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**Working Paper**

## Providing Rural Water: Constraints and Impacts

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PROVIDING RURAL WATER: CONSTRAINTS AND IMPACTS

by

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Providing Rural Water: Constraints and Impacts<sup>1/</sup>

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A team at Cornell is designing the National Statistical Assessment (NSA) for the Rural Water Survey.

Stan Zimmerman in the previous presentation has pointed out that the National Demonstration Water Project (NDWP) has an important role in the Rural Water Survey, preparing several major parts for EPA. The NSA is another major part that is being prepared in full cooperation with NDWP. We will summarize some of the constraints and impacts of providing rural water as they have suggested themselves in the design of our approach to collecting data across the nation.

In our view, it is when you remove the constraints on rural water development that you produce impacts. Sometimes the impacts are ones you want, but sometimes, of course, they are not. There are many, many, many constraints on rural water development and we want to leave you with that point. Many of them are very site-specific and analyzing those in a sensible way means that you have to explore the logic of a particular situation. We can't do that in a discussion like this. The detail is simply too great.

The challenge to public activities, and most of us here are connected with public agencies, is to figure out essentially what we are going to ignore out of all this variety. There are many policies, many approaches, many activities in the public arena that are attempting to deal with this problem. Regulation, providing funds, technical assistance, education, inter-agency coordination; the list, of course, can go on. Much of what we are trying to wrestle with is a sense of the capacity to organize ourselves to get this job done.

We need simplifying ideas. Ideas that help us figure out what's important and what isn't. We often like to think that we should be comprehensive, we want to identify all possible alternatives, rationally evaluate those alternatives and pick the best ones. And, of course, every time we try to do this we end up with a nice guilt complex because

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1/ Presented at Water Problems in the Rural Environment -- Alternative Solutions for Water Supply and Wastewater Disposal, a conference sponsored by the Nebraska Water Resources Research Institute, University of Nebraska - Lincoln, November 4-5, 1976.

2/ Respectively, Professor of Resource Economics, Professor of Rural Sociology, Associate Professor of Rural Sociology and Graduate Assistant, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, N. Y.

we find comprehensiveness exceeds our capacity. And so perhaps the important point is to get some agreement among us, not necessarily because of rational reasons, but just to get agreement on what it is that we want to state as important.

For example, in the past our public approach has been organized largely around the notion of health. Is this a continuing and important problem? Should we continue to be organized around the goal of improving health? I don't think anybody is suggesting that we ignore it. Maybe what we are really saying is, how much should we add to it? In terms of public reaction to what are a lot of very private problems, isn't the rule for public intervention one of how do we help people to help themselves? An old cliché. But like many old clichés, we have to come back and redefine it in new ways for what really is an old problem.

Who is going to do what and how? It's a different kind of game. And shifting from a focus on health to something else is an important point in defining what this new game ought to look like.

### "How Water Made My Mother a Lady"

The Lieutenant Governor spoke this morning about definitions, and we think that's largely what this conference is about. Let us reflect for a moment on water and its meaning.

In historical terms, if we think of the early settlement patterns of this nation and go back to the land migration across the Bering Strait by hunting and gathering tribes, the defining feature that allowed them to settle was the availability of water. An additional feature was the capacity to gather seeds and to be able to plant, harvest, and store, such that a settlement pattern could be created in a single location. Beyond this process it's no accident that all the major settlements in this country are at confluences of water and trade routes. The constant quest, of course, has been to secure freedom from the toil of gathering food, storing it, supplying it and having water available. These benefits mark the beginning point of release from toil and labor.

The concept of freedom from the ties of water in daily routine is still a major feature. On a worldwide basis, the picture of the women at the village well still represents a very dynamic and active process. Anyone who has been in a developing country has seen all that is involved in terms of the work that women go through to accomplish these water-related processes.

In the early history of this country, the rural towns and rural communities were caught in this quest of freedom from the limiting constraints of providing water, disposal of wastewater and securing food and other necessities for livelihood. The meaning that water has, the quest for water as a convenience factor, is no doubt a very real and a personal experience for most people in this room who would have grown up in a context of rurality.

The message that we want to leave with you, is that water is often-times thought of as a physical resource. We'd like to submit to you

that water is a social resource, just as dynamically as it is a physical resource. Water has tied with it a capacity for people to have some sense of pride, some sense of dignity, some sense of privacy, some sense of self-confidence, indeed even personality formation is influenced by water. The liberating processes that water and its availability bring have a great deal to do with what we can call "human development."

One of the authors recalls his own growing-up days on a farm in the Northern part of Utah on an isolated farmstead in a family of eight children. Let us just highlight for you quickly what it meant in terms of the quest as a family for water. There were two drilled wells on the farm, one out by the corral for the livestock and one by the house for the family. Now, as a boy he never could believe this old adage that you could lead a horse to water but you couldn't make him drink, because those horses were always thirsty and he'd pump and pump and pump to try to get enough supply for them and the other livestock. There is a sense of mixed nostalgia about the tea kettles that were always on the kitchen stove that were fueled first by wood and then by coal. The water, of course, also being boiled in a pan for washing dishes and cooking. And then the bigger pans that were there for the Saturday night bath with the line-up of kids waiting for Saturday night baths and the bathtub.

Even today as he sits in a bathtub to take a bath he finds himself trying to make that decision of whether to wash his hair and his face first or the rest of his body first. And it made all the difference in terms of whether he was first in the bathtub or whether he was fourth or fifth. Then there were the washtubs on the stove, the water heating for the laundry and mom out over those hot steaming tubs trying to get the water in the washing machine and get it out and our having to carry it and find a place to dump the water.

One liberating influence was when the pump was moved inside of the house. That really made a "handy" handle on the water source. That meant they had to put in a cesspool. Also they put in a kitchen sink. But then there was the problem, what do you use the kitchen sink for if that's all you've got in terms of the source of water? Do you use it to wash when you get ready for school in the morning and brush your teeth and all that sort of thing? Do you use the same sink to wash the dishes and clothes? They had to go through decisions in terms of using a separate dishpan and so on, so they could use the sink for all the purposes possible. The next great liberating process was when they pressurized the water, put a pump on it and then began to get inside plumbing -- a water heater, for example. With that kind of convenience, that kind of privacy, that kind of a capacity, you were able to step inside the shower and have immediately at hand the hot water and to shave. And what this means, then, in terms of human development!!

It's like coming into a modern socialization process, a modern society. It makes the difference of whether you can invite your friends to your home on a cold winter evening with comfort and confidence that the conveniences are there. Remember those old days, how embarrassed as a teenager to invite friends to come spend a long weekend and have to point out where it was outside that they had to go when they had to go, when it was too cold to go anywhere.

Mother always had a high sense of pride in keeping the kids clean, the house, the clothes and all of that. That's what transformed mother, who was a hard-working woman, into a lady. What a difference it made in her. The liberating influence that it made in her, provides a very vivid recollection. In a real sense it liberated that family from a sense of feeling deprived. It liberated them from the hard choices they had to make in terms of allocation of time. It gave a sense of dignity, a sense of appropriateness, of the socialization processes of having friends in and moving freely within the system. It released the creativity and innovativeness that was in them and it brought the family into a real sense of belonging to a larger society -- a sense of quality of life.

These are some of the meanings that water has; the impacts that can result from being released from the constraints.

### The National Statistical Assessment

What we are asking is, are the goals for today to simply find ways to cut the limits to use, in a broad social cost-effectiveness sense? The physical, biological, demographic, sociological, factors that actually represent constraints are many and varied and very site-specific.

We have indicated some of the impacts of the availability of sufficient quantity and sufficient quality of water on at least the household's behavior, attitudes, status and even changes in social relationships.

We're concerned with developing a general model; only part is the model for the user, that is, the household. The general model is one that ranges from water in repose, that is, surface and ground water through the whole process of identifying it as a source to the providing of it, of treating it, filtering it and so on, to its eventual disposal.

The model is simply an attempt to identify what we feel are key variables in various uses and availability of water in sufficient quantity and sufficient quality for various uses like drinking, bathing and so on. We have an extended list of what goes under each one of these components.

We don't know exactly how to draw a linear causal diagram. What we have done is put the various factors in a circle and said that these, to our knowledge, are the main key variables to consider when you are thinking about the reason for providing people with good water. The first question is one of simply availability of water. Is it available and is it dependable? Is it on a seasonal basis or is it such that you can depend upon it everyday? The next question is affordability. Is the water provided in such a way that you can afford to use it in sufficient quantities? EPA, of course, is concerned with the issue of quantity and quality. But one can think of various uses and the range of uses that one has for water has an impact upon the quantity of water used and the quality which it must obtain. Use is related to cost and income.

A complicating factor here is that the model has to reflect not only those on a community water system, but has to also reflect people who are located on individual wells or other individual sources, whether they are

located on a farmstead or otherwise. Then, of course, there are various social-cultural factors. The attitude towards water in the East is very different than it is in the West -- and various demographic facts like the size of the household, the composition of the household, may be important. Then certainly another factor has to be the piping or plumbing within the household.

Start with uses and consider the variety, not only the normal uses of drinking, bathing, doing dishes and so on, but water for livestock, a garden, etc. And there are also recreational uses, car washing and lawn watering. Some uses obviously require that there be a greater quantity available than if you are only considering prime needs. If you are considering things such as drinking, of course it has to be of a certain quality. Obviously the plumbing and piping system which is available in the household is going to limit both the quantity and the quality which is available. You can think of various households located in Appalachia as contrasted to suburbia and the attendant variations in the plumbing which will impact the quantity and quality which is finally consumed, even though at the "main," that is, the doorstep, you have good quality water.

We would be happy to entertain questions as to how we are going to try to measure these elements and what kind of analytical statements we are going to try to make about them and so on.

How does society impact existing poor conditions in a household? There are certainly many specific variables on which to operate. How does regulation affect it, for example? Where will this impact? Does it impact only on the physical water facilities or do you impact on affordability or do you impact on availability to the household, etc? It will take a multi-faceted approach. Questions of funding, questions of community organization, and state role, local role, federal role and so on.

#### Responding to Community Situations

The list of the individual items runs ten pages, all of which are subcategories under those listed above. And that is still at the individual level and the overall survey includes going from the individual to the community level and asking the question, how far can the individual go in meeting his problems and what assistance could he make use of? The local community is the focus for this. It seems to be the logical place to start and then ask questions, as we will in this workshop, about the proper role of state and federal agencies to backstop the local communities.

Now you all are familiar with community situations -- those that you've lived in, those that you've worked in and those that you've studied. Let us just remind you of a few that are fairly typical of the types of problems that are involved.

Consider a situation reported here in Nebraska involving some 500 users that would need more than 500 miles of pipe to create a system. There were only a few of the potential users who saw they had a problem,

or rather an opportunity to have a better situation. A consulting engineer was hard at work trying to design a system for those 500 potential users. Without greater awareness and/or a way to keep system costs down the outlook is pessimistic. With variations we could probably find that situation repeated over and over again across the country.

Another is a ski area in Utah. The developers had been selling condominiums and other residential units. At first they sold them with a water right that went with the residential unit. But soon the water rights that were available in the nearby stream were all sold but they continued to sell units without water rights. It's going to be interesting to see what happens in that development as the years pass and some find that they can turn on taps and others find out that they are going to have to bring it in by jug. This case is only an aberration, though, of a situation which community after community faces when they go ahead and develop not knowing where the water development is going to take place, not knowing where sewer facilities are going to be; not knowing much of anything about other community facilities but with full expectation that they will indeed be provided. Septic tanks that only work for a few years, wells that are soon polluted and so on, are common across the country.

Then there is the story of a graduate student that we had who got involved in an exercise to provide dye-packets for people to put in their toilets. The stream impacted by their discharge, as a matter of fact, is the university water supply. This was to help people understand whether or not their septic tanks were working. He had very little response until one day a salesman that sold water softeners up and down that stream came by and serviced them. He called up our grad student, complaining bitterly about how his water softening units were getting all cluttered up with all this dye and why was he fouling up people's water systems.

Also consider the case of a small city which has been supplying water to four adjacent jurisdictions. Supply capacity was limited. Concern was expressed over development proceeding so rapidly outside the city limits.

Some suggested that the city was more interested in limiting development of its neighbors than it was in providing water. Some alleged that the central city was concerned about protecting its supply. Even though the city was getting a rate and a half from the surrounding areas, it was reluctant to put up the money to expand its system and make it reliable. Constant friction over this and, of course, many other factors extended over two decades. Fighting with your neighbor municipality is a lot more fun than watching television.

The four surrounding municipalities chaffed under this for quite some time, but found real difficulties in coming to an agreement as to what to do about it. One was essentially a fully developed suburban community to the main city, quite well off, with very little debt, very high incomes. Another municipality was not growing, a very small area indeed, but clearly needing service. It has real problems in terms of water availability, gotten from wells and with obvious problems with



septic tanks feeding back into the wells. Another is growing very fast, no debt, and very little problem of raising funds. The last is growing very fast, heavily in debt, and very reluctant to get into new debt.

There are other features about them that made it difficult for them to agree on what to do and how to proceed and when to do it. Constant negotiations over two decades have finally led to a solution which unfortunately does not include the central city. No state or federal agency provided effective leadership for the solution, although some funding was found after the agreement was reached. The county provided only minimal help in working out the agreement. Is there a problem here? How should similar problems be factored into a national assessment?

Note that one of the things that made agreement finally happen may have been the fact that they had also agreed on a joint sewer system for at least three of these communities. They are now finding it a lot easier to talk about mutual traffic problems, a mutual bus system, recreation programs, location of new retail facilities and the like.

Water has an organizing focus for community development which we think can be very real. Another example is that of a community that has been studied by the Department of Rural Sociology for many years. In the 1940's this community was subject to a very intensive study. We know a lot about what it was like then and there have been repeated follow-up studies. It is clear that in the '40's and part of the '50's this was a community where leadership was very limited, they had a difficult time making a decision to do anything. There was a small group that took responsibility for everything, but they couldn't get anybody else to participate. They were feeling crushed under the problems of managing that community.

In the '50's and '60's with a little stimulation from the Public Health Department of the State, they concluded the quality of the lake that received their wastes was something to which they should pay some attention. The process of considering how to deal with a court order to stop polluting seems to have caused them to look upon the lake, finally, as a resource that might lead to more development in the community. They saw it as a possibility of improving summer recreational activities and a source of new stimulus to the local economy which was badly needed.

The upshot is that they now have a tertiary sewage treatment plant. The old disposal system was sort of an overgrown leaching field; every sewer was said to leak. Then there was a building where the main sewer ended right on the edge of the lake. It was just a pass-through arrangement. The lake was peasoup green. It has changed to quite a clear lake. There were some interesting side effects. The lake now has some rooted aquatic weed problems it did not have before. Sunlight can get down to them where it couldn't before, and they are growing lushly. The fishing at first was very good. The fish were hungry and they bit anything that went by. But it is now clear that the general level of productivity in the lake is lower than it was. So the fishing is not so good, but the swimming is much better. And the community seems quite happy with the new arrangement.

Is that community now more dependent? The state and federal aid for that plant was substantial. The leadership from state and federal agencies was strong. Or do they have more capacity now in terms of dealing with new problems -- the leadership skills? How should we think about this?

Another interesting case comes from a study from Utah where a community had high levels of the characteristics that seem to be related to development. It was on the communication/transportation lines to the large cities around it. They had high solidarity within the community, regular agreement, homogeneity about what things ought to be done. But they didn't have water. And that was the limiting factor in that community.

Through some federal programs they were able to construct a reservoir and in the ten years following the construction of that reservoir they developed an impressive record. The number of acres of land in farms increased 29%, while the state as a whole increased 11%. The number of irrigated acres increased 26%, for the state 3%. The number of farmers who reported that they had to work off the farm 100 days or more a year decreased 26%, while for the state as a whole it decreased 19%. The number of acres of corn harvested increased 237% while for the state it was 44%.

People also reported things like, "now we can grow a garden where we never could do that before. By mid-summer it was completely wilted, there was no water to take care of a garden." And in fact that became such a major impact in that community -- it was a fairly small community -- that for a large number of these ten years, the people within that community won the grand prize in the state garden show. These people, in effect, had been waiting for some sort of catalyst to develop, and it turned out that in their case it was water.

But lest we begin to think that water has the magic to do those things in every case, let us review some other situations along the Hudson River Region in New York that we have studied where the results are less clear cut.

In a fairly complete inventory we attempted to identify the existence of a physical problem in the community -- lack of water, pollution due to inadequate sewers, etc. In addition to whether they have a physical problem, whether they were aware of it, and whether they had the resources to cope with it were also identified. The resources needed were both social resources in terms of organizational capability, and money or physical resources. We were able to identify communities in that region who had a physical problem but were not taking care of it. No issues in those communities were dealing with that physical problem. That was fairly common. We also found communities where there were no major physical problems but there was an issue they were dealing with. There are other combinations where there was a problem and an issue related to it or no problem and no issues. Those are easy to understand. But the ones that we are grappling with are those that have a physical problem but no issue. How do you impact those communities? Do you just go in and provide a facility?

On the other hand, what is going on in those communities that have no problem but are dealing with issues? Could it be that their leadership is so far advanced that they see the problems on the horizon and begin dealing with them now. That seems like a rare kind of occurrence. Or is it that they are just finishing up dealing with the problem and the problem has subsided and the issue has not?

How are these kinds of problems dealt with and how are they seen? At least in part what we are saying is that we need to focus on more than just the provision of facilities; provision of capital funding and the like. Just because you legislate that something will be, and you provide the money for it, doesn't mean it will happen.

Economists have proposed a theory of social overhead capital that is part of our conventional wisdom. It asserts that we should invest in things like sewer and water. Why? Because this reduces the cost of private businessmen and therefore they are stimulated to make investments themselves. Stop and think about that theory for a minute. Does that really explain what we need to understand? Does one little water system represent enough of a change in anybody's cost that it is apt to make a difference? There are cases where it does. There are communities where water has been a very constraining factor. But these tend to be the exceptions. We rarely have enough capital to invest in any rural community so that there is much of a direct impact on the real cost of private activity. The social overhead capital idea does not seem to be an adequate theory in this case. There are some other concepts to consider. Some of what we know about why communities pass bond issues for sewers helps in this regard.

In some studies where they have asked the right questions, it's been found that passing bond issues is closely associated to the degree to which there was a sense of trust between the people of the community and the leadership. Success of a bond issue was not necessarily a case of actual citizen participation. Rather it was a case where people believed that if they really wanted to find out what was going on, they could; if they wanted to participate they would be able to. It was a feeling that the leadership would have answers to any questions that might be asked; faith in the goals that had been articulated by those leaders, and the faith that those leaders could carry out the plan proposed.

This kind of local community leadership, we would submit, is crucial to moving ahead. The development of water projects can produce leaders at the local level who can achieve solutions not just to the water problem, but to other problems that these communities are facing. In this way community development can be stimulated in a lasting way.

There's a theory here that relates back to some notions of communication. The first question is do "messages" get sent to that community? And there are communities after all that don't get much in the way of messages from the rest of us. They are in "the boondocks" and there is a problem in terms of their understanding the opportunities that are available. This is a difficult thing to change. However, there are many communities that are in the center of things, you might say, but

can't hear the messages. They don't have the diversity of leadership in terms of background and experiences, and values and perceptions, to understand what the messages from the larger system are saying. And the development of a water system, sewer or water, can change the ability of a community to hear, to interpret the messages that are around. Water projects may provide the changes within a community that produces the kind of leadership in which people can have some trust.

Problems are not matched by corresponding awareness; and neither awareness nor the physical needs are matched by the capacity to solve the problem. To bring together resources with the needs a variety of different program responses will be needed. Community differences must be dealt with as much as physical differences.