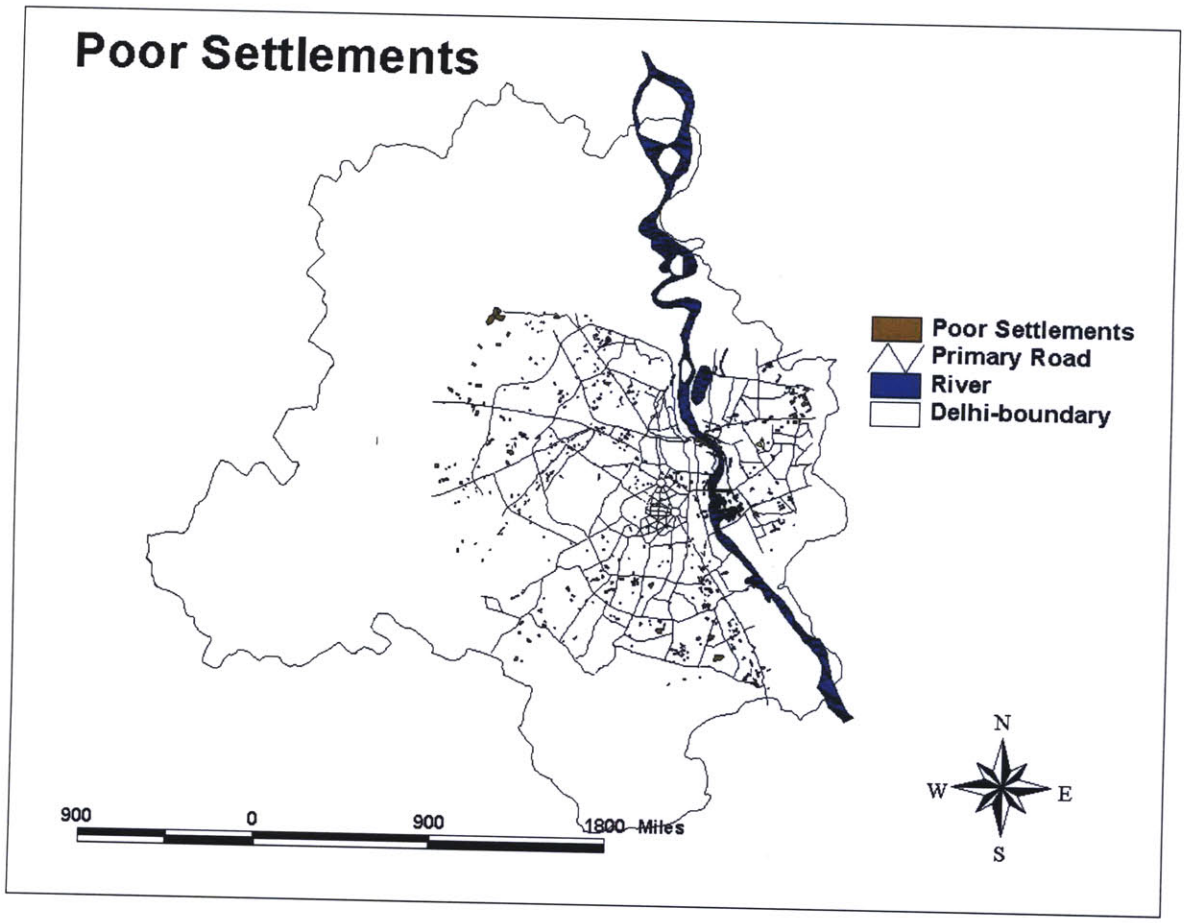

Figure 3.13: Slum settlements in Delhi mapped by NIUA
Source: NIUA, 2001

Automation and Customization

NIUA envisioned a customized system that would be available to communities and government on the web, which both communities and government could access through internet cafes that have proliferated throughout the city. NIUA's goal was to create a system that communities could update on a regular basis through simple, easy to use data entry forms (see Figure 3.14). Government could then used the system to plan need-based service delivery. Although NIUA personnel did create some customized

queries at the household and settlement level, NIUA generally lacked the expertise necessary to build a formal information system, particularly a GIS.[51]

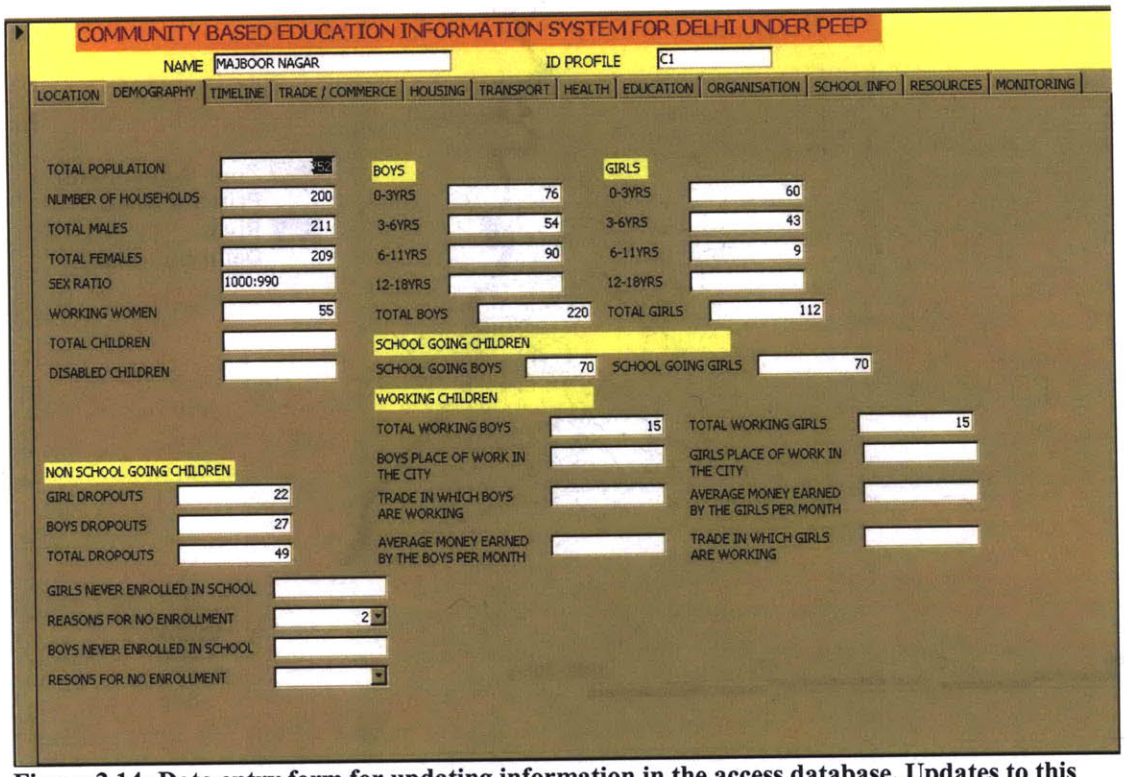

Figure 3.14: Data entry form for updating information in the access database. Updates to this information, however, would not be automatically reflected in the GIS.
Source: NIUA CBIS for Education

3.6 Results

3.6.1 School Enrollment and Retention

According to NIUA documentation for the UNICEF education initiative, "significant programme achievements include…increased enrollments, particularly girls and older children that were daily-wage earners…. [and] simplified policies/procedures

[51] When I joined NIUA in 2003, I had the opportunity to look at the CBIS for education and found that the shape files (spatial data and related files) were highly disorganized, which made it very difficult for people other than the original project associates to manage the system. The shape files were not dated so it was difficult to create a system that would lend itself to times series analysis.

for enrollment."[52] However, in the reports that I reviewed, no data were provided to corroborate this claim or to identify the extent to which enrollment levels may have improved as a result of the program.

3.6.2 Collaboration Difficulties

According to NIUA, SCERT initially provided leadership in the project. However, SCERT's commitment to the project began to decline in 2000 --- only 2 years into the project. Dr. Khosla states that "the change in SCERT's director midway through the project weakened [the agency's] vision and program ownership." She explained that while the original director understood SCERT's role as coordinator of overall program activities, including its own activities in teachers' capacity training, the new director preferred community mobilization activities. Under the new director's leadership, SCERT began to organize community watch groups whose role was to monitor the functioning of schools, including attendance of teachers, etc. This created tension between SCERT and NIUA since, according to Dr. Khosla, the community watch groups were superfluous to the other groups that were already established in the communities such as PTA or *Bastee* Education Committees, which were the neighborhood committees that NIUA facilitators had established in the settlements. Dr. Khosla also expressed that the new director of SCERT did not cooperate well with NIUA because she was "uncomfortable with the presence of a national institute that dwarfed the state level

[52] NIUA, "Primary Education Enhancement Program (PEEP): Community-Based Initiative to Reach the Urban Disadvantaged Child", p. 3.

organization... [53] The situation was further exacerbated by the lack of consistent leadership at the State Department of Education level. During the five year period of the program, the director at the SDE changed seven times.

The CBIS that NIUA developed became a major source of contention between NIUA and the two state government agencies: SDE and SCERT. When SDE and SCERT learned about the information system that NIUA was developing, they wanted to have access to it right away. But NIUA was not ready to turn over the system. "It was unfinished and we were still exploring its potential" Dr. Khosla said when she was explaining why she had not transferred the CBIS to SCERT. She also said that neither SDE nor SCERT had the necessary software or expertise to use the system or to continue developing it. As a result of NIUA's lack of cooperation, SCERT and SDE began to develop their own database without a GIS platform. They were computerizing the administrative data for their jurisdictions such as the number of schools, number of teachers, etc. When NIUA learned about these efforts, Dr. Khosla asked SCERT to provide the data to NIUA so that it could incorporate it into the CBIS that NIUA would then hand over to SCERT once it was completed. SCERT agreed and gave NIUA the contact information of the consulting agency that was computerizing the data. However, Dr. Khosla tried contacting the consulting agency two times, and failed. The consulting agency did not respond for reasons that are unclear.

Another major constraint throughout the duration of the project was the fact that neither SDE nor SCERT had direct control over the MCD's and NDMC's actions. Both the MCD and the NDMC had their own funding sources and therefore did not have to

[53] Interview with Dr. Khosla, January 2005.

answer to the state. As a result, it was very difficult for SDE and SCERT to influence local government's policies and administrative practices in ways that would enable greater enrollment of children in poor communities.

Also, according to NIUA, the Government of India never became convinced of the utility of a CBIS for education management. This position of the Indian government may be due to a lack of understanding of the technology or ideological differences in terms of approach to education administration. For example, when all education initiatives in the city were converged into the Sarva Shisha Abhiyan or Universal Elementary Education program, the Government chose not to continue NIUA's community mobilization activities. This decision may have resulted from the government's idea that education administration focused too heavily on schools and teachers, and failed to recognize the need to extend into the community domain. An example of this narrow approach, Dr. Khosla says, is "the Department of Education program for school drop outs which takes place within school premises... this choice of venue suggests government's lack of knowledge about the major reasons why children drop out of school."

Finally, it is important to note that Dr. Khosla's community organizing work, including the CBIS, never received much attention from her own organization -- NIUA's Director, Dr. Vinod K. Tewari. As a result, Dr. Khosla worked alone with little guidance or hindrances from her supervisor.[54] Dr. Tewari's indifference towards Dr. Khosla's work

[54] In the following chapter I describe in more detail my involvement with NIUA in 2003. For now, I will just briefly describe some incidences that corroborate my claim that Dr. Tewari was not interested in Dr. Khosla's community-based projects (apart form Dr. Khosla's comments, of course). Not only did Dr. Khosla mention in several occasions that Dr. Tewari was removed from her community-based projects, I also noticed that Dr. Tewari often tended not to promote Dr. Khosla's projects in key meetings with

may have been the result of his preferences for more traditional research projects such as econometric studies or project evaluations. Dr. Khosla expressed that Dr. Tewari did not think much of the UNICEF education initiative except that it was a project that generated income for NIUA.

3.6.3 Community organizing

NIUA prroject documents state that Neighborhood Groups and Bastee Committees were formed in 300 settlements. The question is, how long did these groups last? Did these groups create an artificial layer of organizational structure in the community (i.e., did NIUA's community organizing efforts attempt to displace rather than work within existing hierarchies that have been around for decades)? How representative were these groups of their respective communities? Also, why were no zonal *Bastee* Committees established?

In addition to its work in education, NIUA also organized communities around other sectors such as water or sanitation as a means of engaging people in their education enhancement program. In other words, for those communities that regarded water or another issue to be their priority and lacked interest in education, facilitators took on the community's priority issue while simultaneously building awareness about the importance of education:

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outsiders. For example, during a presentation that Dr. Tewari made in May 2003 about NIUA's programs and projects to Dr. Yap Kioe Sheng, Poverty Section Chief of the United Nations Economic and Social Commission for Asia and the Pacific, Dr. Tewari did not mention the CBIS or the community mobilizing efforts. Rather, he focused solely on presenting NIUA's more traditional research projects. Also, when a representative of a GIS firm in Bangalore visited Dr. Tewari to inquire about NIUA's interest in GIS, Dr. Tewari stated that NIUA was not involved with GIS. I had the opportunity to talk to both of these individuals after their meetings with Dr. Tewari and I was quite surprised that he had not mentioned Dr. Khosla's work.

> As education remains low priority with urban poor despite increased education awareness because of a preoccupation with survival needs, education cannot be a stand-alone intuitive but integrated within a broader infrastructure and economic agenda.[55]

NIUA considered this type of flexibility in approach and strategy to be an important contributing factor to the program's ability to scale up.

3.6.4 Government Capacity Building

As explained above, one of NIUA's mandates was to build the capacity of government to promote citizen participation in planning processes. To meet this goal, the government agencies with whom NIUA should have worked more closely were:

State Council for Education Research and Training (SCERT);

- State Department of Education (SDE); and
- Municipal Corporation of Delhi (MCD).

However, NIUA was unsuccessful in building the capacity of the relevant government agencies to continue the community organizing work that NIUA and the NGOs had begun. NIUA stated that "inclusive planning is a major challenge... exacerbated by [the] narrow understanding of community inclusion by administrators, seen largely as community acceptance of centralized decisions."[56]

3.6.5 CBIS

As explained above, NIUA built the CBIS in an effort to store and analyze the large amounts of information that the NGOs were collecting from neighborhoods on NIUA's behalf. The CBIS contained the location and boundaries of 1,190 settlements and

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[55] NIUA, "Primary Education Enhancement Program (PEEP): Community-Based Initiative to Reach the Urban Disadvantaged Child", p. 9.

detailed settlement and household data for 180 neighborhoods. The act of mapping boundaries for all of Delhi's slums gave NIUA significant power because this type of information was unavailable in Delhi, not even within the Delhi Development Authority (DDA), the sole landowning and development agency in Delhi.[57]

Unfortunately, this CBIS was created with little coordination with other agencies. At the time, the University of Delhi was mapping the slums in the entire city of Delhi at ward level with the assistance of the Center for Spatial Database Management (CSDMS) in Delhi. They were also collecting other useful information such as number of households per slum, and the level of presence of state facilities in each ward.[58] It would have been useful for NIUA to coordinate efforts with the University of Delhi, but no such efforts were pursued. Also, NIUA did not coordinate efforts with any of the education public agencies with which it was supposed to be working on the UNICEF project.

As a result, the CBIS development efforts came to a halt when NIUA's involvement in the project ended in early 2002. According to Dr. Khosla, she did not want to transfer the CBIS because "the State Department of Education (SDE) did not

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[56] NIUA, "Primary Education Enhancement Program (PEEP): Community-Based Initiative to Reach the Urban Disadvantaged Poor" p. 10

[57] In February 2003 the Director of the Mater Plan 202 Division, Mr. B.K. Jain from the DDA, learned about the CBIS and requested a meeting with Dr. Khosla at NIUA. At the time, I was working at NIUA and Dr. Khosla asked me to attend. Although Mr. Jain expressed that they needed the data to inform the formulation of housing policies for the Mater Plan 2021, Dr. Khosla did not trust him. She believed that Mr. Jain wanted to know the total area that slums occupied in the city and the locations of these areas in order to relocate the slums and redevelop the land into higher revenue-generating uses. The tension in the room reached a climax when she expressed her strong opposition to relocation policies and Mr. Jain responded by saying that relocation was necessary if costs of on-site upgrading were too high. At the end of the meeting, rather than denying him his request for information, Dr. Khosla artificially created an arduous application process for obtaining access to the data, which the DDA decided not to pursue.

[58] CSDMS is a GIS research and policy institute that promotes GIS and its usage in development activities throughout the Asian region. CSDMS assists "the Asian community in developing their capabilities and policies to maximize the benefits of GIS through advocacy, training, information and the provision of expert advice and assistance." The mapping project that CSDMS was working on in Delhi was part of the Developing Countries Research Center (DCRC) project, which was a joint initiative between the Social

have the capacity to use the system or to complete the digitization of approximately 120 community maps that still remained in paper form." Hence, Dr. Khosla denied the Department of Education request for the system, and the Department of Education continued to develop a non-spatial data base system of its own.[59]

Despite NIUA's desire to retain complete control of the system and not release it to the Department of Education, NIUA tried hard to get funding to continue developing the CBIS and customizing it to meet the needs of SDE and other agencies. However, due to the deteriorating relationship between SCERT and NIUA, UNICEF funding was earmarked to go directly to SDE as per the original project schedule rather than NIUA.[60]

Even if the NIUA had continued to develop the CBIS, the NIUA team lacked the expertise necessary to implement the system according to NIUA's vision. They did not have the knowledge of how to create web-based systems or how to create a formal customized system. Also, NIUA did not know how to enable residents to update the information directly in the GIS. The Access data entry forms were useful for the Access Database but not for the GIS.

3.6.6 Facilitating Participation

To determine the level of participation that the CBIS project may have fostered (if at all), it is necessary to have a clear definition of participation. None of NIUA's project

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Science Research group in the University of Delhi, and DESTIN, London School of Economics. http://www.csdms.org/

[59] It is unclear whether that system was ever completed once NIUA retreated and information collection processes ceased.

[60] Once the CBIS for education project came to a halt, NIUA's attempt to market the information system to other government actors: the Ministry of Urban Development (for the Golden Jubilee Employment Program (SJSRY) program), the Commissioner of North West district of Delhi (who expressed interest in contracting NIUA to develop a system of information for her district), and NICNET. None of these meeting materialized into any formal partnership, however, due to the transfers of key contacts or insufficient resources.

documents properly describe this term consistently, as noted in the introduction to this thesis. NIUA makes a lot of claims that the CBIS enhanced participation or more "inclusive" planning processes, but the question is what kind of participation did it enhance and what does this participation lead to: Full involvement in decision-making? Cost sharing? Involvement in construction processes? Input for decision-making processes?

3.7 Lessons

NIUA took away three important lessons from this education initiative. First, it learned that PLA techniques are useful participatory tools for creating dialogue between residents of slum settlements. This dialogue helps generate a better understanding of the communities' problems and potential solutions (including various forms of local knowledge such as resident perceptions and preferences regarding neighborhood services or other conditions), which communities can use to implement self-help strategies. This local knowledge can help mobilize the community towards a common goal (the resolution of a common problem in the neighborhood).[61] For example, as described in section 3.5.1 above, the *Chapatti* analyses and rank matrices helped communities identify and rank their priority issues in order of importance. Next, community mapping and other

[61] As will be discussed in the analysis section of this thesis, the CBIS that NIUA created for UNICEF's education initiative is an example of a truly bottom-up GIS (i.e., a GIS that consists of community-generated information about residents' environmental perceptions and preferences, rather than administrative data). However, this bottom-up GIS was developed for government ownership and use, not for the use of communities who were providing the data (this adds a new dimension to the PPGIS movement – it is not just about democratizing administrative data or making the GIS technology available to communities, it is also about diversifying the points of view within standard use of GIS by government).

exercises such as trends analyses were used to gather the information needed to better understand the community's priority problems and develop solutions and action plans.[62]

Second, NIUA learned that adding a GIS component to the PLA-based community initiatives provided NIUA with the opportunity to go beyond localized, uncoordinated community development projects to a more comprehensive approach that incorporates community-based projects into the formal, government planning process. The process of gathering local knowledge was no longer only useful for helping communities help themselves. The benefits of participatory processes could be extended beyond the spatial boundaries of neighborhoods or specific points in time. With the GIS, gathering local knowledge was a way to potentially inform government planning and decision-making. NIUA believed that the GIS could be a powerful tool for making community-generated data directly available to government at any point in time.[63] NIUA's assumption was that if government used community-generated data to plan service improvements, these improvements would be more need-based (i.e., better meet the needs of neighborhoods as perceived by the residents themselves rather than outsiders).

Lastly, NIUA concluded that upgrading processes should not be sector-driven. That is, instead of gathering information for predetermined issues (e.g., education), NIUA thought it would be best to move towards a "blank slate" approach whereby development workers initiate work in neighborhoods without any preconceived notions of what the

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[62] Although this chapter presents the opportunities of PLA for gathering local knowledge and mobilizing communities, the following case describes some of the limitations with this regard.

[63] Interestingly, although this GIS was a bottom-up GIS—Dr. Khosla did not envision its purpose to be for community use. Instead, she thought, and continues to think, that it is for use of government primarily. It

neighborhoods need. Instead, they allow the communities to define the services and upgrading processes they need and then help the residents achieve those goals. This "blank slate" approach was ambitious but ultimately too broad, as the next chapter will reveal.

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may be used as a communication tool between government and community, but ownership of the system would remain within government.

CHAPTER 4 - CBIS for Basic Services: Starting Over

4.1 Introduction

NIUA's experience developing a CBIS for improving access to primary education in slum areas in India pointed to other sectors of service such as water, sanitation and paved roads that were of higher priority to slum dwellers than education. While specific community priorities varied significantly across neighborhoods due to differences in conditions, history, and resident preferences, most communities put access to water or street paving at a higher level than access to primary education for their children. According to the NIUA, this finding showed that the education initiative was out of step with the communities. This experience led NIUA to conclude that slum upgrading programs could not be driven by a single, outsider-defined service sector, if they were to be truly participatory and need-based. Rather, the program had to be flexible enough to focus on any sector that communities determined was a priority.

Consequently, NIUA initiated its "blank slate" interventions, which formed part of CARE-India's Promoting Linkages for Urban Sustainability (PLUS) project, based on the idea of initiating its slum upgrading work without preconceived notions of what was needed. It wasn't until later, however, that Dr. Khosla realized that it was not possible to formally engage government in service upgrading efforts and CBIS production if NIUA focused on every basic service, especially in a city like Delhi where there is a wide array of government agencies with overlapping responsibilities. Dr. Khosla recognized that focusing too broadly required NIUA to work with a multiplicity of agencies at various levels of government simultaneously, a condition that made it impossible for NIUA to build the relationships and trust that were necessary for an ongoing, formal NIUA-government partnership. What follows is a description of how NIUA regained an appreciation for the importance of focus for a project.

4.2 Background

Although the story that I tell in this chapter begins with a general overview of the PLUS program, including its goals and major actors, my main focus is on NIUA and its CBIS production undertaking under PLUS. NIUA's involvement in the PLUS project began in June 2002 and lasted until January 2004. Figure 4.1 below depicts the location of the 20 communities in which NIUA agreed to work in Delhi. These communities were to become part of the CBIS.[64] A few of these communities had also been part of NIUAs previous work under the UNICEF education initiative.

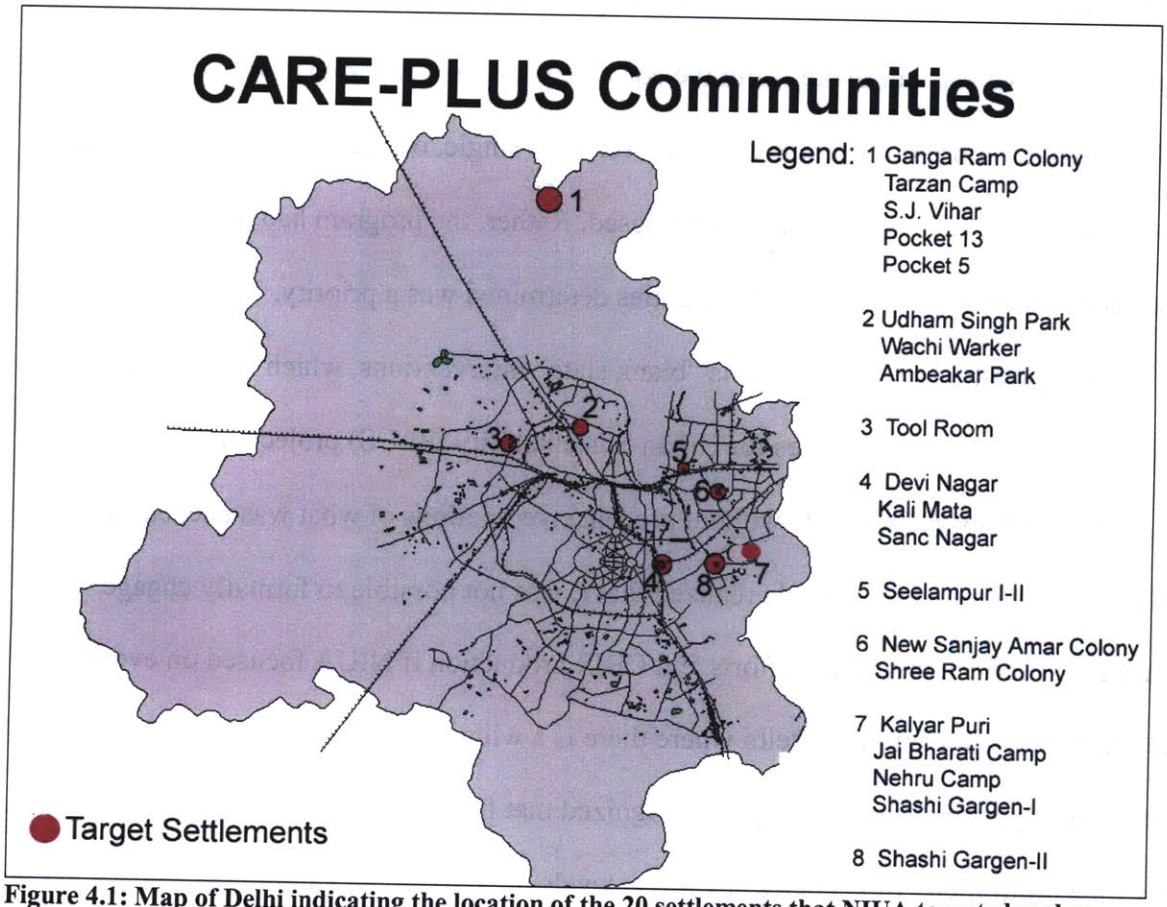

Figure 4.1: Map of Delhi indicating the location of the 20 settlements that NIUA targeted under CARE-PLUS.
Source: NIUA CBIS developed under CARE-PLUS

[64] There were additional communities in which the NGOs in the PLUS project worked, but they did not form part of the CBIS production efforts for reasons discussed in section 4.6.5 below.

In 2003, within only one year of NIUA's involvement in the project, CARE-India informed NIUA that no additional funding had been secured for scaling up the project and that the project would end in 2004. NIUA found itself in the difficult situation of having to initiate an exit strategy from settlements in which it had just begun to work. It also had to cease development of the CBIS. NIUA's goal at that point was to find alternative funding to continue its work in settlements and its production of the CBIS. It was about this time that I began to collaborate with NIUA.

Before I begin to describe the PLUS project and NIUA's efforts in settlement upgrading and CBIS production in Delhi, it is important that I provide the reader with a short background on how I became part of the CBIS production team at NIUA. In Spring 2003, I took a leave of absence from MIT to participate in a field study that Ball State University was organizing in India and other countries in Asia. I arrived in Delhi in January 2003 with six other graduate students from Ball State University to work with NIUA for a period of six weeks. Our tasks were to study the service delivery issues in three of NIUA's 20 target communities (shown in Figure 4.1 above), propose recommendations for improving the communities' priority issues, and customize the CBIS to enable storage, analysis and sharing of information needed to advance each of the three communities' priorities.[65] During these six weeks and for the three months that followed, I also worked as a Research Assistant for Professor Lorlene Hoyt from MIT.[66] The

[65] In November 2002, I received a grant from the College of Architecture and Planning at Ball State University to participate in its Asia Field Study program (CAPAsia) directed by Professors Nihal Perera and Jans Wez. This field study, which took place during January through March 2003, entailed the study of the built environment in cities in Thailand, India, Sri Lanka and Malaysia. One of the projects that we undertook involved working with NIUA on its CARE-PLUS slum upgrading project.

[66] In the summer of 2002, Dr. Khosla traveled to MIT to attend an urban poverty alleviation course sponsored by the World Bank's Cities Alliance program. During this visit, Dr. Khosla met Dr. Lorlene Hoyt, a professor in the Department of Urban Studies and Planning with prior experience and research interests in the development of neighborhood information systems. Dr. Khosla also met with Dr. Ceasar McDowell, the Director of MIT's Center for Reflective Practice, who was using GIS as part of his neighborhood revitalization work in Springfield, MA.

purpose of this research assistantship was for me to gain exposure to NIUA's CBIS production efforts and explore areas for potential future collaboration between NIUA and MIT.

Many of my assessments and observations throughout this chapter are drawn from my own direct experience with NIUA in January through May 2003. Examples of this experience include my own applications of PLA techniques in community workshops, my interactions with residents during my visits to settlements with and without NIUA facilitators, my observation of NIUA PLA training workshops for NGOs, and my daily interaction and collaboration with project staff and field facilitators in the office and on the field.

4.3 PLUS Project Goals

The PLUS project was established in 2000 in direct response to the Census of India's findings that projected that Delhi would become the home of 8 million residents living in substandard settlements by the year 2006.[67] The mission of PLUS was to contribute "to [the]

While Dr. Khosla needed assistance in customizing NIUA's CBIS and making it web accessible, both Dr. Hoyt and Dr. McDowell were interested in learning more about NIUA's participation-based data collection techniques and local knowledge representation methods. Before Dr. Khosla returned to India, all three parties agreed to keep in touch and explore the possibility of collaborating.
That fall 2002, I started my Master in City Planning program at MIT and enrolled in one of Dr. Hoyt's courses entitled "Planning Communication and Media." When Dr. Hoyt learned that I was planning on joining NIUA through Ball State University's field study the following semester and that I was looking for funding to extend my stay at NIUA beyond the duration of the field study, she immediately envisioned me as a liaison between NIUA and MIT for exploring potential areas of collaboration between MIT and NIUA. I prepared a proposal for a research assistantship upon my arrival in Delhi in January 2003, which MIT's Department of Urban Studies and Planning and Dr. Hoyt subsequently accepted.

[67] CARE, an international relief and development organization, began to work in India in 1950, after an INDO-CARE agreement was signed with the Government of India. Today, CARE works primarily in villages across ten Indian States in the sectors of health, nutrition, girl's education, small economic activity development, tribal empowerment, agriculture and natural resources, and emergency preparedness and relief and rehabilitation (http://www.careindia.org:8080/aboutus.jsp). PLUS is its first attempt in India to get involved in the urban development sector (http://www.careindia.org:8080/displaySector.jsp?sCode=CIS19). CARE's involvement in urban development in India constitutes an expansion of its urban development operations from Zambia, Bangladesh and other developing countries (Jha and Singh 2004).

elimination of urban poverty among slum communities in Delhi."[68] As a first step towards this mission, CARE-India piloted the project "to develop, test and demonstrate an approach to urban development that results in the improvement in the quality of life of Delhi slum residents and the rest of the city as well."[69] At the time the project was launched, CARE-India expected to undertake this pilot phase for five years and then scale up the project thereafter. The project was supposed to "significantly improve the quality of life of 35,000 slum dwellers."

Like NIUA, CARE-India also placed great importance to the role of community participation and self-help strategies in slum upgrading:

> By working closely with communities in partnership with NGOs and CBOs, PLUS aims to enable slum communities to address their problems through collective action. ...PLUS will seek to develop and strengthen linkages with existing resources and programmes that can support individual community initiatives and thereby further the inclusion of slum communities into civic structures.[70]

PLUS was supposed to demonstrate the ability of slum dwellers (particularly women) to "inform and manage specific development initiatives and facilities in support of their development aspirations." CARE-India, residents of slum settlements were "a potential force for their own development."

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[68] CARE-India Annual Report April 1998-March 1999 of PLUS

[69] CARE, "Urban Development PLUS Project" Ganhttp://www.careindia.org:8080/displayProject.jsp?sCode=CIS19&pCode=CIP8, Accessed February 9, 2005

[70] *Ibid.* This statement indicates CARE-PLUS' extreme reliance on localized, pluralistic community initiatives for securing "inclusion of slum communities into civic structures," and suggests a general disregard for the role of government in securing inclusion of marginalized groups. This absence of government is consistent with the tendency of the development community and activists to regard government as monolithic and inherently bad (Houtzager 2003). Houtzager (2003) suggests that in a world of increasing concentration of power, the role of government and other political organizations (such as political parties, labor unions or professional organizations) is essential for creating access of marginalized groups to decision-making. These constraints are discussed in greater detail in the analysis provided in Chapter 6.

4.4 Actors and Their Roles

The major actors in the PLUS project in order of importance for the purpose of this study were: CARE-India, an implementation team made up of four NGOs and NIUA (including the GIS contractor and MIT who collaborated with NIUA on the production of the CBIS); community groups; and local government frontline workers. CARE-India was required to establish obligatory contracts with the appropriate state and central government agencies in order to initiate the project. The sections that follow describe these actors and their roles in greater detail, with special emphasis on NIUA and the production of its second CBIS. In addition, I include and discuss the role that I played along with a Professor from MIT in strategic planning for the CBIS. Figure 4.2 below provides a visual representation of these relationships, and Table 4.1 summarizes the roles of these actors.

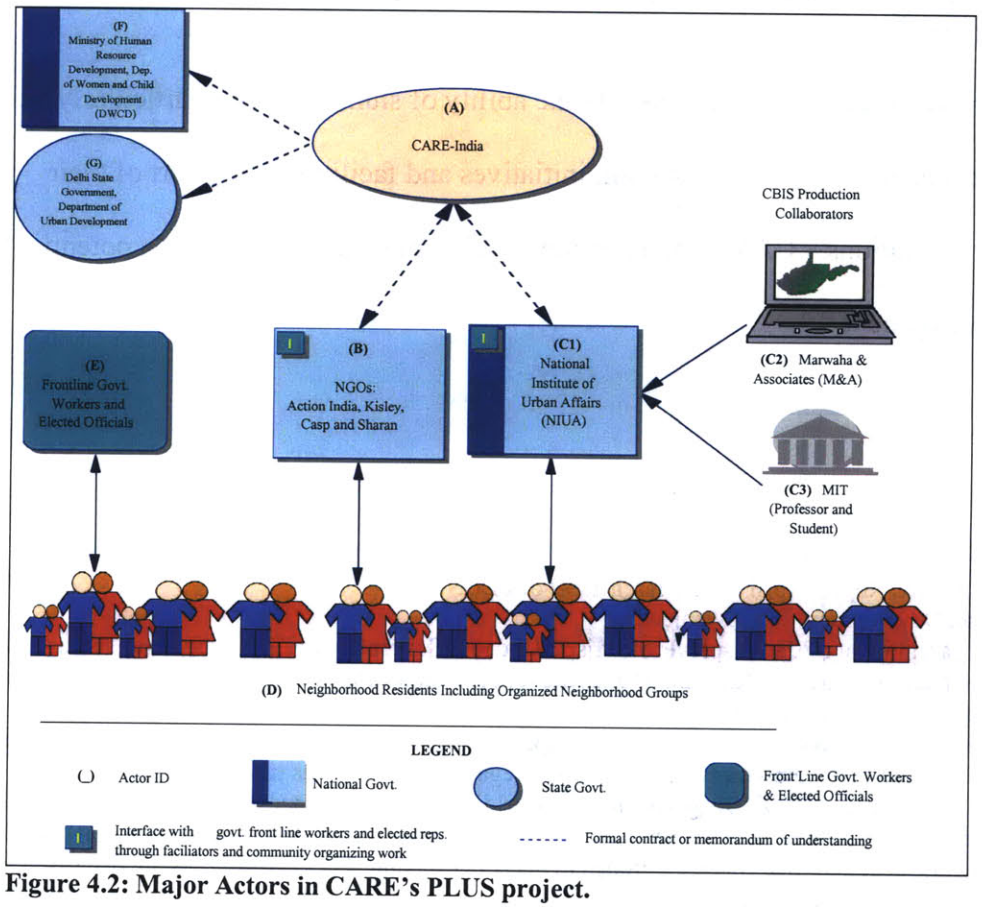

Figure 4.2: Major Actors in CARE's PLUS project.

Table 4.1: Major Actors in CBIS for All Basic Services Project (PLUS)

Actors	Major Roles
(A) CARE-India	Donor; Monitoring
(B) NGO Implementation Team (Action India, Kisley, CASP and Sharan)	Implementation of PLUS project strategies. During the first half of the project, NGOs focused primarily on building a wide array of infrastructure. Later, the NGOs engaged a little more on community organizing for self-help strategies.
(C1) National Institute of Urban Affairs (NIUA)	Community organizing (Inc. action planning and problem solving with the communities); CBIS production; Setting up of City Forum for influencing urban policy; Potential link to Ministry of Urban Development.
CBIS Support: **(C2)** Marwaha and Associates **(C3)** Massachusetts Institute of Technology (MIT) (Professor Hoyt and Myself)	M&A: Data digitization and integration with GIS. MIT: Strategic visioning and planning; Project operations support; Dissemination of information about the project; Exploration of potential opportunities for collaboration between NIUA and MIT
(D) Community residents and groups	Identification of priorities and mobilization around these priorities.
(E) Frontline government workers and elected officials	Interactions with slum dwellers in order to hear their needs and respond accordingly.
(F) Govt. of India, Ministry of Human Resource Development, Department of Women and Child Development	Unclear about its role since it was not a good fit with urban development efforts (it is a better fit for rural development or social services). The potential role of a national level agency in the PLUS project may have been advocacy for "pro-poor" urban development policy.
(G) Delhi State Govt., Department of Urban Development	Help establish linkages to existing government resources and programs for upgrading slum settlements.

4.4.1. CARE-India

CARE-India's role as the donor agency in the project was to monitor and coordinate the activities of the NGOs and NIUA (the implementation team), and to influence urban policy (see A, B and C1 in Figure 4.2).[71] According to CARE-India, monitored the progress of the

[71] CARE, an international relief and development organization, began to work in India in 1950, after an INDO-CARE agreement was signed with the Government of India. Today, CARE works primarily in villages across ten Indian States in the sectors of health, nutrition, girl's education, small economic activity development, tribal empowerment, agriculture and natural resources, and emergency preparedness and relief and rehabilitation (http://www.careindia.org:8080/aboutus.jsp). PLUS is its first attempt in India to get involved in the urban development sector (http://www.careindia.org:8080/displaySector.jsp?sCode=CIS19). CARE's involvement in

implementation team through required monthly, quarterly and annual reports, and through visits to the project sites carried out by CARE-India staff. CARE-India also held monthly meetings with the NGOs and NIUA to coordinate their work and encourage sharing of their experiences in the settlements.[72] Throughout most of the project, CARE-India exerted considerable control over strategy development and implementation, and gave little autonomy to the implementing agencies. This approach created an environment in which NGOs felt more as "sub-contractors who merely carried out activities on CARE's demand" than partner agencies.[73] NIUA was able to play the role of a partner, however, because of its national government agency status.

CARE-India had also hoped to influence urban policy at various levels of government. This role, however, never materialized for CARE-India due to the absence of key government partners in the PLUS project, which are discussed in greater detail in section 4.4.5 below.

4.4.2. NGO Implementation Team

At the start of the project, the implementation team consisted of four NGOs: Action India, Kisley, CASP and Sharan (see B in Figure 4.2). Based on criteria for site selection provided by CARE-India, which focused on vulnerability indicators such as dangerous geographic location, or inadequacy of physical infrastructure, the NGOs chose a few settlements in which to implement PLUS pilot slum upgrading efforts, as indicated by the two-way arrow between the NGO team (B) and the communities (D) (see Figure 4.2). These settlements were located primarily in south Delhi. Due to pressure from CARE-India to spend project funds within an allotted time period, the NGOs spent a lot of time building infrastructure such as deep bore

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urban development in India constitutes an expansion of its urban development operations from Zambia, Bangladesh and other developing countries (Jha and Singh 2004).

[72] The donor's role in the PLUS project differs from the donor's role in the primary education enhancement program discussed in the previous chapter. Whereas NIUA was the main coordinator of the NGOs in the education

wells or water treatment plants in the slums independent of government and with very little community participation and organizing. Within a year or two into the project, however, CARE-India shifted its focus away from infrastructure related tasks to a more process-based approach. It was after this shift that the NGOs were able to dedicate more time to community development activities. Infrastructure development or community organizing notwithstanding, the PLUS project's "blank slate" approach led the various settlement interventions to focus on a wide array of issues rather than one unifying goal as had been the case in UNICEF's education based project.

4.4.3. The National Institute of Urban Affairs

NIUA joined the PLUS implementation team a year and a half after the project had been initiated. NIUA's roles ranged from community organizing for slum upgrading and CBIS production to establishing a City Forum and a link to the Ministry of Urban Development for influencing urban policy. These roles are discussed in greater detail below.

Community Organizing and Slum Upgrading

Through its facilitators, NIUA was intimately involved in organizing communities in order to help them improve their living conditions either through direct self-help strategies or linkages to frontline government workers and/or elected officials.[74] Similar to the role it played in the UNICEF project, NIUA facilitators engaged in community rapport building, participation-

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enhancement program while the donor monitored NIUA's efforts, CARE, the donor agency in the PLUS project, directly coordinated the work of all of the organizations working at the settlement level, including NIUA.

[73] Jha and Singh (2004)

[74] It is important to note, however, that unlike the NGOs, NIUA did not get involved in direct infrastructure upgrades, such as the construction of community water treatment plants, because this activity deviated substantially from NIUA's mandate as a research policy institute. Dr. Khosla states that NIUA's bureaucratic accounting office would have never accepted to keep track of expenses associated with infrastructure development. Another reason why NIUA did not get involved in infrastructure upgrading activities is that Dr. Khosla was ideologically opposed to the idea of building infrastructure without government and community participation, which was the approach that the NGOs were taking as a result of CARE-India's rigid time line.

based data collection and action planning, and community mobilization. These activities enabled residents of various neighborhoods to communicate with frontline government workers about necessary service and infrastructure upgrades. Figure 4.2 shows the interrelationships that NIUA's community organizing work created between NIUA (C1), neighborhood residents (D), and frontline government workers and/or elected officials (E).

CBIS Production

NIUA also used the PLUS project as an opportunity to continue developing the CBIS it had started under UNICEF's education initiative. Although it took some time for NIUA to convince CARE-India of the value of this system, CARE-India eventually formally accepted the CBIS and provided limited funding for its production. NIUA worked with Marwaha & Associates (M&A), an architecture and urban planning firm based in Delhi, to digitize the data that NIUA facilitators were collecting from communities and incorporate these into the CBIS.[75] As shown on Figure 4.2, M&A (C2) interacted only with NIUA (C1) rather than directly with neighborhood residents. MIT also provided support to NIUA in the area of CBIS production as a result of my research assistantship with Dr. Hoyt, which I discuss in greater detail in section 4.4.4 below.

Influence Urban Policy at the City and National Level

Lastly, CARE-India had two additional roles for NIUA in mind with regard to city and national urban policy. First, CARE-India had asked NIUA to help organize a City Forum that would consist of NGO representatives and leading experts to tackle the issue of urban services to the poor, including the sharing of strategies and discussions on changes in policy and legal

[75] M&A conducted similar work for NIUA during the UNICEF education initiative program. The process of digitization under the PLUS program was not as smooth as it was under the UNICEF program due to turnover of

frameworks. Second, CARE-India had hopes that NIUA would be able to help obtain the involvement of the Ministry of Urban Affairs and Employment in the PLUS project. Since NIUA is a research institute under this Ministry, CARE-India considered NIUA to be in a unique position to establish this link. NIUA ended up playing neither of these roles for reasons discussed in section 4.6.3 below.

4.4.4. Massachusetts Institute of Technology (Professor Lorlene Hoyt and Myself)

During the course of my research assistantship with Dr. Hoyt, we collaborated with NIUA in two main areas related to CBIS production: strategic visioning and planning, and project operations. We also helped Dr. Khosla disseminate information about the CBIS project through various forums outside India (e.g., conferences, scholarly publications, and presentations).[76] As we came to know later, the impact of our involvement with NIUA went beyond the PLUS project because our work helped Dr. Khosla begin to develop and implement a vision for the CBIS which eventually led to a partnership with the Delhi *Jal* (Water) Board, the subject of Chapter 5.

Strategic Visioning and Planning

As part of our strategic visioning work with NIUA, our role evolved into a partnership with Dr. Khosla to frame a clear mission and development approach for the CBIS in an effort to

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project associates needed to oversee the information collection process. This issue is discussed in greater detail in section 4.6.4 below.

[76] Dr. Hoyt and I were excited by the prospects of NIUA's CBIS project, and determined to disseminate information about the project to encourage learning and help with future fund raising efforts. For example, on my way back to the United States from Delhi, I stopped in Bangkok to present the project to Dr. Yap Kioe Sheng, Poverty Section Chief, and Mr. Adnan Aliani, Human Settlements Officer, in the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). Through these two contacts I learned about the LOGOTRI local governance conference in Seoul, Korea for which Dr. Khosla, Dr. Hoyt and I prepared an abstract, which was subsequently accepted. As a result, Dr. Khosla traveled to Seoul in September 2003 to present a paper on the CBIS project. We also presented a paper at the International Conference on Public Participation and Information Technologies (ICPPIT-03) at MIT in November 2003, which will constitute a chapter in a forthcoming book. Dr. Hoyt has taken the lead on an article, which was published in April 2005 in the Journal of Urban Technology. In addition, I have given presentations about the project both at MIT and Ball State University since my return from India.

ensure that government would eventually use this information system to improve services to the poor. Our visioning discussions resulted in a two-pronged development approach, which combined the goal of collecting information from communities on multiple service sectors, with the goal of formally engaging government in one sector only. Once we decided to focus on water service delivery, I helpedh NIUA engage with the Delhi *Jal* Board, the main government agency responsible for water distribution in the city. We hoped to gauge the agency's interest in the CBIS and explore the possibilities of an NIUA-DJB partnership.

Dr. Hoyt and I also identified some of the types of CBIS capabilities that would be needed in terms of user-friendliness and accessibility (see section 4.5.5), as well as certain ethical issues that warranted consideration when making resident-generated data (or resident-owned data) publicly available.

Project Operations

My direct involvement in project activities during my first few weeks in the PLUS project enabled me to identify various issues in project management that needed attention because of understaffing of the project. I addressed issues, such as the need for a mechanism to track facilitators' progress in collecting data, as well as the need to establish standards and procedures for data collection and digitization processes in order to improve data quality and reliability. I also initiated activities in other areas such as the preparation of an inventory of all the data that facilitators had collected to date under the PLUS project, and the development of a website to make some of the data NIUA was collecting available to the public. Throughout my time at NIUA, I kept Dr. Hoyt informed of my activities through occasional phone calls and weekly progress reports, which she responded to with suggestions on a regular basis.

4.4.5. Government Agencies

How were the various levels of government involved in the PLUS project? At the local government level, no formal partnerships were established. Instead, NIUA facilitators helped build informal linkages between residents and frontline workers in the Municipal Corporation of Delhi (MCD).[77] However, CARE-India did establish formal partnerships at the Central and State government levels.[78]

Local Government

A formal partnership with the MCD was needed in order to formally recognize or institutionalize the importance of the community-frontline worker linkages that NIUA facilitators were helping form. Such a partnership was also needed to ensure that the MCD would take ownership of (and agree to maintain) the infrastructure that NGOs were building as part of the PLUS program. Because CARE-India never established this partnership, the local government in Figure 4.2 can only be represented by a stand-alone entity of frontline workers.

Central Government

CARE-India signed a contract with the Department of Women and Child Development (DWCD) under the Ministry of Human Resource Development, Government of India (see F under Figure 4.2), as required by the Indo Care Agreement.[79] DWCD's mission is to "give the much needed impetus to the holistic development of women and children...programmes cover welfare and support services, training for employment and income generation, awareness

[77] Informal linkages were also established with other agencies, depending on the need. For example, NIUA helped residents meet with junior engineers from the Delhi Jal Board to address water problems in the settlements.
[78] Both the contract with the Department of Women and Child Development and the No Objection Certificate from Government of Delhi required a long bureaucratic process that postponed the project's start date by two years (i.e., the project started in 1999 rather than 1997).
[79] Signed between CARE and the Government of India in 1950.

generation and gender sensitization."[80] The purpose of the DWCD is to formulate policies and programs, enact legislation, and coordinate the efforts of both governmental and non-governmental organizations to improve the conditions of women and children. Its role in the PLUS project was to design and implement the policy changes needed to improve living conditions for slum dwellers, particularly women and children, in Delhi.

State Government

CARE-India had to obtain an obligatory No Objection Certificate from the Government of Delhi (see G in Figure 4.2). In addition, CARE-India established a memorandum of understanding with the State Department of Urban Development (DUD) whose mandate is to "...plan for various infrastructure facilities and essential services being implemented by various agencies for works such as Water Supply, Sewage Disposal & Sanitation, Urban Poverty Alleviation and various municipal services."[81] The task of DUD was to help link government resources and programs to PLUS efforts.

4.5 NIUA's Settlement Interventions and CBIS Production Process

Whereas sections 4.3 and 4.4 above provided a general overview of the PLUS program, including its goals and major actors, I now turn to NIUA's effort in slum upgrading and CBIS production. Of the various actors listed above, those that were involved in these activities were NIUA, community residents, frontline government workers, elected officials, and the CBIS production collaborators (M&A, Dr. Hoyt and myself). The other actors such as CARE-India and some of the government agencies were also involved, but to a lesser extent.

As in the education project discussed in Chapter 3, NIUA's settlement interventions involved the extensive use of Planning, Learning and Action (PLA) techniques, which included

[80] See: http://wcd.nic.in/.

chapatti analyses (to identify community priorities), rank matrices (to rank community priorities), household and resource mapping, seasonal and trends analyses, as well as street plays, processions, and other tactics for raising awareness among the community's priority issues. These techniques enabled NIUA to collect information about community perceptions and service delivery preferences, which NIUA used to mobilize communities towards collective action and to develop the CBIS.

What was unique about this project was the strong link that existed between information collection and action, the basis for CBIS production. Unlike many information technology projects that focus solely on information collection and system development, NIUA's project exhibited a dynamism that resulted from the symbiotic relationship between community organizing and information collection. In the sections below, I illustrate some of the many ways this relationship contributed to visible change in neighborhoods within a short period of time. I also highlight the opportunities and constraints that the interrelationship between these two field-based activities posed for the production of CBIS technology.

4.5.1 Building Rapport and Information Collection

NIUA's initial rapport building efforts in the communities were limited to transect walks and informal conversations with community members, which were followed immediately by community visioning, mapping and other PLA exercises.[82] PLA exercises were used to gather

[81] See: http://ar.delhigovt.nic.in/URBAN%20DEVELOPMENT.doc.

[82] Rallies and slogan shouting, campaigns, wall writing, and street plays were tactics that were left for later in the process if the facilitators found it necessary to raise awareness and recruit additional people to advance a specific community priority.

and represent local knowledge, formulate action planning, and prepare community maps for the CBIS.[83]

Data Selection Process and Type of Data

As with the UNICEF education initiative, Dr. Khosla generally undertook the task of determining what local knowledge or data to collect in consultation with field teams with little input from outside experts and with no consultation with government.[84] This information related to a variety of issues, such as water, sanitation, and employment. Table 4.3a-c summarizes some of the household and settlement-wide information that NIUA facilitators collected from communities, based on the issue that the communities identified as their priority.

[83] Note that, unlike the UNICEF education initiative in which both NIUA and an NGO coalition worked together to develop the CBIS, NIUA was the only actor involved in CBIS production in the PLUS project due to the multiplicity of goals that typically result from a blank slate approach. In other words, while the work of NIUA and the NGOs under the education initiative was linked by the common goal of increasing enrollment and retention levels in primary schools, the NGOs and NIUA in the PLUS project worked on multiple issues and with different approaches, which made it difficult to work together on the CBIS production.

[84] This was problematic since Dr. Khosla envisioned government to be the end user of the CBIS that would result from NIUA's information collection efforts.

Table 4.3a: Information Collected Regarding Water Service Delivery

Household Level Data	Settlement Level Data
Water Quality • Quality of water (good/bad based on odor, perceived cleanliness or perceived cause of disease) • At least one member has gotten sick from contaminated water in the last 6 months • Type of container used for storing water • Water pressure of source **Water Sources** • Source of water connectivity (municipal supply/ground water; own/shared/community) • Illegal connection to municipal supply • Condition of platform of water tap or hand pump **Water Supply Timings** • Hours of water availability of source **Water Demand** • Daily consumption of drinking water • Bathing location (within premises/outside premises/community bathrooms) • Emergency source of water **Water Accessibility** • Distance to water source **Other** • Member responsible for fetching water (male/female/ child) • Tenure (homeowner/renter)	• Community Taps (functional/non-functional) • Community hand pumps (functional/non-functional) • Location of DJB Water Tankers

Table 4.3b: Information Collected Regarding Sanitation Services

Household Level Data	Settlement Level Data
• Defecation (toilet within home/open defecation/community toilets) • Drainage of home toilets (pit/main drain) • Method of garbage disposal (own dust bin/drain/park/govt. dust bin/private sweeper) • House type (permanent/temporary) • Ventilation System (yes/no) • Cleanliness of house (clean/unclean) • House with frequent illnesses (yes/no) • Waste water outlet • Tenure (homeowner/renter)	• Drain (cemented/temporary) • Broken pipe • Waste water flowing in the open • Soak pit Direction of water flow in drains • Areas where reverse water flow occurs • Areas of drain overflow during rainy season • Drain linkages (rivers/main drain/sewers/lakes)

Table 4.3c: Information Collected Regarding Employment

Household Level Data	Settlement Level Data
General • Family size • Standard of living/household income (low/average/ medium and higher) • Expenditure mix (cloths/food/festival/marriage/education/ transport/medical) • Presence of alcohol and other abuse **Assets** • Entertainment gadgets (TV/VCR, music system) • Electric appliances (heater/fridge/cooler/fan/AC/etc.) • Type of vehicle (cycle/scooter/motor cycle) • Cooking medium (gas/stove/chulha) • Type of telephone (land/cell phone/both) **Employment** • Government/private sector/self-employed • Self-employed type (shop owner/hawker/street vendor/etc.) • Payment Frequency (daily/weekly/monthly) **Commute to work** • Mode of transport to work (bus/scooter/auto/rickshaw/walking) • Distance between work and home **Employment status** • House hold with working man (yes/no) • House hold with working woman (yes/no) **Type of house** • Construction phase (temporary/semi temporary/ permanent) • Number of floors or stories • Number of rooms • Type of use of each room (bathroom/latrine/kitchen/ sleeping area) • Level of maintenance	• Bus stand • Hospital • Religious building • Power station • Shopping center • Water tank • Nearby industrial area

In addition to the household and settlement data listed in Table 4.3 above, NIUA mapped the piped water supply network, including the diameter of pipes, for one ward based on interviews with a local engineer from the Delhi Jal Board. This map is provided in Figure 4.3 below.

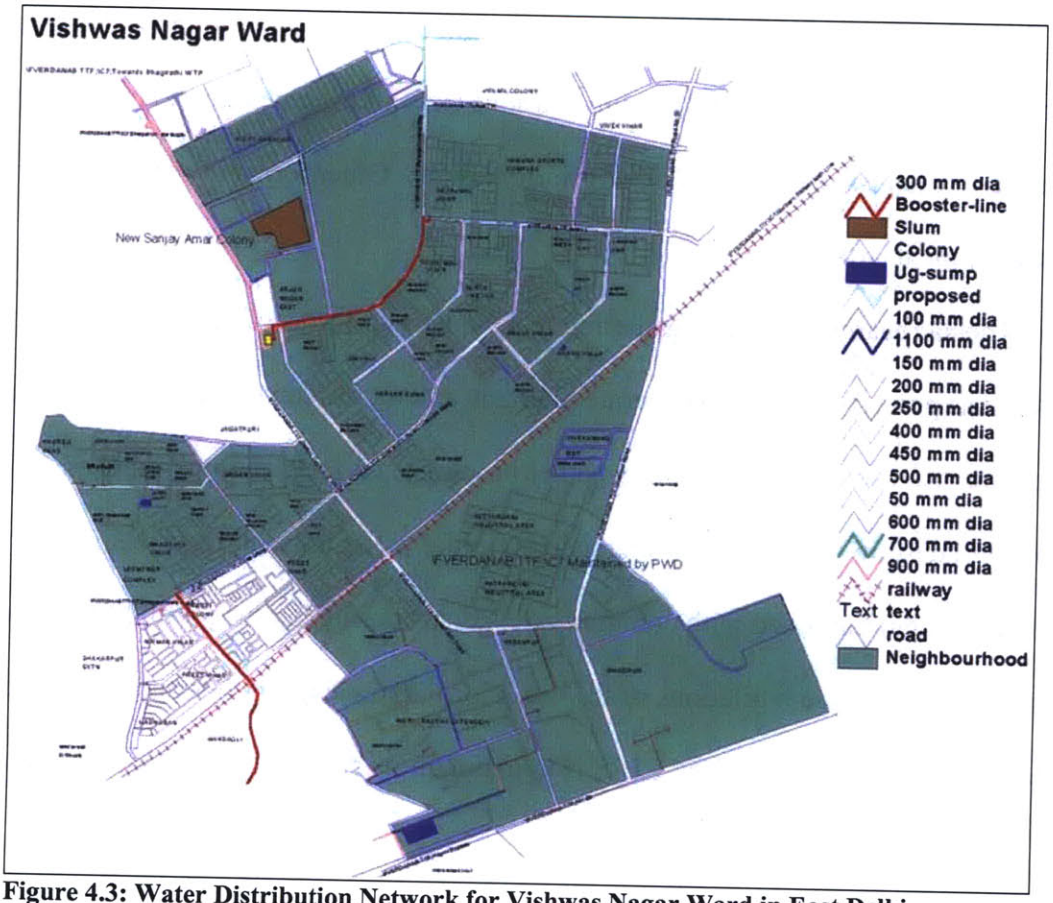

Figure 4.3: Water Distribution Network for Vishwas Nagar Ward in East Delhi
Source: NIUA 1003

Techniques for Information Collection

In Chapter 3, I described the ways in which facilitators used PLA techniques to gather and represent knowledge that residents had about their neighborhoods.[85] Examples of this type of local knowledge are the issues that residents consider to be their neighborhood's priorities, as well as the various solutions that residents identify based on their understanding of the problem and their needs. Forms of representation of this knowledge include *chapattis*[86] (to symbolize an

[85] Examples of this type of local knowledge are the issues that residents consider to be their neighborhood's priorities, as well as the various solutions that residents identify based on their understanding of the problem and their needs. Forms of representation of this knowledge include *chapattis* (to symbolize an issue that the community regards as essential for a neighborhood, similar to the way a *chapatti* is a basic staple for an Indian household) and the various sizes of the *chapattis* (to indicate the level of importance of each issue relative to other priority issues). Other forms of representation are maps, matrices, pie charts, etc.

[86] A *chapatti* is a type of bread (or basic staple) that Indian families eat on a daily basis, regardless of income level. Hence, a *chappati* is an ideal symbol to represent a community's priority issues with regards to basic services.

issue that the community regards as essential for a neighborhood, similar to the way a *chapatti* is a basic staple for an Indian household) and the various sizes of the chapattis (to indicate the level of importance of each issue relative to other priority issues). Other forms of representation are maps, matrices, pie charts, etc.

Dr. Khosla regards these data gathering techniques and forms of knowledge representation as powerful means to generate dialogue among residents and formulate action plans. They are also useful ways to rapidly gather baseline data for planning purposes. In the sections below I describe two types of interactions (initial meetings with residents, and workshop preparation meetings) that I had with community residents during my time with NIUA that brought to light some of the limitations of PLA as a local knowledge gathering tool. These limitations need to be addressed if the CBIS is to maintain its credibility as a tool for storing and analyzing local knowledge.

Initial Meetings with Residents. The conversations that I had with residents during my initial visits to Ganga Ram Colony, one of the resettlement areas in which NIUA facilitators worked during the PLUS project,[87] suggested that there was some confusion among the community residents about what their priorities were. Prior to my visits, NIUA had informed me that the priority issue for Ganga Ram Colony was employment, because 40 percent of the population was unemployed due to the physical distance between the colony and the center of Delhi, where most jobs were located. My conversations with the residents, however, revealed that there was no consensus among the community about its priority issues. During my first

[87] Ganga Ram Colony is a settlement located in Narela sub-city, approximately 35 kilometers north of the center of Delhi (see Figure 4.1). Narela is one of three sub cities that are being developed within the city of Delhi to house the growing number of people who are migrating to Delhi. A large number of slum dwellers residing in the center of the city have been relocated to Narela, a sub-city that is still highly deficient of adequate transportation linkages to the center of Delhi, as well as basic services. Ganga Ram Colony was the settlement in which I worked with two other graduate students during the Ball State University field study program.

transect walk throughout the neighborhood, I asked a group of women "what are some of the major problems that you and other residents of this neighborhood are experiencing?" They responded: lack of adequate water, sanitation, and safety. The second time I returned to talk to residents about the unemployment problem in Ganga Ram, the community residents had organized a meeting for me with government sanitation workers. I was confused again by this experience and asked the people to articulate their main issue. They said sanitation. At this point I looked at the NIUA facilitator for an explanation. She immediately stood up – flustered – and addressed the residents. She explained to them that their main issue was unemployment and reminded them of the chapatti analysis and rank matrices that they had participated in producing a few months earlier.

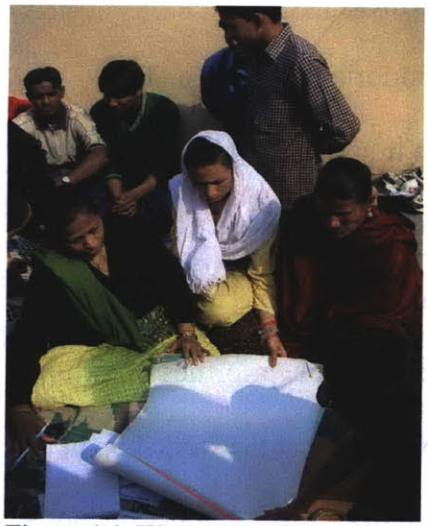

Figure 4.4: Workshop Preparation Meeting
Photo by Dorothee Dettbarn

Workshop Preparation Meetings. Following a few weeks of interviews with government officials to find out about the government's economic development plans for the Narela sub-city (the area in north Delhi where Ganga Ram Colony is located), as well as government employment programs such as the Golden Jubilee Employment Program (known as Swarna Jayanti Shahari Rozgar Yojana (SJSRY),[88] my team and I returned to Ganga Ram colony to plan a participatory workshop that we envisioned would inform residents about government plans (see Figure 4.4). It would also provide NIUA with information about residents' skills and training preferences so facilitators could help establish linkages between residents and employers or training programs. We held two meetings with

[88] We interviewed government officials from the State Delhi Department of Urban Development, the Delhi State

community volunteers and the NIUA facilitator to plan and prepare for this workshop. My goal was to plan the workshop with the community volunteers to ensure that the workshop fit well with the local context. However, every time I asked the residents their opinions about different exercises or information requirements, they would refer my questions to the facilitator. The facilitator would then answer on their behalf. In the end, the workshop was planned by my team and the facilitator, while residents played a support role only. My experience with residents during these workshop preparation meetings indicated to me that residents were too willing to accept the opinions of facilitators without taking the time first to think about what they thought. This experience, coupled with my first two encounters with residents at which I learned that there were inconsistent messages about their priority issues, shed light on some potential limitations of PLA techniques in identifying a "community's" priorities.

What might explain the uncertainty around the community priorities in Ganga Ram Colony? Possibilities include inadequate representation, passage of time and NIUA/facilitator co-optation. Information collected through PLA techniques generalized to the larger community, if the participants in the workshop are representative of the community at large. The women I encountered during my first visit to Ganga Ram colony, who told me that the priorities of the neighborhood were water, sanitation and safety, may not have been present at the workshop in which employment was determined to be a priority. Or perhaps she was present, but her opinions were considered to be a minority view.[89]

Industrial Development Corporation, the Delhi Development Authority and the MCD Slum Wing.

[89] Adequate representation of the community is particularly difficult to achieve in a society like India where it is hard to get men and women to meet together in the same room and express themselves without reserve. I learned this when I held the workshop in Ganga Ram colony to assess the skills of residents and determine if they matched those required by industries that would potentially relocate to Narela from the center of Delhi. We held the workshop on a Sunday so both employed and unemployed people could attend. However, we never anticipated the difficulties associated with getting employed people to attend the workshop, particularly men. Men would not enter the room in which the workshop was being held because it was full of women.

Another issue is the passage of time. Even if the workshop in which employment was designated as a priority issue was representative of the community at large, realities can change with the passage of time. While employment may have been a priority earlier, changes in circumstances between the time the workshop was held and my visit to the settlement may have caused residents to identify new priorities.

Lastly, could it be that the facilitator had not adequately empowered the residents to think for themselves? Were the views conveyed by the facilitator representative of the views of the people? When the facilitators spoke on behalf of community residents, were the residents satisfied with the facilitators' views? Or did they not agree with those views, but felt uncomfortable making their views known because the facilitator was their leader? Did NIUA have a reason to want to highlight unemployment as an issue in the resettlement area more than other issues? This last question implies a concern about NIUA's potential imposition of its views on Ganga Ram Colony. This concern arises from Dr. Khosla's strong opposition to the Delhi Government's slum resettlement practices, which involve the relocation of slum settlements to the fringes of the city. She argues that even though residents of resettlement areas may benefit from better services than before relocation, they experience other costs such as the unavailability of jobs, and thus high unemployment, that go above and beyond the original costs imposed by inadequate services in their original settlements. Given these views, NIUA may have had a reason to ensure that the priority issue for the resettlement area be employment rather than water or sanitation. Another factor that may explain NIUA's focus on employment in the Ganga Ram Colony is that it may have experienced pressure from CARE-India itself to take on employment as a priority, since CARE-PLUS had previously made some visits to Narela with another NGO and had identified (through livelihood mapping) the lack of livelihood opportunities in the area to be a key issue.

4.5.2 Presentation of Data Back to the Community

The previous section examines issues related to gathering data. In this section I briefly discuss issues associated with representing the knowledge that is gathered through PLA exercises. These forms of representations are chapattis (and their sizes), maps, matrices, pie charts, etc. But the question is: do they adequately present local knowledge? Furthermore, can people who were not present in the workshop understand the forms of knowledge representation that are being applied by NIUA facilitators? Although the answer NIUA would give to these questions would be yes (as I discussed in Chapter 3), I observed this was not always the case, as the paper maps and pie charts examples suggest below.

Limitations of Paper Maps

The settlement maps that the communities developed were often difficult to read. The maps were often cluttered, overly large, and lacking in map elements that are frequently indispensable for effectively portraying information to residents and outsiders who did not participate in the production of the map. Examples of these map elements are a legend, north arrow, scale, locator or overview map, and information about the map sources (people present in the workshop), accuracy, and date of production. Figure 4.5 below shows one such map, which was more than 15 feet long and 5 feet wide, as well as a section of the map. The map consisted of more than 10 features at the household level such as location of defecation, drainage types, method of garbage disposal, house type, tenure, etc. Features at the neighborhood level were the location of community toilets, water sources, drains (including their conditions), etc. The crowding together of so much information obscured any clear messages that the map could have conveyed. In the absence of synthesis, analysis or a clear message, can the community maps that NIUA helped produce be regarded as a form of knowledge representation? Or, are the paper

maps just inflexible places for stowing data?[90] This distinction that I make between knowledge and data is not meant to suggest that the paper maps are useless to planners or community residents (because that is not the case). Rather, the distinction is made to show the importance of taking these mapping efforts to the next level whereby data is digitized and incorporated into a CBIS. The CBIS would then be used to create less cluttered maps with clearer messages.

Figure 4.5: Paper-based Community Map and Section

[90] My discussion in this section focuses entirely on paper maps because NIUA did not share computer-generated maps back with the community for two reasons. First, digitization difficulties prevented the timely production of the computer-based maps. Second, Dr. Khosla believed that the community residents could only understand the maps that they themselves had drawn with their own symbols.

Limitations of Pie Charts

Second, I noticed that there is a kind of complexity in certain knowledge representational forms that can act as barriers to the transmission of information beyond workshop participants. This is based on my observations as a participant in a PLA training workshop that NIUA held for an NGO in April 2003. I am particularly referring to NIUA's use of pie charts to portray percentage-based information (collected through the Ten Seeds technique[91]), which confused the NGO workers. While pie charts might seem simple to interpret, the difficulties the NIUA facilitators encountered during NGO training workshop when they tried to explain a pie chart's meaning to the NGO workers was suggestive of the confusion that such charts might create among residents of low-income neighborhoods. Figure 4.6 depicts the pie charts that NIUA facilitators were explaining to NGO workers for more than 40 minutes during the PLA training workshop that I attended.

Figure 4.6: PLA Training Workshop for an NGO
Ms. Leena Kapoor, NIUA facilitator, explains the meaning of pie charts to NGO workers for more than 40 minutes.
Photo by Claudia Canepa

4.5.3 Community Organizing and Leadership Building

As with the education initiative, a central part of NIUA's efforts included organizing neighborhoods into Neighborhood Groups (at the lane or block level) and Bastee Committees (at

[91] NIUA facilitators typically used the Ten Seeds technique, a PLA tool, to obtain percentage information about a variety of topics such as employment, religion, and typical expenditure mix in the community. Because each seed symbolized ten percent of a whole, facilitators would ask community members to use the seeds to indicate the percentage of employed versus unemployed people in the community, or the percentage of women versus men. For example, to indicate that a settlement's population consisted of 70 percent Hindus, 20 percent Muslim and 10 percent Christian and other religions, residents would place 7, 2, and 1 seeds in the three religious categories, respectively. Facilitators would then represent this information in the form of pie charts in order to disseminate it to others in the community.

the settlement-wide level) in order to mobilize communities to take the necessary actions to improve conditions in their neighborhoods.[92] In addition, the enactment of the Right to Information Act in the year 2000 by the State Delhi Government enabled NIUA to apply a rights-based approach to its organizing work. The rights-based approach "changed the mindset of the marginalized groups from begging for provision of services to demanding the needed services as a matter of right like any other citizens living in planned settlement."[93] NIUA thus educated low-income residents about their rights to adequate living conditions, as well as policies, including the Right to Information Act, which they can use to enhance government accountability.

Although most community organizing activities led to some kind of community action, the nature of these activities differed substantially from settlement to settlement, depending on the facilitator in charge (in terms of gender, personality, and approach to organizing) and the nature of the problems in the settlements. These most notable differences varied by degree of community leadership of the NIUA-established community groups, degree of focus of activities, targeted representation, and degree of government involvement.

Degree of Leadership

Although some community groups created by NIUA were relatively independent, most relied heavily on facilitator guidance and involvement. For example, in an evaluation conducted by CARE-India staff, it was noted that in New Sanjay Amar Colony "there is a dependence on the facilitators and supervisors...the community does not hold meetings on their own and meet

[92] NIUA also envisioned Zonal Bastee Committees (neighborhood groups at the zone level), but these were never implemented.
[93] Jha and Singh 2004

only under the presence of the facilitators."[94] Similarly, the Ganga Ram residents' lack of assertiveness during the workshop preparation meetings I held with them suggests that those residents were likewise dependent on facilitators. I thus find it doubtful the community groups ever became strong or independent enough to continue their work after NIUA retreated, especially since NIUA had to initiate an exit strategy within only one year of initiating its work. Yet there were certain members of the community who were proactive during NIUA's involvement. For example, Kamla in Ganga Ram colony, one of the few literate women in the resettlement area, began to hold one-on-one sessions with other women in the community to teach them how to read and write (see Figure 4.7 below). She also became intimately involved in helping resolve community issues such as quarrels between households. She was trained by an NIUA facilitator and encouraged to take this leadership role in the community, and she did, despite numerous obstacles, including her husband's initial disapproval.

Figure 4.7: Kamla
A woman leader in Ganga Ram Colongy, Narela

Degree of Focus of Activities

Initiating a blank slate intervention in a settlement meant NIUA facilitators would focus on whatever the community considered its top priority. However, this focus on one priority was not necessarily followed throughout all neighborhoods. While some facilitators did encourage residents to work on one issue at a time, others enabled residents to work on many issues

[94] CARE-India, Project Document, Baisakhi Meetings in 4 settlements.

simultaneously. For example, while New Sanjay Amar Colony focused primarily on water,[95] Jayabharati Camp, with a different facilitator, took on the issues of community latrines, drainage, water supply restoration, electricity, youth development and women's support systems.[96]

Targeted Representation

From my visits to settlements, it became clear that NIUA facilitators consistently targeted women rather than men for their community organizing efforts since their workshops and community-based organizations consisted of mainly women participants. [97] While this was beneficial for certain issues where women's involvement is vital (e.g., water and sanitation), it was problematic for other issues that required greater participation by men (e.g., employment). The workshop I organized in Ganga Ram Colony illustrates this problem well. Despite my repeated requests to the NIUA facilitator and community leaders on the importance of recruiting both men and women for the workshop on the issue of employment, only 4 men and more than 30 women participated (see Figure 4.7 below). My own attempts to invite more men to participate in the workshop minutes before it started were also fruitless because not only did they feel uncomfortable about being in the same room with all the women, but they also did not know the facilitator. This experience illustrates the constraints that NIUA's almost exclusive focus on women can place on interventions that require the involvement of men as well women. Nevertheless, NIUA's women-centered organizing approach was important for empowering

[95] With the exception of one block that focused on street pavement.
[96] CARE-India, PLUS evaluation, Jayabharati Camp site visit, April 16, 2003.
[97] This contradicts Jha and Singh's PLUS project evaluation, in which the authors state that "one of the highlights [of the project] was its well-balanced gender approach." A "balanced" gender approach implies equal involvement of both men and women, which was not the case with NIUA's work and at least two of the four NGOs in the project (i.e., CASP and ActionIndia, which worked with NIUA under the UNICEF education initiative and thus shared the same women empowerment objective)" Jha and Singh also state that there were no special strategies for getting women on board; women were the most easily involved since they suffered the most from inadequate services problem. Again, my experience with the project directly contradicts Jha and Singh's observations.

women to leave their homes and become active members in their communities in order to improve quality of life for themselves and their families.

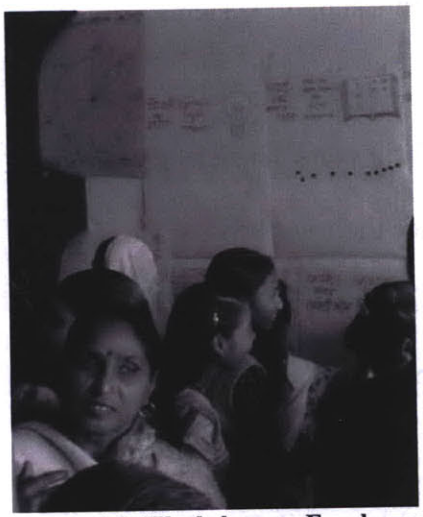

Figure 4.7: Workshop on Employment in Ganga Ram Colony
Due to NIUA's women-centered approach to organizing, almost all participants were women even though employment was an issue that concerned both women and men.
Photo by Dorothee Dettbarn

Government Involvement

Finally, NIUA's efforts to empower residents ranged from little government involvement (community-based initiatives) to more direct links to frontline government workers and, to a lesser degree, elected representatives.[98] Some examples in the right side of the spectrum where government involvement is greater are as follows. First, in Udhan Singh Park, a woman named Bina took the initiative to gather her neighbors in order to clean their street. The group met with the Sanitation Officer to ensure regular attendance of the sanitation worker assigned to their area, and to report the sweeper's requests for money in exchange for his services.[99] In New Sanjay Amar Colony, NIUA facilitators helped establish linkages to both frontline workers in the Delhi Jal Board and elected representatives (the MLA), although most of the focus was more on the former than the latter.[100]

[98] It is important to note, however, that these linkages were not institutionalized because formal partnerships between relevant government agencies and NIUA or CARE were lacking.
[99] Care-India PLUS evaluation, Udham Singh Park On site visit, April 17, 2003.
[100] Due to conflicts in political party affiliations between the pradhan, on one hand, and the Councillors and MLAs on the other, community residents had to interact directly with Delhi Jal Board front line workers rather than their elected representatives. However, the NIUA facilitator did contact the MLA on behalf of the community along with two students from Ball State University.

Figure 4.8: Sanitation problem in Udham Singh Park, Wazirpur

There were also some initiatives in settlements that led to action which required no government action or involvement (left side of the spectrum). An example of one such community-based initiative was a children's street play facilitators organized in Udham Singh Park, a slum settlement in Wazirpur industrial area. As shown in Figure 4.8, the Udham Singh Park neighborhood's major issue was the unsanitary condition of public spaces due to residents' lack of knowledge on how to properly dispose of household solid waste. Children from the community performed in the play numerous times at street corners throughout the neighborhood in order to urge their mothers and fathers to change their waste disposal practices.

The play told the story of a few families in a settlement who got together after the death of a child to mobilize members of their community around the issue of sanitation. Because the child's death was caused by the neighborhood's unsanitary conditions, the families organized a neighborhood-wide clean-up campaign and succeeded in convincing all households in the settlement to dispose of their trash by using dustbins rather than by throwing it out directly onto the neighborhood drains and streets. Figure 4.9 below, depicts a scene in the play in which the father of the deceased child and his friends are participating in a neighborhood procession to urge people to use dustbins while the mother and her friends are planning a neighborhood clean-up day.

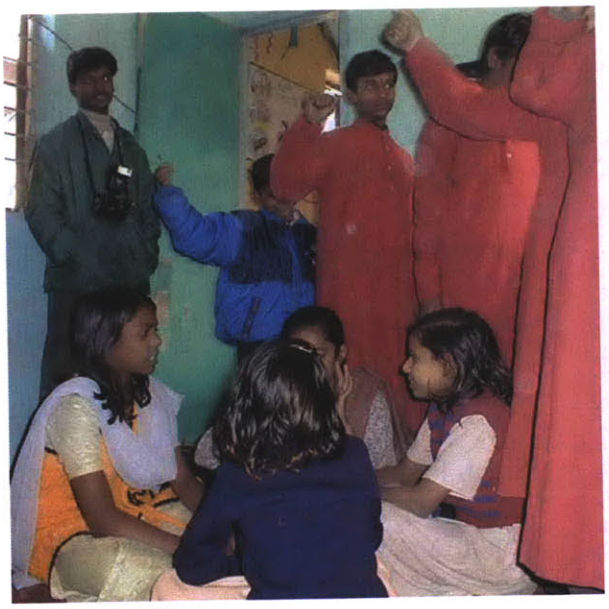

Figure 4.9. Example of Street Play
Children performing in a play about a community's struggle to create clean and safe public spaces in which children can play.struggle to create clean and safe public spaces in which children can play.

4.5.4 System Development

As explained above, NIUA facilitators were collecting large amounts of information from communities to identify and help advance residents' priority issues. Facilitators used this information to guide community-based initiatives (street plays, neighborhood clean-ups), as well as to help facilitate residents' interactions and negotiations with government officials (New Sanjay Amar Colony working with Delhi Jal Board engineers). But Dr. Khosla's vision was to also make this information readily available to people outside the community, particularly government officials who were in charge of planning resource allocation or service upgrading interventions in settlements. Given the capacity of GIS to facilitate storage, sharing, and analysis of large amounts of spatial data, Dr. Khosla wanted to continue building the CBIS that it had started under UNICEF by incorporating newly-acquired PLUS data. NIUA thus embarked on a

CBIS production process that consisted of three phases: populating the CBIS; customizing and automating data entry; and making data available through a GIS web site.

Phase 1: Populating the CBIS

The process of populating the CBIS consisted of recording information on paper, scanning the paper maps, and digitization and transfer of these maps into a GIS database.

Recording the Information on Paper. As the lead facilitator worked with residents to collect household and settlement information on the ground, during community mapping workshops, other facilitators and trained community volunteers took detailed notes (Figure 4.10). They would then meet after the workshop to create neatly drawn (but not to scale) figural paper maps (Figure 4.11), which would be submitted to NIUA project staff.

Figure 4.10: Taking Notes During Community Workshops
The two women in the background dressed in pink and yellow, respectively, are taking notes in order to be able to subsequently transfer the information to paper.
Photo by Claudia Canepa

Figure 4.11: Transferring information to paper
Three girls transfer information collected in a community mapping exercise to paper.
Photo by Claudia Canepa

Scanning and Conversion to Vector Format. NIUA contracted with Marwaha & Associates (M&A) to digitize the data recorded on the paper maps, transfer the data to GIS and hyper-link the digitized maps to the Delhi base map. M&A would first scan the paper maps to capture the graphic symbolism of the map. M&A would then use computer-aided design (CAD)

software to convert the scanned images, which were in raster or bit map format, into vector graphics.[101] Raster data represents map features using pixels. An example of this is a digital photo where each pixel represents a different color and when combined with the other pixels create the image seen in the photo. Vector representation uses points, lines and polygons to illustrate map features. Vector representation is somewhat like a game of connect the dots. In vector files, points are laid down and then connected to form shapes. For example, a person's property boundaries could be created by plotting points at the four corners of the property and then connecting those dots. The CBIS requires the conversion of raster data into vector representation because, while bit maps are only able to store binary values on a pixel basis, vector graphics enable multiple types of information to be attached to each point, line or polygon. In other words, a vector representation of neighborhood boundaries can store information about the number of families in the neighborhood, average income level, and rate of unemployment. This information, which resides in a numerical database, can be queried and then viewed spatially on the vector map. Raster maps, however, may be used to visually represent the area, but cannot be queried to uncover information.

Transferring Data to GIS Platform and Creating Hyper-links. Once digitization was completed on CAD, M&A would use a script to convert map symbols into tabular format. To illustrate this important function, I shall describe this conversion process for one household, depicted as a polygon in a digital map of a settlement. In the household, the polygon consisted of symbols that illustrated that the residents of that household were 2 women, 1 man and 3 children.

[101] This conversion is done by importing the raster image into CAD and then either (1) manually tracing the image to create the vector graphic, or (2) using Optical Character Recognition (OCR) software to convert the image automatically. Both methods are very labor intensive. Contrary to what one would expect, OCR may actually be more labor intensive than manual tracing because it requires the GIS specialist to inspect every line, polygon and symbol on the map in order to manually correct any errors which OCR tends to introduce into the image.

The script recognized those symbols and generated a table for that household consisting of three fields entitled Women, Men and Children, and with the values of 2, 1 and 3, respectively.

Finally, because the newly digitized community maps (and their respective attribute tables) were not drawn to scale, they did not match the actual shape of settlements and, hence, could not be assigned geo-coordinates.

Consequently, rather than create an additional layer in the GIS, M&A had to incorporate the maps as standalone layers by hyper-linking them to the Delhi base map.[102] An advantage of hyper-linking the maps to the Delhi base map was that the integrity of the community drawing was preserved. Hyper-linking also did not affect the users' ability to analyze data at the settlement and household level by conducting queries that would visually depict key relationships between data sets through visual maps. For example, users could implement a query to compare the spatial distribution of water taps to population density in order to see if the spatial distribution of supply matched that of demand. A disadvantage of hyper-links, however, was that it was not possible for users to conduct analyses at the ward, zonal, and city-wide levels because the maps were not part of a geo-spatial reference system.

Phases 2 and 3: System Automation and Web Accessibility

To facilitate easy use of the system by non-GIS experts, Dr. Khosla, Dr. Hoyt, and I identified various capabilities for the information system. As summarized in Table 4.4 below,

[102] It is important to note that NIUA obtained the Delhi base map from the National Informatics Centre (NIC), a national government agency responsible for the provision of information services and information technology. Under the rubric of national security, NIC is extremely possessive of its data. NIUA had to engage in an arduous process with NIC to obtain the Delhi base map. In the end, NIC released the base map only after NIUA agreed to use it for academic purposes only, and not share it with anyone. This restriction may have been an important impediment to NIUA's mission to share the CBIS with government so that it could be used for planning purposes. . For example, Dr. Khosla expressed that the NIC restriction was one of the reasons why she did not share the CBIS with the Department of Education during the UNICEF project.

these capabilities included user-friendly data viewing and analysis, inputting, and maintenance, as well system merging and built-in tutorials.

Table 4.4: CBIS Capabilities[103]

CAPABILITIES	USERS	
	Community	NGOs and Government
User-friendly Interface	All communities for which data has been collected should be able to easily view and analyze the data through the aid of built-in queries	Government officials working in various communities should be able to view and analyze sector-and neighborhood based data (through the Internet)
Data Entry	Should be able to easily input their own data on an as needed basis	Should be able to easily input data that are needed to inform policy-making/program design processes or that would be useful to neighborhood residents
Data Management/ Maintenance	Should be able to easily update information on an as needed basis	Should be able to easily update information on an as needed basis
System Integration		To the extent that NGOs or government already have information systems for particular communities, it is necessary to merge these systems into the city-wide CBIS
User-friendly Tutorial	Should have a built-in tutorial that all trainers could use for training users (should be customized for people of various educational attainment levels, including those who are illiterate)	Should have a built-in tutorial that all trainers could use for training users (should be customized for the various levels of government officials, as well as for various types of NGOs)
Accessibility	Should be able to access the system via the Internet	Should be able to access the system via the Internet

To create a more user-friendly interface for data viewing and analysis, NIUA wanted to automate the CBIS by preparing queries that users could easily access from a series of pull-down menus. For example, a Junior Engineer from the Delhi Jal Board who has received a complaint about a broken public tap in a neighborhood may decide that he would like to take advantage of the trip by repairing other taps that may also be broken in the area. To automatically generate a map of all non-functional taps in the neighborhood, the engineer could simply choose the "Non-functional Taps" option from the "Settlement-level Data" pull-down menu. Similarly, if a Zonal Engineer needed to generate a map depicting all neighborhoods in her zone that are not

[103] Originally included in my Proposal for Research Assistantship (January 2003) submitted on to Dr. Lorlene Hoyt

connected to the sewerage network, she could choose the "Settlements Without Sewerage" option under the "Zonal-level Data" pull down menu in order to generate the desired map. This type of query automation can be customized not just for settlements, zones or the city at large, but also for any territorial delineation within Delhi that is of interest to a user, such as political constituency areas (ward, MLA and MP areas), or local government jurisdictions (MCD, NDMC and DCB).

NIUA also wanted to facilitate data inputting and maintenance by creating simple data entry forms that community members could use to quickly update household and settlement information with minimal training in GIS. Finally, with regards to the accessibility issue, Dr. Khosla's hoped to eventually make the CBIS web accessible to government and communities in a way that is similar to the web-based neighborhood information systems (NIS) in the United States (such as Neighborhood Knowledge in Los Angeles or the NIS in Philadelphia). Dr. Khosla's plan was that community members (and government officials who lacked access to computers and/or the internet at work) would connect to the CBIS through the numerous cyber cafes that are now widespread in Delhi.[104]

Given the aforementioned goals, Dr. Khosla, Dr. Hoyt and I engaged in a strategic planning process that led to the development of a mission and development approach for the CBIS. The mission of the CBIS became "to improve the quality of life of poor communities in Delhi by democratizing information, strengthening civil society, and increasing government efficacy and accountability."[105] The development approach was designed to provide guidance for

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and Dr. Larry Vale, Department Head of the Department of Urban Studies and Planning.

[104] My experience testing NIS web sites from cyber cafes in Delhi, however, made me realize that Dr. Khosla's desire to use cyber cafes for connecting people to the system may be unrealistic in the current context due to the slow internet connections offered by these cafes. I would have to wait more than 10 minutes at times to view a map that I had generated through a query over the web.

[105] http://www.niua.org/newniuaorg/cbis/cbis_index.htm

data collection activities, as well as efforts to involve government in the CBIS production and implementation process (see section 4.6.5 below).

4.6 Results

4.6.1 Overall Slum Upgrading

As explained above, because CARE-India decided not to extend the PLUS project, NIUA limited its upgrading and information collection activities to approximately one fourth of its 20 target settlements. Between July 2002 to January 2004, NIUA facilitators and residents of these settlements made some important achievements. In New Sanjay Amar Colony, for example, 17 new taps were installed as a result of various protests and visits that women residents made to the Delhi Jal Board. When a CARE-India staff member visited New Sanjay Amar two months following the installation of the taps, the women with whom she met exclaimed with excitement "meri gali main bhi nal laga (a tap was installed in my lane too)!"[106]

In Udham Singh Park, in response to the children's street play and other activities designed to enhance awareness among residents about the importance of sanitation, 30 percent of families in Udham Singh Park began to use dustbins for disposing of their household waste. In addition, residents contributed funds for paving streets and building cemented drains. Residents of Jayabharati Camp were also able to get concrete drains in their settlements. However, rather than contributing community funds, they approached their MLA and Councilor and convinced them to sanction the concreting work. In addition, residents of Jayabharati Camp were able to secure the construction of community latrines.

[106] CARE-India New Sanjay Amar Colony Evaluation document, April 17, 2003

4.6.2 Community organizing

NIUA's community organizing efforts impacted neighborhoods in many different interrelated ways: community-based groups were formed, women were empowered, residents' leadership skills were developed and residents were educated about their rights and the various ways in which they could protect those rights. As discussed above, NIUA facilitators established neighborhood groups, consisting mainly of women residents, at the street and neighborhood levels. These organizing efforts were important not only because they mobilized women to create change within their communities, but because they also empowered them as individuals. NIUA's activities enabled women to leave the confines of their homes to interact with other residents in the community and act in solidarity with them. For example, in New Sanjay Amar Colony "a violent incident in which a woman was mercilessly beaten up by her in-laws because she could not deliver enough water for their consumption...finally prompted the community to take action."[107] Following the installation of the 17 taps, women reported that "the male members of the household who stopped the women initially from ... [going out of the home] are more willing to let them attend the community meetings." NIUA facilitators would also hand-pick women for one-on-one leadership training. The stories of some of these women leaders (which I discussed earlier in this chapter) are best exemplified by Kamla, who became a teacher and mediator in Ganga Ram colony, and Bina, who mobilized the other families to participate in a street clean-up in Udham Singh Park. Community residents also learned about their rights and the various procedures that they could use to enhance government accountability. For example, residents of New Sanjay Amar Colony learned that water was a human right[108] and that they could use the

[107] *Ibid.*

[108] The Supreme Court of India's interpretation of the Right to Life clause of the Indian Constitution states that water must be provided to all irrespective of land tenure.

Right to Information Act of 2000 to submit requests to government about standards for service delivery. As simple as it may sound, obtaining information regarding service standards such as number of households per public tap is extremely difficult, which weakens government accountability since citizens often cannot tell if government's level of service is below the standard.

4.6.3 Influence on policy

Did NIUA's efforts in the PLUS project influence urban development policy at the city level? Did NIUA establish a venue through which the CBIS, once fully developed, could be used to influence urban development policy? The answer to these questions is no, because PLUS was missing a partner that was key for not only influencing policy, but also creating a city-wide forum of urban development experts, NGOs, and government officials, that would serve as a vehicle for influencing policy. This missing partner was the Department of Urban Development (DUD), a national-level agency under the Ministry of Urban Development. Although the CARE-Indo agreement required CARE-India to establish a contract with the Department of Women and Child Development (Ministry of Human Resource Development), a partnership with DUD was also needed since it was a more relevant partner for influencing urban development policy.[109] Dr. Khosla states that CARE-India did attempt to establish a partnership with DUD, but it was unsuccessful for reasons that are not clear.

With regard to the formation of the City Forum on urban issues for urban development experts, NGOs and government officials, this too was unsuccessful. Dr. Khosla states the reason why the group did not succeed was that it had no clear mandate and it had no funds or power to

[109] Dr. Khosla says that one of the reasons why CARE-India asked NIUA to become a partner of the CARE-PLUS program was that CARE-India hoped that NIUA's national status would help PLUS secure a partnership with DUD (also a national agency). NIUA's involvement in the project, however, never led to a formal partnership with the

influence decisions. In their evaluation of the PLUS project, Jha and Singh state CARE-India "has been unsuccessful in advocacy of the project to influence policy decisions at the macro level." They list the City Forum as one of the reasons why this advocacy role was not achieved. Other initiatives, such as the organization of a seminar under the Bhagidari umbrella, also did not succeed.[110]

4.6.4 CBIS

As discussed above, Dr. Khosla envisioned a CBIS production process that would consist of three phases: populating the CBIS; system customization and automation; and web accessibility. CBIS production never went beyond the first phase, however, because of various problems that were encountered in the data digitization phase. When I left NIUA in June 2003, eleven months after data collection had begun in settlements under PLUS, NIUA had not yet received a properly digitized map from M&A.[111] By the time information collection ceased in the settlements a few months later, only three settlements and one water distribution network ward map had been digitized.[112] In addition, data for these three settlements could not be incorporated into the UNICEF CBIS and thus became part of a separate database. Integration with the UNICEF CBIS was not possible because it was difficult to make sense of the data structure and relationships that previous Project Associates had set up under the UNICEF

Department of Urban Development.

[110] Jha and Singh, 2004.

[111] M&A had submitted digitized information for certain blocks of settlements, but there were major errors in these data. For example, the unemployment indicator in Ganga Ram colony showed that almost every household in the settlements had a working man and woman living in it, suggesting a very high employment rate, which was not the case.

[112] These digitized data for the three settlements and the ward constituted the beginning of a new CBIS, rather than additional data in the previously developed education-based CBIS. NIUA had hoped to continue developing the previous CBIS rather than develop a new one, but could not do so because of difficulties making sense of files. Had there not been turnover in the project associate, or had the previous project associates better organized the files or prepared a manual to facilitate transition, adding data to the previous CBIS may have been less confusing.

education initiative. As a result, the new Project Associates under PLUS abandoned the old system and created an entirely new CBIS for PLUS.

Finally, although NIUA was not able to seriously embark on phase 3 of CBIS production without having first completed phases 1 and 2, NIUA did create a website to make some of the community maps and profiles available to the public.[113] Although the website contains static maps and does not possess the flexibility that Dr. Khosla envisioned for the future, full-fledged web-accessible CBIS, the website is nonetheless an important achievement for NIUA because it constitutes NIUA's first attempt to share the community-based information with the outside world.

But the question still remains, what were some of the factors that prevented M&A from digitizing the data in a timely and error-free manner?[114] Through interviews I conducted with Mr. Shiv Marwaha (Director of M&A), Mrs. Ruchira Marwaha (the previous Project Associate under the UNICEF project), and the NIUA facilitators, I discovered that some of the impediments to digitization were NIUA's limited knowledge of GIS, lack of quality control of paper map submissions, and the amount of information per settlement maps coupled by inappropriate hardware.

NIUA's Limited Knowledge of GIS

[113] http://www.niua.org/newniuaorg/cbis/cbis_home3.htm

[114] It is important to note that this delay in digitizing the data created various frustrations and problems for NIUA. For example, during the six week period in which Ball State University students worked with NIUA, the students were not able to access the CBIS data. It was not only until days before the students' departure at the end of February 2003 when M&A submitted data to the students so that they could present a preliminary version of the CBIS to NIUA and its various donor agencies. Because a lot of the data were incomplete or incorrect, the students presented only a few indicators. In certain cases, fake data were set up for certain indicators for demonstration purposes only. In May 2003, the data were still not digitized. This was particularly frustrating because we needed the data to present the CBIS to the CEO of the Delhi *Jal* Board. Because we did not have the data, we had to create a dummy settlement map with fake data in order to be able to still present to the CBIS.

First, because Dr. Khosla lacked an adequate understanding of the technical and time requirements associated with the data digitization process, she believed that digitization process was very simple and insisted on paying only 700 rupees per digitized map. The Director of M&A was quite frustrated by Dr. Khosla's insistence on such a low price, which indicated to him that she did not adequately value his time or expertise. In the end, NIUA paid for maps based on their size rather than a flat per unit fee, but this was only after several arduous negotiations that centered on keeping the price too low rather than on more useful discussions such as the establishment of data quality control mechanisms or minimum standards for building the information system.

Lack of Quality Control of Paper Maps

The second problem M&A encountered during the digitization process was a result of lack of quality control of paper maps which may have resulted from the delay in hiring a replacement for the Project Associate position. Ruchira Marwaha, the Project Associate under PEEP (also the wife of the Director of M&A) who had developed quite a bit of GIS expertise during her tenure at NIUA, left NIUA around the time that the PLUS project was launched. As a result, there was no one in the office with GIS knowledge to manage the project and ensure the data collection process in the settlements was consistent with the requirements needed for subsequent digitization. The Director of M&A expressed there were several problems that emerged as a result of lack of proper project management and quality control, from a GIS production standpoint.[115] First, there were problems with the mapping symbology. Symbols were sometimes inconsistent within the same map due to human error. Symbols were also sometimes difficult to read due to water spills or fading markers. Second, the legends that facilitators would

[115] Interviews with Mr. Shiv Marwaha, April 24, 2003; April 28, 2003; and May 18, 2003.

submit to M&A along with the maps did not always include all the symbols present in the map. Thirdly, facilitators did not always include overview or key maps along with their settlement maps. Because the settlement maps were so large, facilitators would often have to cut the maps on a block-by-block basis for scanning purposes. The Director of M&A stated that, once digitized, the absence of a key map made the task of merging the various digitized blocks a burden. Finally, the maps were often drawn on paper that was too thin and would easily rip.

Consequently, facilitators would often submit maps with holes and rips that prevented M&A from properly scanning the maps. Figure 4.12 provides an example of this problem. To minimize these and other problems that would affect data quality in the CBIS, I began to develop standards and procedures for the collection, recording (on paper maps), digitalization, quality control, storing and updating of data. Around this time, two new Project Associates joined NIUA who organized a half-day training session for all facilitators on the new standards and procedures on May 29, 2003.

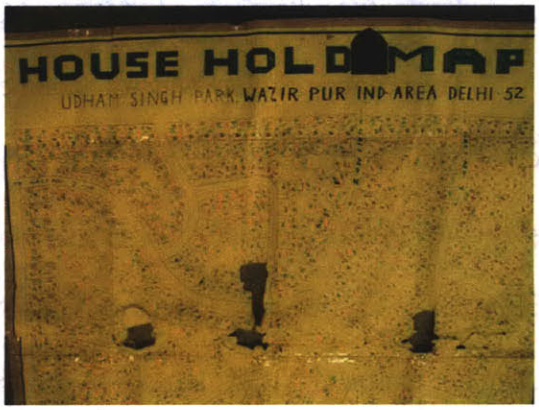

Figure 4.12: Example of holes and rips in map

Amount of Information and Inappropriate Hardware

The Director of M&A encountered problems when attempting to transfer data into the GIS platform. Because the settlement maps were so large and consisted of so many features (or indicators), M&A computers would freeze whenever he tried to run the script to automatically convert map symbols into attributes tables in GIS.[116] This problem could have been avoided by

[116] Not only were there too many features, but there were also some categorization problems. Feature categories were not mutually exclusive (for example, the categories for water consumption were less than 50 liters, 50 to 100, 100 to 300, and 300 or greater). In other cases, feature categories were not comprehensive enough as is shown by the

limiting the number of features in a map and/or upgrading computer hardware. Another option would have been to manually create attribute tables rather than using a script.

4.6.5 Government Use of the CBIS

Despite Dr. Khosla's desire to create a CBIS for government use, by the time Dr. Hoyt and I became involved in the project, NIUA had not yet engaged with any government agency. This situation indicated to me that NIUA needed to change its approach to CBIS production. I determined that it was important to involve government as early in the production process as possible to ensure that the CBIS met the government's information needs. Government involvement in the production process was also vital for creating a greater sense of government ownership over the CBIS project, which I hoped would increase government's willingness to use the CBIS.[117] I came to realize that NIUA needed to focus its efforts on one sector in order to limit the number of agencies with which it needed to engage. This would provide NIUA more time to work with the agencies and better understand their needs and planning process. Dr. Khosla, on the other hand, believed strongly in truly participatory, need-based planning. She was a proponent of working on multiple sectors simultaneously in order to advance the issues that communities themselves considered a priority.

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distance of household to water source feature which consisted of less than 100 meters, 500 to 1000 meters and more than 1000 meters). Finally, features categories were often not well-defined. For example, for the "type of ownership of a water tap" feature, there would be two categories offered: household ownership and community ownership. However, there were some cases in which a tap was owned and shared by a group of families. This third category was not included in the data collection process.
Dr. Khosla also gave a lot of flexibility to the facilitators to collect any additional data that they thought was needed. This resulted in a general lack of uniformity in the type of data collected across settlements, which would make it difficult to make comparisons across settlements.

[117] My belief in the importance of government involvement from the start of the project became stronger when I later learned about NIUA's fruitless attempts to engage government agencies such as the Municipal Corporation of Delhi between September and November 2003. Although it is not clear why government agencies were not interested in the CBIS, it may have been because the CBIS did not meet their data needs or because government did not understand the format of the data in the CBIS (the maps were not drawn to scale). Another possibility is that they did not understand how the GIS would fit into current decision-making processes. These problems may have been addressed if the agency had been involved in the production process.

In a conference call between Dr. Khosla, Dr. Hoyt and myself in March 2003, an important decision was made to reconcile these two opposing views: NIUA would follow a two-pronged development approach whereby data collection activities in settlements would continue to focus on whatever issues were priorities for residents, while NIUA would focus on the water sector only for purposes of building a formal partnership with government and ensuring that the CBIS would be used for planning purposes. This agreed upon approach constituted the beginnings of an important shift in ideology that eventually led to the production of a CBIS for water service delivery.

4.7 Lessons

There are two major lessons NIUA took from the CBIS production experience under PLUS. Both of these lessons shaped Dr. Khosla's future efforts in CBIS production.

The first lesson relates to the realization that one of the major limitations of NIUA's blank slate approach under PLUS was its lack of focus, which had prevented NIUA from formally engaging with government agencies. Although Dr. Khosla valued the importance of empowering communities to determine the nature of NIUA's work in settlements, she believed it was also essential to produce a CBIS for government use. As a result, she began to focus her attention on the water sector for purposes of developing a relationship with the Delhi Jal Board. She did not loose site of this focus even after she decided to leave NIUA to become the Director of the Centre of Urban and Regional Excellence, a non-profit organization in Delhi.

The second lesson Dr. Khosla extracted from the PLUS CBIS project related to the problems that NIUA encountered during the data digitization process. Dr. Khosla, frustrated at what she perceived was M&A's unreliability and over concern for money, decided she needed to find another contractor or learn to do her own digitization work in the future.

CHAPTER 5 - CBIS for Water: The Trial

5.1 Introduction

The previous two chapters describe two attempts to build a CBIS. Although these CBIS projects had positive impacts on localized and uncoordinated community development and service delivery upgrading in many settlements, these two previous CBIS versions were never integrated into larger city planning and policy-making systems. Nevertheless, Dr. Khosla's decision to narrow her focus from all basic services to the water supply and sewerage sector only near the end of the second project represents an important stride for involving government. As a result of this decision, Dr. Khosla shifted from working with multiple agencies to building a partnership with the Delhi Jal Board (DJB). While I was at NIUA in May 2003, we made an initial contact with the DJB's CEO, who became very interested in the CBIS. Although Dr. Khosla left NIUA in October 2003, she did not forget about the CBIS and the DJB.

In her new post as Director of the Centre of Urban and Regional Excellence (CURE), [118] Dr. Khosla contracted with the Water and Sanitation Program (WSP) in July 2004 to conduct a rapid appraisal of current service delivery to the poor, and build a CBIS for water service delivery on behalf of the DJB. Just as the process for collecting data from residents in the previous two CBIS projects had been crucial for building community capacity to participate in neighborhood-based service delivery improvement projects, the process by which CURE built the CBIS with the DJB played an important role in uncovering some of the obstacles that prevent government from meeting the needs

[118] The Centre for Urban and Regional Excellence is a Delhi-based NGO that was established in 2001. Its areas of specialty are policy and institutional reforms for poverty alleviation, and capacity building of local government and civil society for more participatory governance.

of the poor. It is to this next CBIS project, and the degree to which it was embraced by the DJB's reform agenda, that this chapter now turns.

5.2 Background

The DJB was set up in 1998 when the New Delhi Water Supply and Sewerage Disposal Undertaking was turned over from local government to the Delhi State Government. The DJB is the primary provider of water supply and sewerage services in Delhi. Even though the DJB has access to sufficient quantities of water and water treatment capacity, a large gap between supply and demand exists due to line losses and unaccounted-for water (also referred to as non-revenue water).[119] These inefficiencies have resulted in intermittent and unequal water supply. While some areas of the city benefit from almost twenty-four-hour daily water supply, other areas are limited to two-hour shifts in the mornings and evenings. Furthermore, the DJB is experiencing a severe financial crisis. While non-revenue water is estimated to range between 40 to 50 percent,[120] water rates are so low that they cover only about one-third of the cost of water production and distribution. [121] Operational inefficiencies also result in high energy and establishment costs, which (respectively) account for 42 and 45 percent of operations and maintenance (O&M) costs. Presently, the Delhi State Government provides loans to the

[119] Unaccounted-for water or non-revenue water (NRW) is the difference between production and billed consumption. This difference is the result of errors in establishing production and consumption (due to meter inaccuracy or other issues), administrative mistakes (when water is used with the consent of DJB staff, but without being recorded, particularly if no payment is charged as is often the case with large public religious festivals), illegal connections and physical leakage.

[120] Although the 40-50 percent figures are provided in the DJB's May 2004 Workshop Proceedings Report, Mr. Ashish Kundra, Additional CEO of the DJB, NRW stated that NRW in Delhi may be as high as 57 percent (August 2, 2004 meeting with CURE and DJB zonal officials).

[121] Prior to December 2004, tariffs had not been increased since 1998 and before that there had been no tariff increases since 1991 (DJB Inception Report, PWC). The existing rates for domestic metered connections are range between Rs. 0.35 (for volumes up to 10,000 liters per month and Rs. 3.00 per 1000 liters f or volumes above 30,000 liters per month. (Delhi Jal Board, Revenue Department, "Schedule of Rates: 2002 to 2003," and "Rates for Development Charges")

DJB to cover the revenue deficit (approximately Rs. 350-400 crore annually).[122] This situation is further exacerbated by the estimated Rs. 5,000 crore needed for system rehabilitation,[123] as well as the limited capacity of the government as the sole funding source. Given these problems, the DJB is undertaking a massive reform effort to improve services while simultaneously increasing water charges to phase out government financial assistance and achieve full recovery of costs.[124]

To identify the core issues confronting the sector and determine a detailed course of action, the DJB commissioned the Delhi Water Supply and Sewerage Project Preparation Study with funding from the World Bank.[125] The DJB held two workshops in March and May, 2004 with representatives from DJB's management and staff, Central and State Government, Resident Welfare Associations, multilateral and bilateral development agencies, NGOs, and experts from Johannesburg and other progressive water utilities. The purpose of the first workshop was to formulate a vision for the sector and set an agenda for the reform process. The purpose of the second workshop was to develop a Reform Implementation Strategy to take the vision and reform agenda forward.

The DJB vision that was disseminated in the above workshops is "the provision of universal 24/7 safe water and sanitation services in an equitable, efficient and sustainable

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[122] A crore is the number that is represented as a one followed by 7 zeros; ten million. Rs. 350-400 crore is equivalent to approximately $80-92 million (at the current March 2005 exchange rate of Rs. 0.22 to the US$).

[123] Tenth Five Year Plan (2002-07), DJB

[124] DJB Reform Project Report, June 29, 2004

[125] This study was prepared by PricewaterhouseCoopers in association with DHV Consultants and TCE Consulting Engineers Limited. The study was initiated in 2000 and provides a detailed account of the existing infrastructure and institutional arrangements. The recommendations of this study focus on areas requiring critical intervention such as an immediate investment plan for addressing urgent infrastructure, and changes in the institutional arrangements (such as measures for organizational restructuring, corporatization, regulatory mechanism human resource management systems, and information technology development).

manner by a customer oriented and accountable service provider."[126] Among the most salient components of the reform agenda are: the rationalization of tariffs to ensure full cost recovery; phased-in rehabilitation of derelict infrastructure; development of management and geographic information systems; organizational restructuring (such as the establishment of performance-based measures for employees, and the alignment of water distribution, sewerage and revenue collection zones); a management contract with a private operator for two of the DJB's 21 operational zones; and strategies for implementing specific measures to address the needs of the poor. Such measures to target the poor are crucial if the reform project is to generate the necessary support from the poor (who constitute at least 25 percent of the city's population) and their committed advocates.[127] Targeting the poor is also important for reducing illegal and unauthorized connections, as well as instilling a new culture of payment of service, two areas that are key for lowering non-revenue water and improving the DJB's financial position.[128]

Several reform project documents called for an initial "assessment of the needs of the poor using a community-based information system (CBIS)."[129] This inclusion of a CBIS early on in the DJB's reform plans was the result of Dr. Khosla's role as a moderator during the DJB workshops held in March and May 2004. PricewaterhouseCoopers, the consulting agency in charge of organizing the workshops on behalf of the DJB and the World Bank, had requested Dr. Khosla to moderate the two

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[126] DJB Visioning Workshop document, March 2004

[127] As of 2001, the Delhi State Government and the Municipal Corporation of Delhi estimated Delhi's slum population to be approximately 3.3 million, which is approximately 25 percent of Delhi's total population (estimated to be 13.78 million by Census 2001).

[128] Brocklehurst, C.; Tovey, C. "Improved Water and Sanitation Services for the Poor: Recommendations for DJB Policy and Management Contract Design." Report on the Advisors on Serving the Poor, January 2005.

[129] Dissemination Report on the Proceedings of the Workshop on Reform Implementation Strategy for the Delhi Water Supply & Sewerage Sector, May2004; DJB Reform Project Report, June 29, 2004.

"Targeting the Poor" modules of these workshops because she was well-known among development and donor circles in Delhi as a result of her previous poverty alleviation work at NIUA. It was during these workshops that Dr. Khosla reintroduced the CBIS concept into the DJB's agenda.[130] Subsequently, when the Water and Sanitation Program (WSP), the main consultant assisting the DJB with the pro-poor effort, considered implementing the recommendations of these workshops, they turned to Dr. Khosla for assistance. Dr. Khosla submitted a proposal for an initial information gathering and CBIS production phase, which WSP accepted.[131]

5.3 Project Goals and Target Areas

What are the goals of the pro-poor component of the DJB reform effort, and what areas is it targeting during the initial phase of the overall reform effort?

5.3.1 Goals

According to WSP's presentation to experts in the water supply and sewerage (WSS) sector in Delhi, including DJB officials, in August 2003, the main objectives of the pro-poor component of the WSS reform effort are:

- Increase the understanding of current WSS services in poor communities, including the service needs and priorities of these communities;
- Improve access to services through legal and regulatory interventions, tariff and subsidy changes, and affordable financing mechanisms;
- Improve service quality through the application of appropriate technology and infrastructure and partnerships with community-based institutions/intermediaries;

[130] According to the Workshop Proceedings Report "to better address the water supply and sewerage needs of the poor...a rapid assessment including updating and integrating CBIS with existing DJB database" is needed.

[131] This initial production phase was supposed to also include the task of updating the settlement boundaries and data collected previously for NIUA's CBIS. Updating was to be done only for those settlements in the 4 zones targeted in the project.

- Enhance DJB institutional capacity to serve the poor through improvements in information management, monitoring and evaluation, performance-based incentives, dedicated expertise and training of frontline staff; and
- Increase revenue through the reduction of non-revenue water and improved collection rates (convert residents of underserved settlements into paying clients).

5.3.2 Target Zones

To achieve these goals, the DJB, WSP and CURE identified four of the 21 operational zones as target areas for the initial assessment and CBIS. These target zones, which are depicted in Figure 5.1 below, are South II, South III, North West II and Northwest IV.

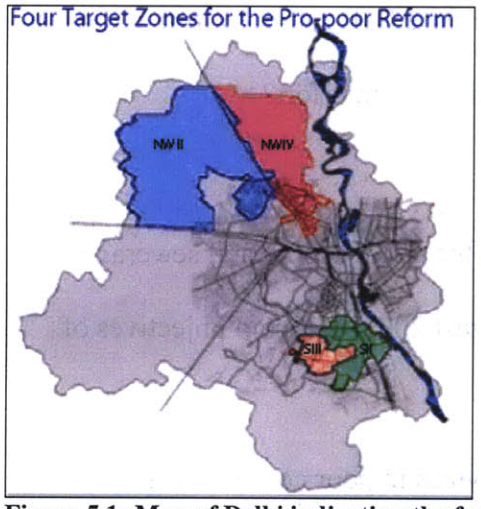

Figure 5.1: Map of Delhi indicating the four target zones for the project.
Source: DJB GIS

Originally, only South II and III were targeted for the pro-poor reform project because they are the zones that are being targeted for 24/7 continuous water supply under the future management of a private service provider. However, CURE added the two Northwest zones because they constitute a better learning ground (compared to the South zones) for addressing the challenges associated with service delivery to underserved areas in Delhi. In Dr. Khosla's judgment, the conditions of underserved settlements and water distribution in general in the South zones are not representative of the conditions in other zones in the city, which are less developed and have less political influence than the more affluent South Zones. Dr. Khosla also wanted to focus on the Northwest zones because many poor settlements had been shifted there in recent years. Finally, the fact that both of these zones are located at

the beginning of the distribution chain, made the Northwest area attractive because it increased the probability of service improvements despite the severe challenges.[132]

5.3.3 Target Settlements

There are five categories of "underserved settlements" in Delhi, which the DJB chose to include as targets for its "pro-poor program": (1) slums (also referred to as JJ Clusters), (2) unauthorized colonies, (3) rural villages, (4) urban villages, and (5) resettlement areas. While these five types of settlements differ substantially from each other in terms of income, proximity to infrastructure, physical layout and legal status, there are settlements in all of these categories that may require the DJB to adopt non-conventional approaches to service provision for them. This is due to various common characteristics, such as the presence of:

- Low quality services resulting in high consumer coping cost;
- High proportion of low-income people;
- High percentage of illegal tappings; and
- High default rates.

5.4 Methodology

The methodology that WSP set forth for the project, which is outlined below in Figure 5.2, was to first conduct supply and demand side analyses of Delhi's WSS sector in order to then develop a policy and institutional framework for improving services to the poor. This framework was supposed to form the basis for enacting future institutional

[132] The DJB Additional CEO was also interested in adding the Northwest zones because he wanted to pursue pilot demonstration projects in zones not under the purview of the private service provider.

arrangements necessary for targeting the poor. [133] These institutional arrangements and pro-poor policies would be tested through the implementation of pilot projects by the DJB in Northwest II and IV operational zones, a management contract with a private service in South II and III operational zones, and other measures. Lessons learned from these tests would then be used to make necessary modifications to the policy framework and institutional arrangements, such as the management contract, in order to then scale up the pro-poor program to the city-wide level.

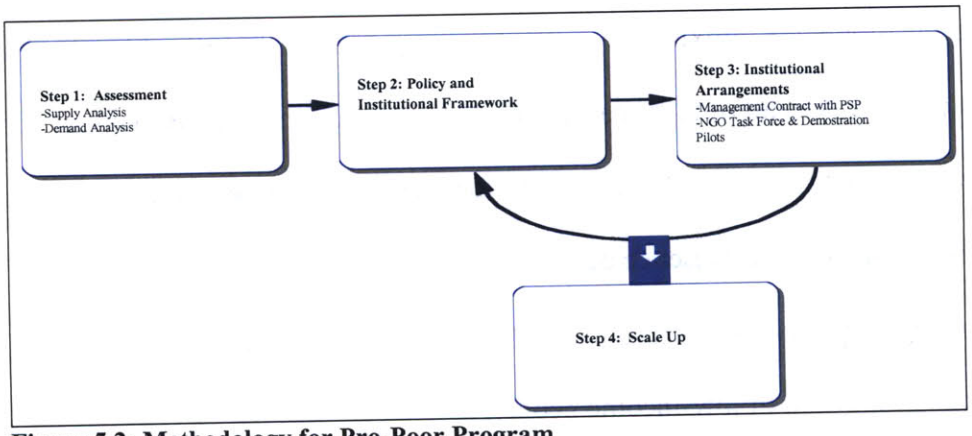

Figure 5.2: Methodology for Pro-Poor Program
Source: WSP presentation to WSS experts, August 3, 2004[134]

5.5 Actors and Their Roles

The major actors in the pro-poor component of the reform project, in order of importance for the purposes of this CBIS study, were: Delhi *Jal* [Water] Board (DJB); the National Informatics Centre (NIC); World Bank actors working in the larger WSS reform project (including their consultants); Water and Sanitation Program (including

[133] WSP's conversations with CURE about "institutional arrangements" were general at the beginning of the project. CURE originally thought that change in institutional arrangements referred to changing the way the DJB was structured in order to improve its ability to better interact with the poor, such as the establishment of an NGO task force that would serve as an intermediary. It was not until later in the project that it became more evident that changes in "institutional arrangements" also meant the establishment of a management contract with a private service provider – and that CURE's work was to be used primarily for the management contract, rather than the DJB-NGO-community structural organization.

their consultants); CURE; myself (as a consultant to CURE); MapAction (U.K); and Génie Urbain Sans Frontières (France). Figure 5.3 and Table 5.1 below summarize (respectively) the interrelationships and roles of the various actors.

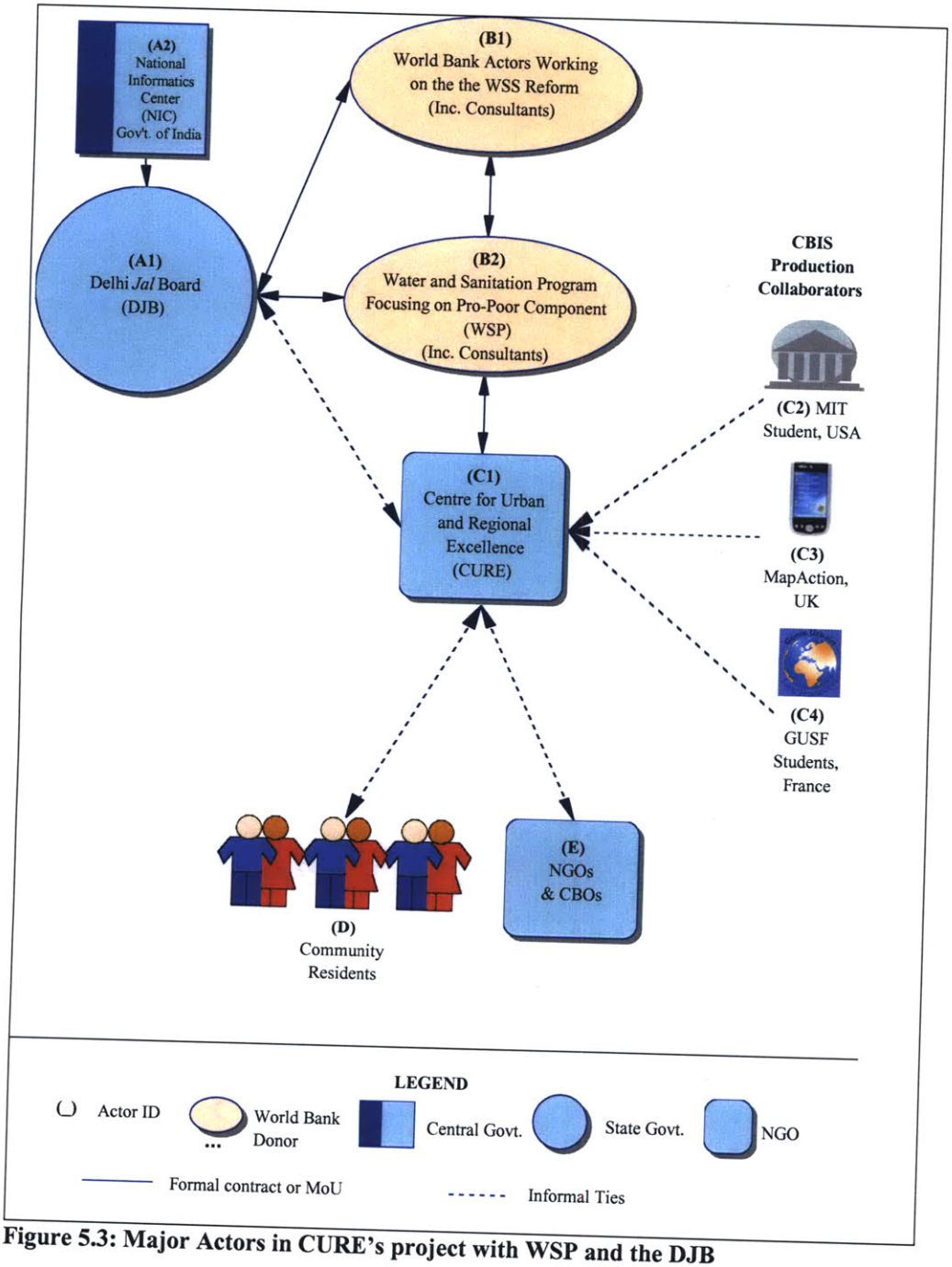

Figure 5.3: Major Actors in CURE's project with WSP and the DJB

[134] Figure 2 merges two flow charts from the August 3 WSP presentation: "Project Anatomy" and "Setting Up a Policy Cycle". One slight modification to the figure is the addition of pro-poor provisions for the management contract with the private service providers (PSPs).

Table 5.1: Major Actors in CBIS for Water

Actors	Major Roles
(A1) Delhi Jal Board (DJB)	Responsible for working with the World Bank and consultants to design and implement a reform agenda that is desirable to the DJB and the Delhi State Government; the Additional CEO monitored and facilitated the work of CURE by requesting periodic updates; and providing necessary information (e.g., paper maps, interviews, and field visits).
(A2) National Informatics Center (NIC)	Has set up a GIS cell or office in DJB headquarters, which is connected to a server in NIC head quarters through a lease line. Has developed the Delhi base map that the DJB uses to map its infrastructure. Has set up a number of restrictions on spatial data to protect "national security."
(B1) World Bank (Overall WSS reform) and consultants	Donor; funded study to guide reform process; responsible for working with DJB and consultants to coordinate and implement all activities associated with the WSS reform process in Delhi. Will be providing a substantial loan to the DJB for financing the reform efforts.
(B2) Water and Sanitation Program (Pro-poor component of WSS reform) and various consultants	Responsible for guiding the pro-poor component of the WSS reform project, including the development of a pro-poor policy framework, and the establishment of pro-poor institutional arrangements (such as ensuring the inclusion of specific measures for addressing the needs of the poor in the management contract with the service provider).
(C1) Center for Urban and Regional Excellence (CURE)	Responsible for conducting the initial assessment on the status of water and sanitation services in poor settlements in the four target zones through primary and secondary data collection. Responsible for forming NGO task force.
CBIS Support: **(C2)** MIT student **(C3)** MapAction **(C4)** Génie Urbain Sans Frontières (GUSF) students	MIT student: My role was to help develop a methodology for CBIS production, and identify the current institutional arrangements for service provision in the four target zones. MapAction: Exposed CURE to new data collection technologies such as GPS and pocket PCs that could help CURE streamline its information collection process and improve data quality; Helped CURE understand technical issues associated with integrating the CBIS data with the DJB GIS. GUSF students: Assisted CURE in developing a prototype, web-based data entry form that CURE could use to demonstrate to the DJB and WSP its future vision for the CBIS (i.e., a CBIS that residents could access online to update their settlement information for DJB use). Also provided GIS training to Project Associate in CURE.
(D) Community residents and groups	Provided information to the CURE team about their settlements, such as boundaries and the status of WSS services.
(E) NGOs	Provided information about their activities in settlements, their organizational goals, and their potential interest in serving as an intermediary between the DJB and residents. Later, interested and qualified NGOs would form a task force that would work with the DJB and communities to improving services in poor settlements.

5.5.1 Delhi Jal Board (DJB)

As the primary agency responsible for the provision of water and sewerage services in Delhi, the DJB has the important role of working with the World Bank and consultants in the design and implementation of the WSS reform agenda to ensure that the reform meets the interests of the current and future residents of Delhi (see A and B1 in Figure 5.3). For the pro-poor component of the reform, which seeks to ensure that the reform process includes specific measures to improve services to the poor, the Additional CEO, Mr. Ashish Kundra, is working closely with WSP (see B2 in Figure 5.3) to develop an institutional and policy framework for ensuring that the DJB reforms in a way that positively impacts the economically weaker sections of society, rather than just people of the middle and upper socio-economic classes. Mr. Kundra also played a critical role in CURE's demand assessment and CBIS production effort (see C1 in figure). He supported CURE's work by formally introducing CURE and the project to all of his personnel in the four target zones and to the DJB GIS office.[135] He also instructed his personnel to give CURE any information it required (such as paper maps and DJB documents), and to take time for meeting with CURE staff, and accompanying them to settlements, if needed. He also monitored CURE's work by requesting periodic updates throughout the duration of the project.

[135] This official presentation to over 20 DJB officials was held on August 2, 2004. Because no GIS personnel attended that meeting, CURE made a separate presentation with MapAction on August 4, 2005 to present the project as well as the GPS technologies that CURE was considering using for data collection purposes. Mr. Vikram Singh, the head of the GIS office in DJB headquarters, did not get involved in the project until late August or September because he was abroad attending a conference when the project started.

5.5.2 National Informatics Centre (NIC)

The National Informatics Centre (NIC), an agency that is part of the Department of Information Technology (under the Ministry of Communications and Information Technology, Government of India), was established in 1977 to facilitate information technology (IT) development in governments at the national, state and district levels. NIC is developing ten national databases for use in planning and decision-making by the government in the following sectors: agriculture; construction and transport; education and manpower; energy; finance; industry; small-scale industries; socio-economic index; trade and media; and government archival information. To facilitate sharing and maintenance of the databases, NIC has established a nationwide Information Communication Technology Network – NICNET – with nodes in central government departments, 35 state/union secretariats, and in almost all of the 602 district collectorates.[136]

For the purposes of this study, NIC's role in the DJB's reform efforts relates to the assistance that NIC is providing to the DJB in the development of a geographic information system (GIS) that contains information on all aspects of the DJB's infrastructure (see A2 and A1 in Figure 5.2 above). NIC has set up a "GIS cell" or office in the DJB's headquarters, which is connected to NICNET, with less than a dozen computers (with Arc GIS 8.3) and a plotter. NIC has developed a base map for Delhi, which the DJB has access to through a lease line that is connected to a server in NIC headquarters. Unfortunately, connection through this lease line is slow and sometimes unreliable.

[136] http://home.nic.in/welcome.htm

Because NIC maintains control over both the GIS cell and the Delhi base map, the DJB's autonomy and efficiency in its GIS development efforts is limited. In addition to the productivity losses that result from the slowness and unreliable nature of the lease line, the DJB is fettered by NIC's numerous spatial data restrictions, which NIC has set up in the interest of "national security." These data restrictions prevent the DJB from sharing digital spatial data with outside agencies, even when the outside agencies are consultants that the DJB has commissioned to do work on its behalf (as was the case with CURE). The DJB's association with NIC also seems to make the DJB more bureaucratic and less accessible to the public. As I will discuss in Sections 5.6 and 5.7 below, the DJB's lack of autonomy with regards to its GIS development efforts presented significant barriers to efficient CBIS production, the future sustainability of the CBIS, and the protection of community interests.

5.5.3 World Bank – Overall WSS Reform

The World Bank, the donor agency that funded the Delhi Water Supply and Sewerage Project Preparation Study initiated in 2000, has played a significant role in influencing the reform agenda, particularly since it will be extending a large loan to the DJB, provided certain conditions are met (such as the execution of a management contract with a private service provider in South Zones II and III). There are many actors from, or brought in by, the World Bank, including consultants such as PricewaterhouseCoopers, DHV Consultants, TCE Consulting Engineers Ltd., and GKW Consulting. These actors are working on various different areas of reform, such as accounting and financial, institutional development, and infrastructure rehabilitation. The pro-poor component of the reform effort is intended to strategically influence the work in each of these areas. For example, the actors drafting the management contract for the

private service provider (which is an item under institutional development) would need to work with actors from the pro-poor component (the DJB, WSP and CURE) to ensure that measures to address the specific needs of the poor are included. The head of the overall reform effort for the World Bank, Mr. Cristophe Bosche,[137] is responsible for coordinating the work of the DJB, World Bank personnel, and consultants (including WSP and CURE).

5.5.4 Water and Sanitation Program (WSP) – Pro-Poor Component of Reform

WSP is responsible for guiding the pro-poor component of the WSS reform project, including the development of a pro-poor policy framework and ensuring the institutional arrangements that address the needs of the poor (such as specific measures to target the poor in the management contract with the private service provider). Mr. Junaid Ahmad (Regional Team Leader), Mr. Salman Zaheer (Lead Utilities Specialist), and Mr. Badal Malick (Economist/Operations Analyst) were the three people at WSP who were working on this project at the time WSP hired CURE to conduct the demand assessment study and initiate the development of a CBIS initiative. Mr. Warren Waters, from the World Bank, joined the project midway following the departure of Mr. Ahmad and Mr. Zaheer. Mr. Malick was the main person in charge of coordinating CURE's work and serving as a link between CURE and the DJB, and between CURE and the rest of the World Bank actors involved (see B2, B1, A, and C1 in Figure 5.3 above).

5.5.5 CURE (Including Residents and NGOs)

As shown in Figure 5.3 above, CURE was hired by WSP to conduct the initial assessment on the status of water and sanitation services in poor settlements in Delhi (see

[137] Mr. Cristophe Bosche is a graduate of the Department of Urban Studies and Planning at MIT.

B2 and C1). This assessment, which was to be used to guide the formulation of pro-poor policies and institutional arrangements, consisted of two parts: (1) secondary research on water and sewerage services in poor settlements in Delhi; and (2) a rapid appraisal of current service delivery, and resident service level preferences, in underserved settlements in the four target zones.[138] Through the rapid appraisal, which was based on brief conversations with residents during transect walks and/or focus group discussions, CURE collected a large amount of data directly from residents (see C1 and D). CURE then used these data, along with settlement boundaries, to populate a CBIS on behalf of the DJB. CURE also identified 21 NGOs and one community-based organization (E) that could form part of a potential future partnership with the DJB for improving services to the poor. Although CURE's work, including the production of the CBIS, was funded by WSP, it was understood by all parties that the DJB was the primary client. Hence, CURE interacted with the DJB as often (if not more often) than with WSP to discuss project-related issues.

The CURE team consisted of three members: Dr. Renu Khosla (Director); Ms. Shveta Mathur (Programme Coordinator); and Mr. Sumit Chakraborty (Project Associate). Dr. Khosla was responsible for managing and overseeing the overall activities of the project. She also worked with Ms. Mathur on writing the reports for WSP and the DJB. Ms. Mathur led the research efforts associated with the literature review as well as the analysis and synthesis of all information collected from settlements. She also led the efforts in computerizing the data that were collected through focus groups discussions. Mr. Chakraborty coordinated the data collection and digitization process, including the

[138] As described in the section 5.3 above, underserved settlements are Jugghi Jhopri Clusters, Resettlement

interviews with DJB officials and the integration of the underserved settlement data with the DJB GIS. In addition to these three members, CURE contracted with a number of outside facilitators and students from the School of Planning and Architecture in Delhi for data collection purposes.

5.5.6 MIT Student (Myself)

My role during the ten weeks that I collaborated with CURE (June through August 2004) was to identify the current organizational structures of the Division offices of each of the target zones, and determine what types of information DJB frontline workers currently use or need to plan service delivery in underserved settlements. I also examined the ways in which the CBIS production process contributed to organizational change, particularly those types of organizational changes that enabled the DJB to better serve the poor. I believed that, for a CBIS production process to serve as a catalyst for organizational change, it had to be embedded into the DJB's current organizational structure. This embeddedness could only be achieved if CURE was well aware of how the DJB's divisional offices conducted their daily operations and made resource allocation decisions. As Barndt (2002) states, "if organizations are to be transformed by embracing these new [public participation GIS tools], then attention must be paid to that transformation."[139] As I will discuss in greater detail in Section 5.6 below, some of the methods that I implemented with CURE staff for purposes of learning about how the DJB divisional offices carry out their operations and how the CBIS would fit within those operations were: one-on-one interviews and small group discussions with zonal engineers, visits to the settlements with DJB engineers, and large meetings with DJB

Colonies, unauthorized colonies, urban villages and rural villages.

officials from multiple levels in order to foment dialogue about people's resistance to improving services to the poor.

5.5.7 MapAction, U.K.

MapAction,[140] a U.K.-based international charity that specializes in geographic information systems development, provided technical support to CURE in its CBIS production efforts. CURE wanted to explore ways to streamline its information collection process in order to speed up the information collection phase and ensure higher data quality. MapAction sent two GIS specialists from the U.K. to introduce CURE to GPS technology and pocket PCs and explore the utility of these technologies in CURE's efforts. Although CURE ended up not using either of these technologies, MapAction did present these technologies at a key meeting that CURE and WSP held with leading WSS experts in Delhi to obtain feedback on methodology. MapAction's presentation increased the prestige of CURE. MapAction also helped CURE better understand the technical aspects of CURE's efforts to integrate its data with the DJB's GIS.

5.5.8 GUSF Students, France

Three students from GUSF, France traveled to Delhi for two weeks in September to provide technical assistance to CURE in database development and GIS. As explained in Chapters 3 and 4, one important component of Dr. Khosla's vision for the CBIS was to enable community residents to update their settlement information in the CBIS on their own. To this end, Dr. Khosla wanted to develop a simple, user-friendly data entry form that would be available to community residents online. The students from GUSF, France helped Dr. Khosla get a bit closer to that vision by developing a prototype online

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[139] Barndt 2002.

database that would be linked to the GIS, enabling community residents' data updates to be reflected in the GIS in real time. Although the CBIS is not yet in a development stage that would allow for this type of web accessibility (for technical and political reasons),[141] the prototype database and entry form was an advancement, nonetheless. Also, the GUSF students trained CURE's Project Associate in the use of GIS, which was crucial for his later work in digitizing settlement boundaries and integrating them into the DJB's GIS.

5.6 CBIS Production Process

CBIS production is a complex process subject to numerous obstacles, particularly since it is a new technology that is supposed to accomplish the difficult task of helping bridge the gap between the DJB and residents of underserved settlements, particularly the poor. The CBIS, which consists of information provided by residents themselves, is supposed to help disseminate the views of the poor to policy-makers and government officials in order to create decisions that are recognized by the poor as meeting their needs. The sections below document CURE's production process in an effort to depict not only how CURE collected the data and developed the information system, but also the types of difficulties that CURE encountered and the ways it overcame them. These sections also shed light on some of the important unexpected outcomes of CURE's work (such as the dialogue that was generated among DJB zonal office personnel about the poor and the interest that certain front line workers began to develop in terms of learning more about the poor).

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[140] For more information, see www.mapaction.org.

[141] The DJB cannot allow the public to have access to its system due to its contract with the National Informatics Centre (the Government of India agency responsible for information services and technology), which prevents the DJB from sharing spatial data with any outside entity or person (unless in the form of a paper map that is not too detailed in scale and does not provide geo-coordinates). More information about the DJB's limitations in data sharing is provided in Section 5.7 below.

5.7 Broad Purpose and Multiple Objectives of CBIS

According to the DJB, the broad purpose of the initial needs assessment, and the resulting CBIS, was to inform the design of specific measures and interventions to improve services to the poor. Similarly, Dr. Khosla stated that the purpose of the CBIS is to help the DJB plan and implement more need-based service delivery in poor neighborhoods. But the questions remained: *what* specific measures and interventions is the CBIS supposed to inform, or *how* will the CBIS help the DJB plan more need-based service delivery? Answers to these questions are crucial for guiding certain components of the CBIS production process, such as the selection of the types of data to collect or the identification of appropriate methodology and techniques for data collection. In addition, a set of pre-determined objectives that are linked to the larger, well-defined purpose of the CBIS is needed to guide the CBIS production process. For example, is the objective of the CBIS to facilitate communication and coordination among the various actors responsible for serving the poor? Or, is it supposed to help generate the organizational and institutional changes needed to better serve the poor? Should it help improve the DJB's financial position? Should the CBIS build community capacity or improve equity in water supply? Different objectives will lead to different CBIS production strategies. However, CURE, the DJB, and WSP never identified a finite set of objectives for the CBIS. Rather, project documents suggest that the CBIS is supposed to fulfill a multiplicity of objectives, as outlined in Table 5.2.

Table 5.2: Multiple Objectives of CBIS Project under CURE

Category	Objectives of CBIS	Source
Communication	Facilitate two-way information flow between communities and policymakers/service providers	WSP-CURE Terms of Reference, July 2004; CURE Inception Report, August 2004
	Facilitate two-way information flow between DJB field staff (frontline workers) and higher-level DJB officials and policy makers	CURE Inception Report, August 2004
	Facilitate inter-agency coordination by strengthening communication between the DJB and different agencies, such as the Delhi Development Authority and the Municipal Corporation of Delhi	CURE Inception Report, August 2004
Financial	Provide settlement information needed to reduce unaccounted-for water and billing gaps	CURE Final Report, January 2005
	Identify the resources (both human and infrastructure) that other government agencies/departments are providing in the settlements	CURE Final Report, January 2005
Equity	Identify and understand inequities in supply (inter and intra settlement group variations)	CURE Final Report, January 2005
	Identify and understand rent-seeking activities that negatively impact the poor	CURE Final Report, January 2005
Organizational Change	Build institutional memory by documenting the knowledge that DJB field staff have about the distribution network in order to ensure that this information remains within the DJB beyond employee transfers or retirement	DJB Additional CEO, August 2, 2004; CURE Inception Report, August 2004
	Through the CBIS production process, help generate activities and dialogue within the DJB that will lead to a stronger interface between the DJB and underserved communities (i.e., motivate engineers to want to better serve the poor)	CURE Inception Report, August 2004
	Help DJB management monitor the quality of services provided by frontline workers, and the effectiveness of customer grievance mechanisms	DJB Additional CEO, July 7, 2004
	Help the DJB be more proactive about service delivery in low-income settlements to minimize problems and complaints	DJB Additional CEO, August 2, 2004
Institutional Arrangements	Inform the formulation of service standards for the private operator in South II and III operational zones	DJB Additional CEO, August 2, 2004; CURE Inception Report, August 2004
	Inform the design of the demonstration pilot projects to test newly proposed institutional arrangements such as partnerships between the DJB, NGOs, and communities.	
Community Building	Serve as a catalyst for grassroots community development and mobilization through the use of PLA techniques	CURE Proposal to WSP, June 2004

The lack of a well-defined purpose and a clear set of objectives for the CBIS gave rise to a production process that was ad hoc and diffused across different interests and priorities. Nevertheless, a significant amount of data was collected in an effort to better understand the current status of services to the poor. The key task was, however, to determine how the various types of data could be used by the DJB, WSP and other policy-makers to inform their efforts in improving services to the poor (one of such efforts, of course, being the pro-poor provisions of the management contract).[142]

5.8 Data Selection

Because data collection was supposed to be completed within a period of four months, Dr. Khosla determined upfront that CURE would collect data through two data collection techniques: focus group discussions with neighborhood residents, and community resource mapping (including the mapping of boundaries of settlements). CURE's process of data selection, thus, focused on identifying the types of data that facilitators would collect through focus group discussions and resource mapping techniques, respectively. Dr. Khosla's primary aim was to identify the types of baseline data that the DJB would require to plan for services to the poor. These indicators were supposed to help measure key phenomena of interest to a water utility, such as demand for water, condition of infrastructure (drains, pipes, taps, etc.), resident perceptions of quality of service, residents' preferred level of service, willingness and ability to pay, political influence, and community organization. Indicators used to estimate demand consisted of population estimates (such as number of households in a settlement), average household income and average household consumption. Similarly, indicators for determining a

[142] As will be revealed in various sections below, as of the time of this writing, only population related data are being used to inform the management contract. There is a wide array of other community-level information that could also inform the management contract design (as section 5.8 suggests).

settlement's political influence included the last time a politician had visited the settlement, and the types of past infrastructure upgrading interventions undertaken by politicians in the settlement.

Types of Data Collected in Focus Group Discussions

Dr. Khosla prepared an extensive list of settlement data to be collected through focus group discussions. This list consisted of approximately 100 items divided into eight categories: (1) General; (2) Water; (3) Sanitation; (4) Health; (5) Thrift and Credit; (6) NGO Presence; (7) Political Structure; and (8) DJB-Customer Interface. Despite the fact that the data collection methodology used during focus group discussions is qualitative in nature, items on Dr. Khosla's list were both qualitative and quantitative. Qualitative items included levels of satisfaction for current levels of service, such as community taps and community toilets. Quantitative items, which far outnumbered qualitative items, included average number of households, average monthly expenditures per family, percentage of households with individual connections, percentage of households using community taps, amount households are willing to pay for different levels of service, average monthly household health expenditures, etc.[143]

Types of Data to be Collected Through Resource Maps

Next, detailed information on service delivery and infrastructure was supposed to be collected through resource maps. Although information collection for the CBIS focused on water supply and sewerage services in underserved settlements in Delhi, information was also collected for other types of services, such as community toilets, waste water disposal, and solid waste

[143] CURE reported these items in quantitative terms despite the fact that the methodology used to generate these numbers was qualitative in nature (i.e., discussions with the community about what they perceived the average amounts or percentages were, rather than the use of random sampling or other quantitative techniques). Problems that resulted from CURE's decision to generate quantitative data with qualitative data collection techniques and then report it as highly accurate quantitative data are described in Section 5.7.

management. Table 5.2 below provides a summary of the types of data that were collected through resource mapping for each type of service.

Table 5.3: Features for Resource Maps to be Included in CBIS for Water

Service Type	Data
Water	**Stand Posts/Water Taps** Water pressure Condition (functional/non-functional) Quality of water Average number of user households Drainage linkages (linked/not linked) **Tube Wells (Motorized Pump) and Hand Pumps** Depth (in feet) Condition Quality of water Average number of user households Drainage linkages **Water Tankers** Delivery type (Fixed route/On demand) Number of trips per day **Other** Community water reservoir/storage tank Water kiosks Small-scale private service provider Other (specify) Percentage of households with on line motors
Sanitation	**Community Toilets and Bathrooms** Type (Connected to sewerage line/septic tank/dry pit) Number of seats (for women/men) Number of bathing rooms/platforms (for women/men) Total number of non-functional seats (for seats that are not used) Charge (for women/men) Management entity of toilets Linkages to water supply (water in toilets) **Other** Open spaces used for defecation (Drain/Park/Roadside/Railway track/Other)
Waste Water Disposal	Drains in the settlement (incl. linkages to water sources) Condition (Non-cemented/Cemented) Type (Open/Covered) Maintenance Level (Good/Poor) Main points of blockage or drain overflow
Garbage Disposal	Informal Dump Site Municipal Garbage Dump Municipal Waste Bins
Community Resources	Roads (dirt/paved) Public Facilities (Schools/Health/Community Center/etc.) Landmarks (Bus stop/temple/etc.) NGO Center

In addition to the features listed above, CURE was supposed to map exact boundaries of all underserved settlements in each of the four target zones.

Obtaining Formal Feedback

CURE attempted to formally obtain feedback on its list of indicators and map features through one-on-one consultations with the DJB's Additional CEO, a meeting with WSP personnel, and a presentation to experts from the water and sewerage sector in Delhi (such as representatives from international donor organizations, NGOs, consultants, consulting firms and members of DJB management and staff).

Consultation with the DJB's Additional CEO. Dr. Khosla, Ms. Mathur (CURE's Program Coordinator), and I shared a preliminary list of indicators with Mr. Kundra on July 7, 2004. Upon his review of the list, the lack of precise definitions of many of the indicators led him to inquire about CURE's information collection methodology. He did not seem to understand fully the concept of a rapid appraisal, but he stressed the importance of standardizing the information collection process. "Everyone should be collecting information in the same way," he said. In addition, he suggested that information about the degree of interaction between the DJB and the community be collected. This suggestion was important because it generated 27 additional variables in an effort to answer the following questions that Mr. Kundra suggested:

- Who are the junior engineers from DJB who visit your community? Do you know their names?
- How often do they visit?
- How do you interact with them?
- Who tells you the timings of water supply?
- Do you have a say in deciding the timings?
- What complaints do you have about the water supply?

- Has the DJB responded? How?
- Do you have a say in capital investments?
- Are the MLAs and councilors involved in capital investment decisions? What role do they play?
- Do you receive bills? How frequently? Average amount? How far is the nearest collection center?

We later learned that the reason why Mr. Kundra added this last category of indicators to our list was that he wanted to monitor the effectiveness of customer grievance mechanisms and the frequency with which DJB staff visited settlements.[144] This made us realize that the DJB was interested in using the CBIS not only for planning service delivery improvements, but also for monitoring the work of frontline DJB staff in an effort to improve DJB accountability.

Mr. Kundra also requested that additional information be collected with regards to other issues. For example, he wanted to know who the operators of hand pumps in the settlements were, whether water tankers were delivered to settlements on demand or on a fixed-route basis, and the number of households in all multi-family buildings.[145]

Meeting with WSP. In this meeting, Dr. Khosla and I presented the sanitation-related indicators to three WSP personnel, who agreed to provide us feedback via email shortly following the meeting. However, no feedback was provided. One question thus arises: if CURE had been more specific in its request for feedback, would a better dialogue been generated with WSP? Rather than asking people to provide feedback, we could have asked specific questions. For estimating the willingness to pay, for example, we were using current household

[144] The Additional CEO's interest in this category was the result of the conclusions of the PwC report on the ineffectiveness of customer grievance mechanisms within the DJB.
[145] Mr. Kundra also suggested that we review the diaries of the Meter Readers/Meter Inspectors when we went to visit the DJB zonal offices. He also asked us to find out how many hotels are located in each zone (hotels are

expenditures and community capital investment on infrastructure as proxies. We could have asked what they thought about these proxies and our methods for measuring them. These types of specific questions may have generated much needed conversation about what phenomena we were trying to measure and how we should measure them.

Presentation to WSS Experts. On August 3, 2004, WSP and CURE held a meeting with WSS experts to present the project and obtain feedback on the overall project methodology, including the list of indicators and data collection techniques. Just as with the meeting with WSP, little feedback was obtained through this meeting. The major feedback we received about data collection related to the need to limit the amount of information collected,[146] and the need to establish quality controls to ensure that the data were reliable. Neither of these suggestions altered CURE's plans in a significant way.

Identifying Relevance of Information for DJB Frontline Staff

In addition to the meetings discussed above, I assessed that it was important for CURE to meet directly with DJB's frontline O&M staff in order to ensure that the data collected met their needs. After all, they are the ones who are in direct contact with the poor and who have major power over resource allocation. It was also necessary for CURE to meet with frontline workers in order to understand the organizational structure of these units and the ways in which they operate. I seemed to me that only after CURE understood the organizational structure and service delivery would it be able to design a CBIS that would facilitate more need-based planning within that structure.

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categorized as industrial consumers). CURE did not incorporate either of these suggestions into its work because it considered them to be outside the scope of the project.

[146] One WSS expert from the World Bank questioned CURE's reason for mapping every single stand post and water tap in each settlement. She thought that this was too time consuming. CURE responded by saying that mapping the

Hence, Mr. Chakraborty (CURE's Project Associate) and I held meetings over a four-week period with more than 25 DJB frontline workers from the four target zones to identify three sets of information:[147]

- What do frontline workers know about the current status of service delivery in poor settlements in the areas under their purview?
- What do they not know about service delivery in these areas?
- What do they not know, but want to know?
- Through these meetings, we learned that contrary to what Dr. Khosla had hypothesized, the DJB frontline workers knew quite a bit about the underserved settlements in their areas. For example, all zones had lists of most of the settlements in their areas by type, and certain zones had hand-drawn maps of the location of these settlements.[148] Figure 5.3 below is one such map that Mr. Ligat Ali (Assistant Engineer in NWII Zone) prepared by hand along with other Assistant Engineers and Junior Engineers for NW II Zone.[149]

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stand posts was often imperative for understanding water problems in settlements since water problems often arise from the mismatch between the spatial distribution of water taps and the spatial distribution of population density.

[147] The frontline workers with whom we met were the Executive Engineers, Assistant Engineers, Junior Engineers, Draftsmen, Head Clerks, Zonal Revenue Officers and Meter Inspectors.

[148] As will be discussed later in this section, although the lists of settlements that the DJB zonal offices had prepared were extensive, CURE did find some additional settlements that were not on the list. This does not mean that services were not being provided in these settlements. This just means that the DJB's zonal office lists were out of date.

[149] This map was a GIS generated map of the zone with the respective MLA boundaries. The engineers used these maps to draw the location of the settlements. They also revised the MLA and zonal boundaries generated by the GIS, as they had been mapped incorrectly by the GIS mapping cell. This discrepancy between the GIS boundaries and the boundaries that the engineers considered to be correct suggests that better coordination is needed between GIS office and zonal offices. Alternatively, the GIS could be decentralized to the zonal level (although this may be difficult due to NIC's requirement to maintain ownership of the DJB's GIS and control it by keeping it in a NIC server).

Figure 5.3: Map of settlements in NWII Zone
This map was prepared for a presentation to the DJB Additional CEO. The figure to the right is the enlarged legend of the map.

Not all Assistant Engineers had mapped the settlements in their jurisdictions, but this did not mean that their Junior Engineers could not easily create such maps (from memory) upon request. On several occasions, I asked the Junior Engineers to map the boundaries of settlements in their jurisdictions. I then went to one of the settlements myself to verify the boundaries with residents and found that they were very close to those that the engineers had provided. In addition, I also collected the 1994 list of JJ Clusters from the MCD and shared it with the junior engineers in all four zones. In all cases, the engineers could look through the list and in a matter of minutes tell me which settlements no longer existed (due to relocation) or which post-1994 settlements were missing from the list. The ability of the Junior Engineers (and some Assistant Engineers) to also quickly map randomly selected settlements from the MCD list suggests that there is a subset of engineers in the DJB who know well what settlements exist and where they are located.[150]

[150] I found that in some zones, the Assistant Engineers and the Executive Engineers had formerly been Junior Engineers in the same zone and had worked their way up the ladder over a period of more than 20 years. In these cases, these engineers knew a great deal about settlements in their zones. In other zones, however, new Assistant Engineers and Executive Engineers had been transferred from the construction department of the DJB or other O&M divisions. In these other cases, these higher-level engineers had to rely solely on Junior Engineers for settlement-specific information.

In addition to knowledge about the location of settlements, Junior Engineers (and, in certain cases, Assistant Engineers) also knew quite a bit about the status of water and sewerage services in their settlements. I discovered this through a process that I undertook with some of the engineers, whereby I would ask them to complete a matrix of potential services (shown below) for five to ten randomly selected settlements in their jurisdictions. Through this matrix, I learned that engineers had no problems providing some of the requested information (shown in the white columns below).[151] For example, they knew whether or not the DJB provides piped water supply to the settlement, the percentage of households connected, and the number of tube wells or pumping stations. They also had a general idea of the number of illegal connections, based on lists that meter inspectors provide to them.[152]

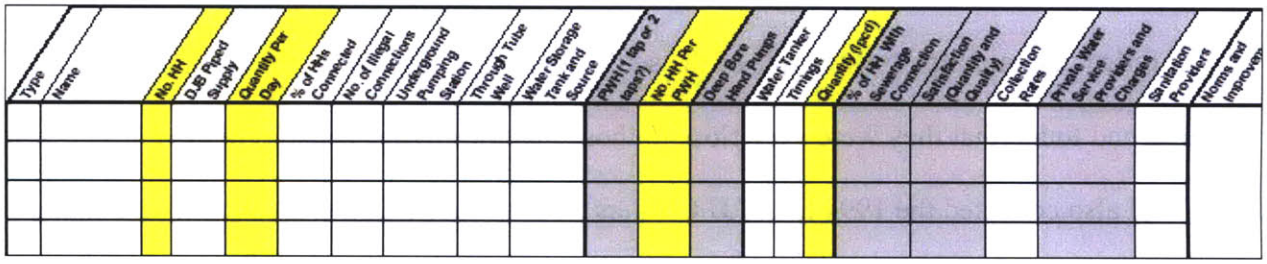

Figure 5.4: Matrix of Services in Settlements
Matrix that I used in my interviews with DJB engineers (mostly Junior Engineers, since Assistant Engineers and Executive Engineers often lacked the knowledge necessary to engage in these types of detailed discussions and would, hence, call the Junior Engineers to the meetings).

[151] It is important to note, however, that in many constituency areas or wards, two Junior Engineers were assigned: one for water and the other for sewerage. In these cases, the Junior Engineers for water tended not to be able to respond to many of the questions about sewerage in the settlements under their jurisdiction, and, similarly, sewerage engineers could not respond to questions about water.

[152] Dr. Khosla's assumption had been that the engineers did not know of illegal connections, and that that is why they persisted. This is why CURE thought that the CBIS would need to include illegal connections. However, based on conversations that Mr. Chakraborty and I had with engineers, even when they knew about the illegal connections, there was little they could do about it. One engineer explained how his life had been threatened when he went to a settlement to remove illegal connections made by an ice factory. He also said that removing illegal connections is usually only a temporary fix to the problem since it usually does not take long for residents to reconnect to the DJB network.

The matrix also enabled me to identify the types of information about which the DJB engineers were unclear (see gray columns in Figure 5.4). What I mean by "unclear" is when engineers were unable to provide information for a particular item, or when they were unable to reach consensus about what the correct information was. For example, in any given interview with two Junior Engineers, if one Junior Engineer said that there were four public water hydrants, and the other engineer said that there were only three, I would consider their answer to be unclear.

Finally, the yellow columns in the matrix depict the items for which the engineers could not provide any response, and felt enough frustration to express their desire to find out what it was. These include number of households in a settlement, quantity of water provided per day for JJ Clusters (due to lack of bulk metering), number of households per tap, etc. The engineers also expressed that they wanted the CBIS to provide the exact boundaries for settlements, and the boundaries of MLA constituency areas and wards. These political areas are crucial for the DJB engineers since they are deployed based on these territorial delineations. Additionally, for Wards in which more than one Junior Engineer (JE) worked, the Ward was subdivided into "store" areas (i.e., the areas covered by each of the JE's stores, or offices). Consequently, the final list of information that the DJB officials determined would add value to their work if it was included in the CBIS was as follows:[153]

[153] It is important to note that in addition to these conversations about information gaps, we also had the opportunity to discuss with the engineers the relevance of other data that we were collecting. For example, when we showed them a sample settlement profile, one engineer asked why it was important to know the socio-economic make-up of a settlement. We explained how this information could help identify willingness to pay for various levels of service in a settlement. Another question that engineers asked related to religion. Why do we need to know about what the percentage of Hindus versus the percentage of Muslims in a settlement, and whether or not there is segregation between the two groups? We explained how information about potential social conflicts or segregation practices could help engineers identify an appropriate distribution of water taps in a settlement.

- Quantity of water supplied to settlements through piped distribution system (especially the JJ Clusters)
- Settlement level population
- Number and condition of public taps in a settlement (functional/non-functional)
- Preferences of residents with regards to water and sewerage services
- Residents' willingness/ability to pay for improved services
- Exact boundaries of settlements in the selected zones, both those served by DJB and those that are under the jurisdiction of MCD, DDA, DSIDC[154]
- MLA constituency boundaries
- Ward boundaries
- JE store boundaries

All of the items above were included in the list of data that CURE would collect, except for the quantity of water supplied, MLA and Ward boundaries, which Dr. Khosla explained was outside the scope of the study. The meetings that Mr. Chakraborty and I had with frontline workers confirmed my view that knowledge about the information needs of the DJB officials, as expressed by them directly, is a crucial component of this CBIS development effort, since it helps ensure that the data collected is valued and used by the water utility.

In summary, contrary to Dr. Khosla's initial understanding that the reason why the poor do not get served is that government does not even know that they exist, the reasons are more complex than this. Simply mapping the settlements and making their location and specific service delivery information available to the DJB through a CBIS is not enough; more work has to be done on determining the ways in which this settlement information needs to be shared between those DJB officials who know and those who do not know, as well as determining what

institutional barriers currently exist to improvements in service provision to the poor, beyond the assumed "lack of knowledge."

5.8.1. Information Collection Process

CURE's information collection team consisted of Mr. Sumit Chakraborty (Project Associate), 14 facilitators, and 8 boundary mapping team members. Mr. Chakraborty, as the main coordinator of the data collection process, was responsible for compiling the lists of settlements for each zone and the paper maps of the target areas from the DJB GIS office.[155] He then would assign the settlements to the facilitators and distribute the maps to the boundary mapping team members.

The facilitators, who had prior experience in the use of Planning, Learning and Action (PLA) techniques, collected information on service delivery and infrastructure (see Table 5.2 above) through resource mapping exercises and focus group discussion (including informal conversations that facilitators would have with residents during transect walks). Facilitators were supposed to use the Ten Seeds technique to collect percentage-based information.[156] They would record the information collected on paper, which they would later submit to CURE for inputting into the computer.

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[154] As discussed above, the engineers had a general idea about the boundaries, but these needed to be checked with the boundaries that residents had identified for their neighborhood.

[155] This is ironic since CURE was hired to develop a CBIS on behalf of the DJB because CURE, in theory, was supposed to know the location and boundaries of these settlements (since it had NIUA's CBIS, which contained the boundaries of 1,190 low-income settlements in Delhi as of 1991). However, CURE did not use this information from the CBIS. Rather, it relied on the DJB's lists of settlements. This issue of why CURE could not update the NIUA CBIS information is discussed in greater detail in Section 5.7.

[156] As described in Chapter 3, the Ten Seeds technique is a participatory tool that facilitators can use to obtain percentage information about a variety of topics such as household connections, religion, and typical expenditure mix in the community. Because each seed symbolized ten percent of a whole, facilitators would ask community members to use the seeds to indicate the percentage of connected versus unconnected households, or the percentage of women versus men. For example, to indicate that 70 percent of a settlement's households are legally connected to the DJB network, while the remaining 30 percent are either not connected or illegally connected, residents would place 7 and 3 seeds in the two aforementioned categories, respectively.

The boundary mapping team consisted of planning students from the School of Planning and Architecture who were hired to map the boundaries of settlements and collect general information on number of households in the settlement, average household size, and status of water and sanitation services. They also took photographs to document their findings. The students would draw the boundaries by hand directly on the DJB paper maps, and then submit these maps to Mr. Chakraborty for subsequent digitization.

CURE would then use the information collected by the facilitators and members of the boundary mapping teams to prepare settlement profiles with the objective of providing snapshots of the history, people, and conditions of the settlements. An example of one such profile is provided in Appendix A.[157]

Coordinating the work of the planning students and facilitators proved to be an onerous task. The first major problem that CURE encountered relates to how difficult it became to obtain paper maps from the DJB. Rather than focusing on the information collection process, CURE had to devote a lot of time to calling the DJB on a daily basis and submitting multiple written requests to the DJB for the maps. As a result of these efforts over a period of more than a month, CURE obtained the maps.[158] At first, CURE submitted map requirements that were not clear, which may have led the DJB GIS staff to decide not to prepare the maps. However, once a more detailed map request was submitted, the DJB GIS office still did not provide the maps.

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[157] This settlement profile is more extensive than the typical profile prepared by CURE since it was prepared by Mr. Chakraborty and me immediately following a transect walk that we did with facilitators. Because we used our own notes from our own conversations with residents to prepare that profile, we could write more detailed descriptions than if we had been asked to use a third person's jottings about a settlement we had never visited ourselves (which is what CURE staff had to do for a large proportion of the 300 settlement for which CURE collected data).

[158] The maps that were requested were four maps at 1: 7500/10000 scale of the four target zones, and 15-20 more detailed maps of the zones 1:5000 scale. CURE requested that the geo-coordinates of each map be included in each print.

Why did the DJB GIS office not provide the maps? Some possible explanations are: lack of communication between the Additional CEO and the GIS staff, the time it would require to prepare the large number of maps that CURE was requesting, and NIC restrictions on spatial data. Because the GIS group's head was abroad attending a conference at the time the project was started, the Additional CEO had to communicate directly with the GIS staff. Despite the Additional CEO's orders that the maps be released, the staff did not release the maps. The staff was wary about having to prepare so many maps (more than 20) free of cost to an outside organization. The GIS office wanted to charge CURE Rs.700 per map to recuperate costs related to time and materials. CURE thought this was ludicrous since the CBIS project was commissioned by the DJB. One of the members of the GIS team also felt very uncomfortable releasing information due to NIC's restrictions, which may have been another reason why it took so long for the DJB to provide the maps.[159] Lastly, DJB personnel explained that map making was slow because the lease line to the NIC computer server where the Delhi Base Map was kept was often not working.

In addition to the difficulties in obtaining the maps, Mr. Chakraborty says "we encountered various problems during the data collection process." At times, the facilitators or students could not find some of the settlements on the DJB's list. At other times they found additional settlements that were not on the DJB's list. Mr. Chakraborty dedicated a lot of time to resolving these issues either by getting directions to the settlements from DJB officials or by asking the DJB officials to take him personally to those settlements. Confusion often escalated when settlements had multiple names, or multiple settlements in different geographic locations shared a name. When facilitators or the students found new settlements not included in the DJB

[159] For example, CURE had requested that the DJB include the geo-coordinates of each map print. This staff

list, Mr. Chakraborty would take the time to meet with DJB officials to inform them of the newly-identified settlements in order to reach consensus on the need to add them to the list.[160] Mr. Chakraborty's decision to involve the DJB officials was important for creating a process through which awareness can be generated among zonal DJB officials about poor settlements and the reasons that may have led to their exclusion from the list. This type of awareness raising may prevent other settlements from being excluded in the future.

Another major problem occurred when the resource maps that the facilitators submitted to CURE did not match the boundaries that the planning students would submit. There are a variety of potential explanations for the discrepancy in boundaries. First, if the students and facilitators mistakenly mapped two different settlements, they would inevitably differ. Another more common explanation relates to differences in resident perceptions of their neighborhood. The boundaries that the facilitators identified sometimes differed from those drawn by the students simply because each group had talked to a different set of residents who might not have shared the same perceptions about their neighborhood's delineations. We had anticipated this problem when we had designed the methodology. According to the original methodology, the planning students were supposed to be sent first to the settlements to map the boundaries. These boundaries would then be made available to facilitators for their resource mapping exercises and focus group discussions with residents. However, this sequence in the deployment of the facilitators and planning students could not be implemented due to the great distances in Delhi, the tight project timeline, and the schedule constraints of the planning students.

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member denied this request, stating that it was against NIC policy.

[160] These face-to-face meetings with DJB officials were only held in the South II and III zones. Mr. Charaborty was not able to personally inform DJB officials of the need to add new settlements to the official DJB list in Northwest II and IV because of the physical distance between CURE's office, which is located in south Delhi, and the DJB NW offices.

In addition to the discrepancy in boundaries, the data collected by the facilitators through transect walks and focus group discussions sometimes diverted significantly from those data that the members of the boundary mapping team would collect. A certain degree of diversion was expected due to the informal nature of the data collection techniques. However, large diversions were unacceptable. Hence, Mr. Chakraborty would use the data collected by the boundary mappers to cross-reference the facilitators' data. Whenever there were large discrepancies, Mr. Chakraborty himself would go to a settlement to verify the numbers. For example, for one settlement in one of the south zones, the facilitators reported that there were 600 households, while the boundary mappers reported that there were only 300 households. Mr. Chakraborty went to the settlement himself and found that the household figure was closer to 300 based on his own observations of the neighborhood during a transect walk and on his conversations with residents. This type of cross-referencing between facilitator and boundary mapper's data, coupled by personal visits to some of the settlements, was Mr. Chakraborty's way of conducting quality control during the data collection process.

5.8.2. System Development

As described in Section 5.6.4 above, CURE collected three categories of information that would ideally be incorporated into the CBIS: settlement data collected through focus group discussions; boundaries of settlements mapped by the School of Planning and Architecture students; and resource map data. In this section, I describe the ways in which each of these three categories of data were computerized and integrated into the DJB's GIS.

Settlement Data Collected Through Focus Group Discussions

Facilitators would record the data that they gathered during focus group discussions with residents on a blank settlement profile template.[161] The completed paper-based settlement profile documents would then be submitted to Ms. Mathur (Program Coordinator) for computerization. These paper-based documents consisted of jottings, usually in Hindi, that facilitators made in the field, rather than well-written descriptions or summaries of information collected from residents.

For the South, the people responsible for data entry were Dr. Khosla and Ms. Mathur.[162] For the Northwest zones, Ms. Mathur, Mr. Darshan Mehra (the Supervisor of the facilitators for the Northwest zones), Ms. Geetanjali Seth (a part time employee of CURE) and one other professional inputted the data. Due to the opportunities for data error, or loss during the data computerization process, CURE took various precautionary steps. First, teams of two were assigned to review and manually key in the data into Excel spreadsheets. Second, these data-entry teams would review the settlement profiles carefully at the beginning of the data entry process to identify any gaps in information or illegible jottings. They would mark these problems in a different color in the spreadsheets and keep aside notes to discuss with the facilitators. Once these clarifications were obtained from the facilitators, the information would be inputted into the computer. After all the data had been entered, Ms. Mathur and one other CURE staff member rechecked the final excel sheet for the South zones. The resulting spreadsheet consisted of information on 71 indicators for approximately 300 settlements. The final step of the data entry and integration process was to import the data from this spreadsheet into the DJB's GIS. This last step was completed by Mr. Chakraborty.

Boundaries

[161] This template consisted of section headings of the sample settlement profile provided in Appendix A.
[162] Originally, CURE hired another professional on a temporary basis to help with the data entry in these zones, but he was dismissed because he lacked sufficient knowledge of Hindi.

There were three methodologies that CURE considered for digitizing and integrating settlement boundaries into the DJB's GIS. Rather than presenting only the one that CURE adopted, it is important that I also describe, briefly, the two superior methodologies that CURE rejected due to the restrictions that NIC placed on spatial data sharing and accessibility.[163] The first methodology, which was the one that would have eliminated the need to manually key paper-based input into the computer, involved the use of GPS devices and pocket PCs.[164] Members of the mapping team could have simply physically walked along the boundaries of the settlement, while the GPS device automatically registered the geo-coordinates of their path. These coordinates could have then been downloaded into a computer and quickly integrated with the DJB's GIS in the form of settlement boundaries. The second methodology involved the use of paper maps (along with their respective geo-coordinates), rather than GPS devices. This methodology would have required the boundary mapping team members to hand draw the settlement boundaries on paper maps (1:5000 scale) provided by the DJB. CURE staff could have then scanned these maps and used special GIS software functions to digitize the boundaries and automatically assign the necessary geo-coordinates to the boundaries. The use of this special digitizing software, however, was possible only if the DJB provided the corner coordinates of each paper map with which to geo-register the scanned versions. Without these coordinates, integration into the GIS was not possible automatically.

CURE could not implement either of the aforementioned options despite the advantages that they posed for the project because of restrictions on the ability of NIC and the DJB to share

[163] MapAction's visit to Delhi in August exposed CURE to these methodologies.
[164] CURE was able to obtain 4 GPS devices and 2 pocket PCs for this work. Although these devices were not made available to CURE until after the project had started, access to the technology or cost were not the barriers to incorporating them into CURE's methodology (especially since MapAction agreed to lend the GPS devices to CURE and provide technical assistance free of cost). The real barriers to the use of these technologies were the Government of India's restrictions on GPS devices and spatial data.

critical mapping information. The main issues revolved around the fact that NIC and the DJB would not tell CURE the parameters of the coordinate system they used for their GIS database and paper maps. This limited the use of GPS receivers because information collected by the GPS receivers would not co-register with Delhi's GIS layers unless they used the same coordinate system. If the government had given CURE the coordinate system of their GIS layers, the GPS receivers could have been set up using that system and the data CURE collected could have been integrated into the City's GIS system. Collecting information using the GPS receiver would have been the most efficient method for the over 300 settlements that needed to be mapped. According to a conversation that MapAction and CURE had with NIC, NIC explained that the restrictions on the coordinate information were due to security reasons.

Restrictions regarding the coordinates systems used were not the only governmental limitations imposed on the project. According to CURE, the government of India does not allow importation of GPS receivers unless permission is given through a special request. Due to this restriction, MapAction could not send the GPS devices to CURE from the U.K. in August as had been planned. Instead, Dr. Khosla had to pick them up herself from the U.K. at the end of September. This unnecessary delay in getting the GPS receivers, that resulted from governmental restrictions on GPS devices, was yet another factor that contributed to CURE's decision not to use GPS for data collection.

Given the fact that GPS receivers would not be a viable mapping device, CURE had hoped to use paper maps that were printed with a grid and coordinates using the local Delhi coordinate system. However, NIC and the DJB were even unwilling to give CURE physical maps with coordinate system information. If CURE had applied this scenario, facilitators could have gone into the field with the paper maps and recorded the boundary points of the settlements on the map. Because the maps would have included the local coordinate system, CURE staff

could have simply scanned these maps and then used digitizing software to enter the boundary points (and their approximate X and Y location) into the GIS without the need to manually draw the boundaries on the GIS.

Yet the limitations imposed by government left CURE with no other choice but to adopt a third strategy for digitization and system integration that did not make use of GPS receivers or special GIS digitizing software. The DJB provided maps of areas within the four target zones, without coordinate information. Members of the boundary mapping team used these maps to record data. Several problems arose very quickly. First, because the base map that the DJB currently has for Delhi is based on 1994 satellite images, development had superseded the map information (i.e., roads and housing development that exist in Northwest Delhi today cannot be found on the maps).[165] Without GPS devices or a detailed map of today's road networks, it was very difficult for the planning students to map the boundaries of the settlements in the Northwest part of the city.[166] Second, because the DJB's paper maps lacked geo-coordinates, Mr. Chakraborty's only recourse for digitizing the boundaries that the students had collected was to manually draw the boundaries directly onto the DJB's GIS. This labor intensive task required Mr. Chakraborty to work in the DJB's office itself because NIC restrictions prevented the DJB from releasing a copy of the Delhi base map to CURE.

Although NIC's spatial data access restrictions were inconvenient for CURE because staff could not work on system integration in house, the restrictions also posed a unique opportunity for CURE to involve DJB staff in the data digitization and integration process, and thereby build the capacity of DJB staff to produce the CBIS on their own. Unfortunately, Mr.

[165] NIC developed the maps based on 1994 satellite images taken by the National Remote Sensing Agency (NRSA). NIC is in the process of updating the Delhi base map using 2002 NRSA satellite photos.

Chakraborty could not pursue this path due to problems associated with the lease line, system overload and low morale among the DJB's GIS team. First, the lease line through which the DJB accessed the base map from NIC's server was often down. Mr. Chakraborty said that the lease line was down about 30 percent of the time. He said that he would often go to the GIS office only to learn that the lease line was down and that he needed to return another day. This caused major delays in CURE's digitization and system integration work. Second, the DJB's system was overloaded with information, which hindered the speed in which one could upload or view information. Finally, Mr. Chakraborty described the environment in the GIS office as "very uncomfortable" due to the low morale of the personnel. Low morale resulted from the fact that the employees had been shifted to the GIS cell from other DJB divisions without their consent, and that the work that they needed to do was laborious and monotonous. [167] According to two DJB GIS personnel who I interviewed, they were trying desperately to be transferred out, but did not feel optimistic because DJB management did not want to have to train new people. They felt like prisoners in the GIS office (which is ironically referred to within the DJB as "the GIS cell"). My enthusiasm about their GIS expertise bewildered them as they saw their GIS skills more as a curse than a gift.[168] Mr. Chakraborty also explained that the DJB's privatization and/or

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[166] The Delhi base map does contain proper information for other areas in the city, such as South Delhi, because they were already well-developed in 1994 and, therefore, development has been less than in newly-developed areas in the city, such as Northwest.

[167] The GIS office consists of 12 people who are, primarily, former draftsmen who were transferred to the GIS office without their consent to work on building a GIS for the DJB that would consist of its water distribution and sewerage networks. According to one of the GIS office's employees, it took 12 people 6 years to finish mapping Delhi's water distribution network. They are now in the process of mapping the sewerage network. They do this by going to the field and pairing up with beldars or other lower-level DJB workers to locate the water and sewerage networks using metal detectors. They draw these networks on paper maps, which they then bring to the GIS office for digitization. Digitization is monotonous because they have to manually draw on the computer all the infrastructure network information that they previously drew on paper. They dislike this work very much and would much rather go back to being draftsmen.

[168] Two DJB GIS employees accompanied CURE and MapAction during a one-day field test of the GPS devices and pocket PCs in Haus Kaus Village. The two engineers were quite excited by these technologies and asked us why the DJB was not using them to map their infrastructure. He said that these technologies could significantly cut down the

restructuring plans may be creating a feeling of uncertainty among the GIS personnel. The personnel seem to be wary of new people who come to visit the office, particularly if the people are associated with the World Bank or the reform efforts in general. Reflecting on his experience, Mr. Chakraborty says "one of the days that I was working in the GIS office, a DJB employee approached me and asked me if I was going to take away his job." Finally, certain DJB personnel may have been wary of CURE since Dr. Khosla, Ms. Mathur, and I had pointed out some problems in their data during our initial visit to the GIS office (i.e., the boundaries of the zones did not match the base map).

Information Collected Through Resource Maps

With regard to the resource maps that the facilitators prepared, Mr. Chakraborty scanned the maps. CURE's plan had been to hyperlink them to the settlements on the GIS as *raster* images.[169] However, Mr. Vikram Singh, the Head of the GIS office, did not allow him to do this because the system was already overloaded. Figure 5.5 below provides a sample resource map.

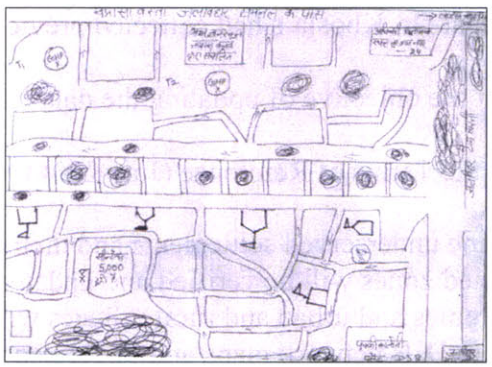

Figure 5.5: Sample Resource Map

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amount of time it would take them to finish building the DJB's GIS. Given their excitement, I told one of the men that I could help them set up a meeting with the Additional CEO so that they could share their experience with the technologies and encourage the DJB to obtain the technologies. As soon as I made that proposal, the man's facial expression changed to a more solemn look; he explained that, despite their excitement about the technology, neither his colleague nor him were willing to assume a leadership role or do anything that would extend their tenure in the GIS office because their number one priority was to be transferred out.

[169] Unlike the digitization process that was undertaken by NIUA, CURE did not plan to convert the raster maps into vector graphics for purposes of a map that could be queried on GIS.

5.9 Results

Unlike NIUA's CBIS production experiences described in Chapters 3 and 4 (which had a strong community organizing component, but little influence over policy), CURE's CBIS project with the DJB lacked a community organizing component (at least in this initial phase), but secured a potentially influential role in policy-making. Not only had the DJB itself commissioned the production of the CBIS, but the DJB was also anxiously waiting for the data in order to guide its institutional reforms. Below are some of the major results of the CURE project, in terms of system integration, identification of reactions to reform, data reliability, influence on policy, and government ownership and community interests.

5.9.1. System Integration and Sustainability

As was described in Section 5.6 above, CURE collected information from approximately 300 communities in the four target zones and then digitized this information directly onto the DJB GIS. System integration, in that respect, was achieved. However, CURE could not update and integrate all of the other data that Dr. Khosla's had collected previously during the NIUA CBIS projects, despite the fact that the objective of updating the data (rather than just simply collecting new data) was stated in the Terms of Reference (July 2004):

> ...the location of low-income underserved settlements and their boundaries [in NIUA's CBIS] in the selected zones will be verified and updated. In addition, data from unauthorized colonies and urban and rural villages will be added. The data will be transferred on to DJB network maps and integrated with their existing databases.

This type of more comprehensive data integration, which involved cross-referencing newly acquired data with previously acquired data, was not completed. CURE did not update the data because NIUA had used a Delhi base map for its CBIS that did not match the DJB's Delhi base map. Had NIC provided the base map to NIUA years earlier, this problem would not have

occurred and CURE would have been able to incorporate NIUA's data and the CURE newly-acquired data into the DJB's GIS. This result would have meant that CURE would have continued building on the previous CBIS, rather than having to start over.[170]

Even though CURE was not able to update or build upon NIUA's CBIS, the fact that CURE integrated its newly acquired data into the DJB's GIS constituted a significant achievement toward advancing Dr. Khosla's vision of getting government to use the CBIS for planning improvements in service to the poor. On March 1, 2005, CURE presented the CBIS to DJB personnel, the Vice Chair of the DJB, as well as WSP. The CURE team presented to the DJB personnel a map of a zone depicting all the slum settlements (JJ Clusters) without piped water supply. According to Mr. Chakraborty, the engineers became fascinated when they saw the resulting images and requested to see more query results, such as the number of JJ Clusters with more than five water hydrants or at least one tube well. Mr. Chakraborty states that "with each query that CURE did, the engineers became more and more excited at what they saw, even though the queries were taking a lot of time to build due to system overload[171] and the slow lease line connection to NIC's server." This positive reaction that engineers had towards the CBIS suggests that the engineers may be willing to use the CBIS for planning purposes, provided it is easy to use and it meets their information needs.

However, there is much more that needs to be done, in terms of system development, capacity building, and data accessibility, if the system is actually going to be used by the DJB for improving serviced in underserved settlements. As discussed in earlier chapters, an integral part of system development is the creation of automatic queries that users can easily access through

[170] As explained in Chapter 3, because of the fees that NIC charges for its Delhi base map, NIUA chose not to use NIC's base map for the first version of the CBIS that it developed during the UNICEF education initiative. Instead, NIUA digitized an Eicher paper Delhi map on its own.

pull-down menus. This type of system customization was not included in the Terms of Reference for the initial phase of the project, but is vital if the system is to be used in the long run by people without GIS expertise.

In addition to system automation, it is necessary to build the DJB's capacity to continue producing the system and maintain it to ensure system sustainability in the long run.[172] On this front, CURE accomplished very little. DJB officials did not accompany facilitators on any visits to settlements for data collection purposes, even though Mr. Kundra said that it was OK for them to visit some settlements with CURE facilitators. Furthermore, CURE's Project Associate did not involve the DJB GIS staff in the data digitization and integration process within the DJB's GIS office. Hence, CURE did not build the DJB's capacity to integrate community data into its GIS. Furthermore, no GIS personnel were trained to use the system, at any level within the DJB. This type of user training is critical for the success of the CBIS. Who within the DJB would use the system? Would it be management staff or frontline workers, or both? CURE did not seek answers to these questions despite Dr. Khosla's hope that the CBIS would some day be used by government.

Both WSP and the DJB's Additional CEO mentioned that certain technical requirements are needed if CBIS implementation is to be a realistic goal. First, it is imperative that the speed for accessing the base map be increased either by improving the lease line connection or by transferring the base map to an in-house server. In addition, the DJB currently stores its own spatial data on its own server. The capacity of the server may need to be expanded due to the large amounts of data that are being collected to prevent system overload. Mr. Waters from

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[171]The DJB's GIS already has too much data, which is why it is so slow.

[172] This does not mean that the DJB would be responsible for producing or maintaining the CBIS in the future, but rather that the DJB is aware of the processes through which the CBIS is produced and maintained. This type of

WSP, who was present at CURE's GIS presentation to the DJB, said "currently the system is too slow for people to use it since it takes approximately five minutes to refresh an image." Also, the Additional CEO mentioned that for engineers to use the GIS, the system would have to be readily available in the zonal offices. This means that GIS should not be centralized in headquarters.

5.9.2. Potential Effects on Organizational Change

Just as NIUA's data gathering processes with residents led to community development (as discussed in Chapters 3 and 4), it is my opinion that the process through which a CBIS is co-produced with government may also have the potential to contribute to organizational change and policy implementation. This opinion is based on certain key interactions that CURE had with DJB officials during the CBIS production process that suggest that CBIS production, if undertaken in a participatory manner with DJB officials, may help uncover some of the tensions and reactions among lower-level DJB officials to reform decisions made by upper management. CBIS production may also help enhance awareness among DJB officials about information gaps that may exist about the current status of services to the poor and the extent to which the needs of the poor differ from those of more affluent neighborhoods. Thomas and Grindle (1990) state "a policy reform initiative can be altered or reversed at any stage in its life cycle by the pressures and reactions of those who oppose it.... The decision process needs to be envisioned as a series of formal and informal stages, with numerous actors, not as a single point with a single decision maker."[173] It is thus necessary to bring to light these tensions in order to address them and sustain the reform through the implementation stage.

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involvement is expected to generate a sense of ownership among the DJB officials and, hence, a potentially higher willingness to use it.

[173] Thomas and Grindle – "After the Decision: Implementing Policy Reforms in Developing Countries", 1990.

So how did CURE's CBIS production process uncover some of these tensions? The first incident relates to an initial meeting that the DJB Additional CEO had with personnel from the division offices of the four target zones to introduce the CBIS project. It was this meeting, where the Additional CEO also introduced the DJB's pro-poor reform plans, which initiated a series of heated discussions among Executive Engineers, a retired Chief Engineer, a Superintendent Engineer, and the Additional CEO about the pros and cons of improving services to the poor. The main arguments in favor of improving services to the poor, which were introduced by the Superintendent Engineer and the Additional CEO, respectively, were (1) that production costs associated with tanker supply (which is the mode of water supply that is often used for poor settlements that lack land tenure) are significantly higher than piped water supply, and (2) that the DJB is obligated to provide water to all under the Supreme Court's interpretation of the Right to Life. However, there was a series of arguments that were raised against serving the poor:

- The DJB is not allowed to extend services to settlements that lack land tenure (based on the High Court order)[174]
- Connecting underserved settlements to the distribution network will strain the system and, thus, further deteriorate services for everyone
- It is technically unfeasible to connect many underserved areas to the network, due to the difficult physical conditions that prevail in these types of settlements.
- Cynicism about the results of willingness-to-pay studies based on the idea that although people in underserved settlements say that they are willing to pay, they will not, because they are used to getting "things" for free.

In subsequent smaller-group meetings that I had with Assistant Engineers, one Assistant Engineer mentioned that he was morally opposed to the DJB reform effort because the new

[174] Interestingly, however, according to a conversation that I had with Mr. N.C. Ram (Executive Engineer – NWIV), the DJB unofficially extends services to areas where there are illegal connections in order to regularize those connections. The DJB will hold special camps (community meetings) in settlements to inform people that penalty

policy planned to charge the poor for water. He believed that water is a basic necessity and that the government should provide free water to the poor. "The government has plenty of money—it is all a matter of how it chooses to spend it," he said. When I asked him to describe the nature of his work in the JJ Cluster that was located in his area, he said that residents of the JJ Cluster were generally polite people who did not complain very much. "I don't think that they feel very comfortable submitting complaints," he said. In another meeting that I held with a different Assistant Engineer and his two Junior Engineers in South III where I asked a similar question about an urban village, the Assistant Engineer exclaimed with disdain that he did not like to go to visit the urban village in his ward because the people there are "village people that throw dung in the drains... they are rude and uneducated... and the network is full of dead ends because of the narrow streets...70 percent of the complaints for my ward come from that urban village alone." Contrary to the first engineer with whom I had spoken, this statement demonstrated a general unwillingness to work in poor settlements due to cultural barriers or difficulties associated with that work. These differences notwithstanding, both statements represent an opposition to the DJB's pro-poor reform agenda.

It is important to note that many of the arguments that were raised by the engineers, such as technical concerns related to straining the existing system and reducing quality of service to everyone, were well-founded and required the DJB to act accordingly. Other arguments, such as those related to prejudices against the poor, also needed to be addressed through awareness raising workshops or other means. The question is, will these concerns be addressed, or will they be forgotten? If they are lost, then the CBIS production process that initiated these conversations had little effect on organizational change. However, if they are subsequently addressed, then the

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fees for illegal connections will be waived and back fees will be reduced if they choose to regularize their

CBIS process may have contributed to establishing a more interactive process of policy design and implementation, whereby policy decisions are refined and changed based on ongoing interactions between stakeholders and learning (see Thomas and Grindle 1990). However, because there was no formal mechanism set up to ensure that the concerns that CURE uncovered through its meetings with DJB officials were not only expressed to DJB management and the World Bank, but also acted upon, the impact of the CBIS production process on policy design and organizational change was minimal.

Lastly, the CBIS production process enabled DJB officials to realize that there were a lot of underserved settlements that they had not included in their formal inventory of settlements. Mr. Chakraborty's meetings with the DJB to review the lists and the additional settlements that CURE was finding was very helpful in enhancing DJB awareness about the magnitude of the underserved settlements.[175] Furthermore, Mr. Chakraborty would draw attention to many of the settlements through his detailed discussions (often complemented with photographs) with DJB officials about the status of services in the settlements. There was also one instance in which Mr. Chakraborty took one engineer to a JJ Cluster that he was visiting for the first time even though it was in his ward. These discussions and visits to settlements can play an important role in sensitizing DJB officials to the needs of the poor and facilitating organizational change.

5.9.3. Credibility and Usefulness of Data

Despite the aforementioned strides in terms of data integration, and the unexpected role of the CBIS production in initiating dialogue and ownership among DJB officials about the DJB's pro-poor reform agenda, CURE faced certain challenges that limited the credibility and usefulness of its data. These challenges relate to CURE's approach to data collection and

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connections.

presentation, which WSP and, to a lesser extent, the DJB found problematic. "CURE's final report raised more questions than provided answers," said one of the members from the WSP team. The main issues identified by WSP team and the DJB Additional CEO were: (1) limited data reliability due to problems with data collection methodology; (2) confusing presentation of data; and (3) the collection of potentially irrelevant data. The subsections below present each of these problems from the perspectives of each of the main actors: WSP, the DJB and CURE. The stark differences in perspectives are evidence of the complexity associated with CBIS production processes and the need for better, ongoing dialogue between the actors involved in the project.

1. Limited Data Reliability

Although CURE has substantial experience in working with communities to gather data for visioning and community mobilization purposes, CURE's data collection activities during the DJB's CBIS project suffered from certain structural problems that limited the reliability of its data for policy-making. Among these problems, the most salient were: inappropriate choice of certain indicators for the chosen methodology (or inappropriate methodology for certain chosen indicators), lack of uniformity in data collection methods, and inadequate quality control measures. These problems are discussed below.

Inappropriate Indicators for Chosen Data Collection Method. CURE's list of indicators for the CBIS included certain types of indicators, such as population figures, average household size or average household income, which could not be reliably estimated through focus group discussions, the chosen data collection method. For example, when facilitators asked a group of residents how many households were in their neighborhood, the residents often provided different responses depending on their level of knowledge of their neighborhood, what they

[175] CURE found 21 new settlements that were excluded from the DJB lists in the South zones.

perceived as their neighborhood's boundaries, or their own definitions of a "household."[176] If facilitators were unsure about the reliability of the information that they were collecting from residents, they would often cross-check the data with other residents or community leaders to adjust the data. But even then, how did the facilitators know what settlement boundaries these leaders had in mind when they provided their population estimates?

Neither CURE, WSP nor the DJB had realized the potential problems associated with the use of focus group discussions for collecting quantitative data such as population figures. It wasn't until CURE compared its population data with the engineering consultants' data (used to prepare the cost estimates for the management contract) that the issues of data reliability for certain variables surfaced. Table 5.4 below provides a comparison of CURE population figures for underserved settlements to the overall population estimates in the two South zones computed by the engineering consultants based on the census data. This comparison suggests that CURE's data collection methods may have overestimated population in the settlements surveyed.

Table 5.4 Comparison of CURE Estimates and Census-based Population Figures
Source: Brocklehurst, C.; Tovey, C. 2005

	Estimated Population of CURE-surveyed settlements	2005 Population from Engineering Report
South II	790,000	767,785
South III	450,000	615,159

The fact that CURE's estimate for a sub-set of settlements of the South II zone exceeds the census-based estimate for the entire zone raised questions about CURE's data collection methodology, as well as the 2001 census. WSP and the rest of the poverty advisors spent a

[176] Mr. Chakraborty himself expressed that, in one of his visits to a settlement to reconcile a discrepancy between the data provided by the boundary mappers (who said that there were 300 households) and the facilitators (who said that there were 600 households), he asked a resident how many people lived in the settlement and the man responded 1 lac or 10 million people. This ludicrous response made Mr. Chakraborty realize how unreliable it was to simply ask residents to tell him population figures for their neighborhoods. Mr. Chakraborty ended up estimating the population to be 300 households or 1,500 people (assuming a household size of 5 people) for that settlement.

significant amount of time trying to explain the discrepancy,[177] but in the end they concluded that it was CURE's methodology, and not the Census information, that was unreliable. This conclusion was based on an in-depth review of CURE's data collection methodology, which suggested that CURE had overestimated population for underserved settlements.[178] Consequently, the Report of the Advisors on Serving the Poor that details recommendations on DJB pro-poor policy and management contract design states:

> There are severe limitations to the [CURE] data. It should be borne in mind that the data were collected using qualitative techniques (Focus Group Discussions, key informant interviews etc.) and not through widespread random sampling. The numbers are therefore estimates, and must be treated as such.

WSP and the poverty advisors' review of CURE's population figures focused on the variables from which these figures were derived: estimates for household size and number of households, both of which were gathered through the focus group discussions, WSP began to review these figures. CURE's facilitators had reported average household sizes of 11 people for some settlements. Based on WSP's direct conversations with the facilitators, there is a possibility that certain facilitators may have increased household size in settlements with a greater proportion of Muslims due to the assumption that families tend to be larger among Muslims than

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[177] For example, the poverty consultants attempted to adjust CURE's population figures by comparing the Census 2001 slum population estimates for the city as a whole (2 million) to those of Delhi State Government and MCD Slum and JJ Wing figures (3.3 million). The poverty consultants assumed that, because the Census focused on only the slums that were legally "notified as slums by the State governments," the Census may have undercounted the slum population by 13% (the difference between the Census figures and the State Government and MCD estimates). Based on this analysis, the poverty team proposed that 50 percent of the JJ population in each of the south zones (approximately 15 and 6 percent of CURE's population figures underserved settlements in Zones South II and III, respectively) be added to the Census figures, which could then be used to estimate costs for engineering works. Yet this approach to reconciling CURE's figures with Census figures was abandoned based on a conversation that WSP had with the Census of India, whereby the Census of India assured WSP that there was no way that the slum population could have been undercounted by more that 2 to 3 percent.

[178] A similar review of the 2001 Census statistical techniques is needed to identify the degree to which the Census may have underestimated population. Although the Census states that the margin of error is between 2 to 3 percent, there is a need for a third-party to verify this claim.

Hindus.[179] Because WSP considered this potential bias unacceptable, average household size was adjusted to 5 people per household across all settlements. But the population figures were still too high. To check the average number of households, the poverty advisors calculated the population density for the settlements. Results considered very high by WSP ranged between 14,000 and 23,000 people per hectare. One settlement reported the unrealistic population density of 109,000 people per hectare. Based on these density calculations, the poverty team identified 17 settlements for which population data needed to be collected again. After visiting these settlements, CURE's Project Associate and a supervisor adjusted the total population figures from 110,000 to 65,000 people, suggesting a margin of error of approximately 50 percent.[180]

At first, CURE had trouble accepting these data reliability issues. In a conversation that I had with Dr. Khosla in January 2005, she stated that even if the data gathering process for the CBIS overestimated the number of people living in underserved settlements, the margin of error could not surpass 10 percent. Even though she did not have evidence to corroborate this claim, she felt very strongly about the ability of her data collection methods to provide useful rough estimates for improving pro-poor policy. Yet with time, as it became increasingly clear that CURE's methodology was more prone to error than other methodologies, Dr. Khosla accepted that a different methodology would have been better for generating population estimates that were of sufficient quality for WSP. However, she still could not understand why "the engineers" were seeking figures that were so exact. In her judgment, rough population figures were

[179] Members of CURE staff, however, state that no such bias occurred. The households that were reported to have 11 people consisted of more than one family.
[180] The population figures for 6 of the 17 settlements were revised downwards.

sufficient for estimating the costs of connecting those households currently without household connections.[181]

The poverty team's inability to reconcile CURE's population figures eventually led WSP to contract with another agency to collect more reliable population data for the JJ Clusters in the South target zones only.[182] This decision to hire another agency to work with Census and their own data is significant because it means that CURE's population data was ultimately not accepted by WSP. Members of the poverty team explained with frustration that they suspect that CURE may have overestimated population figures in underserved settlements in order to bring more attention to the poor, a tactic which backfired because it led the engineering consultants to reject CURE's figures in their cost estimates altogether. This has made it very difficult for the poverty team to ensure that the interests of the poor are included in the World Bank-led reform process.

Lack of Uniformity in Data Collection Methods. CURE's approach to information collection, in general, lacked the rigor necessary for engendering sufficient trust among certain future users of the data, particularly those who are most familiar with random sampling or other statistical techniques to information collection. WSP stated that clear procedures for information collection, including well-defined variables and detailed guidelines, are necessary to ensure uniformity in data collection methodology across settlements. The DJB Additional CEO also shared a similar view. In a conversation that I had with him in March 2005, he stated that

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[181] For example, she stated that the DJB has already determined that, based on a rough population estimate of 400,000 of unconnected residents in the two South zones, the total estimated cost for connecting these residents (assuming a household size of 5) through shared connections for groups of five households is approximately Rs. 5 million. The DJB has stated that this is a reasonable cost and that it can cover it without any problems, especially if the costs are phased in over a 5-year period (the duration of the management contract). (Conference Call held with Dr. Khosla on March 8, 2005)

[182] This agency is CE Info Systems (http://www.mappls.com/), a GIS firm that has collected population data for Delhi.

"information should have been collected in a *scientific* manner to ensure that the same questions were asked in similar ways across settlements."

WSP explained that the fact that CURE did not adequately define variables may have led facilitators, in certain cases, to collect different types of information for the same variables. One of the major sources of contention between WSP and CURE on this front related to the variable "percentage of households with private connections." In a report to WSP, the consultants advising the DJB and WSP on pro-poor policy and management contract design, state:

> The estimates for the number of unconnected need to be treated with extreme caution. These have been calculated using CURE figures for "households with private connections." However, during data collection, it appears that CURE may not have distinguished between private illegal gali taps and legal DJB connections. It is crucial that these figures be clarified, as the estimates for future investments and service requirements are highly sensitive to them.

Based on my conversations with CURE, the variable "households with private connections" meant different things depending on the type of settlement. For example, in JJ Clusters, the variable consisted of households with illegal, private connections since household connections are illegal in JJ Clusters.[183] However, in urban villages, rural villages, regularized-unauthorized colonies and resettlement colonies – the variable "households with private connections" could have consisted of legal and illegal connections because facilitators did not make that distinction when they made inquiries to residents. CURE assumed that, for the most part, these private, household connections were legal, and that any illegal connections were minute. However, the poverty consultants still felt uncomfortable with the variable since, in

[183] It is unclear, however, if this number included only individual, private connections, or if it included shared, private connections as well. This distinction was important because the poverty advisors needed to calculate the number of people with no access to any private connection (shared or individual) or community taps in order to calculate the costs associated with necessary improvements to temporary supply option, such as tanker delivery or storage tanks. Interestingly, however, Dr. Khosla was unaware of this reason when I spoke to her in March 2005, which might explain the bewilderment that the CURE team felt by this and the other numerous, similar, data-related inquiries made by the poverty consultants.

order to reliably estimate the number of unconnected households, they needed to subtract the number of households with *legal*, private connections from the total number of households.

Other examples of variables that were not adequately defined prior to data collection are the household variable itself, as well as the willingness-to-pay variable. What constitutes a household? Is it a group of people living under the same roof? If there are three families living in a housing structure, does one consider the families as three separate households or just one? Do the families need to be sharing a kitchen in order to be counted as one household? What if the people living in the housing structure are not blood-related? With regards to the willingness-to-pay variable, it is not just a matter of asking residents if they are willing to pay for water. More relevant questions are: how much are they willing and able to pay, and for what level of service? These are all examples of questions that CURE did not consider with sufficient detail prior to starting data collection.

Putting aside the confusion about the definitions of certain variables, CURE did try to promote uniformity in its data collection processes across settlements by preparing a detailed guide of questions that facilitators used to lead the focus group discussions. In addition, CURE trained the facilitators to apply resource mapping exercises for collecting spatial information about the settlement, as well as the Ten Seeds techniques for collecting percentage-based information.[184] However, once facilitators began to go out into the field, they found that resource mapping and Ten Seeds techniques were not appropriate participatory methods for non-slum settlements where they found that it was more difficult to get people to come out of their homes

[184] These are techniques that Dr. Khosla's projects at NIUA used extensively in slum settlements. However, they had never been tested in other types of settlements, such as urban villages or unauthorized colonies, which tend to be much larger in size and consist of more affluent residents.

to participate in focus group discussions and resource mapping exercises.[185] As a result, CURE staff decided that Ten Seeds and resource mapping would be done only in slums. In the rest of the settlements, information would be collected only through conversations with residents, without the aid of the participatory techniques that help add uniformity to the data collection process. CURE thus provided facilitators with a lot of flexibility to collect data in the ways that made the most sense to them given settlement characteristics and circumstances of the focus group discussions, which resulted in variable data collection methods across settlements.

While CURE considered flexibility a vital part of any participatory-based rapid appraisal, WSP and the DJB considered the non-uniformity that resulted from this flexibility a shortcoming. WSP was also concerned about how members of the focus groups were chosen and the wide array of focus group sizes (10 to 25 people). Facilitators would form focus groups spontaneously during their unannounced visits to the neighborhoods. There were no pre-set procedures on how to ensure that the people present in the focus group discussion were representative of the rest of the community (except that multiple meetings were held in larger settlements that are more likely to be heterogenous). Furthermore, while some facilitators cross-checked data with the Pradhan or an elderly community leader, other facilitators chose not to review their data with leaders in the community. In the end, CURE learned that a middle ground was needed; one that was characterized by clearly defined variables and more uniform data collection procedures, but at the same time was sufficiently flexible to enable facilitators to adapt to local conditions in each neighborhood. This type of middle ground, however, is difficult to

[185] Facilitators found that, in more affluent areas, people are less willing to come out of their homes to engage in conversations with strangers. In addition, urban villages and regularized-unauthorized colonies tend to be much larger than slums, which makes resource mapping onerous.

achieve due to the significant tension that exists between uniformity (control) and flexibility (autonomy), as this chapter and the previous two chapters suggest.

Quality Control. Divergence in opinion between WSP and CURE also existed with regards to quality control. Whereas CURE believed, particularly at the beginning of the project, that its quality control measures were sufficient, WSP considered CURE's quality control to be ad hoc, at best.

In an effort to ensure data quality, CURE organized two training sessions for field facilitators: the first session (August 6, 2004) introduced the indicators and the data collection methods, and the second session (August 24, 2004) encouraged facilitators to share their experiences during their first two weeks in the field and troubleshoot. In addition, two Supervisors were supposed to check the quality of the data that the facilitators collected by reviewing the data with the facilitators and visiting the settlements themselves, if they found it necessary. As described in section 5.6.3, Mr. Chakraborty also conducted quality control by comparing the data that the facilitators collected on population and household size with the data that the boundary mappers collected. However, with regard to the other indicators for which CURE did not have data from the boundary mapping team, CURE staff did not have an easy mechanism for quality control. Dr. Khosla, Ms. Mathur and others also conducted quality control during data entry by identifying data discrepancies as they keyed in data into the computer themselves. They would then point out discrepancies to facilitators and asked them to return to the field to resolve them.[186] These and other measures are described in more detail in section 5.6.4.

[186] However, Dr. Khosla's and Ms. Mathur's quality control was limited to only those settlements in the South zones for which they entered information. There were three outside people who were hired to do data entry for the

The abovementioned quality control mechanisms were crucial for the CBIS production process and are indicative of CURE's serious approach to the project and its commitment to producing quality data. However, WSP raised some important points about certain gaps in CURE's quality control approach. According to WSP, CURE needed to devote more time to data analysis as a quality control mechanism in of itself. In other words, quality control did not just pertain to information collection and data entry activities. CURE needed to analyze the data for purposes of testing its quality. For example, CURE could have checked the quality of its population figures by calculating population density and other diagnostic measures. These types of calculations could have been conducted during different stages of the information collection process in order to ensure that facilitators were collecting reliable data. WSP also stated that CURE could have conducted an extensive quality check after completing information collection but prior to submitting its data to WSP by triangulating its data, wherever possible, with other third-party sources of data. For example, population figures could have been checked with the 2001 census data. Similarly, infrastructure related information could be checked with DJB zonal staff.

2. Presentation of Data

After the information had been collected, CURE presented its data to WSP and the DJB in the form of a final report in November/December 2004.[187] The poverty advisors reviewed this report and identified numerous problems with the way the data were being presented. "In general, the results in the report are inadequately qualified and their source poorly explained,"

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remaining settlements in South zones. For the settlements in the Northwest zones, the field supervisor entered all of the information collected by the facilitators who he supervised.

[187] CURE also presented its data in a GIS presentation to DJB officials and WSP in DJB headquarters. However, because WSP does not have access to the GIS and its understanding of CURE's GIS work is limited, the data that CURE presented through the GIS did not receive much attention from WSP.

they said.[188] The report was an indication of the difficulties that CURE was experiencing in aggregating qualitative data and presenting it at a scale beyond the neighborhood in ways that were not misleading to people who were unaware of CURE's data collection methods. The poverty advisors provided WSP with a document outlining the various problems that they had identified in the report. Based on the poverty advisors' recommendations, WSP asked CURE to revise the report. Yet the second report, which CURE submitted in January 2005, continued to have various problems. Near the beginning of this version of the report, CURE states: "Since qualitative and not quantitative measures were used to make the rapid assessment, results from the study can only be treated as indicative of the state of services." But CURE then proceeds by presenting information in ways that imply a level of precision that is not warranted by CURE's data collection methods. One example of such language is: "in about ten percent slums about one-third residents paid between Rs. 51-150 for alternate water supply arrangements."[189] According to one of the poverty advisors, in one of the versions of the report that CURE submitted to WSP, CURE provided numbers with up to 2 decimal points. CURE was asked by WSP to revise its report a total of four times during a period of five months. Despite all these revisions, WSP was still unsatisfied with the report.

When describing these data presentation problems, WSP stated that it did not believe that CURE was trying to be deceitful, but rather that CURE may have lacked sufficient research expertise. However, Dr. Khosla recognizes that an important outcome of this project is that the CURE team learned a significant amount about how to present qualitative and quantitative data to people who are unfamiliar with participatory data collection techniques. Ms. Mathur states that she now recognizes that CURE's way of presenting data in tables and graphs led WSP to

[188] Preliminary Report (Second Draft), December 2004

believe that CURE had employed random sampling techniques and household questionnaires, rather than the focus group discussions. She states that "all of the qualitative data could have been coded (0=negative and 1=positive...) rather than just [stated as] as percentages as far as community perceptions are concerned."[190]

3. Collection of Potentially Irrelevant Data

In the DJB Additional CEO's view, much of the information that CURE gathered may be irrelevant for the DJB. He said that a CBIS should contain only the information that is required to inform and enforce pro-poor provisions of the management contract, or some other action-oriented agenda. He said that the type of information that is action-oriented is that which relates directly to the status of infrastructure and service delivery, and the gaps between supply and demand. When I asked him to point out some of the irrelevant information, he said that the names of the MLAs and Ward Councilors were irrelevant for identifying the status of infrastructure and service delivery.[191] He also said that if the DJB were to continue with the CBIS, the number of indicators would have to be reduced.

The Additional CEO's concerns about the irrelevance of certain data suggests the need for CURE to review each of the indicators with the Additional CEO and other DJB officials to determine what exactly they consider relevant or irrelevant, and why. This dialogue is needed because, from CURE's perspective, its data are very relevant for planning and monitoring service delivery in underserved settlements. For example, the number of hours of water supply that residents have reported in September 2004 could be compared to the number of hours

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[189] CURE's Final Report submitted to WSP, January 2005.
[190] Email correspondence, April 5, 2005
[191] Interestingly, however, the names of these politicians are important if this information system is to serve as a tool for service delivery at the settlement level. For example, if a new service upgrading scheme is being devised for a district that requires the involvement of all MLAs and councilors in the zone, the Public Relations office of the DJB

reported by residents a year from now to determine if water supply has improved in the last year. CURE states, however, that the CBIS' relevance stems not just from its data, but also from the processes that CBIS production engenders—such as the dialogue that was generated among DJB officials about the pro-poor agenda (described in sections 5.7.2), or the visits that DJB officials made to underserved settlements with CURE staff, which exposed the officials to areas that they may not have visited previously. Data relevance notwithstanding, CURE agrees with the Additional CEO about the need to limit the number of indicators for which data are collected.

5.9.4. Influence on Policy (Action Oriented)

Because the CBIS project was embedded in the larger reform project, it had a great potential to influence policy from the beginning. In fact, the CBIS was supposed to facilitate analyses of data that WSP and the rest of the poverty team would use to formulate the pro-poor contractual obligations for the management contract and guide pilot projects in specific settlements. This constituted a great opportunity for CURE, an intermediary between government and the poor, to influence policy. While CURE may have influenced policy to some degree (e.g., the December 2004 policy note that CURE helped draft with WSP and Cities Alliance for the DJB), overall CURE was not as influential as it could have been. Despite the problems with CURE's population data which undermined CURE's credibility, other factors that limited its ability to influence policy were: (1) CURE's limited experience with data processing, analysis and presentation; (2) the limited knowledge of WSP and CURE of the management contract design process; and (3) CURE's role as a "champion" for the poor.

1. Data Processing, Analysis and Presentation

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could quickly generate a list of all of these officials from the CBIS, rather than have to ask each Executive Engineer in the district to provide a list.

Although access to data can be a source of power for strengthening arguments and moving agendas forward, CURE was not as empowered by its data as it could have been due to its limited experience in data processing, analysis and presentation[192] -- skills that are vital for strengthening arguments and supporting conclusions. As the poverty advisors state, CURE needed to present its data and conclusions about infrastructure, coverage gaps and resident perceptions in a more coherent manner:

> The data...need to be better presented; the tables showing access to water supply are very unclear and hard to read, and thus make it difficult to ascertain the infrastructure and coverage gaps.[193]

The poverty advisors had so much trouble making sense of CURE's report that they had to put the report aside and draw their own conclusions from the data. The policy recommendations that CURE originally included at the end of its report were also not taken seriously by WSP and the poverty advisors because the recommendations were, in many cases, very general and detached from the data.[194] The following is one such recommendation:

> Data on supply of services to the range of low-income communities suggests that there are clear differences in access to WSS services across the settlements with JJ and slum populations, new resettlement colonies and unauthorised non regularised colonies not connected formally to network supplies and receiving the lowest level of services by way of inadequate and unreliable supply through public stand posts, tanker services or neither. These settlements must be the initial targets in any expansion plan for service expansion.

CURE did not use its data to support the above recommendation. Upon the poverty advisors' own examination of the data, they noticed that, contrary to CURE's recommendation, connection rates are already relatively high in most of the settlements surveyed, except for the JJ

[192] These three areas of expertise includes spatial analysis, which could have employed given the fact that it was building a community-based GIS. Interestingly, no such analyses were included in the report, not even a single map (except for some screen shots of the CBIS presented briefly at the end for exposition purposes only).
[193] Preliminary Report (Second Draft), December 2004
[194] In the end, WSP asked CURE to remove its policy recommendations from its fourth and final report.

Clusters where legal connections are not available and there is the highest incidence of poverty. The poverty advisors thus concluded:

> [I]t is logical that interventions aimed at addressing the needs of the poor should be focused on these settlements [i.e., JJ Clusters]...most of the other types of settlements [which are connected to the network] will see substantial improvement in service as a result of improved service delivery in the Zone as a whole.[195]

The other two types of colonies that CURE recommended for targeting (i.e., resettlement colonies and unauthorized non-regularized colonies) in the DJB's service expansion plan, are not being formally targeted as a group. Perhaps if CURE had included data to support its recommendation, the poverty advisors would have been able to better understand why CURE believed it was necessary to target them.[196]

The fact that the poverty advisors disregarded the report all together means that CURE missed a unique opportunity to influence the conclusions of the poverty advisors. "CURE did not really have a seat at the decision-making table because it did not deliver its end of the bargain...which was to provide useful, reliable data on services to the poor," expressed one of the members of the poverty team. The situation was exacerbated when WSP asked CURE to remove all of its policy recommendations from the report. These problems may be the reason why Ms. Mathur said that if she could do the project over again she would "add more time for data processing and analysis."[197]

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[195] March 2004 report. The poverty advisors used CURE's database to generate a detailed list of settlements that need to be targeted, which consists of all the 94 JJ Clusters surveyed by CURE in the South zones along with 5 unauthorized regularized colonies, 5 unauthorized non regularized colonies and 3 urban villages (which were reported as having households without connections, or it was unclear about the extent of connections).

[196] The question of how to identify people who are truly "water vulnerable" in a way that is not just geographically based was an issue that WSP had asked CURE to address when the project was launched. CURE was supposed to address this issued in its literature review, submitted to WSP one month after the project was initiated. The issue, however, is complex and was only marginally addressed.

[197] Email correspondence, April 5, 2005.

It is too simplistic to conclude, however, that CURE did not exert influence over policy and decision-making just because CURE's report was not as useful to WSP and the poverty advisors as CURE would have hoped. Of course CURE influenced policy; but it influenced it in a different way. CURE had substantial information in the form of photos, videos and stories that enabled CURE to take a personalized approach to the issue of water provision to the poor – an approach that is based on the direct knowledge of those affected by the issue. Through presentations to DJB officials and direct conversations with the Additional CEO and WSP, CURE did influence policy. It just influenced policy to a lesser extent than it probably would have had its report been more useful to the WSP team.

2. Limited Knowledge of the Management Contract Design Process

Another reason why it was difficult for CURE's data to be used to influence policy may have been CURE's and WSP's lack of knowledge of the policy-making process itself. In terms of the management contract design process, for example, both CURE and WSP had little prior experience with this type of work. It was thus difficult for CURE and WSP to know ahead of time what types of community data could be useful for informing this process, and how these data should be collected. Once the information was collected, most of the other information was not used. Instead, WSP focused almost exclusively on the population figures, and paid little attention to the numerous other types of data that CURE had collected or could collect. One member of the CURE team stated:

> Initially when the project was conceived, the focus was as much on qualitative issues as quantitative issues…However, I feel that the WSP ended up focusing only on population figures... [and stopped paying attention to] the quality based targets for the management contract. For example, it is possible to use the data derived from FGDs to say that "x" number of settlements have tanker supplies only and therefore these settlements could be identified to the management contractor as the ones that would require water supply connections within a certain time frame. Simple guidelines and targets for the management contractor

> could have been made which were 'settlement oriented' rather than 'population oriented' as that is how the data collection was designed...It was basically up to the WSP to use the data in an appropriated way and maybe think out of the box rather than follow standard management contract methodologies.

During the course of the project, CURE shared the above viewpoint with both Mr. Waters and Mr. Malick from WSP, but their response was that they had to follow the poverty consultants' point of view. One CURE team member explained that "[t]hey [WSP] were not willing to try something else... their argument being that the poverty consultant had considerable experience with management contracts."

Another example of how resident's local knowledge may be used to better protect the interests of the poor in the management contract is as follows. CURE's data indicates that 90 to 100 percent of households in formal settlements are connected to legal water supplies. Based on this information, the poverty consultants assumed that formal settlements did not need targeting since most households in these settlements were connected to the network and would, hence, benefit from overall improvements to the water distribution system. The people that needed targeting, on the other hand, were those living in JJ Clusters, where households were not legally connected to the network because of their illegal land tenure. This decision was rational given the data that were available.

A limitation of this approach, however, is ---what about the 2, 5 or 10 percent of households in the formal settlements who are not connected? Would these people's interests be jeopardized simply because they do not live in "targeted" settlements? This could constitute a potential area on which local knowledge could shed light. Who are these few unconnected households in these untargeted formal settlements and why are they not connected? Will they be able to connect once the private service provider comes in, or will they need financial or other assistance? CURE's work with communities could help shed light on this issue. The relevant

questions are then, what is the best way to collect this information about non-connected households in formal settlements and in what form should it be collected? The purpose of engaging residents could thus be to answer some of these questions as a means to ensure that the interests of the most vulnerable are considered in the management contract.

Had WSP and CURE had direct prior experience with management contract design, perhaps they would have been able to think together in a more creative manner on how to supplement the conventional data that is typically used in the design of management contracts (such as population estimates) with local knowledge to ensure that the pro-poor provisions in the contract protect the poor as much as possible.

3. CURE's Role as a Champion for the Poor

Finally, the fact that CURE was a local NGO that was representing the interests of the poor, and the poverty consultants were foreigners, may have contributed to some of the misunderstandings that made it difficult for CURE to become part of the policy-making process. One member of the poverty team said that Dr. Khosla assumed an important role of being a "champion for the poor," but that this role may have also at times made it more difficult for CURE to compromise. Dr. Khosla had been a strong proponent of equal standards for all (i.e., household connections for all). This is something that the other members of the poverty team were fighting for, too. However, when it became clear that the DJB could not formally announce a policy to provide household connections in settlements without tenure, a compromise was made, which was to provide shared connections to groups of five households in the settlements without land tenure, and household connections to all other settlements.[198] Yet, according to the

[198] This policy stance was made explicit in an email correspondence from Mr. Ashish Kundra (Additional CEO) to Mr. Cristophe Bosche (World Bank) dated October 24, 2004 in which Mr. Kundra states that "the DJB would be

member of the poverty team with whom I spoke, Dr. Khosla kept pushing for household connections despite the DJB's stated policy stance. This approach, coupled with the reliability issues of CURE's data, alienated her even more from the locus of decision-making. In the end, Dr. Khosla herself began to withdraw in response to the criticisms about her data collection methods, as well as because of time limitations.

Of course there is another viewpoint to be considered. While certain members of the poverty team may have considered Dr. Khosla's unwillingness to compromise a shortcoming, in Dr. Khosla's judgment WSP and the poverty consultants compromised too soon. During a phone conversation that I had with Dr. Khosla in May 2005 she stated that a potential explanation for the readiness of the poverty consultants and the World Bank to compromise may be that they are only transient participants in a long-run effort to improve services to the poor in Delhi. The poverty consultants, she said, are hired on a short-term, contract basis; they are foreigners with no roots in Delhi and their primary concern is to complete the task for which they have been contracted (in this case, the formulation of recommendations for the design of the management contract). Following the completion of these tasks, the contractors return to their respective countries or travel to other countries to fulfill other assignments. Similarly, she stated, the World Bank's (including WSP) primary concern is to ensure that its loan goes through. Once the loan is disbursed, the World Bank's role in the policy reform efforts is reduced to monitoring only. Dr. Khosla's assessment was that, given these realities, overcoming current political constraints to policy reform or establishing measures that would facilitate future reform are secondary activities for both the World Bank and their contractors.

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willing to consider a policy review in providing [JJ Clusters] connections, on a group connection basis…5-10 households."

In contrast, Dr. Khosla, a Delhiite who has been involved in the cause of improving services to the poor in Delhi for decades, is committed to creating change for the long haul. She explained that, although she was delighted when she learned that the DJB had decided to provide shared connections in JJ Clusters, she wanted to push to see just how far the DJB would go. She said that she had hoped to have more support from the World Bank and the poverty consultants (vis a vis the DJB) in advocating a policy that would include household connections. In addition, the fact that the water company in Bangalore had recently begun to provide household connections to settlements without land tenure fueled Dr. Khosla's optimism about securing major advances in pro-poor policy for the water sector in Delhi. She thought that, even if the Bangalore example did not exert enough pressure on the DJB to induce it to adopt a similar stance in the present, certain seeds could be planted for future policy change by getting the DJB to think about alternatives. Dr. Khosla also thought that provisions could be included in the management contract that would require the water company to provide household connections in future years. However, none of these paths were taken because, in Dr. Khosla's view, the poverty consultants and WSP compromised too soon.

5.9.5. Beyond the South Zones and the Management Contract

One of CURE's main concerns about the project is that WSP ended up focusing almost exclusively on the South zones and the management contract design. But as explained above, the goals of the project are much broader than that. First, four zones -- not two – were chosen as target areas. In addition, while CURE's data were to be used to inform the management contract, the data were also supposed to provide a general understanding of the status of service delivery and infrastructure in all underserved settlement, as well as inform pilot demonstration project in

the Northwest zones. But all of these other areas seemed to be put on a backburner during CURE's involvement in the project.[199]

5.9.6. Community Interests Compromised

As stated above, Dr. Khosla's vision was to create a CBIS that would enable the DJB to plan service delivery and infrastructure improvements in ways that would better meet the needs of the poor, as expressed by the poor themselves. Based on this vision, the system would serve as a tool for facilitating a two-way communication between the DJB and the poor. This would require residents of underserved communities to have access to the system in order to update the data that DJB officials could then use to plan for service delivery. In turn, DJB officials would update their data on service delivery in order to communicate with residents.

The fact that the CBIS has been integrated into the DJB's GIS, and is owned solely by the DJB has severely compromised this vision due to the restrictions that NIC has imposed on the DJB that prevents outside organizations from accessing its GIS. Although the public can obtain paper maps, the cost of these maps may be too high for slum dwellers to pay.[200] Consequently, CURE's project with the DJB does may not constitute an example of a GIS that has empowered citizens. Rather, it may disempower citizens because it extracts data from them and hands it over to a government agency that is unwilling or unable to provide the public with access to the data. Government may or may not use these data in ways that would benefit the poor, and there is little that the poor can do to protect themselves from potential negative uses of the data since they have no ownership rights over the data. Furthermore, since the methodology that CURE used for information collection did not incorporate PLA techniques and community organizing, CURE's

[199] One of WSP's explanations for not using the other data is the time it would take to review the reliability of the data, since the problems that were encountered with the data in the South have negatively impacted the credibility of all of CURE's data.

data collection process did very little to help communities better understand their neighborhoods and better articulate their needs to government (something that had been done so well by NIUA in the previous projects described in Chapters 3 and 4).

5.9.7. Relationships between Actors and Future of CBIS?

Unfortunately, the data reliability issues generated much tension between CURE and WSP. From CURE's perspective, WSP had requested a rapid appraisal with rough estimates for population at the beginning of the project. Yet, midway through the project, WSP began to request more exact figures, which the originally agreed upon methodology could not provide. This questioning of methodology, coupled by the constant flow of data related inquiries that ensued for four months, created havoc for CURE's operations as CURE had to spend a lot of time going back out into the field to adjust or justify its data. Furthermore, CURE could not understand why, if WSP knew that CURE's rapid appraisal would be used for informing the design of a management contract, the poverty advisors who were supposed to work on the management contract were not brought in at the beginning of the project to ensure that the proper indicators and data collection methods were chosen.

Members of WSP, on the other hand, said that CURE had assured them that the focus group discussions and participatory techniques were reliable methods for collecting data and that adequate quality control measures were going to be built in. Due to Dr. Khosla's reputation and experience with participatory techniques,[201] WSP trusted Dr. Khosla and agreed to CURE's suggested methodology. However, WSP states that CURE's use of loosely structured focus

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[200] The DJB wanted to charge CURE, for example, Rs. 700 per map.
[201] CURE had also positioned itself as a consulting agency with significant expertise in sound research and community consultation.

group discussions to collect data and its misleading approach to data presentation undermined CURE's credibility.

In the end, when I asked WSP if they would continue funding the CBIS production, WSP said that it was not their decision to make. That if the DJB wanted to continue to produce it, WSP would fund it. When I asked CURE the same question, Dr. Khosla mentioned that it would continue, provided that it could work directly with the DJB with minimal contact with WSP. The DJB Additional CEO seemed ambiguous about how to proceed. On the one hand, he acknowledged that he found it useful to see the spatial distribution of varying service levels in underserved settlements. However, he also said that, if the DJB were to continue, its GIS would have to be decentralized to the zonal division offices to enable DJB officials to easily access the system. He also said that the indicators needed to be chosen more carefully and limited in number. Finally, he commented that perhaps a CBIS would be more appropriate for an agency that focuses on poverty alleviation, such as the Delhi State Government Urban Development Department or the MCD slum wing, rather than a water utility. This final comment is important because it suggests that CURE may have not succeeded in showing the DJB the utility of a CBIS for its own planning purposes. This ambiguity notwithstanding, he did eventually agree to continue partnering with CURE in order to go on with the CBIS production process, provided CURE would find the necessary funds from a third-party organization.

CHAPTER 6 - Analysis and Synthesis

6.1 Overview

This thesis critically examines three projects that aimed to improve basic services to poor communities in Delhi: (1) UNICEF's education initiative; (2) CARE's Promoting Urban Services Linkages for Urban Sustainability (PLUS) program; and (3) CURE's Targeting the Poor Project with the Delhi *Jal* [Water] Board (DJB) and the Water and Sanitation Program (WSP). These three projects tell the story of an extended attempt by one highly committed woman, Dr. Renu Khosla, to develop a community-based GIS that would improve communication between the poor and government, and thereby promote more need-based planning of basic services in Delhi. Over a seven-year period, Dr. Khosla worked with many individuals – first, at a national government agency (NIUA), then in an NGO (CURE) – which helped her take the community-based GIS from an idea to an experimental tool that was integrated into the GIS of the Delhi *Jal* Board, which is the main state agency responsible for water provision in Delhi.

These three projects illustrate the opportunities created when a merger between low-tech participatory mapping techniques and a GIS takes place. However, these projects also highlight the challenges of these types of endeavors, and the limitations of a techno-centric approach to creating government policies that are based on needs and preferences of low-income residents, as expressed by the poor themselves. Although significant strides were made during this seven-year period, the community-based GIS in Delhi remains in production and "trial" mode.

This chapter synthesizes the main characteristics and lessons of this endeavor, starting with the strengths and weaknesses of participatory data collection techniques (i.e., Participatory, Learning and Action (PLA)), the conditions that led to Dr. Khosla's decision to incorporate a

GIS into her work, the impact of this decision, and the benefits and challenges that arose once a partnership was established with the water company.

6.2 PLA Unpacked[202]

The UNICEF initiative and PLUS projects, like most participatory development projects, shared the following themes: (1) bottom-up development; (2) the empowerment of marginalized people (particularly women); (3) a stress on self-help strategies and the private sector (due to a general distrust of government); and (4) the celebration of local knowledge are expert technical knowledge. NIUA, the main implementing agency in both projects, regarded participation as a way to improve services to the poor in a need-based manner. Both projects applied PLA techniques and promoted community organizing to improve school enrollment (in the case of the UNICEF initiative) or community-defined projects (in the case of PLUS). "Participation," however, can be a fuzzy concept. It is thus important to ask the following questions: What types of participation did NIUA's application of PLA foster, and for what types of services? Additionally, what were the limitations of PLA in fostering participation?

6.2.1. Types of Participation

NIUA's application of PLA fostered three types of participation in service delivery upgrading: (1) information sharing and mobilization; (2) decision-making; and (3) implementation (e.g., construction and maintenance in street paving projects). The first type of participation – information sharing and mobilization – refers to direct community involvement in the identification of the communities' needs and expectations, which is particularly important for designing service delivery improvements that respond to the needs, cultural identities, and

[202] This subsection analyzes the major characteristics and lessons of NIUA's application of PLA during the UNICEF and PLUS projects. The difficulties that CURE encountered with PLA are described in Section 6.4.

financial capabilities of communities (Whittington et al. 2000). The design of appropriate service delivery involves participatory needs assessments, as well as campaigns to generate demand for certain services (e.g., campaigns to educate residents about the need for sanitation to reduce public health hazards).[203] This type of participation was the strongest in the NIUA projects, since the facilitators were well-trained in the use of PLA techniques for fostering dialogue and learning, and thus converting tacit knowledge into explicit knowledge. Chapter 4 identifies some limitations of PLA as a local knowledge gathering and learning tool: first, confusion about the priority issues due to inadequate representation of community interests in community workshops, changing circumstances over time, or potential co-optation by facilitators. Second, the difficulties that people with lower education may have in understanding pie charts and other conceptual tools. Yet, these limitations do not mean that PLA was not a helpful tool for promoting dialogue within communities and completing community-based needs assessments.

The second type of participation – involvement in decision-making – relates to "the interaction between internal (local) and external actors who jointly identify priorities, analyze current status, select alternatives, and implement [them...P]articipation is seen as a right, not just as the means to achieve a project's goals" (McCall 2004). An important point regarding this type of participation is that the "internal" and "external" actors involved in decision-making in NIUA's projects were community residents (mostly women) and the facilitators, respectively.[204] In contrast, decisions in which government officials were the external actors were much less common. Most participation in decision-making was related to neighborhood-level, self-help

[203] These outsider-organized campaigns are typically organized by implementing agencies. However, groups or community leaders could also organize campaigns to disseminate information to the larger community.
[204] Although in theory facilitators act as conveners while residents are promoted to the position of "expert," my observations of the dynamics between facilitators and residents (which I describe in detail in Chapter 4) during the PLUS project suggest that facilitators often played more proactive roles.

activities outside of the government realm. Furthermore, there was no joint decision-making with government at the policy level.

Lastly, the third type of participation is the direct community involvement in the implementation of community-defined projects. The NIUA projects consisted primarily of a type of participation characterizable as community involvement in "independent initiatives from, and 'owned' by, local people, and self-mobilization to perform relevant activities" (McCall 2004). This type of participation can include direct involvement in infrastructure construction and maintenance for purposes of replacing government's role in service provision, as with communities in Wazirpur who contributed time and money to pave their own streets. This type of participation can also include time contributed by residents to monitoring the quality of the service improvements made by service providers or community-based groups (e.g., women monitoring the construction of latrines to ensure that they were properly connected to the sewerage lines). In the UNICEF project, members of the Bastee Education committees played an important role in mobilizing parents to enroll their children in school at various times throughout the year (a job that was typically done by the local government teachers only at the beginning of the school year). This type of participation helped community members develop a sense of ownership of whatever project they were working on, which the literature on participation claims leads to improved project outcomes.

Table 5.2 provides a summary of the three types of participation that NIUA's application of PLA fostered.

Table 5.2: Types of participation

Type of Participation	Definition
Information Sharing/Community Mobilization	Participatory needs assessments whereby residents identify their needs and priorities. Outsiders may also intervene by implementing education campaigns to generate demand for certain services that are

	deemed vital for the common good (e.g., sanitation for public health).
Decision-making	Interaction between internal and external actors for joint decision-making.
Implementation	Community involvement in implementation activities (e.g., infrastructure construction and maintenance) as well as independent initiatives.

6.2.2. Types of Service

Proponents of PLA regard it as a highly flexible tool that can be adapted to address various issues in any service sector. NIUA's experience is consistent with these claims. As was shown in Chapters 3 and 4, Dr. Khosla spent a great deal of time adapting the PLA tools (such as household maps, resource maps, and problem matrices) to the various issues that communities selected as priorities. As a result, facilitators were able to work with residents to collect much information on a wide array of issues such as education, family dynamics (e.g., gender roles), street paving, water, sanitation, and employment. This highly versatile nature of PLA tools made it possible for NIUA to pursue its "blank slate" approach in the PLUS project, whereby facilitators would initiate work in the settlements without preconceived notions of what was needed.

6.2.3. Limitations

Although PLA has the potential to foster these three types of participation at the micro (i.e., neighborhood) level, at city levels, beyond the neighborhood, for purposes of allocating resources or devising policy, NIUA's projects exhibited PLA's most significant limitation. PLA was unable to help community residents influence policy. As described in Chapter 1, Abbot et al. (1998) suggest that this limitation may be caused either by the difficulties in scaling up PLA information, or the idea that local knowledge may be presented in ways that policy makers regard as "illegitimate" or unusable. Another explanation for this limitation may be that PLA tools have been designed to collect local knowledge, but not to integrate local with expert knowledge. CURE's project suggests that, while these factors may have played some role, the

main obstacle to influencing policy at a larger scale was not the nature of the PLA tools, but rather the paradigm that the participatory development discourse has induced. As Kothari (2001) states:

> Within participatory discourse a number of binaries or oppositions, are presented (see Chambers 1997), such as 'uppers' and 'lowers', North and South, professional knowledge and local knowledge, which are continuously evoked and rehearsed as plural slogans of participation and empowerment. These dichotomies set up oppositions invested with notions of the morally 'good' and the morally 'bad' (Henkel and Stirrat 2001), and then becomes the main aim of participatory approaches to development to set about reversing them, as reflected in the title of one of Chambers' books, *Rural Development: Putting the Last First* (1983). Participatory methodologies, then, require the formulation and adoption of a framework in which the micro is set against the macro, the margins against the centre, the local against the elite, and the powerless against the powerful.

Cleaver (2001) builds on Kothari's critique of these dichotomies by asking the following question: "Are we not in danger of swinging from one untenable position (we know best) to an equally untenable and damaging one (they know best)?" Such reductionism, I would agree, has resulted in an almost exclusive focus on the micro-level, on people who are considered marginal and vulnerable, and a rejection of the macro. Consequently, it is not surprising that the PLA approach and methods that emerged from this paradigm are not well-suited to affect policy-making.

The paradigm's excessive focus on the micro is also particularly problematic since it leads to an uncoordinated, pluralistic approach to community organizing, which is less politically effective than coordinated, large-scale collective action, preferably linked to a political organization that has the power to provide direct access to decision-making (Houtzager 2003; Moore 2003).[205]

[205] In addition to the ideas of uncoordinated and coordinated empowerment, Moore (2003) distinguishes between individual and collective empowerment: the former taking place at the level of the individual while the latter is considered to be a collective phenomena. Although NIUA stated the importance of collective empowerment (even if

6.3 PLA-GIS Merger

The North-dominated discourse on public participation GIS (PPGIS) tends to describe PPGIS in the South as "a spontaneous merger of participatory development methods with geo-spatial technologies" (Weiner and Rambaldi 2004). What are the circumstances under which participatory development practitioners in the South choose to integrate GIS into their work, and how do these circumstances influence the approach to GIS production? Furthermore, what is the impact of GIS on organizational culture or behavior?

During the UNICEF education initiative, the chief factor that led NIUA to discover the potential usefulness of GIS in its efforts to improve primary school enrollment and retention in poor settlements was NIUA's dire need to store and analyze the large amounts of information that the 15 NGOs were collecting from over 150 settlements in Delhi. NIUA's role as coordinator of NGO efforts required NIUA staff to monitor the progress of the NGOs and provide any necessary guidance. The adoption of GIS for data storage, retrieval, and analysis thus seemed like a logical step for NIUA.

NIUA's decision to use GIS thus did not arise from a desire to influence policy-making or help government establish a more integrated, need-based approach to service delivery, but rather from the need to monitor large-scale micro-level work. Consequently, NIUA integrated the PLA-generated data in ways that preserved the community-drawn sketch maps, placing little attention on scaling up and "legitimizing" the data or combining it with expert knowledge. In other words, NIUA digitized community maps just as the communities had drawn them and then hyper-linked them to the Delhi base map. This type of integration prevented the aggregation of

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it was somewhat uncoordinated), NIUA's inability to form independent zonal and neighborhood-level committees (Zonal Committees and Bastee Committees, respectively) may have resulted in greater promotion of individualistic empowerment than collective empowerment.

household and neighborhood data, which kept NIUA from conducting ward, zone, or city-level analyses that would be useful for influencing policy. But this integration was helpful for facilitating the monitoring of the NGOs' micro-level work.

Although Dr. Khosla's GIS did not rescale the UNICEF initiative's focus from the micro-level to the state, it did impact Dr. Khosla's thinking in an important way. Using GIS for monitoring NGO-led work in settlements led Dr. Khosla and her team to realize that GIS could be a potentially powerful tool for disseminating community data to government for facilitating more need-based service delivery. This initial shift in attention towards government was of significant value, given the intense focus on the micro-level and general distrust of government that the participatory development paradigm engenders among people (including myself at the time).

This type of focus on government, however, still fell within the participatory paradigm since it was based on a simplistic view of the state. According to this view, government has little or no truly reliable data on the poor, and thus needs to be "enlightened" by the community-based GIS. Local knowledge is celebrated as the "truth," and the problem of inadequate service delivery to the poor is reduced to a simple problem of information asymmetry:

> Distance between service agencies and the poor in the country, including in Delhi, is wide, with the former steering clear of any engagement with the poor... these agencies are constrained by ineffective/ nonexistent information systems /databases resulting in a governance failure a propos the poor (Khosla 2003).[206]

It is thus not surprising that the solution, from this reductionist view of the problem of inadequate service delivery to the poor, was to inform government about the location and needs of the poor, with the expectation that services would improve accordingly. Efforts to improve

services to the poor were translated into a managerial exercise based on tools, like PLA and GIS, for collecting, storing and disseminating information. These information technologies were placed on a pedestal, so to speak, high above all other possible solutions to improving service delivery to the poor. The assumption was that these tools would make bureaucrats more aware and in touch with the needs of the poor, which would then lead to appropriate service delivery (Rew 1985, Mohan 2001). As Mohan (2001) states, "this belief is based upon a technocratic view of the state, in which it is a 'black box' that responds to 'inputs' in a balanced(?) and rational manner." Such an assumption ignores the presence of power relations and resource scarcity, which make policy and resource allocation decisions highly contentious, political, and unpredictable.

In summary, NIUA's decision to incorporate GIS into its work had nothing to do with its desire to scale up its focus from the neighborhood level to policy or macro-level planning processes, but rather to adequately monitor the large amount of micro-level work of NGOs working under its purview. This led NIUA to integrate the PLA data into the GIS in ways that facilitated micro-level planning (not policy-making) and preserved community drawings. An important impact of the GIS on NIUA was that it enabled Dr. Khosla to begin to think about ways to formally involve the state in her work for purposes of creating systemic change (by using community data to influence more macro planning and policy-making processes). Although this new focus on the state is an important advance in Dr. Khosla's poverty alleviation efforts, it is still within the participatory development paradigm since it continues to regard local knowledge as the "truth," with which the state needs to be enlightened in order to better serve the

[206] Khosla, R. "Community-based Information Systems: A Tool for Efficient and Bottom-up Local Governance." Paper Prepared for the Regional Seminar on Capacity Building in Innovative Approaches to Local Government Management, Seoul, September 2003.

poor. This shift in thinking within that paradigm occurred towards the end of the UNICEF project.

6.4 Government Involvement

Once Dr. Khosla began to focus on the state, how was formal government involvement in the CBIS production process eventually achieved, and what can be learned from the experience of producing a CBIS in partnership with government? This subsection presents four topics that may be of interest to an organization attempting to produce a community-based GIS in partnership with government. These include tensions in approaches, the main lessons of co-production, the challenges of co-production, and the possible disempowerment of community residents.

6.4.1 Tension between Sector-based Focus and Holistic Focus

A tension exists between the need to include data on multiple sectors (for purposes of remaining true to the philosophy of enabling communities to choose their own priority issues) and the need to focus on one sector for purposes of establishing a formal partnership with government. In the PLUS project, this issue was never fully resolved. Recognizing that it was not possible to work with a multiplicity of agencies, Dr. Khosla decided to focus on the water sector mid-way through the project for purposes of establishing a partnership with the water company. But this decision related to partnership building efforts only. With regard to data collection activities, NIUA continued to collect data for multiple sectors in order to remain true to the participatory spirit of the PLUS project, as envisioned by CARE, the donor agency.[207] Had the PLUS project continued, Dr. Khosla would have continued to collect data on a variety of sectors,

[207] Certain PPGIS researchers stress the importance of a multi-sector approach based on the idea that, "from the perspective of neighborhoods, problems are often interlocking" (Barndt 2002).

even though this multi-sector approach was straining CBIS production due to the large amounts of data that facilitators were collecting. This experience suggests the tension between a narrow or broad focus to CBIS production that arises from the desire to be truly participatory by allowing residents to choose their own priorities, while simultaneously producing an information system that would be useful to government.

6.4.2 Main Lessons of the Co-production Process

Once Dr. Khosla became Director of CURE and secured a partnership with the donor (WSP) and the DJB, CURE began to produce a CBIS for (and with) the DJB. The most important lessons of this co-production process were (1) the recognition that government does have knowledge about the poor, (2) the importance of quantitative data and unpacking local knowledge, (3) ideas about why government may be interested in using a community-based GIS, and (4) the importance of establishing direct access to decision-making.

1. Recognizing that Government Does Have Data about the Poor

Prior to partnering with the DJB, Dr. Khosla and her team (including myself) viewed government as a monolithic entity that lacked the information necessary to adequately plan for service delivery in low-income neighborhoods. CURE's working experience with the DJB led CURE to subsequently view government in a different light. CURE learned that zonal engineers (particularly the Assistant and Junior Engineers who are regarded as "frontline" workers) knew much about the location and status of services in low-income areas. The people who did not know were at higher levels of government. Recognizing the existence of these knowledge differentials and the differences in information requirements between different levels of personnel within the DJB is important, since it requires a change in approach from one that focuses simply on providing community-based data to the DJB to one that attempts to build on

what the DJB already knows. This new approach seeks to (1) identify the knowledge gaps at different levels within the DJB, and (2) understand how these knowledge gaps contribute to low-quality services in low-income neighborhoods. Answers to these questions are crucial for designing a CBIS production process that is tailored to the needs of any government agency that is seeking to improve services to the poor. This type of tailoring cannot happen if CBIS production is based on the assumption that government knows nothing.

2. The Importance of Quantitative Information and Specifying Local Knowledge

The issues that the consultants hired by WSP had with CURE's data suggest that, if the purpose of the CBIS is to influence policy-making, it is important for CBIS producers to be open to effectively combining quantitative and qualitative information. Since both types of information are needed to negotiate policies, a CBIS that consists only of qualitative information may be less useful to policy-makers. Policy-makers will have to search elsewhere for the required information not included in the CBIS. As Bardnt (2002) states,

> [t]here is often a mismatch between those who work with the quantitative information and those who approach an issue from the direct knowledge of persons affected by the issue. Organizations who know the story best often reject the use of quantitative information. They have often learned that political argument can be won with a personalized approach to the issue. But the quantitative and analytical approach to data can also be an important political tool. Ultimately, "stories" can be disregarded if the listener does not accept how typical the cases may be.

The problems that WSP had with CURE's data also suggests that quantitative-minded policy makers may share a general distrust of qualitative data. Data collection methods for qualitative data thus have to be rigorous in order to withstand critique and be regarded as sufficiently reliable for informing policy. CURE's experience with the DJB and WSP casts doubt on the ability of GIS to "legitimize" local knowledge, as the literature suggests. Data used to inform high-profile policy-making processes undergo rigorous inspection; great emphasis is

placed on the rigor with which data were collected and the way data are presented. If policy-makers believe that data are unreliable, there is a high probability that they will not be used.

It is important to note that CURE's experience diverges significantly from the participatory development discourse that celebrates local knowledge over expert knowledge. Both are important. The key is to determine which type is appropriate for which decisions. Furthermore, there are many different types of local knowledge, such as residents' perceptions about safety in their neighborhood, or residents' knowledge about location of water leakages. The pertinent questions thus are "what types of local knowledge are needed for which components of a policy-making process, and what is the most appropriate methodology for collecting them?"[208] When asking these questions, it is important to recognize that PLA-based techniques need not be the only type of data collection methodology used.

3. Why were Government Officials interested in the CBIS?

Practitioners and researchers interested in creating community-based information technologies for establishing closer links between communities and government often ask, why would government be interested in using such systems? In the case of CURE's project, DJB officials at different levels had differing ideas about why they were interested in using a CBIS. The CEO was interested in using the CBIS to monitor service delivery to settlements. He was most interested in the fact that PLA techniques could be used to identify illegal connections, which suggested that his main goal may have been to exert greater control over residents.

The Additional CEO expressed interest in using the CBIS to monitor the effectiveness of customer grievance mechanisms. That is, he was interested in using a CBIS to better monitor his

[208] These questions are much more useful than the questions that are typically asked in the PPGIS literature: How can local knowledge be used to influence policy? Or how can local knowledge be integrated into a GIS that is used to inform policy-making?

frontline workers, ensure greater accountability in service provision, and establish stronger links with the public.

The Superintendent Engineer for south Delhi was interested in developing a CBIS that his zonal staff could use to depoliticize the budget process (i.e., the CBIS would serve as technocratic tool that zonal staff could use in conjunction with upper management to counteract unreasonable works demanded by politicians).

Lastly, zonal staff members were interested in using a CBIS as a tool that would help them prepare presentations to the Additional CEO about the number and type of settlements, and the status of services in their zones.[209] The staff take these presentations very seriously. The thought of having all of their information centralized and easily accessible was very appealing to them.

4. Access to Policy-making (Action)

The fact that the CBIS production process was directly linked to action (i.e., informing management contract design and, subsequently, pilot demonstration projects) was very important because it recognized that there is a continuum from data to information to action. However, CURE's experience in working with WSP and the DJB shows how challenging it can be to turn data into information that can be useful in a public policy context; it requires in-depth knowledge of the policy-making process (in this case, the management contract design process), and experience in data processing and analytical techniques. Chapter 5 presented the difficulties that CURE encountered in both of these areas, which not only prevented CURE from developing data that policy-makers found useful for decision-making, but also limited CURE's ability to influence the design of the pro-poor provisions for the management contract. Despite these

difficulties, the fact that CURE was able to secure a partnership with WSP and the DJB that linked data collection to an action agenda was quite an accomplishment.

6.4.3 Lessons about Obstacles to Production

The main challenges that CURE encountered during the production process resulted from (1) difficulties in applying PLA, (2) government restrictions, (3) clashes in communication between project actors, and (4) absence of key players at the beginning of the production process.

1. Difficulties in Applying PLA

As discussed in Chapter 5, CURE experienced great difficulty in applying PLA techniques for data collection. According to the original methodology that CURE had set forth for data collection, facilitators were to use resource mapping and Ten Seeds techniques to collect much of the data from communities. Yet CURE ended up using these techniques in JJ Clusters and rural villages only; a separate methodology, which relied on loosely structured focus group discussions only, was applied in urban villages and unauthorized colonies.

Because there is much concern about the potential of GIS to foster the rational planning model among grassroots organizations, it is critical to ask why CURE experienced such difficulties using PLA. Do these difficulties suggest that CURE was abandoning PLA because it needed to collect data in ways that could be more easily integrated into the GIS? The answer to this question as of the time of this writing is no. A close examination of the project suggests that CURE's difficulties in applying PLA may have arisen from two other factors.

First, the project timeline was such that Dr. Khosla determined that a rapid appraisal, based primarily on loosely structured focus group discussions with minimal use of PLA

[209] These are new presentations that were begun as part of the reform process.

techniques, was more appropriate than more time consuming PLA and community organizing work.[210] To ensure that the data were ready to inform the formulation of the pro-poor provisions for the management contract by October 2004, data collection for over 300 settlements needed to be completed within a period of four months.

Second, facilitators were accustomed to working primarily in JJ Clusters, and had no prior experience working in urban villages, rural villages and unauthorized colonies. Their approach to PLA, while appropriate for the JJ Cluster context, was out of step in other settlements. For example, facilitators expressed that they could not carry out PLA techniques in these other settlements because the residents were more affluent and less willing to come out into the streets to participate in PLA exercises. These settlements also tended to be much larger than the JJ clusters, making it difficult to prepare settlement-wide resource maps in single, half-day visits to settlements.

It is important to note, however, that CURE did make some attempts to streamline the data collection process and facilitate integration with GIS by exploring the potential utility of GPS devices and Pocket PCs. The use of these two devices would have improved data reliability and reduced the amount of time required for data entry, but it also may have created a more top-down method for collecting information. Yet, in the end, CURE did not use these alternative technologies. Hence, although CURE's need to integrate data into the GIS may have contributed to CURE's limited use of PLA (as compared to NIUA's use of PLA), evidence suggests that more relevant factors may have been project time constraints and CURE's lack of experience working in settlements that were not JJ Clusters.

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[210] This proposition was based on Dr. Khosla's and WSPs understanding that more extensive community involvement, based on PLA and community organizing, would be pursued in the future during the development and implementation of the pilot demonstration projects.

2. Government Restrictions and Costs

National government restrictions on and costs for spatial data were significant obstacles to the CBIS production process for three reasons. First, the fact that NIC charged a fee for the Delhi base map which NIUA considered too high to pay, led NIUA to create its own Delhi base map by digitizing an Eicher paper map of Delhi. This decision became quite problematic years later when CURE attempted to continue building NIUA's CBIS. Rather than updating NIUA's CBIS in order to integrate it with the DJB's GIS, CURE had to start from scratch because the NIUA base map did not match the DJB's base map (which is NIC's base map). Had the costs associated with the NIC Delhi base map not been an issue for NIUA, NIUA would have used NIC's base map to generate the first version of the CBIS under the UNICEF initiative, which would have facilitated future integration into government agency systems.[211]

Second, NIC restrictions on release of digital spatial data, or coordinate information on paper maps created inefficiencies in CURE's data collection process. These inefficiencies were generated by the fact that the NIC restrictions on spatial data had left CURE with no other choice but to use data collection methodologies that were more labor-intensive and less reliable than other methodologies that would have involved the use of GPS devices, pocket PCs, or digitizing software.

Lastly, because the DJB cannot make its spatial data available to the public due to NIC restrictions, CURE's ability to realize its vision for the CBIS (which involved making the CBIS available on the web and accessible to all) was constrained. This problem was exacerbated by the fact that CURE integrated the community-based data directly into the DJB's GIS. The data thus are owned by the DJB, and neither the community nor CURE have rights over it.

3. Clashes in Communication between CURE and WSP

Engineers and other professionals see the world through a different lens than participatory practitioners. As discussed previously, the participatory development paradigm rejects the role of the expert. It also values indigenous knowledge over scientific taxonomies, has an alternative vision of rigor, gives comparison precedence over measurement, and values visual media more than verbal or alphabetical literacy. These differences in paradigms, compounded by cultural differences (East-West, gender), resulted in significant communication gaps.

4. Absence of Key Players

The poverty experts with whom WSP contracted for the management contract design should have been present at the beginning of the CBIS production process. Indeed, their parameters would have helped ensure that the right data were collected in a manner that would be useful for them. However, the poverty experts had not yet been hired at the time. This experience provides an important lesson, which is that the main actors involved in drafting DJB policy (as reflected in the management contract design) were not DJB officials, but outsiders (staff at the World Bank, and other consulting firms). This is further evidence of the need to deconstruct "government" or "policy-makers" in a public policy context.

6.4.4 Empowerment or Disempowerment?

If empowerment is defined as both (1) the processes through which the poor become empowered (the means to the end), and (2) the end itself (i.e., the actual ability to exercise power) (see Moore 2003: 272), one could conclude that CURE's CBIS production process accomplished neither. Community participation, which is a vital ingredient of both types of

[211] At the time, however, NIUA had not thought about integration with government systems. NIUA was simply trying to build a CBIS for in-house monitoring of NGO poverty alleviation efforts.

empowerment, was minimal in the project. Unlike the participation that was present in NIUA's PLA-based data collection processes and community mobilization efforts (summarized in Table 6.1 above), participation in the CURE project was limited to residents providing information to facilitators. Some knowledge sharing and generation may have occurred among residents during the focus group discussions, but it was minimal compared to the learning that had taken place previously during NIUA's long-term involvement with communities. Hence, from the "process" standpoint, residents were minimally empowered. With regards to the desired outcome, which is to ensure that the voices of the poor influence policy making, empowerment was also weak. Due to the problems in the data collection methods discussed in Chapter 5, much of the information that CURE has collected was not used by the poverty consultants for their management contract design recommendations. As of this writing, the fact that the data may never be fully utilized is problematic because it means that residents who participated in focus group discussions contributed their time for very little benefit. Furthermore, in the absence of a gatekeeper of the data, or community ownership or control over the data, the possibility that the data may some day be used against the residents could result in community disempowerment.

CHAPTER 7 - Conclusion

Participatory or community-based GIS seems like a contradiction in terms. GIS is often referred to as a complex, elitist technology that reinforces top-down decision-making and encourages the use of quantitative data and expert knowledge instead of local knowledge. Participation, on the other hand, is a mechanism for promoting bottom-up planning processes and implementing policies and services that citizens recognize as meeting their needs. How then can GIS be used to promote participation and facilitate the active political involvement of the citizenry, particularly the poor?

In recent years, an increasing number of organizations with a strong commitment to direct democracy have experimented with a variety of GIS applications in an attempt to empower citizens, particularly the marginalized, to influence government decision-making. In the developing world, certain NGOs and government agencies have begun to merge low-technology participatory mapping and other data collection techniques with GIS as a means to transform local knowledge to a form and scale that is effective for policy-making. This merging is particularly useful in many Indian cities, for example, where rapid urbanization, inadequate neighborhood-level data, and the presence of multiple, overlapping government agencies result in ad hoc, reactive approaches to service delivery. The premise is that if local knowledge can be adequately captured and made available to policy-makers and government officials, government will use the resident-generated data to devise more need-based policies and service delivery.

Participatory development practitioners and advocates of public participation GIS thus place emphasis on ensuring that participatory methods for data collection adequately represent local knowledge (e.g., a stress on adapting to the local context and addressing issues of

diversity and differentiation within communities). They also focus on the value of GIS for representing, analyzing, and disseminating local knowledge. That participatory GIS projects seldom make it beyond the production phase and are difficult to sustain over time has led researchers and practitioners to focus on factors that contribute to successful GIS implementation in government agencies and community-based organizations. Examples of some of these factors are sufficient allocation of resources, adequate staffing, timely and sufficient training, and organizational policies and communication mechanisms that support utilization of the technology (informal connections, in the case of community organizations).[212]

My research on the three participatory GIS projects that Dr. Renu Khosla undertook in Delhi over a seven-year period demonstrates that -- while the technical and methodological approaches described above are important for gathering local knowledge, integrating it into a GIS, and ensuring its use by government and/or community organizations for affecting policy— political economy issues related to information gathering and policy-making are vital for understanding the unpredictable nature of participatory GIS projects and their limited influence on policy.

Although there are numerous lessons that can be drawn from the combined experiences of the three projects in Delhi, there are three important findings from a political economy standpoint. First, contrary to the popular belief that government lacks adequate neighborhood-level data on the poor, my interviews with Delhi Water Board junior engineers suggest that frontline workers know a significant amount about the status of water service delivery and infrastructure in settlements under their responsibility. Junior engineers visit these settlements on a daily basis to resolve infrastructure maintenance issues, address other customer

[212] See Azad 1993; Crosswell 1991; Onsrud and Pinto 1993; and Sieber 2002.

complaints, or accompany local politicians to meet with residents and review requested works. The government officials who lack information about the poor are at higher governmental levels and are responsible for making city-wide resource allocation decisions. They are also key players in policy-making.

The aim of participatory GIS projects then is not simply to collect local knowledge and make it available to government, but rather to identify and fill the junior staff's knowledge gaps. In addition, participatory GIS projects need to promote sharing of information on the poor between lower-level staff and higher-level officials, if it is to fulfill its aim of influencing policy. The reasons for the lack of sharing between different levels of government, however, are complex and go beyond the problem of fragmented communication channels. For example, there may be reasons that junior engineers are unwilling to pass on their knowledge to higher-level officials, particularly if the information can negatively affect them or limit their autonomy. Another possibility is that certain information about maintenance-related needs may reach top-level officials, but top-level officials may disregard this information because they favor new construction. These complexities suggest that participatory GIS projects need to take a more sophisticated approach to data gathering and GIS implementation, one that considers the knowledge differentials between and motivations of different groups within the state.

Second, participatory GIS projects that aim to establish closer linkages between low-income residents and government are difficult to devise and implement because the entities involved in these projects (i.e., development practitioners, usually from NGOs, and government/policy-makers) have very different ideologies. In fact, these differences are so great that they often keep these groups from working together. In the most extreme cases, for example, participatory practitioners' distrust of government may be so significant that they may work independently of government by promoting self-help strategies and private sector

participation at the community level. NGOs' primary reason for collecting data on the poor is to help uncover the tacit knowledge that the poor have about the conditions in which they live by converting it into explicit knowledge. This process of knowledge articulation, NGOs claim, empower citizens because it enables them to better express their needs for informing self-help strategies and government decision-making.

Government, on the other hand, may be interested in data on the poor in so far as it facilitates its work or provides it with greater control over society. The moment participatory data collection becomes a political threat to government or reduces its control over the population, the government often abandons the project. For example, the Delhi Water Board wanted to acquire neighborhood-level data not for the purposes of empowering people, but rather for obtaining the support of the poor through improvements to basic services provision. It is for this reason that central government restrictions on spatial data, which prevented the Delhi Water Board from making resident-generated data available to the public, were not an issue for the Delhi Water Board. Spatial data are often highly political and can be used by residents to undermine the autonomy of government. If CURE had required the Delhi Water Board to make public the data that CURE was collecting on its behalf, the Delhi Water Board may have never embarked on the project.

An examination of Dr. Khosla's approach to development over time, however, suggests that NGOs and government need not remain in isolation. For example, prior to uncovering the potential of GIS in promoting more need-based policy-making during the UNICEF initiative, Dr. Khosla worked with communities independently of government. Once she began to integrate local knowledge into the GIS for internal monitoring purposes, however, Dr. Khosla began to consider the possibility of involving government. Although Dr. Khosla had a very simplistic view of government when she finally established a partnership with the Delhi Water

Board (a view that was based on the assumption that government had no data on the poor), the process of participatory GIS production helped her understand the complexities of government. The fact that Dr. Khosla, a participatory practitioner who stresses bottom-up planning and local knowledge over top-down decision-making and expert knowledge, formally established a partnership with government that enabled her to acquire a more nuanced understanding of government's knowledge and motivations suggests that the gap between the ideologies of participatory practitioners and government officials may be reduced over time. This reduction may occur, provided there is an opportunity for the two groups to interact and learn more about each other's views. Perhaps, with time, the Delhi Water Board may better understand the positive implications of having a more educated public, despite the potential loss of government control, and be more willing to make resident-generated and other types of data available to the public. A passionate intermediary or "GIS champion" who understands the concerns of both the NGOs and the government, and has direct experience with the policy-making process, is probably needed to shepherd the project through the various stages of GIS production and implementation. The type of convergence in ideologies that is required to co-produce a participatory GIS, however, is difficult and less common than the natural state of equilibrium, which is for the two groups to work separately. This gap may explain why partnerships between NGOs and government in the production of community-based IT are not common and are often short-lived.

Finally, the third finding, which is an extension of the second observation, emerged from my desire to understand how NGOs or other organizations involved in community development carry out the task of information collection and GIS development, and the implications of this approach on the future use of the information by government officials and policy-makers. CURE's direct contact with communities, coupled with its nimbleness and

flexibility, enabled CURE to adapt its data collection techniques to the local context and the preferences of residents in different settlements. For example, while certain traditional participatory techniques such as community mapping were used in slum settlements, only focus group discussions were conducted in the other types of settlements where more affluent residents are less likely to participate if the other techniques were used. Dr. Khosla's previous work at NIUA also exhibited a high degree of flexibility in an effort to remain true to a truly participatory approach to community development, in which residents determine both the issues on the agenda and the course of action.[213]

Both CURE and NIUA's data collection also valued local constructs over scientific taxonomies, and differences (comparisons) over absolute measures (measurement). Furthermore, Dr. Khosla, like other protégés of Robert Chambers, has an alternative vision of rigor in which credibility of data is built upon trust and rapport with informants and the convergence of information obtained by different methods or facilitators. This type of approach for data collection is very difficult to grasp for government officials and policy-makers who are accustomed to "scientific" data collection methods, such as formal sampling and surveying techniques. Government officials and policy makers also find participatory data collection techniques problematic because the types of decisions they need to make often call for more accurate quantitative information on realities of the poor, which the NGOs often find too complex to quantify. For example, the management contract that the World Bank was preparing on behalf of the Delhi Water Board had a set structure with which the poverty consultants had to work. This set structure required cost estimates based on reliable population data, and there was little opportunity, according to the consultants, to include resident

[213] Although NIUA is not an NGO, it acted as a quasi NGO with regards to the two community-based projects under

perceptions and other types of non-conventional data in the management contract. In summary, the differences in views between NGOs and government about the way data should be collected, coupled with the rigid structure of many current policy-making processes that stress highly accurate and "objective" data, suggest that government officials and policy makers may not be able to use non-conventional resident-generated data even if they want to.

In conclusion, the three projects that Dr. Renu Khosla undertook in Delhi with the help of many individuals, first at NIUA, and then at CURE, provide important insights for participatory GIS projects that aim to promote the use of local knowledge in policy-making. These insights suggest that technical and methodological approaches to GIS production process, which focus on the adequacy of data collection methods from the perspective of diverse communities, securing resources and training users, may result in a project that falls short of intended outcomes because of the political economy of data gathering and policy-making. Consequently, it is imperative to place great emphasis on the processes through which participatory GIS are produced to ensure that dialogue and understanding between the NGOs and policy-makers is maximized. Just as a lot of time has been spent in the participatory development field to develop community-level processes to uncover local knowledge, similar processes need to be devised for unearthing the expert knowledge, motivations and constraints of different groups within government. Furthermore, a politically and technology savvy intermediary or "GIS champion" that adequately understands the concerns of the NGOs and the policy-makers, and has direct experience with GIS development and the constraints of the policy-making process, may be needed. This way the promise of participatory GIS can be fulfilled.

Dr. Khosla's leadership.

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APPENDIX A – Sample Settlement Profile

Ashoka Bindusar Camp (ABC)
Settlement Type: Slum/JJ Cluster

Location: Kailash Hills, South II Zone (Near Harerana Temple)
MLA Constituency No. 6 (Ohkla)
Ward 8 (Sriniwaspuri)

Area (Acres):

Political structure:
Mr. Parvez Hashmi, Local MLA
Indu Verma, Councillor
Mr. Parmeshwar Singh, informal leader
No formal pradhans

Government Personnel Working in the Settlement:
Mr. R.K. Ray, DJB Junior Engineer

History: Ashoka Bindu Sar Camp was established in 1986. It provides housing for informal house servants and laborers who work in nearby affluent colonies in Kailash Hills and its surroundings. With time, this settlement has become well-connected politically. While other camps in the vicinity have been relocated, ABC has not only been able to remain in its current location, but it has also secured various upgrades such as cemented drains, 2 community water pumps, paved lanes, and a Sulabh toilet complex. In addition, 90 percent of the population are ration card holders. In 1990, it was recognized as a JJ Cluster by the MCD.

Population: Approximately 400 households

Household Size: Five to six members.

Education (% of children in school):

Major Community Groups (including thrift and credit):

Major Occupations: The majority of the population comprises of people from informal service sector such as house servants, cooks, dhobis (people who wash clothes), etc. In addition, there are people who belong to the labor class such as factory workers, masons and daily laborers.

Average Income: Rs. 2,000 to 6,000

State of Origin: Thirty percent of the population are from Bihar, 20 percent are from UP and the rest comprises of people from West Bengal, Rajasthan and Haryana.

Caste: Ten percent of the population belong to the high caste such as Brahmins, etc. Fifty percent form the scheduled caste (SC), 30 percent from other backward castes (OBC), and 10 percent from more other backward castes (MOBC).

Religious Distribution: 90 percent of the population is Hindu and 10 percent belong to other religions.

Housing: More than 90 percent of the houses are permanent (pukka).

Water Supply Status:
People get water supply from three main sources:

1. Two Community Pumps
2. Water Tankers
3. Overhead Syntex Tanks

Community Pumps
The settlement has two DJB community pumps, installed in 1998, which provide ground water for drinking and other purposes. One pump is located at the top of the hill on which the settlement lies (See Figures 1 and 2). The other pump is at the bottom of the hill near the entrance to the settlement.

Seventy-five percent of the installation costs were covered by World Vision, an NGO that was operating in the settlement at the time, and 25 percent came from community contributions.

According to Mr. Parmeshwar Singh (the community's elderly informal leader), the pumps require repair once every six months. DJB operators are quite responsive to maintenance requests from the community. Residents have expressed that the water quality is not good (a lot of mineral deposits, as evident from rusted tap). Depth of water table for this pump is at 500 feet. Water is provided to residents twice a day in the morning (6 AM) and in the evening.

Figure 1: Cement structure in which water pump at the top of the hill is located

Figure 2. Water pump at the top of the hill

Water Tankers

People obtain drinking water through water tankers, which come 3 times a day between 5 AM to 8 AM, 11 AM to 3 PM, and 5 to 8 PM. Because the settlement is located on a hill and it's streets are extremely narrow, the tankers come to the main road in the outskirts of the settlement. People spend a lot of time waiting for water (See Figure 1).

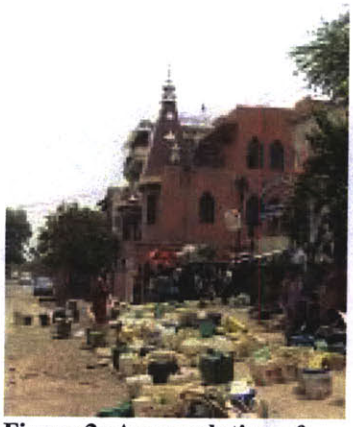

Figure 3: Accumulation of containers at entrance of settlement prior to tanker arrival

When the tankers arrive, it is usually emptied within 5 minutes so those who are not waiting at the side of the road don't get water. Since there isn't enough water for those who do wait, fights occur. After the tanker leaves, people struggle to carry their water up the hill to their homes--bucket by bucket (see Figures 4-6)

Figure 4: Arrival of water tanker

Figure 5: Residents fighting for water

Figure 6: Transporting water back to the home

Overhead Syntex Tanks

There are various overhead syntax tanks located at various parts of the settlement. These tanks provide water for non-drinking purposes. Residents reported that the water is salty so they prefer not to use it for bathing purposes.

Toilets and Bathrooms:

There are no households with individual toilets in ABC. Sulabh International has built a toilet and bathroom facility for the community. It consists of 10 toilets and 5 bathrooms for men, and 10 toilets and 5 bathrooms for women (See Figures 7 and 8). It is managed by a private contractor. Charges are Rs. 1 per visit. Children below 12 years of age and handicapped persons are exempted from the charge. The facility is not well-maintained because of lack of water (people have to carry their own water for toilet purposes). A bore well had been dug near the premises, but has since gone dry due to water table depletion. According to Mr. Parmeshwar Singh (the community's elderly informal leader), there are plans to shut down this facility due to lack of maintenance.

Figure 7: Outflow of waste water

Figure 8: Soiled toilet

Drainage System:
The MCD has provided cemented open drains throughout most of the settlement. Cemented drains are cleaned once per week. Residents hire private sweepers who charge Rs. 20 from each household for cleaning up the choked drains.

Waste Disposal:
Most households had dustbins for disposing the waste. Households hire private waste collectors who collect the garbage from door to door on a daily basis. Households make payments directly to the waste collectors.

Electricity:
Every household has a metered connection and they pay Rs. 2 per unit. The average monthly bill for a household is Rs. 150 to 300. The 2 community pumps also have meters for billing for electricity use.

Other Facilities (Education, etc.):
There is a small primary school in the community, which is run by an NGO.

NGO Presence:
In addition to the NGO that runs the school, World Vision, another NGO, operated in the settlement from 1992 to 1998. They worked in the areas of education, water and health.