Perspective Paper

The Challenge of Sanitation and Water

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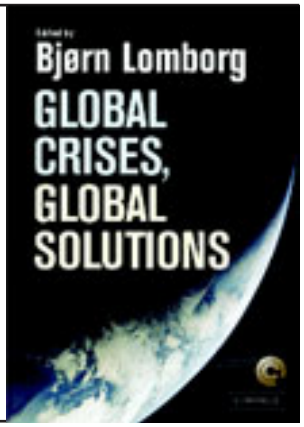

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OPPONENT NOTE ON WATER AND SANITATION

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There can be little question but that Awater and sanitation@ represent one of the great challenges facing the world. Although I have a major concern about Rijsberman=s characterization of the importance of water scarcity in providing water and santitation services, I am in substantial agreement with much of the substance of his paper. I begin this opponents note with a series of short comments on the principal points found in the Challenge Paper. These are matters where I differ only by degree, if at all, with the substance of the paper. Following that I present a more extensive treatment on the general question of water scarcity and argue, contrary to Rijsberman, that the pervasive scarcity of water world-wide and the absence of institutions which allocate it effectively among competing demands is central to the problem of providing adequate water and sanitation services to the unserved.

SHORT POINTS OF COMMENTARY

There are a number of important points in Rijsberman=s paper that invite further elaboration. They are treated briefly below:

The Millennium Development Goal (MDG): The author is correct in identifying the provision of water and sanitation services to the Aunserved@ as a critical challenge. He is also correct is noting that net benefits will likely be maximized by investing jointly in the facilities needed to supply water and wastewater treatment. While it is convenient to use the Millennium Development Goal (MDG) of halving the number of unserved by 2015 as a framework for the quantitative analysis, the goal itself seems unreasonable and unlikely to be obtained no matter how much is invested. If the MDG is to be achieved it will be necessary to bring sanitation services to 825,000 unserved people EACH DAY (between now and 2015). The companion figure for water supply is 581,000 unserved/each day. This goal does not seem physically, institutionally or economically attainable.

Benefit-Cost Analyses: The benefit-cost analysis is incomplete but necessarily so for the reasons that the author advances. The paper contains a good survey of the available cost and benefit data but the data are far from sufficient and the resulting B/C ratio must be interpreted as simply an indicator that the net benefits of the proposed investments would be significant.

Multiple, Combined Interventions: The author notes both explicitly and implicitly that the strategic focus of efforts to address this challenge should be on a combination of interventions including technology and institutions. This point is critically important for, as is noted, here and there throughout the paper, the purely technical solutions of the past have not always solved the water problems to which they were directed and, in some instances, have led to worse problems. In many, many instances, the neglect of institutional problems has undermined efforts to solve significant water problems.

Water and Economic Growth: The evidence cited in the paper confirms the widely ignored notion that water is a necessary but not sufficient condition for economic growth. All too frequently politicians and others assume that the provision of water and sanitation services *by themselves* will guarantee economic growth. The evidence suggests that water and sanitation

must be available if significant growth is to occur but their presence does not assure such growth.

The Role of Desalinization: Desalinization has been widely heralded at one time or another as the solution to many of the world=s water problems. It is true, as the author states, that the costs of desalinization have been coming down but that is not the full story. Desalinization costs are very sensitive to the salinity of the feed water. Desalinization of brackish waters and waters that are mildly saline can be economically justified for some high valued uses. Sea water desalination remains enormously expensive when all costs are fairly accounted for. There is a tendency to promote seawater conversion projects that are joint with power plants. The resulting costs are almost always understated because the power is subsidized and all of the joint costs are allocated to power production. Seawater conversion is unlikely to be the solution to water problems except in a few instances where there are no alternative sources of supply and there is considerable wealth to defray the costs of seawater desalinization..

THE PROBLEM OF WATER SCARCITY

The principal shortcoming of this paper centers on Rijsberman=s assertion in his introductory section that the problems of water supply and sanitation have little to do with water scarcity which, he avers, A..is not the issue for all but the largest cities in dry areas.@ Here it is argued that water scarcity is indeed the issue (floods and flood control excepted) and that the pervasiveness of such scarcity the world over will likely constrain, even severely, the extent to which we are able to provide adequate water and sanitation services to most if not all of the world=s population. Rijsberman notes that A...because water for domestic purposes is of such high value and clear priority that it takes precedence over other uses.@ This argument would be more compelling if reasonably well-functioning markets or other allocative institutions which respond to relative values to ensure that water is allocated to its most valuable uses (more or less) existed and are reasonably widespread. Unfortunately, such institutions are the exception rather than the rule. Additionally, scarcity is further exacerbated by declarations that all have certain fundamental rights to water. The fact is that water is not freely available nor freely allocable as between domestic, agricultural, environmental and other uses. It is for this reason that communities in both dry and humid areas struggle to obtain the water supplies needed to support existing and anticipated population and economic growth. In the United States, for example, the Atlanta, Georgia urban area in the humid southeast struggles to obtain additional water in the same way that Las Vegas, Nevada in the arid southwest does. Spain is embroiled in a paralyzing political conflict over how to provide water for the rapidly urbanizing Mediterranean Coast even though those demands could be met by relatively modest reallocations from the agricultural sector. And, in the continuing absence of effective reallocative institutions, significant numbers of Mexico=s urban residents may be hard pressed to find domestic water supplies in the future (National Research Council, 1995). Other examples abound.

Beyond the absence of market institutions there are circumstances which promise to intensify water scarcity in the future. Rijsberman alludes to these circumstances but does not elaborate

sufficiently to show how they will lead inevitablty to heightened water scarcity. The compelling and urgent nature of these problems likely means that in the absence of effective allocative institutions, the solutions to these problems may stretch or even crowd out the financial resources needed to provide adequate water and sanitation services to most, if not all, of the world=s population. Stated differently, the need to resolve these water problems which affect both rich and poor, will generate formidable competitors for the expertise and resources needed to develop the water and sanitation services for the world=s unserved. These problems, which include the maintenance of sustainable ground water resources, the maintenance and enhancement of water quality and the need to feed a more populous world, will in the future compete to some extent for the resources that might otherwise be devoted to the water problems of the poor. The remainder of this paper is devoted to a discussion of these three problems and how they may come to dominate our thinking and action about water resources.

The Importance of Sustainable Ground Water

Ground water accounts for approximately a third of the world=s usable water supply. Ground water is a particularly attractive component of the water supply because its availability is not linked directly to precipitation and runoff. This means that ground water is specially important in times of drought when surface water supplies may be significantly reduced. Ground water overdraft in which the quantities of water pumped exceed the quantities recharged threatens the sustainability of many of the world=s ground water resources. Overdrafting may be justified and economically appropriate in the short term as, for example, when it contributes a supplementary source of supply during drought periods. In non-drought periods overdrafting stops and aquifers have the opportunity to recover. By contrast, long term overdraft is not sustainable. Long term overdraft is always self-terminating and the mechanism of termination is the economic exhaustion of the aquifer which occurs when water tables fall to the point where pumpers can no longer afford to extract.

Rijsberman notes in his introduction that: AThe fall in groundwater [sic] levels, particularly in India and China, threatens the livelihoods of the farmers in these areas as well as the food supply for a significant share of the world population.@ Ground water depletion in China appears to be occurring on an enormous scale. Evans, et al (2003) report that there have been Amassive declines@ in ground water levels in the Hai, Huai and Huang river basins which cover an area where 430 million people live. Falling water tables are not confined to China and India but are found virtually everywhere around the globe. Thus, for example, it has been well documented that the Mexico City Aquifer, which is relied upon by a significant proportion of Mexico City=s 14 million residents, has been continuously overdrafted for nearly a century (National Research Council, 1995). Postel(1999) reports that ground water depletion is now widespread in central and northern China, parts of India and Pakistan, the western United States, North Africa, the Middle East and the Arabian Peninsula. The sustainability of ground water resources around the world is threatened and unless ways are found to address and attenuate persistent overdraft, accustomed supplies of water will be lost and the costs of extracting ground water that remains will rise.

Perhaps the most common way in which ground water overdraft has been addressed in the past is by constructing additional surface water storage and conveyance facilities which then permit new increments of surface water to be substituted for the depleted ground water. In the absence of effective controls over ground water extractions, this strategy is just a short-term palliative. For example, it has been documented that in the southern Central Valley of California there have been three recurring cycles of ground water depletion, followed by surface water importation, which is then followed by depletion again as the economy and population of the region grows (Vaux, 1986). Moreover, this strategy of alleviating ground water overdraft by importing additional surface supplies is becoming less viable as surface water supplies become fully appropriated.

Continuation of persistent ground water overdraft threatens to reduce supplies at a time when demands for water world-wide are growing. The continuation of the widespread failure to address problems of persistent overdraft serves only to intensify further the generalized global scarcity of water and to make scarcity even more acute in areas where long-term ground water overdraft occurs. The need to maintain and sustain local and regional economies that are dependent upon ground water overdraft will create especially vexing problems in areas where alternative supplies are not available. The need to rescue such communities will create additional competition for both water supplies and appropriate infrastructure and render the problems of providing water and sanitation services to the unserved even more difficult to solve.

Water Quality

The availability of water is inextricably a function of water quality. Any discussion of the adequacy of existing or potential water supplies carries - explicitly or implicitly - assumptions about the suitability or lack thereof of the quality of water to serve intended uses. Some uses, such as domestic use, require waters of very high quality. Others, such as landscape irrigation, require waters of lesser quality. Rijsberman notes that the cleanup of surface waters in western Europe and North American that began with the provision of sewage collection and disposal a century ago and was followed by significant investment in wastewater treatment facilities over the last several decades has been a real success story. While the trends in surface water quality in Europe and North America have generally been positive in recent decades, water quality trends in the rest of the world have not and there are reasons for suspecting that a continuing decline in water quality world-wide is to be expected (Ongley, 1999).

New chemicals, whose biological properties are not understood, appear every day. At least some of those chemicals and their byproducts and residues will find their way into the environment along with existing chemicals that will continue to be discharged to the environment. Given the pace and sophistication modern industrial research and application, it appears likely that both ground and surface waters will be subject to continuing contamination from both natural and synthetic chemicals. In addition, past land use practices have left toxic residues in the soil, many of which are migrating inexorably toward some nearby aquifer. With time more aquifers will become contaminated with chemicals that have migrated through the soil profile over very long periods (National Research Council, 1993). Inappropriate land use practices, which occur

because land use is largely unregulated in most parts of the world, will result in new chemical legacies that will lead to further ground water contamination.

Even granting that the provision of sanitation services to the unserved will lead to improvements in the quality of local receiving waters, there is an irony in the fact that the poorest countries are least able to manage, enhance and maintain water quality. This will almost always mean that declining water quality will lead to declines in the availability of water - increasing scarcity - in the poorest countries. In fact, the general relationship between GDP and water quality suggests that the poorer a country, the less able it is to manage water quality so that inevitably water availability itself is a function of the country=s relative wealth (Ongley, 1999). The likely declines in water quality will contribute further to water scarcity. This will be especially pronounced in areas where the demand for high quality water is growing and may interfere directly with efforts to make domestic water supplies available to the unserved.

Feeding a More Populous World

The criticisms of irrigated agriculture often mask its importance in feeding the world. Rijsberman notes this fact and cites studies which document that irrigated agriculture contributes significantly to the reduction of rural poverty. However, the importance of irrigation and the availability of water for irrigation may be far more critical than is suggested by the contribution of irrigated agriculture to poverty reduction. Agriculture water users are frequently thought of as the supplier of last resort when additional water supplies are needed for critical domestic and environmental purposes. This is because agriculture accounts for such an overwhelming proportion of consumptive water use and because many agricultural water uses of are relatively low value. Nevertheless, in a recent report from the World Watch Institute, Postel and Vickers (2004) note that water shortages will soon manifest themselves as food shortages. If such shortages are to be averted, irrigated agriculture will probably have to be expanded. Yang et al. (2003) show that as an empirical matter when water availability in a country falls below 1500 m^3 /capita/year, the country begins to import food stuffs which are predominantly cereal grains. These food imports compensate for the local water deficits since the water needed to produce the imported food does not have to be taken from the local water budget.

As population grows, the demand for food increases. So long as food stuffs can be traded relatively freely in world markets, increasing demand for food drives increases in the world-wide derived demand for water. Again, so long as trade can be accomplished relatively freely, countries whose water supplies are insufficient to allow them to grow the food needed to feed their populations can import Avirtual water@ in the form of imported food (Yang and Zehnder, 2002). In this way, the demand for water in water poor countries is transmitted as demand for food to water rich countries. The significance here is that although agriculture, which is now regarded as the suppliers of last resort, will find itself the focus of intensifying demand. Yang et. al. (2003) examined water availability world-wide and identified 21 African and Asian nations whose indigenous water supplies were less than 1500 m^3/capita/year in 2000. Using a range of population projections these authors identified an additional 14 countries in Asia and Africa that will fall below the threshold by 2030. (Note: The status of China is uncertain. To avoid a deficit

below the 1500 m^3 annual per capita threshold the Chinese will need to develop virtually all of their surface supplies [Zehnder, 2003].) They estimate that the water deficit of both groups of countries in 2030 would be 1150 km^3/yr, roughly 13 times the annual discharge of the Nile River.

There are two immediate implications of these circumstances. First, for water deficient countries that have insufficient wealth to purchase needed foodstuffs in international markets, the need to feed additional numbers of people who might otherwise starve, will compete for resources that might have been used to provide water supply and sanitation serves. The need to provide such services as well as the food that cannot be grown because of water scarcity will require investments considerably in excess of those presented by Rijsberman. Second, to the extent that water deficit countries are able to translate their water deficiencies into effective demand for food in world markets, the derived demand for water for agriculture in the water surplus countries of North America, western Europe and - possibly - Australia. This means that increasing world population will intensify the scarcity of water, not just in rapidly growing, water deficient countries, but in the water surplus countries as well.

CONCLUSIONS

The provision of water and sanitation services to the unserved as well as the provision of water and the implements of water management to the poor is surely one of the great challenges facing the world. This challenge is embedded in the more general challenge posed by world-wide water scarcity. The daunting tasks of providing water and sanitation services and improving the lot of the rural poor in developing countries will be difficult enough where water is plentiful or susceptible of being reallocated. In a world confronted with sharply intensifying water scarcity, the task will be even more difficult.

The persistence of long-term ground water overdraft world-wide threatens to diminish absolutely the availability of ground water both in terms of quantity and price. If overdraft cannot be attenuated, regions and economies that are dependent on ground water overdraft will require additional supplies from elsewhere if they are to survive. Widespread institutional solutions to the problems of overdraft seem unlikely and the result will be intensifying water scarcity, particularly in regions where alternative sources of supply are either non-existent or very costly. Some of these regions will have significant numbers of people who do not have access to water and sanitation services. Intensifying water scarcity will increase the difficulty of bringing such services to these people.

Similarly, general trends of water quality decline world-wide are unlikely to be reversed in the near future. Water quality decline is a particular problem in the developing world where the financial and institutional resources needed to manage water quality are generally unavailable. It is true that the provision of sanitation services to the unserved will have substantial positive impacts on the quality of local receiving waters. Nevertheless, growing water contamination from industrial and agricultural sources as well as Alegacy pollution= of ground water suggests that water quality will continue to decline in many parts of the world and reduce the quantities of water available for high valued uses, including domestic uses. The resultant increase in the

scarcity of water for domestic uses will further complicate the problem of providing water and sanitation services for the unserved.

Finally, as has been observed, water scarcity may in the future manifest itself in food shortages. It is instructive to note that 4 of the nine countries which Rijsberman lists as high priority countries for water supply service are also countries whose annual per capita water availability will fall below 1500 m^3 by 2030. These countries will come to be water deficient in the same time frame that efforts will need to be made to provide water services to significant numbers of unserved. In addition, the observed tendency of countries to import cereals once they have become water deficient means that increasing population will result in further intensification of water scarcity world-wide.

While Rijsberman makes a useful distinction between the problems of managing water scarcity and the problems of providing water access and sanitation services to those who don=t have them, it is simply not true that water scarcity and the need to manage that scarcity will have no impact on the ability of world to address the water and sanitation challenge. In the absence of reallocative institutions which can facilitate the movement of water from relatively low-valued uses to higher valued uses, the problem of providing the water itself as well as the problem of providing access to water for the unserved and the poor promises to be more formidable than the Challenge Paper suggests.

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