IMPACT ASSESSMENT OF TAANKA STRUCTURES IN THAR REGION OF RAJASTHAN

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1. INTRODUCTION

Water is unarguably the most vital natural element for life to sustain on planet Earth. Simply defined, water is LIFE which means that water is an indispensable part of our lives. It is used for irrigation, cooking, washing, cleaning, drinking, and other activities. For an individual’s well-being, water is essential for maintaining good health as it helps to regulate body temperature, carry out normal functioning, aids in digestion and removes toxins from the body. However, water distribution on the planet is highly uneven which can be understood from the Fig. 1 below:

![Graph depicting water distribution on Earth](Image)

*Fig. 1 Water distribution on the earth (El-Ghonemy, 2012)*

The water quality and its availability have always played an important role in determining not only where people reside but also their quality of life. Even though there always has been abundant fresh water on Earth, water has not always been available where and when it is required, nor is it always of suitable quality for all purposes. Therefore, water should be considered as a finite natural resource as it has limits and boundaries to its availability and suitability for use.

1.1 Importance of Water

Water affects everything from education, health, environment, poverty and especially women and children. Water can mean different things to different people of varying backgrounds. For family houses, educational institutes and workplaces, water can mean health, hygiene, sanitation, dignity and productivity. For religious, cultural, and spiritual
places, water can mean a relationship with creation, community and oneself. In natural environment, water can mean peace, harmony and preservation.

It is estimated that by year 2030, 40% shortfall in freshwater resources coupled with a rising world population will led towards a global water crisis [1]. The United Nations predicts that around 3 billion people will be seeking clean water, by 2025.

Let’s look at a family caught in water crisis, it’s likely they live on less than $1 per day. Women and girls are responsible for water collection in 80 per cent of households without access to water on premises. They go off to collect water, many walk up to 3 hours a day to fetch water from the nearest pond, swamp or river which is exposed to all kinds of germs. Time spent in gathering water is the time they can’t spend learning to read, write, earn an income or take care of their family. When they make it home, the little water they’ve collected isn’t clean. Most families know that the water is contaminated with germs that cause diarrhea, dehydration and even death, but what choice do they have. Kids, especially babies are the most affected by these germs. According to a UNICEF report, in about every 19 seconds, a mother loses one of her babies to water-related illness.

However, water crisis is solvable. Some are brand new and innovative like water filtration systems, while some are age old like drilled or hand-dug wells. A safe water project in or near a village restores hours each day to a person’s life. Clean water means less disease, that’s less money spent on medicines which means more money for books and school uniforms. If the water project is built near a school, it can increase attendance especially among young girls.

1.2 Rationale of the study

For the past several decades, the practice of traditional rain water harvesting techniques for drinking water is declining significantly and the dependence of the villagers on the modern methods like tube wells is increasing. The Indian state of Rajasthan has the country's 10% land mass but only 1.1%, surface water making it almost completely dependent on ground water which is fast depleting. What's worse is that only 10% of wells have water that is safe for drinking and 88% of Rajasthan’s water is saline, 55% has very high fluoride [2].
While the ground water level in Rajasthan is depleting rapidly, it is also polluted over a large area. In addition, the pressure of increasing population and animal population is also increasing on the drinking water sources. In such a situation, traditional techniques have special importance in solving the problem of drinking water.

Table 2: District/ Region wise Area of Thar Desert [3]

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>District / Region</th>
<th>Area in Km²</th>
<th>Percent Area of Thar Desert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Jaisalmer</td>
<td>36401</td>
<td>32</td>
</tr>
<tr>
<td>2.</td>
<td>Barmer</td>
<td>28387</td>
<td>24</td>
</tr>
<tr>
<td>3.</td>
<td>Bikaner</td>
<td>30248</td>
<td>25</td>
</tr>
<tr>
<td>4.</td>
<td>Jodhpur</td>
<td>22850</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Thar Desert of Rajasthan</td>
<td>119886</td>
<td>100</td>
</tr>
</tbody>
</table>

The Thar desert region in Rajasthan is a water deficient region. The average annual rainfall of the western arid region is 317 mm and that of rest of eastern Rajasthan is 680 mm [2]. In Jodhpur District, the average rainfall (2011-2020) is just 392.84 mm (Ground Water Year Book Report, 2020-21, Rajasthan). With frequent droughts and chronic water shortages, the communities in the rural parts especially women and young girls are forced to live with poverty, illiteracy and poor health and hygiene due to lack of basic amenities. Due to less rainfall and ground water being polluted, water harvesting techniques have immense potential, so that the water needs of humans and animals can be met. One of the main techniques is ‘taanka’.

**Pic 1: Coupled with poverty, drought, COVID-19, Thar is looking at a critical period in near future**

Rainwater collection and storage in an underground cistern locally known as taanka is an age old common practice of western Rajasthan. It is a convenient way of providing clean and fresh drinking water in areas where groundwater is saline in most places and is at substantial depths. For families who reside in the desert and have to fetch drinking water from a distance, a water taanka is a crucial requirement. Various types of taanka from rectangular to circular
in shape and capacity ranging from as small as 1000 liters to 5,00,000 liters are prevalent in this region [2].

Gramin Vikas Vigyan Samiti (GRAVIS) NGO has developed scientific innovative methods on-site to construct such *taankas* in various districts of Rajasthan. Another NGO known as ASHA for Education has also played an instrumental role in not only providing clean drinking water to the rural communities but also helped in promoting socio-economic empowerment of communities along with improving girls’ education and healthcare. Such projects have given great relief to the water stressed communities and also generated awareness among women and young girls on matters of their primary healthcare and education. In this report, we will study the various impacts and influence of *taanka* construction in Jodhpur district of Rajasthan.

2. **THE PROJECT**

ASHA for Education and GRAVIS co-ventured the project ‘*Water, Health and Education for Women and Children*’ in the Thar region, with an objective to give relief to women and girls in drought situation and ensure their health and education through infrastructure development, capacity building, exposure and community participation. One of the method they embraced to achieve this objective was to construct sustainable and economical *taanka* structures. GRAVIS has inspired project villagers of Water, health and education for women and children in Thar to construct more than 500 drinking water *taankas* on the basis of improved technology. As a result, the villagers have not only ensured the availability of potable water, but have also saved money and labor in bringing water and got rid of the compulsion to drink saline water due to water scarcity. Along with this, the housewives have also got rid of the stress due to lack of water.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Year</th>
<th>No. of villages</th>
<th>No. of <em>taankas</em> constructed</th>
<th>No. of beneficiary people benefited</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2009</td>
<td>6</td>
<td>9</td>
<td>54</td>
</tr>
<tr>
<td>2</td>
<td>2010</td>
<td>6</td>
<td>11</td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>2011</td>
<td>6</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>2012</td>
<td>6</td>
<td>22</td>
<td>132</td>
</tr>
</tbody>
</table>

*Table 2: Availability of water through *taanka*"
The selection of the project location was done on the basis of community working in mines, quarries, and unorganised sector, BPL families and those living in scattered settlements (locally known as dhanis). These areas had difficulty in accessing clean and reliable source of drinking water and basic amenities like food and education. The project spreads across 6 villages (Annexure-I) of Osian block in Jodhpur district. A socio-cultural mix of population inhabits the block which comprises of many socially and economically deprived castes and communities. Irrigation in the block mainly relies on rainwater but some elite groups have tube wells and drinking water is fetched through tanks and naadis in the villages.

2.2 Duration
The Project was started in the year 2007-08 and it is still continuing with the support of GRAVIS.

2.3 Key Activities under the Project
The activities of the project focus on ensuring water security, better education and healthcare of women and girls. For a detailed description, see Annexure-II.

3. RAINWATER HARVESTING TECHNIQUES
Rainwater harvesting is an age old custom, undoubtedly a viable decentralized water source. Rainwater harvesting which is “conscious collection and storage of rainwater to cater to the demands of water, for drinking, domestic & irrigation purposes” meet about 35% demand of
drinking water and also of orchards in hot arid zone through rainwater harvesting using taanka [2]. If collection and storage are designed carefully, it is possible for a family to live for a year in area with rainfall as little as 100 mm to 200 mm per year. The project proposed the construction and maintenance for taanka structure along with some innovative technical improvements.

4. Taanka
A taanka is an underground rainwater storage reservoir, constructed either in the community or in the household (HH), wherein rainwater from rooftops, a courtyard or natural or artificially prepared catchment flows into the paved underground pit, through filtered inlets made on the external wall of the structure, where it is stored and can be used by one family during the dry season.

In the project, emphasis was laid on the construction of HH taanka as it will adhere to the particular family in question and will be in the reach of those families who were not financially sound and have to fetch water from far-off distances.

4.1 Building Materials
The most common construction material for improved taanka is stone masonry with cement plaster and cement concrete. Good quality stones, coarse aggregates, fine aggregates, cement and water are the building materials for the construction of a masonry taanka. The traditional construction of taanka varies from simple mud plaster to lime mortar, however wide variations have been observed.

4.2 Technical Design of taanka
The taanka is an underground pucca pool which is usually round. Where the land is hard, this soil is used to make dry sloping platforms from outside to inside the four circular ditches. This sloping surface platform is called the agor or the catchment area (or the catchment area of the tank from where the rainwater is collected). The flow of water falling into the agor is done towards the taanka and one to three inlets are made in the taanka, through which the water enters the taanka.

A solid texture of limestone or cement is made at the mouth of the taanka. An exit door is made on one side in the taanka so that excess water can be taken out. To take out the water
from the *taanka*, there is a small lid on the roof of the *taanka*, which is open and water can be drawn from the opening with the help of a bucket and rope. In many areas, the agor of the *taanka* is of natural sloping land. In many areas, especially in sandy places, artificial catchment areas have to be made. These *taankas* are usually made near the houses.

For circular tanka, depth (or diameter) can by determined by

\[
D = \left( \frac{1.27 \times V}{0.33} \right)
\]

Where,

- \(D\) is diameter as well as depth in meters
- \(V\) is capacity in cubic meters.

**Fig 1: A typical *taanka* structure with details**

4.3 Characteristics of a Typical *taanka* Structure

i) Its four baffle valves are helpful in preventing the soil coming with water.

ii) There is no smell in the water of the *taanka*.

iii) *taanka* construction is an economical activity.

iv) All the rain water reaches the *taanka*.

4.4 Improvisation work by GRAVIS

GRAVIS has done experimental work to improve the technique of *taanka* construction on the basis of public participation:

1. In places where stone blocks are not available, a cement-concrete molding wall has been made by molds.
2. In order to reduce the cost of construction, the roof of the *taanka* is made of small pieces of stone or the domes are made of cement and gravel.

3. Various types of silt catchers have been made to prevent the soil coming with rain water from entering the cistern.

4. The work of installing lattice at the entrance and exit has been done.

5. The rooftops of the households constructed under the scheme Pradhan Mantri Jan Awaas Yojana have also been innovatively linked with the *taanka* structure so that water efficiency improves. It means that earlier the catchment area or agor which used to be constructed is now being replaced with the household rooftops.

*Fig: 2 It is to be mentioned here that the villagers have liked and adopted sample no. 1 more*

![Diagram](image)

*Fig 3: Design of roof top rainwater harvesting through taanka by GRAVIS*
4.5 Repairing and Maintenance of taanka

On the basis of work done by GRAVIS, it can be said that following precautions should be taken for the maintenance and repair work of taanka:

1. To make a fence of thorns around the agora to stop the animals.
2. Cleaning the agora every year before the rains.
3. Every year soil gets deposited at the bottom of the taanka. To clean this soil, at the time of constructing a taanka, make a stone ladder for the entry of a person in the taanka and make the mouth of the taanka covered at the man's entry.
4. Installation of iron nets at the entrance and exit of water to prevent soil and other unnecessary things.
5. Fixing of iron cover on the roof of the tank to drain the water, which can be closed by locking.
6. Manufacturing of silt catchers by new techniques to prevent soil going into taanka.
7. To make separate proper places for filling water pitchers and feeding the animals.
It is worth noting that under the program to improve the manufacturing of traditional taankas, GRAVIS has taken all the necessary steps for cleanliness.

**Pic 3: Taanka Maintenance Training at Gagadi Centre**

Under the Project, trainings were organized by experts for the beneficiary families. In training, communities learned about design of taankas, importance of catchment area/agor, cleaning of tank and protection of catchment and taanka from any damage. Sessions on safe drinking water practices by Master trainers where proper use of alum and potassium permanganate to purify water are also held.

5. IMPACT

According to the UNICEF estimate of 2016, worldwide women and girls spend 200 million hours or more collecting water every day. Tankaas represent an important aspect of water security in the Thar region of Rajasthan. As a matter of fact, these rainwater harvesting taankas can prevent people from having to collect water from a distant source, thereby saving their precious energy, money and time. taanka ownership has a profound impact on household health, hygiene and overall quality of life.
5.1 Socio-cultural Impact

While providing a secure source of water, *tankaas* bring many other social advantages to the rural community of the Thar Desert. Water security eliminates the need for women to walk for fetching water and opens up a world of opportunity for her. This can be well understood through following case studies:

- When GRAVIS started working in this field about 13 years ago, it put forth the condition that it would work only for those poor and socially backward families who would support their daughters to get an education, as generally there is no tradition of teaching girls in such villages. This innovation was done in this study area with the cooperation of Village Development Committee (VDC) and tireless efforts of GRAVIS. Families of women (belonging to backward castes such as Meghwal, Dewasi, Jat etc.) like Dhapu Devi from Vijyanagar village, Kabbu Devi from Chinchawla village, Chanda Bhadu from Utambar (Ramnagar) village, Baby from Dabli village, Ilki Devi from Meno ki Dhani village started sending their daughters to schools and colleges. The time saved by the beneficiary families allowed the girls to spend more time on their studies and improve the women’s reputation in the society and contribute to the GDP of the nation. Also, they motivate their parents and other elders and the younger ones to adopt good habits/practices learned in schools.

*Pic 3: A woman taanka beneficiary no longer dependent on water fetching from far off places*

*Estimation of actual time saved and the water availability of taanka throughout the year:*
Average water capacity of a taanka of size 10 x 10 ft = 20000 litres (l)
Per capita water requirement for rural areas = 40 litres per capita per day (lpcd)
For an average family size of 5 members, volume of water requirement = 5*40 = 200 lpcd
Total time (in days) saved in water fetching = 20000/200 = 100 days
This means that the temporal impact of taanka construction is 100 days which means for 3 to 4 months, the villagers have water security. If winter rain comes, then again time saved is approximately 2 to 3 months. Therefore, total time saved in water fetching due to the construction of a family taanka is 5 to 7 months.

Following are some of the case studies which help support the fact that literacy rate increased in various villages of Jodhpur as more and more people started coming forward to educate the young generation:

i. Bhanwari Devi’s eldest daughter Manisha, belonging to Meghwal caste, even cleared Rajasthan Eligibility Examination for Teacher (REET) 2021 Exam held by the government for which she was honored by the Village Panchayat. This became a milestone achievement for her family and the whole village. It proved to be an ideal case for all those who believed in the village and society that girls should get married early and education has no importance for girls. Manisha expressed in the Gram Panchayat Sabha that most of the girls of Thar desert are not able to give way to their life as they waste their time in family needs and water supply. If more girls get such opportunity, then can become independent and empowered in life.

ii. When the permission for taanka construction was granted to the family of Bhapu Devi (Dewasi caste) of Vijaynagar village, her elder daughters Shobha and Mamta used to bring water from a hand pump which was about 2 to 3 km away, along with their mother. This meant everyday 4 to 6 hours were spent in fetching their water. With taanka construction, she is now spending her saved time in animal husbandry and daughters’ education so that one day she can see them become as teacher and nurse. and vowed against girl child marriage.

iii. Efforts by GRAVIS have changed the fate of around 30-35 families of Indo ki Dhani, Dhani - Meghwal ki Dhani, as today not a single girl is illiterate in this Dhani. Earlier the girls were busy in the household chores as the people including mothers of this area were engaged in agriculture and mining. With the cooperation of VDC and tireless efforts of
GRAVIS, people gradually started realizing that girl child education is also very important. Now, girls have started enrolling in colleges after passing senior secondary.

iv. The social evil of girl child marriages also received a bolt as community members realized the importance of education and now without formal education, they don’t send off their daughters for marriages.

● Earlier during the famine, water used to be supplied through rails as the villagers of Indo ki Dhani didn’t have the means of collecting water. Then all the members of the family used to run away and stand on the train, thereby blocking water supply and unequal distribution of water. In such conditions, many times there were battles and people used to wait for water till midnight. With the taanka now in every household of this Dhani, the social ruckus created has now also been diffused due to self-reliant taanka structures. This shows that taanka structures helped in strengthening community relations and maintaining harmony among community members. and in famine situation, they proved to be an effective source of water.

● The access to water represents the status of the families in this region. Therefore, the access to a taanka decreases the gap between the lower and upper classes, as people become self-reliant. Another case study about Ilki Devi (Meghwal caste) of Meeno ki Dhani village, is also an inspiring one. Fetching water from long distances was compulsory for her even during pregnancy. This resulted in 2-3 miscarriages due to the hectic routine of fetching water and other household chores. Moreover, she was ostracized by her family and relatives for refusing to fetch water due to ill health. After separation, she attended a meeting of a SHG run by GRAVIS and became a member of that group. Thereafter she discussed about her water problem in the group and the group put that matter before the VDC which granted permission to build taanka in her home. She is now a proud taanka owner with her name written on it. This shows that women feel empowered with their names on the taanka. Many have become part of Self Help Groups (SHGs) which help them in constructing taanka for water security. The project gave women like Ilki Devi confidence and inclusion in social gatherings.

Pic 4: Some proud women taanka owners
As the construction of these structures has led to an increase in agricultural productivity, farmers do not have to leave their villages in search of work in the nearby urban areas. Hence, the migration rate has also gone down significantly.

5.2 Health Impact

- The water from the *taanka* is of better quality than from other sources, the taste and cleanliness of the water is enhanced.
- Given the cleanliness of the water from the *taanka*, the risk of contracting diseases decreases, which entails that the health of the beneficiary population is increased and savings come from the no necessity to reach health care.
- Daughters of women like Bhanwari Devi, Dhabu Devi and many others including them now do not require to travel long distances in search of water which helps in reducing physical burden, mental stress and anxiety. Improvement in the overall health and well-being including menstrual hygiene and sanitation of the community women and girls is seen.
Table 3: The presence of various chemical constituents in excess quantity in water affects the human health adversely. Bureau of Indian Standard has prescribed standard limits for drinking purpose (IS-10500: 2012).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Constituents</th>
<th>Acceptable limit (ppm)</th>
<th>Permissible limit (ppm)</th>
<th>Probable effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TDS</td>
<td>500</td>
<td>2000</td>
<td>Beyond limit water bitter in taste and can cause stomach disorder.</td>
</tr>
<tr>
<td>2</td>
<td>Chloride</td>
<td>250</td>
<td>1000</td>
<td>Indigestion, bitter taste</td>
</tr>
<tr>
<td>3</td>
<td>Sulphate</td>
<td>200</td>
<td>400</td>
<td>Causes stomach disorder.</td>
</tr>
<tr>
<td>4</td>
<td>Nitrate</td>
<td>45</td>
<td>No relaxation</td>
<td>Methemoglobinemia in bottle fed infants and Gastro-intestinal problems.</td>
</tr>
<tr>
<td>5</td>
<td>Fluoride</td>
<td>1</td>
<td>1.5</td>
<td>Above permissible limit causes skeletal and dental fluorosis and non skeletal fluorosis</td>
</tr>
</tbody>
</table>

5.4.1 Groundwater Quality

a) Groundwater Flouride Distribution

Long term use of groundwater for drinking results in the onset of widespread fluorosis, from mild forms of dental fluorosis to crippling skeletal fluorosis. According to ‘Hydrogeological Atlas of Rajasthan, Jodhpur District, 2013’, 68.8 % of total geographical area of Jodhpur district is affected with fluoride contamination as it exceeds the maximum permissible limit of 1.5 mg/l.

Table 5: Groundwater Flouride Distribution of Jodhpur district (2013)

<table>
<thead>
<tr>
<th>Flouride Concentration Range (mg/l)</th>
<th>Jodhpur</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (sq.km.)</td>
</tr>
<tr>
<td>Less than 1.5</td>
<td>7083.6</td>
</tr>
<tr>
<td>1.5 to 3.0</td>
<td>11242.7</td>
</tr>
<tr>
<td>Greater than 3.0</td>
<td>4370.7</td>
</tr>
<tr>
<td></td>
<td>22,697.0</td>
</tr>
</tbody>
</table>

Also, according to ‘Ground Water Year Book Report, 2020-21, Rajasthan’, Jodhpur district is moderately affected with 31% to 40.00% water samples having fluoride above 1.5 mg/l. This shows that from the project implementation to till today, the flouride concentration has reduced significantly.
b) *Groundwater TDS distribution*

Total Dissolved Solids (TDS) indicate the nature of water quality for salinity. According to WHO specification, TDS up to 500 mg/L is highest desirable and up to 1000 mg/L is under maximum permissible category.

*Table 6: Based on the concentration of TDS, ground water can be classified as shown below*

<table>
<thead>
<tr>
<th>TDS Concentration</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 500 mg/L</td>
<td>desirable for drinking</td>
</tr>
<tr>
<td>up to 1000 mg/L</td>
<td>permissible for drinking</td>
</tr>
<tr>
<td>up to 3000 mg/L</td>
<td>useful for irrigation</td>
</tr>
</tbody>
</table>

- TDS value in Jodhpur district varied from 182 to 5506 mg/L. Therefore, it is seen that water quality is not suitable for drinking in large number of samples.

### 5.3 Economic Impact

With the *taanka* construction, maintenance and repair, the employment in the rural area is more stable. New economic activities such as construction of houses, purchase of agricultural tools and machinery, repayment of loans, etc are some positive outcomes to the beneficiaries of the water harvesting structures. With improvement in agricultural output and spurt in economic activities, the income of the villagers has increased manifold. The construction of a typical household *taanka* approximately saves 1000-2000 rupees per month, which are being used in other HH activities like buying agriculture products, education of the children, saving for medical purposes of the family etc.

- Furthermore, *taankas* represent a much cheaper water source than the taanker system, which becomes even more expensive in times of drought and water shortage. This can be explained through following two cases:

i. Dhapu Devi, who earlier around 7-8 years ago used to draw water (slightly saline) from hand pumps. Sweet drinking potable water could be brought by tractor but the tanker used to charge 500 to 700 rupees at that time. Also, her family did not have any means to store any water. Sweet water became available for about 4 to 6 months after the *taanka* was made. Also, money is saved since the need of purchasing water is lower.
ii. Another case is of Chanda Bhadu of Utambar (Ramnagar) village. Due to a small tank in her house, the tanker could not empty it completely and the cost per tanker used to be Rs 800 to 1000 in summer. Chanda brought water in the morning and did labor work during the day which caused pain in her head and stomach further which caused her to spend 2000-3000 rupees per month in medical care. The financial condition of the family was staggering due to Chanda also not working as a laborer due to medical reasons. After \textit{taanka} construction in 2017, clean drinking water is now available to her family for 4 to 6 months after the rain water is collected. With this money, Chanda has also bought 3 cows by saving a little. By rearing animals, she saves 8 to 10 thousand rupees per month from ghee, milk and curd. A small effort gave a momentum to the stagnation in the lives of Chanda and her whole family of 7 members and life got back on track for them.

- Increase in savings through alternative employment sources. For instance:
  
i. Earlier Kabbu Devi used to reach late for her labour work under MGNREGA which resulted in the problem of loss of wages, as most of her time was wasted in water fetching. But with \textit{taanka} structure nearby her house, she reaches on time for her labour work. This saves her time, money and energy.

ii. Baby of Meghwal caste of Dabli village earned her own independent living by integrating the art of embroidery which she learnt from 'Bhomiya ji' SHG run by GRAVIS in Dabli village and jutti-making by her father-in-law. She started doing embroidery work on the leather jutti. The shoes which were earlier sold for Rs 250-300, now started selling for Rs 700-800 after embroidering. This work increased her importance not only in the family but also in the society. The family members also started giving her full time and support so that she could embroider. The importance of hand embroidery and these shoes is very high in this area. She is also teaching this skill to other teenage girls of the village.

iii. The number of domestic animals such as cows and goats has also increased in the villages after the construction of water harvesting structures as these have facilitated increase in income of the family thereby increasing their savings which can be utilised in some other alternative employment and generate further income. Let’s look at the case of Bhanwari Devi (Chirai village) of Meghwal caste. She used to travel 1.5 kms. daily for
fetching water while taanka construction helped her save time for herself and her girls. She got sewing training by joining a SHG and started sewing people's clothes in the village. Along with that, she also taught her three daughters the art of sewing which helped her in generating income for her family.

5.4 Environmental Impact
Rainwater harvesting has been shown to improve water-use efficiency, reduce soil erosion, improve soil fertility, and increase agricultural productivity [4]. Indirectly these benefits are observed for taanka rainwater harvesting.

5.4.1 Impact on Physical Environment

5.4.1.1 Air Quality
In construction phase, various project components such as site preparation, approach roads etc. require land clearing, levelling, excavation, grading activities, vehicle movement etc. This results in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily affect ambient air quality. There is a risk of nuisance and health effects to construction workers onsite and to a lesser extent to nearby receptors from windblown dust (on the village access roads) due to transportation of raw materials. Further, the movement of vehicles carrying raw materials on unpaved area within the project site and on access road sometimes causes fugitive dust emission and reach out to the surrounding of project site like nearest settlements. Hence, the distribution of impact can be considered medium, duration of impact is short and intensity of the impact as medium.

5.4.1.2 Soil Quality
During construction phase, due to excavation on project site, levelling, there is generation of loose top soil. The impact observed here is loss of topsoil. However, these activities and associated impacts are limited to be within the project boundary and during construction phase only. Considering the activities limited within the site, short duration of construction phase and low intensity, significance of impact is evaluated as Low.

5.4.1.3 Noise Quality
There is no major source of noise pollution except project activities and some vehicular movements carrying raw material for construction. So the impact on ambient noise quality is found to be low.
5.4.2 Impact on local ecology

The below mentioned activities of the construction phase can have an impact on the local ecology of the region:

- Land clearing and levelling- This may cause some loss of natural vegetation.
- Fencing of taanka structure- The prevalent wildlife in western Thar region includes the leopard, the Asiatic wild cat (*Felis silvestris ornata*), the chinkara (*Gazella bennettii*), the chousingha (*Tetracerus quadricornis*), blackbuck (*Antilope cervicapra*), the Bengal desert fox (*Vulpes bengalensis*) and various reptiles. Due to construction activities, such animals may temporarily migrate to other places due to habitat loss and disturbance. Even domestic animals owned by the households such as cows and goats may be affected if they get near to the fencing and are injured.

5.4.3 Groundwater Quality

With the taanka structures built in most of the villages, there is decreased dependability on groundwater resource. This has resulted in the replenishing of ground water level as earlier it was over exploited for domestic purposes and decreased groundwater pollution.

- Rainwater harvesting through taanka has a lower environmental footprint than mains water as the mains water is pumped long distances and treated heavily to make it potable. Water for irrigation, washing and toilets, does not need to be potable so using rainwater direct from a building’s roof and storing it in a nearby taanka should have a lower carbon footprint.

6. CONCLUSION

This research based study demonstrates that rooftop rainwater harvesting technique through taankas are a lifeline for rural communities of Indian Thar Desert as these sustainable structures provide efficient, cheap and reliable water security in the region. This innovation by GRAVIS along with ASHA for Education NGO has changed the fate of more than 2500 families belonging to backward classes and scheduled tribes of Jodhpur district. The majority of taankas are worthwhile investments that provide substantial direct cost savings to beneficiaries, women empowerment, improvement in girl’s education and health well-being as well as numerous indirect benefits that have not been quantified. More people should be made aware of this technique and development agencies should focus their efforts on the improvement and maintenance of existing taanka.
REFERENCES


