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Author

Campbell, Tim

Publication Date

1987-04-01

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Tim Campbell

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For the Urban Poor

Reprint No. 215

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From *Journal of the American Planning Association*, Volume 53, Number 2, Spring 1987.



Applying Lessons from Housing to Meeting the Challenge of Water and Sanitation for the Urban Poor

Tim Campbell

The pace of investments in water and sanitation lags far behind urban population growth in Latin America and the Caribbean. The health consequences of this shortfall amount to hundreds of thousands of deaths annually. This article suggests that a sociotechnical strategy is required, based on the housing experience of the past few decades, to reduce costs of producing sanitation and to minimize the risk of disease. The strategy involves fundamentally altered assumptions about state responsibility for water and sanitation. Concomitantly, beneficiaries must do more to build, operate, and maintain water and wastewater systems.



The prospects for meeting water and basic sanitation goals for 1990 are rapidly diminishing in Latin America and the Caribbean; major revisions in the conventional strategies for investment are now imperative. Urban populations in Latin America could number 220 million by 1990, about 40 percent of them poor and subject to serious health risks. Water-borne diseases could claim hundreds of thousands of lives a year among children.

The challenge by the turn of the century is to extend service to three times as many urban residents as are served today (Campbell 1984). Under conventional approaches, the needed facilities could cost \$37 billion (U.S.) by 1990 and \$50 billion more by the year 2000 (in 1980 prices; Campbell 1984). Those resources are not likely to be available.

This article argues that a new long-range strategy is needed to meet water and sanitation needs and that this strategy should build on the housing experience of the past two decades. As in housing, many prevailing assumptions regarding conventional technologies and centralized delivery of service are inappropriate for low-income communities. A long-range strategy for water and basic sanitation should include revised (lower) standards of service, phased investments, and the use of new, low-cost technology.

Campbell is a research associate at the Institute of Urban and Regional Development, University of California, Berkeley, and a consultant in urban studies and planning. He received a Ph.D. in urban studies and planning from M.I.T. and a master's in city planning from the University of California, Berkeley.

Community participation and self-reliance must be greatly increased to coordinate service improvements with household economic and resource conditions, as well as to protect water and wastewater systems from decapitalization through neglect. Participation of low-income settlements in water and sanitation projects is an opportunity that has only scarcely been tapped in Latin America.

Lessons from the housing sector

The experience in the housing sector over the past two decades contains much of what needs to be known for a new water and wastewater strategy. First, the housing experience has helped to discriminate among the variety of low-income settlement types. Second, within those types we have learned that it is important to understand the conditions governing investment decisions by households. Third, policy-makers must find ways to trigger households' investments and form partnerships among households and water utilities to expand services.

Diversity of settlement types

Low-income areas vary in their ability to pay for water and wastewater services and to organize self-help efforts. The most important settlement types include squatter settlements, which everywhere share an ambiguous or outright illegal jural status; quasi-legal settlements on official streets but without complete compliance with building or subdivision codes; and slums or *tugurios* characterized mainly by extremely

poor conditions and an evolutionary trajectory that is basically degenerative, i.e., decapitalizing.¹ As illustrated in Figure 1, those three settlement types encompass approximately 75 percent of the urban population in Latin America. Public, middle class, and luxury housing comprise the remaining 25 percent.

Figure 1 also relates these settlement types to key variables in basic sanitation. Many residents of "quasi-legal" settlements, for example, can afford water and wastewater service. Perhaps 10 million to 15 million urban residents without indoor water or standpipe service fall into this group of homeowners who bought their dwellings with the expectation of having standard services, or at least of not having to organize and participate in service improvements. The future water and wastewater needs of this group can be met, in part, by using the administrative and police powers of local government to set conditions on land developments or require building permits to ensure the inclusion of basic infrastructure such as sanitation facilities. City authorities may also be able to lower standards to ensure that privately organized settlements are served, for example, with standpipe or trunk line services and some basic or low-cost infrastructure. But this would vitiate whatever legal, moral, or political leverage authorities have over developers in these circumstances.

Squatter settlements, by comparison, get organized to various degrees in the process of settlement and they lack the cloak of legitimacy of quasi-legal settlements: they are illegal outright. Over the years, many

have become familiar and have been accorded a status of worthy adversary by local governments. They are sometimes parties to good faith negotiation with authorities over matters of housing and infrastructure improvements. A thin corporate air is even detectable in some squatter settlements, especially older ones, where the common struggle for survival has infused residents with a sense of cohesion. Above all, a generative process is visible in squatter settlements marked by progressive improvements in shelter and infrastructure. A viable strategy based on experience with self-help and upgrading in housing would be to tap the organizing energies intrinsic to many squatter settlements. In those settlements local participation is relatively easy to elicit. Projects can be executed by special municipal teams collaborating with water utilities, and with local residents and their organizations.

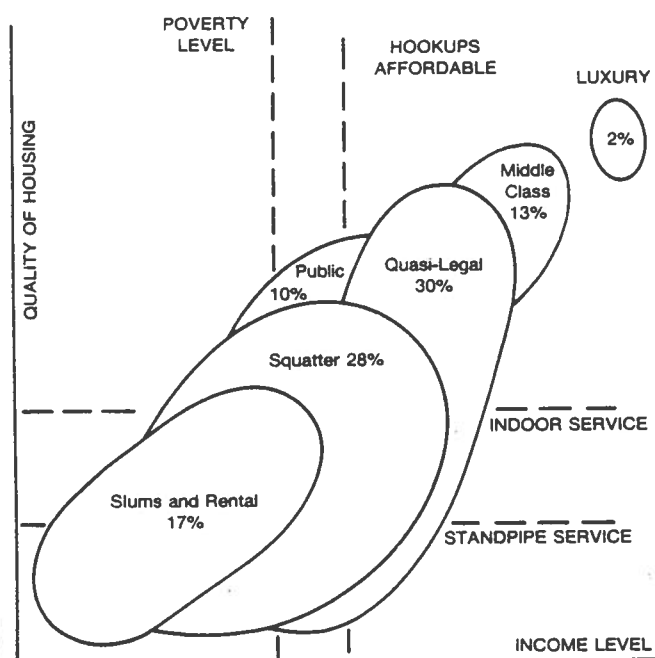
In both quasi-legal and squatter settlements, some form of subsidy is vital to keep monthly utility payments in line with the fluctuating and small incomes of the poor. Thus, more vigorous cross-subsidization may be required, with wealthier customers charged higher rates to help defray costs of low-cost sanitation improvements.

Rarely are cohesiveness or self-help investments found in slums. The intense poverty there, as well as their transitory nature and lack of internal organization, make slums a difficult grouping to improve through self help.

Household investment decisions

Households living in low-income settlements are capable not only of adapting to generally adverse economic, employment, and political conditions, but also of investing in housing and sanitation despite them (Campbell 1980). Experience in housing has shown that low-income households can be induced to make these investments by manipulating two factors that are characteristic features: 1) the variety of resources, both monetary and nonmaterial, in the urban environment and 2) uncertainty. Households may be seen as small production centers that transform this variety of resources, both to offset uncertainty and to meet their basic needs (Turner 1968; Leeds 1974; Marris 1974; Campbell 1980; Strassman 1982; Gilbert 1983). Before committing resources to improvements, households must be sure that investments will not be lost because of the sometimes intermittent nature of their income, vagaries of health, natural catastrophes, or, in squatter settlements, eviction. To reduce uncertainties, households must be able to decide how much of their time and effort should be dedicated to generating and evaluating nonmonetary resources—such as rumors about evictions, tips, suggestions, folklore, and accumulated experience.

Many experiments in low-income settlements in Latin America and the Caribbean reaffirm that reducing



Source: Author

Figure 1. Schematic map of housing and facilities by income level

uncertainty encourages households to mobilize significant monetary and nonmonetary resources and over time to transform them into what are normally public sector goods. In one of the most careful studies of its kind, for example, Strassman (1982: 157) found that by installing water connections to illegal plots in low-income settlements of Cartagena, Colombia, the government "released a zeal to transform and expand" housing and facilities that led to a doubling of housing value across a broad cross-section. The squatters' investments were unleashed when uncertainty was reduced by having sanctioned water provided to illegal plots, thereby effectively conferring a kind of legitimacy. Improvements included roofs, rooms, paint, and kitchens; in 25 percent of the houses, toilets or septic tanks replaced latrines (Strassman 1982: 105). That experience has been replicated in scores of cities, among them Rio, Lima, Santiago, Bogotá, and Mexico City (Cohen 1983; Burns 1983). Extension of water and other services to squatter settlements in Manila resulted in 60 to 85 percent increases in property values (Keare 1983; see also Jimenez 1982).

Ironically, materials and tools are not decisive in this improvement process. New and appropriate technologies, even if cheap, also do not normally trigger household investment, although lowering costs always helps. More important, the household needs to know that whatever resources it commits will not be lost. A second decisive factor is that the cost in terms of personal time and effort must fit the household's budget and organization. Sponsored efforts to improve will fail if they disrupt normal allocations of tasks, jobs, money, and time within a household. This applies equally to individual toilets and do-it-yourself community sanitation systems.

Triggering household investment

To summarize, the most important factor governing the mobilization of dormant resources in low-income communities is uncertainty and the risk of losing resources. The relative success of self-help efforts in expanding housing quality and infrastructure in the past serves as a guide, but not a blueprint, for extending a self-help strategy to the water and wastewater sector. Low income residents are willing to work, and are even able to specify with whom they would collaborate (networks of kin, friends, associates), specifically on sanitation facilities (Elmendorf and Buckles 1980). But to trigger those investments, national and local authorities must be willing to take the difficult steps of acknowledging the legitimacy of the settlements and of helping organize participation by residents to build and maintain systems. Authorities and sponsoring institutions can help mobilize private resources and household investments in a number of ways, including partial investment in infrastructure or

symbolic recognition of the legitimacy of settlements. Recognition can take many forms, including the open engagement of authorities with local settlements through meetings, and letters of acknowledgment, or in the most diluted form, neglect through which authorities decide not to remove settlements over a long period of time.

The groundwork for institutional change

A variety of routes and mechanisms of official sponsorship can accelerate and magnify community participation in self-help efforts to improve the sanitary environment in low-income communities. But there is a great deal of policy and institutional distance to cover. Public utilities must improve their attitudes toward low-income settlements. National governments must give utilities more autonomy, and utilities have to strengthen their management operations. The key lesson from the housing experience in the past decade, however, is that public utilities must learn techniques of community organization and must incorporate household participation in project design and development.

Changing public utilities' attitudes toward low-income settlements

The limited technical and financial resources available to public water and wastewater utilities put them in a position roughly analogous to that of housing agencies 20 or 30 years ago, before self-help and upgrading strategies were formulated. Also, housing institutions then, and public utilities now, do not discriminate among settlement types. Whether squatter settlement or slum, they are seen as urban cancers, "disordered," rapidly growing places of "marginal" populations, incapable of or unwilling to pay for services. From the standpoint of public utilities, low-income populations are as much contributors to a poor sanitary environment as victims of it. They are the locus of lost water and lost revenues through clandestine connections and therefore are perceived as bad investment risks due to theft and the poor prospects of cost recovery.

Cities have grown faster than most public utilities could extend service. The high cost of conventional water and wastewater technologies has forced utilities to abandon master plans, if indeed they ever had them, and concentrate first on extending water to wealthier areas, which are often technically easier to serve and which can pay for service. (In Recife, for instance, low-income settlements occupy swampy terrain classified in the sewerage master plan as "difficult" or "impossible to sewer," i.e., technically or economically unfeasible.) For similar reasons, operations and maintenance of systems are made even more difficult



Squatter settlement in Bogotá, Colombia. (Photo by Shari Kessler)

due to poor access, irregularity of lot layouts, personal threats to utility personnel, or vandalism.

The better water utilities serve perhaps 25 percent of the poor and meter service to most of the wealthier customers. But most utilities have to struggle not only to read meters regularly, but also to transfer data, bill customers, and collect revenues. Arrearages of 20 percent to even 50 percent are not uncommon. Also, the tendency of national authorities to keep rates artificially low for political reasons means in many cases that revenues to utilities do not cover operation and maintenance costs, much less depreciation and interest. Unmetered customers, mainly the poor, are normally charged a "minimum" tariff, which covers about 15 cubic meters (about 3800 gallons) a month, even though many low-income customers actually use far less due to a lack of demand, failure of pressure in the system, or leakages. Unaccounted for water ranges from 25 to 50 percent of the amount pumped into the system. In short, water utilities lose much of the water they produce, cannot bill customers by unit consumption, and in the end, collect revenues for far less than half of all the water they deliver.

For these reasons, water agencies are usually not inclined to mount large campaigns to extend service to the poor.

Loosening central government control

A strong hand at the national level dampens the responsiveness of public utilities to local problems. Most Latin American countries have a national authority or institution that is responsible for policy

regarding services, including tariffs. In small countries, a single national authority has overall authority. Elsewhere—in Brazil, Mexico, Colombia, and Peru, for instance—national authorities set norms and standards that cover state or local agencies. Sometimes, as in Brazil, credit is made available to encourage local companies to build and expand services. A national tariff board in Colombia rules on all rate changes and, until recently, was reluctant for political reasons to approve increases. Thus, genuine desires to improve water and sanitation services for the poor are hampered by national financial and perhaps political constraints. There are many variations on this form of control, but with sharp exceptions, such as Medellín in Colombia and Monterrey in Mexico, the pattern of national authority over cities with less than about a million in population holds generally true across Latin America. If those problems are resolved and utilities are strong enough financially, they will be in a better position to mount a sociotechnical approach to extending services to low-income settlements.

Sharing responsibility with low-income settlements

For many years, international borrowing has been a lever to improve management, financial practices, and technical procedures in public utilities. Ironically, although borrowing money from international sources has led to many improvements, it is the debt burden that has triggered change in attitudes toward low-cost sanitation, at least in Brazil. Brazil cannot afford to provide conventional sanitation for some 20 million

low-income urban residents, despite an existing investment program backed by dedicated internal financial resources and heavy borrowing from the World Bank. This means that, as with housing, low income communities must share the task of supplying water and wastewater services with the government and must assume more responsibility for construction and operation of water and sanitation facilities.

Lessons from Brazil in low-cost sanitation

Numerous pilot projects underway in Brazil are widening the experimental path toward alternative solutions using low-cost technology (Campbell 1986). In dozens of cities, such technologies range from simple pit latrines with hydraulic seals and pour flush toilets to simplified sewerage systems. Those systems are being put in place by state companies, cities, and other executing agencies with significant participation by beneficiaries. City governments have initiated action in many instances because the new "democratic opening" in Brazil with free municipal elections recently has reinforced the political ties between low-income settlements and their local governments. But public utilities invariably get involved because they develop water supplies, wholesale and retail them, treat sewage, and have the most complete engineering expertise.

About 40,000 users in a score of Brazilian cities now benefit from new technologies that cost from a third to a half the cost of conventional wastewater systems. In the Baixada Fluminense, a low-lying area of three million persons in the metropolitan area of Rio de Janeiro, the state water company, CEDAE, has offered condominium sewerage connections² to 4,000 residents and intends to connect most of the rest of the local housing to condominium networks. CEDAE requires that neighborhood groups be organized so that the company can explain the technology, gain access to rear yards, and marshal unskilled labor for the excavation and backfill. This experiment started in Natal, in the Northeast of Brazil, where some 8,000 low-income people were connected to condominium systems developed by the city working with engineers from the state water company and a technician sponsored by the World Bank and the United Nations. The Natal experiment led to similar efforts in many other parts of the country, and the World Bank is considering a large loan to support a full program of low-cost sanitation in the context of Brazil's national water and sanitation plan.

Another, cheaper, experiment is underway in Recife where on-site solutions—improved, ventilated pit latrines—are being built along with drainage improvements in three low-income communities. They can be built for about \$55 (U.S.) per capita, not counting

sheds, collection, and treatment. That compares to about \$125–\$230 for conventional sewerage with treatment (depending on how much treatment capacity is included). Collection and treatment costs of on-site solutions have not yet been established on an operational basis, i.e., when a fleet of vacuum trucks is operating routinely to service urban pit latrines. Authorities in Recife made only little use of unskilled labor, but they did concentrate on sanitary education and training of users in operation and maintenance.

Those experiments are promising but are still only the precursors of operational models that still must be developed. Operational models must overcome several problems that the early experiments uncovered. For one, state water companies have been timid in experimenting with technologies, tending to adhere closely to the condominium model from Natal. Another serious problem is that users of a condominium system in Rio can actually end up paying more up front for low-cost alternatives because CEDAE prorates the costs of excavation for connection and collector lines to a user population proportionally much smaller than the number of users of equivalent conventional sewerage.

Although the Brazilian experiments are developing hybrid technological and institutional formulas, the experiments leave much room for increased local responsibility and control. The most consistently successful record on this score seems to be the water cooperatives organized by the Rural Basic Sanitation Program (RBSP) in Colombia's National Institute of Health. Over the past 20 years, RBSP has refined an operational routine that incorporates community organizational efforts, which result in an average of more than a 20 percent contribution by beneficiaries. Nearly 2,000 rural water systems are successfully operated and maintained by local water boards, which set and collect their own tariffs and maintain average bank balances of \$500. Gradually, RBSP must consider extending its operations into small towns and cities, just as the Brazilians must begin to extend more responsibility to local users.

Thus, one of the most important lessons from Brazil is that the first step in adopting alternative approaches is not necessarily a grand change in national policy regarding the poor. Self-help efforts in housing also went on for ten years before national policy began to change in Mexico, Peru, Brazil, and elsewhere. Of course, legal, financial, and policy reforms are needed. But it is equally important to begin transforming local utilities. They will require new skills in planning, technical, and socioeconomic areas not required at present by conventional technologies. Utilities must greatly expand and refine their information on low-income and hard-to-sewer areas so that they can take advantage of new and emerging technologies that can cut costs by a third. Utilities need to understand the capacities of low-income populations to pay, their

ability to participate in the design, implementation, and operation of wastewater disposal systems, and the importance of education and follow-up.

Conclusions: Toward alternative strategies for water supply and wastewater disposal

Financial resources are not available to meet less developed countries' goals for water supply and wastewater disposal. I have argued that governments and the professional community must make fundamental changes in assumptions concerning standards, approaches, and technologies. Many national and international institutions have combined efforts to develop and improve the engineering, but not yet the commercial, feasibility of alternative, low-cost technologies suitable for low-income urban areas. At least seven major components of a technical, institutional, and socioeconomic nature must still be tackled to mount more effective programs. These are:

1. Formulate a national policy on low-cost water and sanitation together with an investment plan and institutional mandate to mount a program and identify geographical and technical areas of action.
2. Expand the skills and expertise of public utilities to handle the special social and economic characteristics of the urban poor in relation to organization, local participation, and cost recovery.
3. Lay plans for low-cost technology suited to the circumstances of place and population. Most sanitation master plans are geared to conventional sewerage and are unrealistic about the financial feasibility of investment plans. A new kind of streamlined, strategic sanitation plan is needed to bridge the gap between master plans and national program budgets and to reconcile budgetary constraints with the need for improved water and sanitation at the city and district levels.
4. Assess the social, economic, and institutional aspects of technology options so that more informed choices can be made by local decision makers.
5. Experiment with forms of local participation in construction, operation, and maintenance, but also with operations, tariff collection, and administration.
6. Develop more imaginative repayment schemes to reconcile the intermittent nature of income among the poor with the requirements for steady payments to crediting institutions, and establish subsidies to keep costs for the poorest households within the accepted standards of five percent of monthly household expenditures.
7. Develop minor technologies, such as vandal-proof spigot for public standpipes, and designs for drinking water, laundry, and personal hygiene integrated into a single facility so that local communities can control, expand, and administer it.³

Perhaps the most important innovation needed is modification in the *unwritten* standards regarding water and sanitation service. Universal house connections, water-borne sewerage treated at remote sites, and centralized control—of planning and administration by professionals and of captation of water and delivery to individual faucets—constitute unwritten and expensive standards of service, which may not be viable financially or politically. The barely perceptible shifts of power that accompany decentralized control are perhaps what make central authorities most anxious about self-help.

The sociotechnical approach advocated in this article embodies a challenge to those standards. In housing, the challenge was stiffly resisted at first because political leaders were reluctant to give *de jure* responsibility, even if *de facto* they abrogated their obligations to provide shelter. The challenge was resisted also because self-help means lower standards, in accordance with individual and community abilities to pay, and a time frame for finishing stretched out over a long period, at least insofar as achieving conventional service standards is concerned (Turner and Turner 1972). A sociotechnical approach, in effect, sacrifices written and unwritten standards in the interest of short-term gains. Yet housing efforts of the past, and Brazil's low-cost water and sanitation program today, suggest this shift need not be disruptive. In the end, new strategies for water and sanitation must incorporate users to elicit community resolve, handle the minutiae of decisions in, and the unpredictable staging of, household investments so as to fit the delicate balance of household resources.

Notes

1. Others include rooming houses (*cabeca de proco*, or *casas subdividas*); one and two room rental units with shared facilities (in Mexico, *callejon*, in Chile, *conventillo*); temporary government housing; multiunit developments (*unidades vecinales* in Lima, and *conjuntos* in Rio); and proletarian or popular housing (*vilas* in Brazil and *Ciudad Kennedy* in Bogotá) (Leeds 1974).
2. *Condominial* systems refer to an intermediate type of collection characterized by backyard connections that avoid expensive breaking of streets, reduced or zero excavation, user maintenance, and individual cleanouts, and sometimes reduced-diameter pipe. *Simplified* sewerage in Brazil refers to conventional sewerage networks but with reductions in depth of excavation, pipe diameters, and inspection boxes.
3. Work should also be done on biological waste disposal systems such as the Mexican SIRDO (Schmink 1984). The SIRDO (Sistema Integrado de Reciclaje de Desechos Organicos), under study in several locations in Mexico, can serve the waste disposal requirements of between 50 and 150 persons in clusters of households for a cost 40 percent below standard, water-borne sewerage systems. In addition, the SIRDO has the advantage of integrating organic waste, thereby reducing solid waste collection and at the same time producing a high-quality humus fertilizer for sale on local markets. Relatively intense organizational and educational efforts are required to launch this system, although organizational requirements may be expected to diminish as experience and knowledge increase.

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