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Rainwater Harvesting: Some Crucial Issues

I am grateful to the organizers for providing me with an opportunity to participate in this conference. It is an honour and a privilege to address this distinguished audience. I notice that the discussions at this conference are going to be of a technical nature. I will not venture into those areas. I am not a scientist or a technologist, but a former administrator and policy-formulator who has been writing and speaking about issues relating to water policy, planning, projects, conflicts, and so on, over the last two decades and more. What I propose to do today is to provide a brief background to the emergence and evolution of the idea of rainwater-harvesting in the water policy debate in this country and then proceed to indicate a few issues or conundrums on which further work seems to be needed. My remarks will be based on facts relating to India, but I hope they will be of relevance to this international conference.

The practice of rainwater-harvesting goes back to ancient times, but the term itself is relatively recent. I remember being somewhat puzzled when I first encountered this term some years ago. The word ‘harvesting’ is primarily used about crops. One has also heard it used in the context of saving human organs from dead bodies for use. However, what does one mean by ‘harvesting’ water? In this use, as in other uses, the connotation of the term has two components, namely that of gathering or saving and that of storing for future use. In a sense, big dams may also be described as water-harvesting structures,

but that is not common usage. The term is generally used in the local small-scale context.

Two decades ago, the term did not figure prominently in water policy debates, though it might already have come into use. The reason was that the idea of dam-building held strong sway over the minds of engineers, planners and administrators. From the latter half of the 19th Century to the middle of the 20th, and even into the 1970s and 80s, water policy and planning meant big dams. That was what was regarded as ‘water resource development’. To the engineers and planners of the time ‘water’ meant not rain but rivers; and in relation to river waters they tended to talk not of ‘harvesting’ but of ‘harnessing’, an ambitious, equestrian metaphor. Rivers, like horses, were to be harnessed and brought under human control; this was part of the Promethean philosophy of conquering and subjugating nature, exemplified dramatically in the gigantic American dams. An American water manager is reported to have said “I love pushing rivers around”, a revealing declaration that Indian water engineers and managers might not have articulated explicitly but subscribed to implicitly. Gigantism was an essential part of that religion. It continues to flourish in China, and our engineers and planners regard China with great admiration and envy. However, I must not digress from the theme of this conference.

The point that I was trying to make was that given the strong belief that water policy meant building dams, preferably big ones (and naturally to be built by the state through its engineers), and/or long-distance water transfers, there was little room for thinking about local, small-scale, decentralised harvesting of rainfall. When a few instances of social mobilization for that purpose achieved remarkable success – for instance, the late P. K. Mishra’s effort in Sukhomajri in Haryana, Anna Hazare’s Ralegan Siddhi in Maharashtra, and later, Rajendra Singh’s work in Rajasthan – the official water establishment could not

ignore them but tended to accept them reluctantly as useful but minor, secondary and supplementary to the big dams and reservoirs, which, according to them, must be the main plank of government policy.

We have come a long way since. As disenchantment with big projects grew, and as the local small-scale successes multiplied, thinking not only outside but even within the Government began to change. Today local rainwater-harvesting, civil society initiatives for the purpose, the role of NGOs in this context, the revival of traditional customs, practices and institutions, the restoration of old, defunct water bodies, and so on, are parts of official policy and government programmes. To revert to a distinction made by me earlier, the ruling metaphor has shifted from ‘harnessing’ to ‘harvesting’, or at any rate both metaphors are heard. It must be stated, however, that the Promethean approach of controlling nature and the related tendency towards gigantism continue to command much adherence in this country, and the holders of that belief are apt to think of themselves as ‘mainstream’ and of others as ‘maverick’, or ‘biased’ or ‘misguided’ or simply ‘lacking in expertise’. They also tend to sound notes of caution about recourse to rainwater-harvesting. I shall come to that shortly.

In recent years many outside the government (and perhaps a few inside) have been arguing that we simply cannot continue with the old policy of building supply-side projects in response to projections of demand for water; that before we even think of supply-side answers we must first look critically and stringently at demand projections; that we have to get away from competitive unsustainable demand; and that the whole approach in water policy must shift from what has gone by the name of water resource development to restraining the growth of demand. I am a strong advocate of that point of view. However, we cannot rule out supply-side responses altogether. When we have done everything that we can to restrain the growth of demand, we may still need some augmentation of the water available for use. There are only

three ways in which this can be done; large projects, drilling for groundwater and local small-scale augmentation through rainwater-harvesting and micro-watershed development. The three are inter-related; all three have the potential of bringing some benefits; and all three have also the potential of adverse impacts.

The adverse impacts of large dams are by now amply clear: submergence of land, some of it fertile or forested; displacement of people and their livestock, sometimes on a large scale, and destruction of their livelihoods; disruption of the habitats and passage routes of wildlife; impacts on flora and fauna, in particular on aquatic life; alteration of the micro climate; possibilities of reservoir-induced seismicity; possibilities of vector-borne diseases; changes in river morphology and water quality; impacts on the river regime, riparian settlements, livelihoods, aquatic life, and groundwater-recharging downstream of the dam or barrage; deterioration of the estuary; and so on. One must add that the likely impacts cannot be fully foreseen; there may be unexpected consequences. The over-all balance of costs (financial, economic, environmental, social and human) and benefits, direct and indirect, in such cases is often highly uncertain. There is therefore a strong case for avoiding such interventions or at least reducing them to the minimum. They should be regarded as projects of the last resort, to be chosen only in those cases where that is the only option or unquestionably the best of available options.

From the late 1970s and early 1980s onwards there has been an explosion of groundwater use in India, making this country the largest user of groundwater in the world. This produced dramatic results in the short-term in agricultural production and prosperity, but has had serious consequences in the longer term: in many parts of the country aquifers are getting depleted and polluted and contaminated. There is great concern about this, and it is clear that severe restraints need to be imposed on the extraction of groundwater.

It is against that background that the case for extensive, decentralised, small-scale, community-led, local rainwater-harvesting becomes very strong. A few celebrated instances such as those I referred to earlier indicated that this approach had the potential of becoming a significant part of the national water policy and planning. The message was beginning to spread and find acceptance even in official circles, but cautions have already begun to be sounded by some critics. We are told that interceptions in the upper catchment will affect the availability of water lower down; that extensive recourse to rainwater-harvesting will affect the hydrological cycle; and that such small-scale interventions are no answers to the needs of a large country as they will not add significantly to water availability.

The point about the downstream impacts of interceptions is valid and needs to be taken seriously, even if it seems odd that this issue is often raised by supporters of large dams which have much greater downstream impacts. Any intervention, whatever the scale, will have its impacts and consequences, and we need to take them into account; all that one can say is that the impacts of local, small-scale interventions are more manageable than those of large ones. Whenever rainwater-harvesting is proposed to be undertaken in any area, it is certainly necessary to consider how this will affect areas lower down. In fact all such local interventions must be in harmony with the overall basin hydrology and with other uses within the basin.

The other two points, namely, whether such interventions will affect the hydrological cycle and whether they will add significantly to water availability, are inter-related. On the latter point, we have an estimate of 140 BCM as “additional runoff capture” given by two scholars, Professors Kanchan Chopra and Biswanath Goldar of the Institute of Economic Growth, Delhi, in a monograph prepared by them on ‘Sustainable Development Framework for India: The Case of Water Resources’ for the UN University, Tokyo, in 2000. That number may be

open to debate, but it seems clear that we are not talking about small or insignificant additions. However, is this true additionality, or will it be offset by a corresponding reduction in river flows? If it is true that extensive recourse to rainwater-harvesting or “catching the rain as it falls” will result in a reduction in run-off, then the possibility of a reduction in river-flows must be examined. If indeed there is a reduction, then it may be a case of gaining on the swings and losing on the roundabouts.

I believe that this is not the case. Let me explain this with reference to Indian facts. The precipitation over the Indian landmass is 4000 BCM. Out of this a certain quantum will be lost through evaporation and transpiration and will not be available for use. Because of this, the availability of surface water flows as measured near the terminal points of the river systems is estimated as only around 1900 BCM. That is a large gap. Extensive decentralised local rainwater-harvesting may conceivably reduce the incidence of loss through evapo-transpiration to some extent. The hypothesis is that a small part of the large difference between precipitation and river flows can be captured through local rainwater-harvesting, and that this will constitute an additionality. Chopra and Goldar’s estimate of 140 BCM may or may not be correct, but there does seem to be scope for some additionality. This is an area where further research is called for.

Leaving aside the question of additionality, there is a question of choice between alternatives. Given the spatial and temporal variability of precipitation, some capture and storage has to be done, but where and on what scale? Should we capture rainfall and run-off locally in a small-scale and decentralised manner extensively wherever feasible, or should we wait for the run-off to form rivers and for rivers to attain their full size, and then store their flows behind large dams in big, centralised reservoirs, and transfer them over long distances through canals? The choice between these alternative approaches (local,

decentralised, small-scale, people-centred *vs* large, centralized, techno-centric), or a combination of the two, is a complex matter requiring multiple and inter-disciplinary perspectives, but it is a study that needs to be made.

Another question that needs to be considered is regarding the manner of putting the captured water to use. Should it be used direct from the surface structures or should it be stored in underground aquifers and drawn therefrom? The latter will reduce loss through evaporation but will involve the use of energy to pump the stored water up for use. In Alwar District of Rajasthan the water-harvesting efforts promoted by Rajendra Singh follow the practice of using the harvested water to recharge aquifers and then drawing the water from wells where the water level goes up. It is of course possible that the precious water so harvested may be used to grow water-intensive crops, so that the demand once again overtakes the availability. There is also the danger that the water harvested by villagers through social mobilization may be extracted by a rich farmer through power-driven borewells or tubewells. Some kind of regulation is needed to prevent such developments. In some places, for instance in Alwar District, the regulation is achieved through social sanctions. This may not work in all places. Legal regulation of groundwater by the state is difficult because under Indian law the owner of land owns the water under it and is at liberty to extract the water as he or she wishes. Efforts at regulation through law have not been very successful so far. We have to see whether the Maharashtra Water Resources Regulatory Authority is able to tackle this problem successfully.

It may seem that I have digressed from the subject of water-harvesting to groundwater, but there is a relationship between the two through the use of water-harvesting for re-charging groundwater. The Government of India has established a National Council for the Artificial Recharge of Groundwater, and water-harvesting structures are among

the means that will be used. Similarly, when arrangements for the rooftop collection of rainwater are required by the building laws as in Chennai, the water so collected is often directed to underground aquifers.

In this context I must refer to the recent work of Dr. Tushaar Shah, our most eminent scholar on groundwater. He considers various answers to the projected water crisis, discounts the possibility and desirability of building a large number of dams and advocates the storing of water in underground aquifers through what he refers to as Aquifer Storage and Recharge for minimising loss by evaporation. Rainwater-harvesting will be among the means of recharge.

I have tried to provide a general overview on the subject of this conference in broad terms with reference to conditions in India. I hope that what I have said will be useful in setting the stage for the detailed technical discussions that are to follow. Thank you.