INSIGHTS

Overcoming the Myths of the North

To help developing countries improve water quality and sanitation, scientists and engineers need to learn the arts of persuasion and cooperation.

BY CHRISTOPHER HAMLIN

A great many of the world's water problems are experienced and resolved on the most local levels. In the developing world, the large-scale turnkey projects of international agencies often don't work as well as the smaller "own-key" projects developed locally. Often, the large projects assume political, financial, professional, and administrative structures that are unavailable in developing countries.

In particular, such projects are usually ill-suited to the needs of the large numbers of poor people, often transients, who occupy temporary accommodations within and around the expanding metropolises of developing countries. Indeed, lack of adequate sanitation is a distinguishing feature of those populations.

Those who live in such communities do solve water and sanitation problems, but rarely in optimal ways. They rely on wells, pumps, and local water sellers; dig latrines; and use other low-tech means. In many cases, public health workers, local and foreign, have helped make such locally appropriate technology solutions significantly more satisfactory.

In cases like this, field experience overcomes professional traditions and training, as well as existing institutions for the application of expertise. Some of the assumptions about problem solving, however, inhibit a more flexible response to the water and sanitation problems of cities in the developing world. Therefore, I propose a different perspective toward the application of expertise.

Problem Solving

In retrospect, the progress in sanitation that occurred in towns in the late 19th and early 20th centuries in America and Europe can seem a mere matter of implementing straightforward technical solutions. In the developed North, our ability to provide water and sewerage to periurban areas—we call them suburbs or housing developments—has generally kept pace with urban growth. For the most part, we have maintained and sometimes improved environmental standards.

Unavoidably, expectations for the developing world are informed by the sanitary achievements of the cities and towns of the industrialized countries and on beliefs, often incorrect, of how those achievements came about. As public health officials and sanitation workers became more professionalized, the difficulties were foreshortened and the successes magnified. Textbook traditions tend to extract soluble problems from complex social, political, and physical situations: thus, engineering education rarely involves immersion in local politics and rarely confronts the possibility that solutions that look good on the drawing board may be

politically uninteresting or otherwise unfeasible. Agencies, whether nongovernmental or public, typically treat hygienic infrastructure in terms of problem solving, assuming that a discrete and definable problem exists, and that a solution needs to be designed and implemented—ideally within a short time frame as dictated by a world driven by annual reports and funding deadlines.

To improve a community's water and wastes systems may seem a straightforward matter requiring only a minimally competent civil engineer. Isn't it just a simple matter of digging some holes, each allotted to its proper purpose? In fact, even with unimpeachable expertise, very modest improvements in public hygienic arrangements can be enormously difficult to achieve. Hygiene, after all, is not a subspecialty of medicine or engineering, but a facet of community life. Local views about which people and actions are clean or dirty, acceptable or outrageous, form key parts of the unwritten rules that govern social life.[1] In Gabriel Chevallier's comic novel *Clochemerle*, so minor a matter as the building of a new public urinal disrupts the stability of a French market town.[2] What seem to outsiders like straightforward solutions to clear-cut technical problems involve changes not only in daily life and habits, but in standards of public behavior, familial, gender, political, and economic relations, and even personal identity.

As an historian of science, technology, and public health, I draw on the historical record to reveal how much we misunderstand and oversimplify the problems encountered in creating urban sanitary infrastructure. On the other hand, I also draw on history for general suggestions of how to successfully apply expertise to local water problems in the developing world.

The historical record suggests to me three main myths of the North, templates we have misdrawn from the experience of public health in the industrialized nations, and which continue to inform our intervention in the developing world. The first is that external authority—for example, education, access to expertise or finance, or coercive regulation—is a necessary, and even sufficient, basis for hygienic improvement. The second is that changes in hygiene come about through an orderly pattern of problem-definition, goal setting, analysis, implementation, and assessment. The third is that improved hygiene is mainly a matter of applying general scientific principles to particular cases. I do not suggest that states, experts, or nongovernmental organizations should not be involved in urban water policy. I am calling only for a fuller recognition of, and greater response to, some of the frequently encountered constraints in the establishment of effective measures of sanitation.

Safe Water as Social Action

Revisiting one of the most famous cases of public health improvement will help make clear why those assumptions are inadequate. Consider John Snow's 1854 demonstration of cholera as a water-borne disease. As usually written, the story exemplifies successful applied science. By mapping cholera cases in the epidemic of 1853-1854, the London physician associated cholera incidence with consumption of fecally contaminated water. On the basis of that evidence, Snow predicted that the causal agent of cholera was a particulate microscopic agent, predictions confirmed by Robert Koch three decades later. Once Snow's work was published—and publicized—the onus, and equally the basis, for action passed to governmental bodies. They invested in the new plant that would prevent fecal contamination, though they did so less rapidly than one might expect. This sounds like an exemplary story of external authority, applied science, and a bureaucratic mode of decision-making—until we look more closely at the processes of change.

To start with, Snow's discovery did not mark the beginning of concern about the effects of water on health—that goes far back in western and nonwestern medical traditions. In London, complaints about bad water were central in a campaign for better and cheaper water a quarter of a century before Snow. One might wonder how this could be; the complainers were not thinking of specific water-borne diseases, and they had no epidemiological data nor any satisfactory means of measuring water quality. By the time Snow wrote, sanitary reformers had already directed the public's imagination to environmental quality and, in particular, to contamination by wastes.

Still, even in his own city, Snow's science alone could not compel the kinds of changes we might expect. Contemporaries,

even those who did not take issue with Snow's analysis of the data, did not wholly agree with what Snow had shown. That cholera was transmitted by water in one case did not mean that this was the only, or the usual, means of its transmission. Some accepted that contaminated water had been implicated in the occurrence of the disease, without adopting the view that something in the water was a necessary cause. Some were not convinced that cholera was a specific disease, or, if it was, that a specific disease implied a specific cause. Some demanded that the supposed causal agent be identified and isolated, but even when Robert Koch later identified the cholera vibrio in the early 1880s, this seemed to many authorities not explanation enough, since not everyone who ingested the microbe got the disease.[3]

It was evident that there was some relationship between cholera and contaminated water that warranted further investigation, but that tentative generalization was inadequate to answer the most important question Snow, and those water analysts who accepted his demonstrations, could not answer: Will this water kill me? They could point, with greater or lesser precision, to an increase in the level of risk from ingesting contaminated water. Simply to say, "I don't know," or to refer to the general process of microbial transmission, or the increased likelihood of infection, was unsatisfactory in this particular case, and is not likely to be helpful in similar situations today.

Probabilistic statements in particular are hard to assimilate, especially when they refer to events that may still seem unlikely.[4] Rarely can the sanitation professional guarantee that a particular action—the adoption of public or private water treatment, a change in modes of waste disposal—will completely eliminate fecal-oral disease. People come and go, we can't keep track of microbes, there are too many means of contamination, and technologies of purification may fail, and do, sometimes spectacularly as in the cholera epidemic in Hamburg in 1892-1893.[5]

Regulator's Bind

Snow, too, was fortunate in having little prior connection either to the politics of London's water or to any other institutions that threatened to disturb local social and political stability. There was no reason not to trust his science. There was no basis to brand him as one of "them"—a member of some group that uses science to take advantage of "us."

For many water professionals this will not be the case. Often the first thing people want to ask about an intervening expert is who this character is and what his or her presence portends. Environmental psychologist Michael R. Edelstein has described a phenomenon called regulator's bind that arises in the practice of environmental regulation. No matter how genuine a regulator's concern for the public's well-being, that expert's statements reflect perceptions of the legal status of the problem and the willingness of institutions to deal with it, and are interpreted accordingly.[6]

Whether people find in science a compelling reason to act depends more on who brings the science to the public than on the quality of the science. Moreover, there is no magic point at which science suddenly becomes definitive. Indeed, where consequences of erroneous public action are great, the greater will be the countervailing scientific criticism generated. Water projects often do have high consequences.[7]

Even when we are confronted with a degree of scientific certainty, it's not always clear how to respond. Even if we accept the link of cholera and contaminated water and recognize a public obligation to prevent disease, we could make a good argument for a number of appropriate responses. The following arguments were considered in late 19th-century London and in other towns as they contemplated the construction of sanitary works.

- Since cholera has occurred from water taken from downstream intakes, it could be prevented if the water were taken from higher upstream.
- Since cholera has occurred from drinking water that has been contaminated, it could be prevented by purifying the water before consumption.
- Since cholera has occurred from the contamination of the water by the excreta of cholera victims in particular, disinfection of these substances or sequestration of cholera victims will prevent the disease.
- Since cholera comes from drinking water, it is better not to drink water; better to stick to beer, wine, tea, or bottled water.

Each argument carries assumptions about who is respon-

sible for maintaining public health, and what the possible response may be to do so.

Choosing a Way

In the 19th century, the idea of taking water from upstream was the main response to Snow's demonstration. This assumes that the suppliers of water either bear responsibility for the problem or represent the most practical site for intervention. In Snow's time the suppliers of water were for-profit companies with monopolies of supply, and their interests were judged by many consumers to conflict with their own. Distrust of water suppliers made this solution the most obvious one. Under public pressure, the companies improved water intakes, and eventually, in 1901, public utilities bought out the private water companies. More recently, the supply of water in Britain has returned to the private sector, with regulatory oversight by the state. Where a water supply is publicly built and maintained, it is not clear that this would be the obvious solution.[8]

The second argument suggests that water should be purified before consumption rather than using upstream water that can be presumed uncontaminated. This approach shifts the burden of responsibility for purification. Should the job be contracted out, should it be the responsibility of some unit of local administration, or should it be the responsibility of the consumer? Indeed, one of the responses of the water companies to scientific explanations like Snow's was to accept his demonstration but to argue that the responsibility for purification lay with the end user. Surely, they argued, it was wisest to purify as late in the process as possible in order to neutralize any contamination that might have occurred between waterworks and consumer. In situations where water is stored, and where there are not good household disposal methods, this may be particularly appropriate. At the same time, such an approach may be regarded, as it was by water reformers in London, as a signal to the suppliers of water that they can be reckless about water quality. If there is unequal access and application of in-home means of purification, this solution may be no solution at all, at least if the problem is perceived as a public goal of eliminating disease from a community. If, on the other hand the problem is understood as providing individuals and households with the means to avoid disease, then consumer purification may be an acceptable solution.

The third argument, for safe disposal of waste, assumes that the means are available to do so. If adequate technologies are available to treat wastes, that approach may work well. However, protection by separation of infected people is unlikely to work very well. For diseases with nonsymptomatic carriers or long latencies during which a person may be infective, it will simply be too hard to keep track of the people who are transmitting the microbe. Historically, the isolation, either of the diseased or of the non-diseased, has been one of the most frequent responses of humans to communicable diseases, and it may continue to seem an obvious response. Certainly it requires no expensive technical changes in water supply or waste disposal, nor any bothersome changes in personal habits. In this case, as with the others, culture affects the attractiveness of the option. Where there is significant concern about the "pollution" of local society by "foreigners," such an option may be attractive. In highly cosmopolitan communities, however, it is likely to be much less so.[9]

Given the rise of the bottled water industry in many parts of the world in the past two decades, the fourth option, which might once have seemed to many water professionals outrageous as a circumvention of public responsibility, is again plausible. Snow himself noted that brewery workers near the famous Broad Street pump were remarkably exempt from cholera. People in many cultures and times have used various kinds of watery drinks that provide for the body's needs with less risk of water borne disease.[10]

It may be that people will not take any of these responses. Having heard the scientific evidence, even having heard it many times over in the most graphic language possible, people may still decide that the threat of fecal-oral disease is not high on their list of priorities: the costs of taking any action are simply too high.

20-20 Hindsight

The four options outlined above were created in the context of a centralized water supply and a general acceptance by the state of a responsibility for public health. But those conditions cannot be assumed in all cases,

and where they do not exist, the range of options for providing good safe water will be even larger.

Retrospectively, things are simple: we can see that it was wise to take steps to protect the sources of water. But while our epidemiological and technical knowledge may eliminate some options and clarify the consequences of others, knowledge alone does not provide definitive solutions. Prospectively, plausible options abound. An intervener can try to craft a solution best suited to local institutions and resources, but such crafting falsely assumes those institutions and resources to be static and under-represents how much technical achievement is an art of practical local politics.[11] It also betrays the intervener's own estimation of whose interests matter most and may well generate opposition and fall victim to the problems that generally plague turnkey approaches.

When we focus in on the historical experience of achievement in water and sanitation, we find that the best technical solutions are less important than the questions of who benefits, what the implications are for structures of power and society, and whose knowledge can be trusted. This is the case not merely for the developing world, but for the developed as well.[12] While the public reasons for improvement of water tend to focus on health, need, and amenity, other factors often count more, such as who owns what land, which areas will be served, what labor will be employed, and whose political power will be enhanced by a water project. While engineers and development workers learn to operate effectively in such contexts, engineering rarely recognizes the skills that lie beyond technical knowledge.

Community Action

"Own key" solutions to local water problems are by no means incompatible with the involvement of outside experts. But the expert's role will be different. Most who work on public projects in cultures other than their own agree that it's important to be well versed in local ways. There is less agreement about what to do with that familiarity. Should one be a resource person, available for help once a community has decided, on its own, to embark on some project, or rather should one be an active partisan? If there is a lesson from history, it is that we should not idealize community decision-making and that there is no role which is not partisan in some way. In any community there will already be a sanitary politics, a distribution of power. Often hygienic improvement required appealing to many constituencies with many diverse reasons. The intervener with a sense of the complex history of sanitary improvement, as well as a sense of local social structure, and some appreciation of ethnographic theories and methods, will be much better positioned to intervene effectively to improve water quality.[13]

It is probably unrealistic to expect periurban settlements in the developing world to follow the same evolutionary path as towns in the developed world have done. Often the capital required is not available. Nor are the institutions that guide the expenditure of capital up to the job. Nor for that matter are the water-intensive solutions of the developed world the ideal solutions to problems of sanitation elsewhere. Under these circumstances, it may seem that there is little we can do but stand by and watch. Yet there was and is more to successful sanitation than plenty of money and a powerful state. It would be as wrong to write off periurban communities in the developing world as too poor and anarchic to solve problems of sanitation as to think that they will and should recapitulate the sanitary achievements of urban settlements in the developed world. If public health experts from the North are to contribute to this achievement, they should draw on parts of their history and professional identity that have been suppressed: their ability to *engage* in politics, not to circumvent it with scientific authority. What is now necessary is to recover these lost strains of professional heritage, bring them back into professional education, and rethink the identity of the professional sanitarian in a post-colonial age.■

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NOTES

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2. Gabriel Chevallier, *Clochemerle*, trans. J. Godefroi (Harmondsworth, UK: Penguin, 1951).

3. Christopher Hamlin, *A Science of Impurity: Water Analysis in Nineteenth Century Britain* (Bristol, UK: Adam Hilger, Ltd. and Berkeley and Los Angeles, CA: University of California Press, 1990).

4. Theodore Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, NJ: Princeton University Press, 1995).

5. Richard Evans, *Death in Hamburg: Society and Politics in the Cholera Years, 1830-1910* (London, UK: Oxford University Press, 1987).

6. Michael R. Edelstein, *Contaminated Communities: The Social and Psychological Impacts of Residential Toxic Exposure* (Boulder, CO: Westview Press, 1988).

7. David Collingridge, and Colin Reeve, *Science Speaks to Power: The Role of Experts in Policy-Making* (New York, NY: St. Martin's, 1986).

8. Jan-Olof Drangert, *Who Cares about Water: Household Water Development in Sukumaland, Tanzania* (Linkoping, SW: Linkoping University Studies in Arts and Sciences, 1993).

9. Judith Leavitt, *Typhoid Mary: Captive to the Public's Health* (Boston, MA: Beacon Press, 1996).

10. Daniel Roche, "Le Temps de L'Eau Rare: Du Moyen Age à l'Epoque Moderne," *Annales: Economies, Sociétés, Civilisations* (39) (1984), pp. 383-99.

11. B. Latour, "Aramis, or the Love of Technology," trans. Catherine Porter (Cambridge, MA: Harvard University Press, 1996).

12. Christopher Hamlin, "Reflexivity in Technology Studies: Toward a Technology of Technology (and Science?)," *Social Studies in Science* (22) (1992), pp. 511-44.

13. The interdisciplinary training of water scientists in Sweden at the universities of Gothenberg and Linkoping exemplifies this approach.