

Common Rainwater Harvesting Structures in Bikaner City: Problems of Changing Land Use and Future Prospects

Abstract

Before the advent of centralized drinking water supply, rainwater harvesting tanks were important sources of domestic water needs in Bikaner city, alongwith a few wells, and household rooftop rainwater harvesting structures. However, public water supply more or less rendered them in disused condition, even as mining and residential encroachment devoured their catchment areas. This paper looks into the past condition and present problems of these tanks in Bikaner city, and suggests their possible utilization, as an integral part of a new city-wide rooftop rainwater harvesting system. The latter will enable an enhanced, more decentralized, sustainable drinking water supply for the future Bikaner city.

Keywords: Common Property Resources, Rainwater Harvesting Structures, Decentralised Water Supply, Changing Land Use, Bikaner City

Introduction

Water resource availability and accessibility today is declining fast even as the centralized water supply system fails to keep pace with the growing demand. Significance of water harvesting measures is becoming evident in this scenario. Attention is naturally drawn to the regions with tradition of rainwater harvesting. In the monsoon climate of India, with its characteristic dry and wet seasons and ephemeral water resources, water has been harvested since ancient times. This is especially true for arid and semi-arid lands, where this has been in practice for drinking and irrigational purposes. Water from seasonal streams, for e.g., is diverted to storage structures, known as zing in the cold desert of Ladakh or kere in the semi-arid Karnataka, and is used for humans, animals as well as crop irrigation (Agarwal and Narain, 2001). In the arid Thar desert, situated to the west of Aravalli range in Rajasthan, drought prevails two-fifth of the time and nearly 30 percent of the land is open pastureland. People here, thus, have a natural tendency to store foodgrains, hay and rainwater.

However, there has been a general decline in the decentralized, traditional rainwater harvesting practices and structures, such as ponds and tanks. This can be linked to the overall decline of Common Property Resources (CPRs) which include forests, pastures and tanks as well. The CPRs could be maintained earlier because the human and biotic pressure on them was limited and people willingly participated in the management of what they considered as life-support system of the society. These were conserved zealously.

The local communities had developed several indigenous management systems through various socio-cultural mechanisms and used the CPRs in a sustainable manner (Gadgil and Iyer, 1989). Establishment of strong state control over CPRs by the colonial rulers broke down these management systems. State's monopoly over these resources has been strengthened with even greater zeal, since independence, by the probable urban-industrial bias of the Indian government. There has been a simultaneous restriction of people's rights over CPRs. All these have led to their continuous over-exploitation and severe erosion (Guha, 1983; Singh, 1986; Gadgil and Guha, 1992).

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Objectives of the Study

The objectives of this study are

1. To acquire knowledge about the present-day use and disuse of rainwater harvesting structures in Bikaner city of Thar desert of Rajasthan.
2. To gain knowledge about changing land-use with respect to rainwater harvesting structures in the city.
3. To look into the future prospects of rainwater harvesting in order to enhance decentralised water supply sources.

Methodology and Sources of Information

This study is based on primary as well as secondary sources of information. The historical information on the rainwater harvesting structures, or tanks, of Bikaner city has been derived from Rajasthan State Archives, Bikaner as well as talks with the elderly persons living near various tanks. The present day status and problems of land-use associated with rainwater harvesting structures have been delineated through a field-based empirical study of the adjacent areas of the tanks in different parts of the city. Based on this past and present information, suggestions regarding future alterations in rainwater harvesting process and structures have been made.

Rainwater Harvesting in the Thar Desert and Bikaner City

The people of the Thar desert used to build wells and step wells (called baoris) for domestic needs. In the saline or brackish ground water areas, however, rainwater was harvested by constructing pucca catchments, which drained water into artificial, covered storage pits called kunds. In areas with hard ground, rainwater was simply collected in excavations known as sar. The people of the semi-arid Pali district, west of the Aravalli range, had a tradition of roof-top rainwater harvesting for household uses (Agarwal and Narain, 2001). The general practice of the kingdoms and their officials was to construct their own water bodies, while the masses managed at their own level. The rulers of the Bikaner state were exception in the sense that they laid emphasis on building canals for irrigation purposes. The Gang Canal in Ganganagar district is a well-known example.

The city of Bikaner was founded in 1489 by Rao Bika, in an area covered by sea during the hoary past. The area itself is characterized by the presence of impermeable layer of calcrete duricrust, or mudiya kankar, which facilitates excellent runoff and has, thus, been instrumental in the establishment of rainwater harvesting structures in the form of tanks, which dotted the whole city and its environs. These tanks were chief sources of domestic water supply for the city - several houses had wells, or even tankas, the rooftop rainwater harvesting structures. The latter stored rainwater, called palar, which was used for drinking purposes only. During years of drought, the household tankas were filled with water brought from public wells and tanks.

According to a Report, at the dawn of the 20th century, the total number of tanks in the city were around 40 (Agarwal and Narain, 2001). Powlett (1932), Matheran (1995) and Sohanlal (n.d.) indicated a very low number of tanks too, but Joshi (2004)

claims to have counted at least 69 big and small tanks (called talabs and talais, respectively), and estimates their actual number at more than 100 in the first half of the last century. The Bikaner city of yore could, thus, easily be christened as "the city of tanks". The tanks were differentiated internally as talabs/taals or talais. Talabs in Bikaner are bigger, rectangular structures, having pucca floors and always sloping towards Gau Ghat (Cows Ghat), so that there is no pollution of drinking water consumed by the humans. Talais, on the other hand, are comparatively smaller, circular tanks mostly used for drinking purposes for the humans.

Past Utilisation of Tanks in Bikaner

For about four centuries and a half (454 years) from its establishment till the time the kingdom resorted to free water supply in June, 1943 in the Bikaner city, tank culture dominated the scene (Joshi, 2004). All the higher or lower sections of the society used to build and look after their tanks by self-help approach. Most of the talabs and talais in Bikaner belong to different castes, communities or cults. The talais like Sutharon ki Talai, Darjion ki Talai, Chhimpolai, Chungaran, Kasaiyon ki Talai, Kukh Sagar belong to different castes and communities. The Brahmsagar talab was dedicated to Dadupanthi saints. Some of the tanks were also built by the well-to-do for public good, for warding-off the water crisis and for attaining spiritual peace. These were often built in memory of family members. Included in this are the talais of Farsolai, Gop Talai, Mirzamal ki Talai, and big talabs like Harsholav, Phoolnath and Gharsisar, amongst others. One or two talabs were built by the kings, generally on demand of the rich or the saints, for e.g., Sursagar in front of the Junagarh Fort, Shiv Sagar near Shivbari temple and Kalyan Sagar (Table 1).

Table 1 : Dedication of Tanks in Bikaner City

Type	Dedicated to		Unknown	Total
	Caste/ Community	Family Member Memory		
Talabs	01 (8.33)	09 (75.00)	02 (16.67)	12 (100.00)
Talais	28 (52.83)	09 (16.98)	16 (30.19)	53 (100.00)
All Tanks	29 (44.62)	18 (27.69)	18 (27.69)	65 (100.00)

Based on : Archival Sources; Joshi (2004)

Note : Figures in parenthesis in percent.

The tanks in Bikaner served varied purposes, foremost being the supply of drinking water for men and animals. Other purposes included bathing, religio-spiritual and those related to Karmakanda. The bigger talabs performed greater number of functions than the smaller talais, which is also reflected in the number of ghats (banks) these contained. A talab could have Panyar (drinking water) Ghat, Gau Ghat (for cows), Mardana Ghat (for bathing of men), Janana Ghat (for women), Chetan Ghat for meditation, Dan Ghat for the alms, Kriya Ghat for Karmakanda, besides Syahu Ghat for bathing of outsiders. The smaller talais had only the former three ghats. The tanks were commonly used by the public

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though there were some for private or exclusive use too (Table 2).

Table 2
Past Use of Tanks in Bikaner City

Type	Public Use	Private/ Exclusive use	Not known	Total
Talabs	11 (91.67)	01 (8.33)	-	12 (100.00)
Talais	33 (62.26)	07 (13.21)	13 (24.53)	53 (100.00)
All Tanks	44 (67.69)	08 (12.31)	13 (20.00)	65 (100.00)

Based on : Joshi (2004) and Fieldwork, 2013-14.
Note : Figures in parenthesis in percent.

Besides drinking, water and bathing, tank-water could be used elsewhere too. For e.g., the water of Dhobi Talai was used for washing of clothes, the members of chungar community earlier used water of Chungaran talai for lime kilns, while the water of Savalaxhi talai was later used for dyeing and printing of clothes by the chhimpa community. The tanks were often accompanied by temples or centres of religious practice. Talabs such as Sansolav, Phoolnath, Devikund, Shiv Sagar, Brahma Sagar and Gharsisar fall in this category. The tanks were also associated with religio-ceremonial purposes like post-crematory baths and ablutions. Harsholav talab is, thus, associated in this manner with Harsha Brahmins, Hinglaj with Acharyas, while Kalyan Sagar was earmarked for the royal family. Amongst talais, Kharnada, Chetolai, Chhimpolai (Nokha Road) and Bhaktolai can be counted in this category.

Present Status and Problems of Changing Land-Use of Tanks

In the past, maintenance of the tanks was ensured by people's participation. These were considered as social resources. People used to voluntarily desilt the tanks before the monsoon. When people went to temples in the morning, they used to take bath in the tanks and to dig 8-10 buckets of silt and throw it away from the tank. Activities like making bunds, planting in the catchment area (agor) of the tanks etc. were performed with a sense of social responsibility. However, the need for maintenance of tanks disappeared with the provision of centralized water supply. At present, six talabs and only one talai - the privately owned Gop Talai - are in working condition. Several tanks have been completely lost, or are in the process of being filled up. In most cases, only structural remains are to be seen (Table 3).

Table 3

Present Condition of Tanks in Bikaner City

Based on : Field Observation, 2013-14
Note : Figures in parenthesis in percent.

In earlier times, nobody was allowed to cultivate, defecate or even to enter the catchment of tanks with shoes on. The trustees of the respective tanks appointed guards to prevent transgression of the agors (catchments). Penalties were fixed by the king for encroaching upon it or for blocking the flow of water in it. Water harvesting structures like tanks and

wells, now, have not only lost importance due to centralized water supply through pipelines but have also become targets of the encroachers. The encroachment of the agors by the rapidly growing population primarily due to in-migration from rural areas, and earlier on, by the land-hungry mafia for mining of gravel for construction purposes has been widespread. This has been facilitated by a legal loophole, i.e., the catchments of the tanks were not in the name of individuals but public welfare trusts which had no ownership rights. In this situation, encroachers and miners have made hay. Only two big talabs, Harsholav and Sansolav, have been left with relatively safe catchment areas now (Table 4).

Table 4

Encroachment of Catchment Area of Tanks in Bikaner

Type	Mine Encroachment	House Encroachment	Relatively Safe	Total
Talabs	06 (50.00)	04 (33.33)	02 (16.67)	12 (100)
Talais	16 (30.19)	37 (69.81)	-	53 (100)
All Tanks	22 (33.85)	41 (63.08)	02 (3.07)	65 (100)

Based on : Field Observation, 2013-14
Note : Figures in parenthesis in percent.

The erstwhile 'City of tanks' has, thus, lost its character. Due to widespread encroachment of the catchment areas, the tanks no longer accumulate rainwater, which in any case is already scarce in this desert region. Only half a dozen talabs still remind of the good old days. Of these, the resuscitated and renovated Sur Sagar, and Kalyan Sagar (royal crematoria with artistic chhatris or cenotaphs) are tourist attractions. Sansolav, Harsholav and Devikund Sagar have religious significance. Sansolav, Harsholav and the disused Shivsagar are planned to be developed as the potential tourist attractions. The talais have almost been wiped off the city map. Twenty of them have been reduced to small grounds only, 27 have been disused or lost to other land uses, three have been replaced by parks (Jassolai, Bhatolai and Gabolai), Hakolai is now city's official garbage dumping ground, while Savalaxhi too has become receptacle of sewage wastes (Table 5).

Table 5

Contemporary Use of Tanks in Bikaner City

Type	Tourism/ Religious/ Private*	Disused/ Lost	Park/ Garbage	Ground	Total
Talabs	06 (50.00)	06 (50.00)	-	-	12 (100)
Talais	01* (1.89)	27 (50.94)	05 (9.43)	20 (37.74)	53 (100)

Type	Working	Completely Lost	Structural Remains only	Being Filled	Total
Talabs	06 (50.00)	02 (16.67)	04 (33.33)	-	12 (100)
Talais	01 (1.89)	19 (35.85)	30 (56.60)	03 (5.66)	53 (100)
All Tanks	07 (10.77)	21 (32.31)	34 (52.31)	03 (4.61)	65 (100)

All Tanks	07 (10.77)	33 (50.77)	05 (7.69)	20 (30.77)	65 (100)
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Based on : Field Observation, 2013-14

Note : Figures in parenthesis in percent.

Future Prospects

The smaller tanks or talais of Bikaner city have become disused, deprived of catchments, desiccated and even lost. Only larger talabs, associated with temples, religious practices or tourism survive in some form; some of them having relatively safer catchments, like Sansolav; and having at least some religious and tourist utility. The volume of water is much depleted due to catchment area encroachment.

The areas of the rainwater harvesting structures could be put to use in a modified manner. These tanks/tank areas could be used to store water obtained from rooftop rainwater harvesting. Each household would harvest rainwater falling on his rooftop. This water will be conveyed to the tanks via pipes and will be stored as surface or subsurface water, in the sub-surface storage tanks. Wherever available, the catchment areas should be preserved alongside. In fact, this rooftop rainwater harvesting system would cover the whole city, wherein the harvested rainwater will be conserved in overground/underground storage tanks, the latter could be built even below the parks in different neighbourhoods. Former tanks of the city could readily be made a part of this proposed rainwater harvesting system. Development of tanks for their aesthetic and tourist value can also be synchronized with this. All this would allow decentralized storage and enhancement of drinking water resources for various parts of the future Bikaner City.

Conclusion

The Bikaner of yore was a 'City of Tanks' because the geological structure afforded formation of water tanks. These tanks were used to fulfill domestic needs, alongwith wells and household underground rain water storages, until centralized water supply was started. The latter, alongwith in-migration of people and encroachment on catchment areas, have been instrumental in disuse and even wiping off of the tanks. In order to ensure sustainable water resource availability in future Bikaner, a rooftop rainwater harvesting system could be developed, in which the harvested rainwater will be stored in surface depressions or underground storage tanks in different localities. The erstwhile, lost or surviving tanks can be integrated in this suggested system.

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