

Jal Swaraj

A REPORT ON THE TECHNICAL, LEGAL AND ADMINISTRATIVE ISSUES CONCERNING THE JOHAD IN LAVA KA BAAS

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The report is prepared by a Group of Eminent Persons convened by the Centre for Science and Environment



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PROFILES



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alleviation programmes.



Dr M C Chaturvedi did his civil engineering from University of Roorkee in 1946. While serving the government, he designed the Rihand dam. Later he went to the University of Iowa. Dr Chaturvedi became the founder-head of the civil engineering department of Indian Institute of Technology (IIT), Kanpur, and also of applied mechanical engineering at IIT Delhi. He has been on the board of consultants of several dams like the Tehri and Beas. He has been a visiting professor

at universities like Harvard and Houston in USA. Currently, he is also involved in the Centre for Science and Environment's (CSE) activities as a Distinguished Fellow in the institution.



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an enthusiastic participant at the Rio Earth Summit in 1992.

Jal Swaraj is the only way to Gram Swaraj

On June 20, 2001, Tarun Bharat Sangh (TBS), a non-governmental organisation (NGO) working in Alwar district of Rajasthan, received a notice from the Rajasthan irrigation department saying that the earthen groundwater recharge structure which it had helped to build in the village Lava ka Baas was both technically unsafe and illegal. TBS was given 15 days to remove the structure, failing which action would be taken under the Rajasthan Irrigation and Drainage Act, 1954.

The structure in question is a small earthen embankment over a narrow, almost triangular gorge, in a nallah. The total length is only about 225 metres. And the average height is 15.5 metres. It is built on the community grazing lands of Lava ka Baas. The village is a small settlement located near Thanagazi in Alwar district. The villagers have constructed the structure with technical support from TBS. This NGO has constructed over 4,500 such structures in over 700 villages in the region. The villagers of Lava ka Baas were desperate for water --- the village has only one handpump for its entire human and animal population — and they have invested Rs 3 lakh of their own meagre savings in building the structure. The rest of the funds — Rs 5 lakh — came from an industrialist in Churu district who gave the money in memory of his mother. The work on the recharge structure began in March 2001 and was completed by mid-June.

Subsequently, the department conducted a technical study of the structure. Its report of June 29, 2001 details the technical and legal problems with the structure. In its assessment of legal issues, it says the structure is in violation of the 1910 agreement between the erstwhile states of Alwar and Bharatpur. According to the technical report, "In 1910 a dispute arose between the erstwhile states of Alwar and Bharatpur over the middle stretch of the Ruparel river. In settlement of the dispute, the court ordered that during the monsoons the water of the Ruparel river would be divided between Alwar and Bharatpur districts of the basis of 1:1.234 parts (45:55). To implement the decision, a pick-up weir was constructed so that the division of water was done in a manner that Alwar received 45 per cent of the flow and Bharatpur 55 per cent. This decision is being

complied with till date. The existing structure will contravene the agreement."¹

Furthermore, as the villagers did not seek permission from the department before construction of the dam, it is in violation of the Irrigation and Drainage Act under sections 55(3) and 58(2) and thus it is a punishable offence.

The report concludes that the *johad* at Lava ka Baas in Alwar district could lead to a water shortage and have a negative impact on agriculture in Bharatpur district. This in turn could lead to unrest in Bharatpur.

On July 1, 2001, the district administration decided to take action by breaking down the structure. Officials backed up by a police force appeared at the site of the structure. However, the intervention by the chief minister of Rajasthan, Shri Ashok Gehlot, and the chief secretary, Shri Inderjit Khanna, at the instance of the Centre for Science for Environment, stopped the structure from being demolished. The irrigation administration instead directed the villagers to deepen the existing spillway of the structure to drain out the watecollected in the reservoir in order to reduce the water impounded and thus make the structure safe.

The villagers deepened the spillway by digging a channel with a further (2.6 metres) depth based on the directions of the administration and, thus, lowered the height of the spillway by (10.2 metres) from the maximum height of the structure leaving an impoundment of about (3.5 metres) depth. But the problem remained as the local administration was convinced that the further deepening of the spillway was inadequate and wanted it deepened further, which would have rendered the structure more or less redundant. The entire dreams of the villagers who had built the structure and who were seeing water for the first time in their wells would have been dashed.

In the meantime, fast moving developments in the state were threatening to blow the issue out of proportion. For instance, a key opposition leader and former chief minister, Shri Bhairon

^{*} Jal Swaraj Water Self-Reliance

^{*} Gram Swaraj: Village Self-Reliance



The Group of Eminent Persons along with the villagers at Lava ka Baas

Singh Shekhawat, condemned the efforts of the villagers in constructing the structure without the permission of the irrigation department. The state irrigation minister, Shrimati Kamla Beniwal, also made a statement to the press that any activity relating to the storage of water without prior permission from the irrigation department would not be tolerated. She went on to say that "every drop of water that is received through rain belongs to the irrigation department."²

The Centre for Science and Environment, concerned that these events could impede, if not destroy, the growing nationwide movement for water conservation and rainwater harvesting, decided to intervene by requesting a group of eminent people — well known for their work in the field of agriculture, irrigation engineering, natural resource management policy and law — to visit the village and study the matter.

This report is based on the visit of this Group of Eminent Persons to Lava ka Baas on July 19, 2001 and their meetings with local villagers, workers of TBS and officials of the district administration, including the district magistrate, Shri Tanmay Kumar. The group later went to Jaipur that evening to meet the chief minister, Shri Ashok Gehlot, and later held a press conference to brief the media on its findings.

The group comprised of the following:

- Dr M S Swaminathan, eminent agricultural scientist, Chennai
- Dr N C Saxena, secretary, Planning Commission, Government of India, New Delhi
- Dr M C Chaturvedi, former founder-head of Department of Civil Engineering, Indian Institute of Technology (IIT)-Kanpur and Applied Mechanics Department, IIT-Delhi and visiting professor, Harvard University
- Dr G Mohan Gopal, director, National Law School of India University, Bangalore
- Mr Om Thanvi, editor, Jansatta, New Delhi

The work of the group was coordinated by the Centre for Science and Environment

The team received inputs from Dr M S Rathore of the Institute of Development Studies (IDS) in Jaipur and Tej Razdan of the Jheel Sanrakshana Samiti in Udaipur. CSE is extremely grateful to IDS, Jaipur for the facilities it provided for the press conference.

> — Anil Agarwal Sunita Narain

If the *johad* was broken, the entire dreams of the villagers who were seeing water for the first time would have been dashed

Rainwater harvesting, livelihood security and the structure at Lava ka Baas

It is vital to recognise that food security depends on four issues: food availability, access to food, absorption of food by the body, and sustainability of food production. But for all this, water is critical and, therefore, the availability of water is a critical determinant of food security. The World Food Programme and the M.S.Swaminathan Research Foundation have just published the *Food Insecurity Atlas of Rural India*. Out of the 16 states studied, the villages of Rajasthan stand 13th in food insecurity and the state's rural areas are classified as 'severely insecure'.³

With very limited surface water and groundwater resources, Rajasthan faces a serious problem of water scarcity. Overdrawal and pollution will become increasingly severe as population increases and economic development takes place. Groundwater tables are already being undermined. According to the government's own estimates, out of 37 districts in the state, 27 districts have a serious problem of depletion of the groundwater table.⁴ In the districts of Alwar and Bharatpur, groundwater levels have shown an alarming decline. The only districts where groundwater tables have improved are in the areas along the Rajasthan canal, which, in fact, are facing a serious problem of waterlogging. Rajasthan also

Children enjoy the benefit of their parents' hard work



faces problems of groundwater quality due to inherent geohydrological characteristics, which will get exacerbated as development takes place.

It is in this specific context of Rajasthan that it is important to understand the potential of rainwater harvesting. Over the last one hundred years or so, we have seen two major paradigm shifts in water management. One is that individuals and communities have steadily given over their role almost completely to the state in the management of water resources. The second is that the simple technology of using rainwater has declined and in its place exploitation of rivers and groundwater through dams and tubewells has become the key source of water.

As water in rivers and aquifers is only a small portion of the total rainwater availability, there is growing and, in many cases, unbearable stress on these sources. Dependence on the state has meant that costs have increased; with cost recovery being poor the financial sustainability of water schemes has run aground; repairs and maintenance are abysmal; and, with people having no interest in using water carefully, the sustainability of water resources has itself become a question mark — problems we see across the board today. As a result, there are serious problems with

government drinking water supply schemes.

Despite all the government efforts, the number of 'problem villages' — government classification of villages that do not have access to adequate or potable drinking water — does not seem to go down. As one senior government official has put it "in our mathematics, 200,000 problem villages minus 200,000 problem villages."⁵

Rainwater harvesting can help to

According to the government's own estimate, out of 37 districts in the state, 27 districts have a serious problem of depletion of the groundwater table

address the serious problems of drought and water scarcity in Rajasthan, as in other droughtprone areas of the country. For instance, even if the villagers living in the Rajasthan desert were to capture a meagre 100 mm of water in a year over one hectare of land, they would receive as much as one million litres of water. Not surprisingly, the people of Rajasthan have a long-standing tradition of rainwater harvesting.⁶

The key component of rainwater management is 'storage' especially in a country like India where the monsoon gives us on average about one hundred hours of rain and then nothing for the remaining 8,660 hours in a year. This water has to be captured in large reservoirs with large catchments by building large dams, in small tanks and ponds with small catchments, or by storing it in a way that it percolates down into the ground and gets stored as groundwater.

In this context it is important to realise that there is no technological alternative but rainwater harvesting for villages like Lava ka Baas. After 50 years of independence the village has virtually no drinking water and absolutely no irrigation sources. The current irrigation strategy of the country which relies on large inter-basin transfers or exploitation of existing groundwater reserves has no answers for these people, situated as they are in remote areas with hilly terrains. Large irrigation projects - undoubtedly important for many other parts of the country - will simply never reach every village in the country. Therefore, large irrigation projects provide solutions to certain regions but cannot droughtproof or irrigate the entire country.

The Rajasthan government itself estimates that while the total cultivable area of the state is 25.7 million ha and the net sown area in 1995-96 was 16.57 million hectares, the ultimate irrigation potential is estimated to be only 5.53 million ha a mere 21.5 per cent of the cultivable area. In 1999, the surface irrigation potential was only 2.83 million hectares.⁷ By the mid-1990s, groundwater development was already very advanced — over 50 per cent of the ultimate potential — and next only to Punjab, Haryana and Tripura.⁸ The existing groundwater use is becoming



Women at Lava ka Baas

unsustainable in many parts of the state.

Villages like Lava ka Baas will, therefore, have to depend either on groundwater or on local water harvesting. In fact, these two must go together because use of groundwater can only be sustained if there are local efforts to recharge the aquifers. It is for this reason we would argue that not only is rainwater harvesting critical for 'local food security' and livelihoods but that it also provides the most cost-effective and feasible technological option today to meet water and irrigation needs of poor and water-scarce villages.

But rainwater harvesting — building and sustaining small and medium structures for capturing rainwater — is just not possible without community involvement, indeed control. We have seen many such important efforts go waste without local partnership and, therefore, what pleased us most was to see the involvement of the villagers in Lava ka Baas. These poor people have invested over Rs 3 lakh of their own earnings into building the structure and even more through their *shramdaan* (voluntary labour). Today, governments are looking for such models to emulate as they are coming to understand that without people's participation these projects are built in one monsoon and disappear after a few years.

It is for these reasons that we are convinced that the work of Lava ka Baas must be supported. In our view these water harvesting initiatives foster both a *Sarvodaya* approach in providing water to all and an *Antyodaya* approach in water sharing.

After 50 years of Independence, Lava ka Baas has virtually no drinking water and absolutely no irrigation sources. Hence, rainwater harvesting is the only alternative

Water harvesting initiatives like the one in Lava ka Baas foster both a Sarvodaya approach in providing water and an Antyodaya approach in water sharing

However, we recognise that this case illustrates that there are several issues — technical, legal and administrative --- that need to be sorted out so that we can create the right framework for the growth of community efforts in water management. We recommend that a set of guidelines be developed for the promotion of community-based water harvesting initiatives by a group of eminent people who have long experience in social mobilisation, rural development and water resources management. We would also recommend that the department of irrigation be renamed the department of water so that it recognises its role in both promoting water conservation and development integrally.

Most importantly, we must convert this conflict into a "win-win" situation for all - the people of Alwar, living upstream of the river, and Bharatpur who use the downstream flow of the river. Bharatpur also has a growing problem of depleting groundwater tables and salinity. It would be important to work with these communities to change their irrigation systems and for them to also harvest their rainwater endowment so that they can recharge their groundwater reserves. We believe it is possible to convert this current controversy into an opportunity for the future. The central issue is to undertake a river basin-level integrated environmental and economic systems planning to develop the portfolio of activities needed for sustainable development.

Rajasthan: ahead in water harvesting

We are also very encouraged to learn that the current government of Rajasthan has taken the concept of rainwater harvesting on board in its water management strategies. Rajasthan has taught the entire world the importance of the raindrop. The technological sophistication of the indigenous systems of water harvesting in the state — the millions of *tankas, kundis, nadis, talabs, kuis* and *johads* — is now being recognised.

We understand that the government is giving priority to water harvesting structures in its drought relief programmes. In the drought-relief operations of 2001, over 100,000 works have been taken up, out of which more than 50,000 are water harvesting structures and include efforts to revive traditional sources of water.⁹ Under the Rajiv Gandhi Drinking Water Mission, over 31,000 traditional sources of water have been identified and work is on to repair and renew these structures. In urban areas, building byelaws have been amended to promote rainwater harvesting and recharge of groundwater. We understand that the Hon'ble Governor and Chief Minister of the state have provided a model for others to emulate by making sure that their residences have installed rainwater harvesting systems.



Villagers gather to voice their concern

We are delighted to hear of these initiatives. These programmes, we believe, will go a long way in enabling us to use drought relief as a permanent and long-term relief against drought. But we also know that such programmes need political leadership and commitment at the highest level and for this reason we would like to place our appreciation on record for the efforts made by the chief minister, Shri Ashok Gehlot, in promoting these efforts for local food and water security.

It is in this context that we would like to make the following remarks on the water harvesting structure in Lava ka Baas.

Ambit of the law

The Group looked at the legal issues raised by the notice served on TBS and the related technical report of the Rajasthan irrigation department. The notice to TBS has been served under the sections 55(3) and 58(2) of the Rajasthan Irrigation and Drainage Act, 1954. These sections state:

"55. Offences under Act.- Whoever, without proper authority and voluntarily does any of the following, that is to say—

(3) interferes with or alters the flow of water in any river or stream, so as to endanger, damage or render less useful any irrigation or drainage work;

[shall be liable, on conviction before a Magistrate, to a fine not exceeding one hundred rupees, or to imprisonment not exceeding one month, or both, for the first offence; and to a fine not exceeding five hundred rupees, or to imprisonment not exceeding three months, or to both, for a subsequent offence].(substituted by Raj. 29 of 1991 w.e.f. 17-11-92)"

"58. Power to arrest without warrant - Any person in charge of, or employed upon, any irrigation or drainage work may remove from the lands or buildings belonging thereto, or may take into custody and take forthwith before a magistrate or to the nearest police station, to be dealt with according to law any person who within his view, commits any of the following offences.—

(2) without proper authority interferes with the



supply or flow of water in or from any irrigation or drainage work or in any river of stream, so as to endanger, damage or render less useful any irrigation or drainage work."

The technical report states that "the construction work on the above mentioned Laha ka Baas (read Lava ka Baas) named dam on the Ruparel river is contrary to the sections 55(3) and 58(2) of the Irrigation and Drainage Act and hence illegal."

The report makes the following additional points:

- (a) "The construction work on the proposed Laha ka Baas dam is being undertaken in Alwar district which may lead to adverse impacts on water use and agricultural management in Bharatpur district and there is full likelihood that this will lead to unrest in Bharatpur region."
- (b) "If other NGOs continue to undertake illegal work on the drains and rivers of the state in the same manner then there will be an adverse impact on the organised use of the state's water resources and its planned dams and schemes and there will be no control on them of the state government. In many regions, there will be a strong possibility that these activities could increase unrest."
- (c) "The above mentioned dam constructed near Laha ka Baas is entirely unsafe according to technical parameters and there is a possibility that even a small downpour could result in the breaking of the dam which means that the likelihood of life and property downstream being harmed will remain. In the current situation it is not proper to maintain such an unsafe dam. Therefore, there is a need for appropriate administrative and police arrangements to remove it because the people of the nearby area benefiting from it will not let it be removed easily."
- (d) "In 1910 there was a dispute over the water of the Ruparel river between the then Alwar and Bharatpur states and for its resolution, the court had ordered that during the monsoon the water of the Ruparel river will be divided in the ratio of 1:1.234 (45:55) between Alwar and Ruparel

The report mentions that if NGOs continue to undertake illegal work on drains it could have an adverse impact on the state's organised use of water resources and schemes Notice served on TBS is legally deficient because the Irrigation and Drainage Act, 1954 explicitly states that it does not apply to minor irrigation structures



Local people admiring the water harvesting initiative

districts and for its implementation the Barah pick-up weir was made which automatically distributes the water between Alwar and Bharatpur which is approximately 45 per cent and 55 per cent. This order is being implemented till today......The above description makes it clear that the above mentioned dam is contrary to the court order on water distribution and if people of the downstream region get excited on this issue and go to court then there is a possibility that there will be a decision in their favour as well as it will be difficult to control the public unrest. Therefore, it is appropriate to remove this illegal construction."

The above notice and technical report thus raise both legal and technical issues. Our comments are as follows:

(a) Firstly, based on the material available to us, it appears that the notice served on TBS is legally deficient because it invokes a law which does not apply to the johad in question (the Irrigation and Drainage Act 1954). Whereas the Act explicitly states that it does not apply to minor irrigation structures, the concerned johad is a minor irrigation structure, as confirmed to us by irrigation officials concerned during our visit. (Section 3(ii) of the Act states that in this Act, unless the context otherwise requires, "Irrigation works" means a work or system of work, natural or artificial, not being a minor irrigation work as defined in section 2 of the Rajasthan Minor Irrigation Works Act, 1953.)

Should there be any other ground for invoking this Act, this has not been spelt out in the notice served on TBS or pointed out to us. Under the circumstances, it appears that the notice lacks sufficient legal basis and has been prepared in haste without careful consideration or framing of legal issues.

(b) The notice served on TBS and the technical report of the irrigation department do not indicate how the Lava ka Baas johad contravenes the 1910 Bharatpur-Alwar agreement. District authorities could not produce a copy of the Bharatpur-Alwar agreement on which they had purportedly relied in issuing the notice to TBS. The only document that could be produced by them was a barely legible copy of an apportionment award by a colonial official at the turn of the century. The only relevant provision of this award that district officials could point to is that the waters of the Ruparel river would, at a designated point, be divided on a 55-45 basis between Bharatpur and Alwar, Beyond a vague reference to the division of "unrestricted flows", district authorities could not point to any provision in this award or elsewhere that explicitly imposed on Alwar either an agreement to guarantee a minimum flow of water to Bharatpur, or an obligation to desist from building any structures on the river or in the catchment area. Restrictions on such vital matters as the freedom of a state to tap water resources cannot be implied, but should be explicitly adopted. District officials referred to a Privy Council decision on this matter, however, none of the officials had ever had the opportunity to see such a decision, except one engineer who claimed to have read it some three decades ago. Finally, the only provision of which district officials could point as the basis of their legal action in this regard was a sentence in a booklet produced by TBS entitled Phir se bahne lagi Ruparel by Professor Mohan Shrotriya and Avinash which says that "In those days the Bharatpur Maharaja had been able to obtain an order from the court that the Alwar Maharaja should not build any dam on the Ruparel." TBS confirmed that this casual sentence was based on hearsay rather



Water in a degraded catchment

than on any knowledge or review of a court order or an agreement. It appears that this unsubstantiated and unofficial NGO statement was what was relied upon by district authorities in issuing the notice. In any event, even if such an agreement — or judicial decisions — exist, their legal effect after an eventful century requires very careful legal analysis before any final view may be taken. For these reasons, our view again is that district officials have failed to substantiate their case that the Lava ka Baas structure violates a turn of the century Alwar-Bharatpur arrangement.

(c) in any event, an arrangement pertaining to river waters of the Ruparel river does not apply to the *johad* because, as a factual matter, it has not been built on the Ruparel river. The johad is built in a relatively distant part of what may be considered the catchment area of the river (although we are not aware of any legal demarcation of the catchment area). This is confirmed by the government maps which show that the johad has been built on an unnamed nallah of the catchment of the Ruparel river, described as the Udaynath ka Nala by the local people. In the district revenue records, the nallah is described as gairmumkin nallah (literally meaning one that is impossible to call a regular nallah and that it is only on occasional nallah). The notice is thus further vitiated by the erroneous assumption that the *johad* is constructed on the river. Even if there are arrangements between Bharatpur and Alwar applying to river waters, their

extension to the catchment area of the river would raise a number of complex issues because agreements for sharing of river waters generally place restrictions on the obstruction on flows on the main stem of a river or its tributaries. Such automatic extension to an undefined catchment area would mean that even the construction of roads and houses in the area — or indeed afforestation schemes that reduce run-off of water and top soil or even household-level initiatives to conserve rainwater falling on roofs - could be construed as obstruction of water in violation of agreements regarding river water flows or adversely affecting irrigation structures under the law. For instance, a little below the Lava ka Baas iohad, we saw the water of the nallah being restricted by the foundation of a culvert built for the road connecting Sariska with Jaipur. If all flows in the catchment were covered by the river water sharing agreement between Alwar and Bharatpur, then even the construction of this culvert, among many other such constructions, may have to be considered illegal. Such an approach would create a cloud of legal doubt over thousands of irrigation, public works, agriculture and private structures and potentially open a legal Pandora's box, with uncertain consequences for the ability of government to undertake development activities.

- (d) The catchment of the Lava ka Baas johad is no longer an unrestricted catchment. TBS and local villagers have already constructed over ten johads in its catchment. Thus, under the arguments made in the notice served on TBS, all these structures will also have to be declared illegal and removed. In addition, some 350 johads had been built by the villagers and TBS in the catchment of Ruparel by September 30, 1997 because of which the Ruparel had begun to flow round the year according to TBS. All these structures would also become illegal.
- (e) The district authorities claimed that there was a provision in its notifications that impoundments of water up to two metres.depth were acceptable. But the district and irrigation

In the district revenue records, the nallah on which the johad has been constructed is described as gairmumkin nallah, literally meaning that it is only an occasional nallah

The Lava ka Baas structure occupies 3,900 ha of the total 325,000 ha catchment area of the 90 km Ruparel — just 1.2 per cent of the total catchment of the river

authorities could not produce any such order. In any case, a blanket rule of two metres depth is not acceptable to us as it would render many water harvesting structures costineffective.

It is obvious to us that the notice served on TBS has been prepared without a proper review or understanding of relevant documents and laws and legal advice. Existing law has provided adequate space for construction of a large number of similar structures -- for rainwater harvesting and for public works. It is not clear why any publicminded group - in particular the district administration - should now expend time and resources to build a tenuous case that the Lava ka Baas johad and similar structures are illegal. Given the unplanned proliferation of laws and regulations in our country, it would not be impossible for the government to find some provision (such as the Rajasthan Minor Irrigation Act, 1953) relying on which the government could argue that the johad is illegal. However, it would be entirely erroneous to extend and distort laws governing government irrigation facilities (colonial laws intended to facilitate the construction of irrigation schemes) to rainwater harvesting, a related but entirely different policy issue. The strategic consequences of this extension would be quite disastrous - complex and protracted litigation that could last for years while developmental activities for water conservation are held up. Actions intended to harm government constructed or maintained irrigation structures or impede them should rightly be illegal. However, these actions should be distinguished from efforts intended to facilitate water conservation and water management by communities. There is currently no legal regime governing this latter set of actions and, in the absence of a clear provision of the law that prohibits them, there is no basis to consider them illegal. If the government is not prepared to take this view, then it must realise that many structures and obstructions to water flows including roads and buildings and many existing water harvesting structures -- and the chief minister's own programme for people's initiatives or rainwater harvesting --- would have to be declared illegal leading to immense litigation. The laudable efforts

of the Rajasthan government cited above and various NGOs to promote people's participation in rainwater harvesting will come to a halt in a region which is highly drought-prone.

We, therefore, strongly recommend that the Rajasthan government desist from taking the narrow legal view that has been taken in the notice served on TBS. In fact, such a narrow view would raise questions even about afforestation and other watershed development activities in the region because forests have the same impact on the hydrological regime as water harvesting structures — whose main objective is to recharge the groundwater — both reduce monsoonal flows but increase dry season flows.

Therefore, the only remaining issues are technical ones. Firstly, whether the Lava ka Baas structure will have any adverse impact on downstream flows in the Ruparel river as implied in the technical report prepared by the Rajasthan irrigation department. And, secondly, whether the structure is safe or not.

Technical issues

DOWNSTREAM IMPACTS: It is our opinion that the Lava ka Baas structure will not have any adverse impact on downstream flows. On the contrary, more such structures if built in the catchment of the river could even have a beneficial impact.

Firstly, the catchment of the Lava ka Baas structure even though it is no longer unrestricted is only about 3,900 hectares (ha) as compared to the 325,000 ha catchment area of the 90 km Ruparel river before it flows into the Sikripatti dam. This is only about 1.2 per cent of the total catchment area of the river. Moreover, Bharatpur district receives not just the waters of the Ruparel but also that of Gambhiri and Banganga.

Secondly, as the Lava ka Baas *johad* is not a dam with a canal to abstract water from the *nallah* — it is a water harvesting structure called *johad*, traditional to the area, whose main objective is to recharge the groundwater reserves — all that it can do at worst is to reduce the monsoon flow by a



An apparent benefit of the johad

very slight amount because of its small catchment. In this way, it would contribute to reduction in floodwaters — Bharatpur does suffer from floods — and at the same time it would increase dry season flows in the river because of increased groundwater recharge. Thus, if many more such structures were built in the catchment of the Ruparel, the downstream areas would receive more water during the dry season when they need water the most.

It is quite possible that even the monsoonal flows in the river Ruparel will not get affected. The Investigation, Design and Research (Irrigation) Unit of the Rajasthan government had released a study entitled A study of the impacts by the small water harvesting structures in the catchment area of Sainthal Sagar dam in June 1999. The study had tried to assess the impact of over 200 johads and check dams built in the neighbouring 50,300 ha watershed of the 45 km Arvari river. The study assessed the monsoonal flows of the Arvari river into the downstream Sainthal Sagar for nine years before and 11 years after the construction of the water harvesting structures began in 1987 with the help of TBS. The study concludes "there is no impact on the yield of the Sainthal Sagar after the year 1987 due to water harvesting structures in catchment areas."10 The changes in the year-to-year flows into the Sainthal Sagar dam were strongly correlated with the total quantity and distribution of rainfall in the particular years (see table 1: Where is the impact of water harvesting on downstream flows?).

Moreover, extensive groundwater recharge through structures like the one at Lava ka Baas

should also have a beneficial impact on both the quantity and quality of groundwater downstream. The Ruparel river basin has steep hills but the plains are extremely flat leading to slow groundwater and surface water flows. The extensive deforestation in the area has also reduced groundwater recharge by allowing the monsoon rains to run off fast. Groundwater recharge is also naturally low because the bulk of the rainfall occurs in a few short spells generating a lot of runoff. The groundwater in the Bharatpur area is known to be saline. Extensive groundwater recharge should not only help to raise the groundwater levels but also reduce the groundwater salinity in this region over time. Thus, from the point of regional water resources development in the Ruparel river basin, rainwater harvesting for the purpose of groundwater recharge will have a beneficial impact both upstream and downstream.

There is a need to develop robust models to predict the exact impact — both in terms of time and space — of water harvesting structures on the hydrology of watersheds. Unfortunately, such models do not exist at the moment.

SAFETY OF THE LAVA KA BAAS STRUCTURE: A report on the safety of the Lava ka Baas structure has already been submitted by Professor M C Chaturvedi, one of the undersigned, to Shri Ashok Gehlot, chief minister of Rajasthan, after his visit to the site of the structure on July 12, 2001 and discussions with irrigation department engineers.¹¹ We reiterate a few key issues raised in the report. We believe that the view that the structure is technologically unsound arises from a fundamental conceptual error. A johad is not a large dam as conventionally understood. It is a very small structure, which has developed evolutionally for the storage of water by the people using locally available materials. Its design is as much an art as it is a science. Therefore, applying safety principles which are normally used for large dams to these small traditional structures. is not correct. Unfortunately, no design norms exist for such small structures. The only available norms that can be applied to these structures are those prepared by the Central Research Institute for

Extensive groundwater recharge through the *johad* at Lava ka Baas should have a beneficial impact on both the quantity and quality of groundwater downstream

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Table 1: Where is the impact of water harvesting on downstream flows?

Annual rainfall vs capacity of Sainthal Sagar filled up from 1998: pre and post water harvesting activities

Year	Annual Rainfall (mm)	Dam capacity filled up (million cubic metres)
1987	148 Low rainfall	5.89
1984	208 Low rainfall	4.81
1988	283 Low rainfall	10.08
1990	332 Low rainfall	2.11
1989(e)	333 Low rainfall	8.16
1991	344 Low rainfall	6.31
1982(c)	361 Low rainfall	11.72
1997(f)	366 Low rainfall	3.85
1986(d)	384 Low rainfall	6.81
1994	434 Low rainfall	7.28
1981	558	13.73
1998	603	10.62
1996	625	3.73
1993	629	13.73
1983	676	13.73
1992	764	13.73
1985	806	13.73
1995	921	13.73

Notes: a) The average annual rainfall of the area is 600 millimetres (mm).

b) The full reservoir level capacity of Sainthal Sagar is 13.73 million cubic metres (mcum).

c) The year of 1982 caused a good yield of 11.72 mcum despite a low annual rainfall of 361 mm because of two consecutive rainstorms which gave good runoff. The first of 115 mm on dry ground lasted from July 7-18 and the second of 186 mm on damp ground lasted from July 23-August 18.

d) The year of 1986 which received an annual rainfall of 384 mm, comparable to that of 1982, however, produced a very low yield of 6.81 mcum as compared to 11.72 mcum in 1982. The first major storm of 103 mm from June 24-July 3 came on totally dry ground and produced no runoff. The second one of 236 mm from July 19-29 which came on damp soll did produce some runoff.

e) The year of 1989 gave an annual rainfall of only 333 mm but produced a good yield of 8.16 mcum. The first major storm of 127 mm from August 11-17 came on damp ground and after five days another storm of 149 mm from August 23-September 2 occurred. These two consecutive storms contributed to a high yield.

f) The year 1997 saw an annual rainfall of 366 mm and it generated a yield on only 3.85 cum. The reason for this low yield was the poor daily rainfall pattern which resulted in poor runoff.

Thus, the above illustration for the years 1982 and 1984 prior to 1987 and for 1989 and 1997 after 1987 shows that though the magnitude of the annual rainfalls for four years are more or less of the same range, due to varying rainfall distribution patterns they gave different contributions to runoff. The construction of the water harvesting structure has had no role in affecting the runoff into the dam.

Source: Government of Rajasthan 1999, A study of the impacts by the small water harvesting structures in the catchment area of Sainthal Sagar dam, Investigation, Design and Research (Irrigation) Unit, Jaipur, mimeo.

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Dryland Areas (CRIDA) of the Indian Council of Agricultural Research, Government of India, for what it calls a water harvesting *bandhi*.¹²

Our preliminary studies show that the Lava ka Baas structure has (a) much higher capacity than that required for the storage of maximum annual runoff, (b) it satisfies the basic requirements for stability, and (c) has ample capacity in the waste weir. Any shortcomings noted will be brought to the attention of the villagers and TBS and they will be rectified well in time. There is thus no need to lower the spillway further and, thus, reduce the capacity of the structure. Moreover, during our visit to the site on July 19, the district administration did not raise safety as a major concern to the group.

Government-civil society relations

It is also clear to us that Lava ka Baas illustrates the changing nature of relations between government and civil society. Both sides will have to learn to work together in a relationship of trust and mutual respect. This is not the case at the moment.

The relationships will have to be built on the changing nature of governance that we are seeing in the country. On the one hand, the role of the state in providing effective and credible development assistance is on the decline. On the other hand, the size and effectiveness of civil society, both as an effective development agent and critic, is increasing. The prevailing hierarchy and local power structures will inevitably heighten the conflict, unless a special effort is made to understand the situation and respond to it accordingly.

In Lava ka Baas, we could see two conflicts in action. One was the classic administrative conflict — between two neighbouring districts — which is quite common across the country and the other was the government-civil society conflict. Even though administrative conflicts between neighbouring districts are quite common but there was one thing unusual about the conflict in Lava ka Baas. The district magistrate of Alwar was found defending the interests of another district, Bharatpur. We believe that the inter-district conflict has got subsumed by the government-civil society conflict.

We believe that the local administration and civil society groups should be strongly encouraged to work together to bring together water and people's participation — two critical elements for improving food security, eradicating poverty and encouraging decentralised governance of natural resources in Rajasthan.

Acknowledgement

We wish to place on record our deep appreciation of the warmth with which the Hon'ble chief minister of Rajasthan, Shri Ashok Gehlot, received us and assured us that he would take into consideration our above views.

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