

# **Impact of Rejuvenation of Lakes A Study Report**



**Submitted to  
MANUVIKASA, SIRSI**

**Submitted by  
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## CONTENT

<b>Executive Summary -----</b>	<b>5</b>
<b>Introduction-----</b>	<b>7</b>
<b>About Manuvikasa -----</b>	<b>11</b>
<b>Survey Purpose -----</b>	<b>12</b>
<b>Methodology-----</b>	<b>13</b>
<b>Profile of the Sample Villages-----</b>	<b>17</b>
<b>Main Findings-----</b>	<b>18</b>
<b>Common Village Profile-----</b>	<b>19</b>
<b>Overall Impact-----</b>	<b>20</b>
<b>Long term impacts-----</b>	<b>22</b>
<b>Application of this survey-----</b>	<b>26</b>
<b>Discussions-----</b>	<b>27</b>
<b>Historical relevance of the lakes --</b>	
<b>Lake technicalities-</b>	
<b>Participatory approach of the lake rejuvenation-</b>	
<b>Ecological aspects of the Lakes-</b>	
<b>Change in ground water and irrigation-</b>	
<b>Improved cropping pattern and area-</b>	
<b>Socio-Economic aspects of the lake-</b>	
<b>People perception and sustainability aspects -</b>	
<b>Lake Ecosystem services-</b>	
<b>Conclusions</b>	



ಕೆರೆಗಳ ಪುನರುಜ್ಜೀವನ ಕಾರ್ಯ  
LAKE REJUVENATION PROJ

ನೇತೃತ್ವ An initiative of  
ಮನು ಏಕಾಸ MANUVIKASA

ಕೆರೆಯ ಹೆಸರು: ಕಾನಕಟ್ಟೆ ಕೆರೆ. ಗ್ರಾಮ: ಮಾಳಂಜಿ  
ತಾಲೂಕು: ಸಿರಸಿ, ಜಿಲ್ಲೆ: ಉತ್ತರ ಕನ್ನಡ.

Lake Name: Kanakatte lake. Village: Mala  
Taluk: Sirsi. Dist: Uttarakannada

ಜಲ ಸಂಗ್ರಹಣಾ ಸಾಮರ್ಥ್ಯ: 80 ಲಕ್ಷ ಲೀ. Water storage Capacity: 8  
2019-20 ವರೆಗೆ. Supported By

 **HDB** FINANCIAL SERVICES

## EXECUTIVE SUMMARY

The Per capita, water resource availability has dwindled rapidly during the last few decades. Rapidly decreasing groundwater levels is posing huge challenge for development. Rainfall is the major source for ground water recharge, which is supplemented by other sources such as recharge from canals, irrigated fields and surface water bodies like reservoirs, tanks, ponds *etc.* By rejuvenating the reservoir or tank is a promising strategy to arrest the declining of water table. In view of faster depleting ground water resources, the Manuvikasa a well-known non-governmental organization involved in the construction and rejuvenation of different rain water harvesting structures in four districts viz., Uttara Kannada, Shimoga, Dharwad and Haveri since 2003. The Manuviaksa has developed over 2900 water tanks and conserving 2320 million litres of water every year.

The study was conducted to analyze the influence of this rejuvenation on biological community, cropping pattern and also social as well as economic impacts. The key objective of the survey was to assess the efficacy of the lake restoration endeavor taken up by the MANUVIKASA in the taluks of Sirsi, Sorab, Hangal, Mundgod and Kalghatagi spread across Uttar Kannada, Dharwad, Haveri and Shivamogga district with the support of HDBFS.

Lakes have been rejuvenated considering all engineering aspects such as proper mapping, ensuring saucer shaped lake structure, optimum desilting by maintaining the required depth of the lakes, creating strong embankment, letting appropriate outlet for excess water to flow. Adopting a participatory approach, stakeholders have been involved in planning, executing and post rejuvenation of the lake initiatives. Ecologically, it is noticed that water storing capacity of the lake has increased by 70%. At least in four lakes, water was overflowing while three lakes due to scanty rainfall, water collected was less. The farmlands with silt from the lake are rich with soil nutrients. It is noticed that at least 25% of the change in the cropping pattern. At least in two lakes there is considerable positive change in its ecology and functionality. Socially, the rejuvenation activity has enabled all types of community members to come together to support this rejuvenation initiatives irrespective of caste, creed, gender and economic status

The overall opinion of people of water harvesting adopted villages was great satisfaction with the active participation of Manuvikasa and their committed efforts for sustained performance in restoring ground water. This activity would definitely bring momentum for rainwater harvesting continue in the village as is evident from community's interest to increase the number of ponds, tanks by constructing new ones.



## INTRODUCTION

Lakes in rural areas play an important role in providing various ecosystem services to humankind. They are the lifeline to our agriculture, livestock, and other domestic needs. It is commonly stated that “there is no place left where lakes can be constructed as the lakes have been constructed at all the places in the country where it should be constructed”. Hence, India is known as land of lakes. However, over hundred years of existence of these lakes, they are under looked as key resource that needs to be maintained and protected. There may be several reasons attributed to it such as ignorance, centralized regulations, change in the ownership, urbanization etc. In a current scenario of water scarcity, frequent drought like situations, flash flood, depleting ground water table, a need is being felt by a people to relook at these water resources. This scenario of lakes is evident in most part of the country. The number of tanks rehabilitated effectively is negligible compared to the total number of tanks. With limited water resources, vagaries of the monsoon, and looming water scarcity in many parts of India, the need for rehabilitating and restoring the tanks assumes significance. India has thousands of tanks and ponds that, if rejuvenated, will contribute significantly to not only increasing food production but also provide a variety of livelihood options to the rural poor and women.

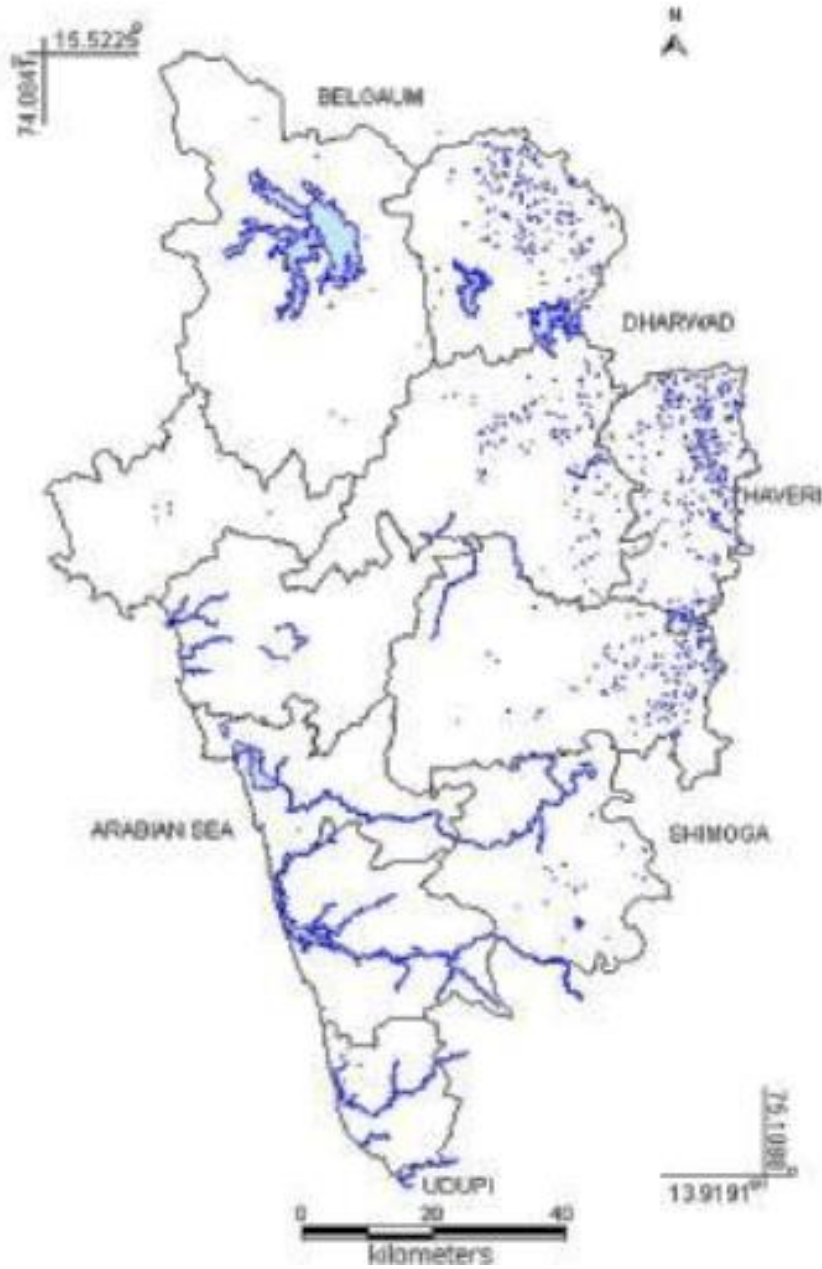
Karnataka has 36,672 tanks with a command area of around 690,000 ha distributed in 27 districts. About 90% of these tanks have a command of less than 40 ha. The administrative perception of a tank seems to be purely in engineering and technical terms while expertise from other fields (e.g., agronomy, hydrology, watershed and social sciences) for a holistic management of tanks is woefully missing.

The government of Karnataka recognizes the importance of tank rehabilitation. However, holistic planning or management has not been contemplated for the sustainability of the benefits. Detailed water accounting/auditing of each watershed has to be carried out. Issues such as improving the groundwater regime to enable conjunctive use, catchment area treatment to reduce further silting, integrating programs like fisheries, strong irrigation-agriculture extension, etc., have not been considered in the planning process.

Though Karnataka is known for tank management by the local communities, maintenance and management practices introduced by the State in recent years have undermined the importance of community participation. The consequence is that a large number of tanks in Karnataka today become ineffective or in some cases defunct, the area irrigated by tanks has declined, and the local ecosystem deteriorated. The tank was meant not only for agriculture but also served as a resource base for many other activities like collection of fodder and fuel, making of bricks, pots, and baskets, etc., with women always offering their assistance in these processes. Hence, the tank and its surroundings used to be the common property of the village and its people. In Karnataka, districts like Uttar Kannada, Shivamogga, Dharwad and Haveri generally receive good rains annually compared to other part of the state. The undulating and plain topography in these districts enable to have good number of lakes. Over several years, the existing lakes in this region are subjected to several adversaries such as siltation, non-maintenance, encroachment, broken embankments, infested by weeds and shrubs etc. Net result is that the most of the lakes are in degraded conditions. There was an urgent need to rejuvenate these lakes in this region as it was affecting the farming community due to water scarcity with erratic rainfall pattern. The efforts address this concern and issue by MANUVIKASA with the help of the donors is quite welcome.







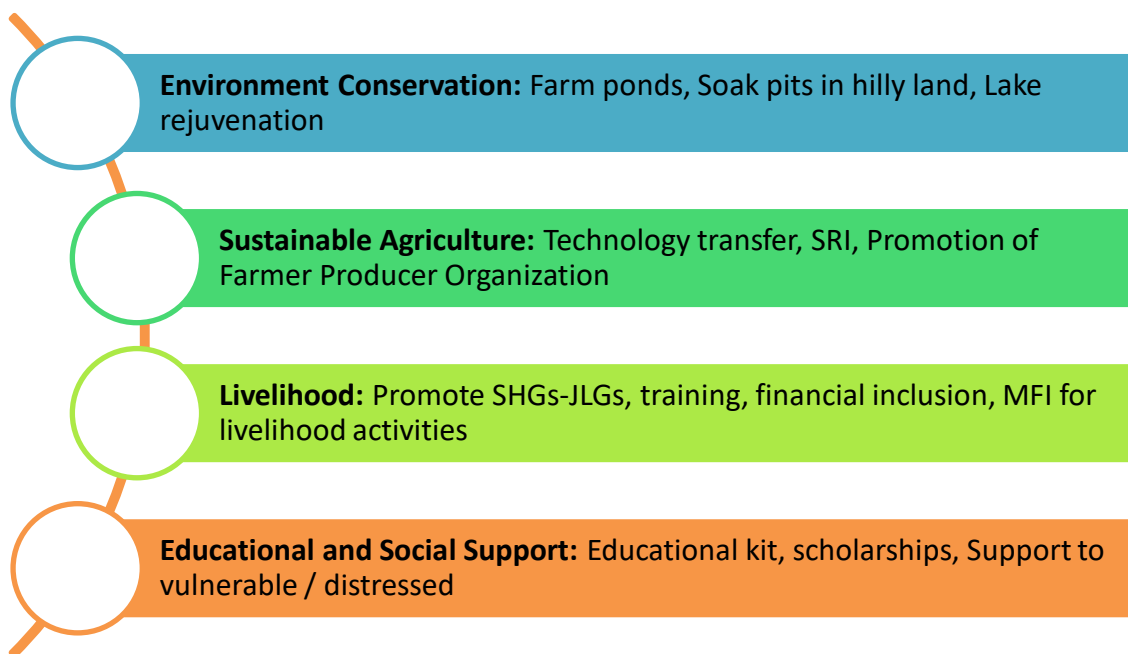
Water bodies of Uttara (ENVIS Technical Report: 81, November, 2014, CES, Indian Institute of Science, Bangalore-560012, India.)

## ABOUT MANUVIKASA

Manuvikasa is a non-governmental, non-political, voluntary organization committed for the advancement of education, environment and rural folk. It was registered in the year 2003 and working in Haveri and Uttara Kannada districts of Karnataka, India. The organization is addressing the issues like alleviation of poverty, awareness activities on different social problems; water conservation, publicize human rights and child rights, employment creation, proper management of natural resource and various other issues for rural development.

Water and soil are major natural resources available to the human being and these resources are depleting due to unsustainable and irrational use. More dependency on tube wells or bore wells is resulted on negligence of tanks and surface water storage structures. Conservation of environment and improve food security, improve agroforestry, horticulture, water conservation, promote green and clean energy. In this regard, MANUVIKASA, in Uttara Kannada, Shivamogga, Dharwad, Haveri since 2003 is focusing on water conservation through development of farm ponds and small tanks. Till date MANUVIKASA has developed 2900 water tanks and conserving 2320 million litres of water every year. It is attributed to have developed maximum water conservation structures in eastern part of Western Ghats. Their key areas of work can be classified into

| 10



## PURPOSE OF IMPACT SURVEY

An assessment study is conducted to evaluate the different water harvesting systems adopted for improving groundwater recharge and associated benefits for the farming community in the project areas where Manuvikasa has created rain water harvesting structures in different eco-regions. The key purpose of the survey was to assess the efficacy of the lake restoration endeavor taken up by the MANUVIKAS in the taluks of Sirsi, Sorab, Hangal, Mundgod and Kalghatagi spread across Uttar Kannada, Dharwad, Haveri and Shivamogga district. The key aspects that were taken up into account in this assessment was to know the

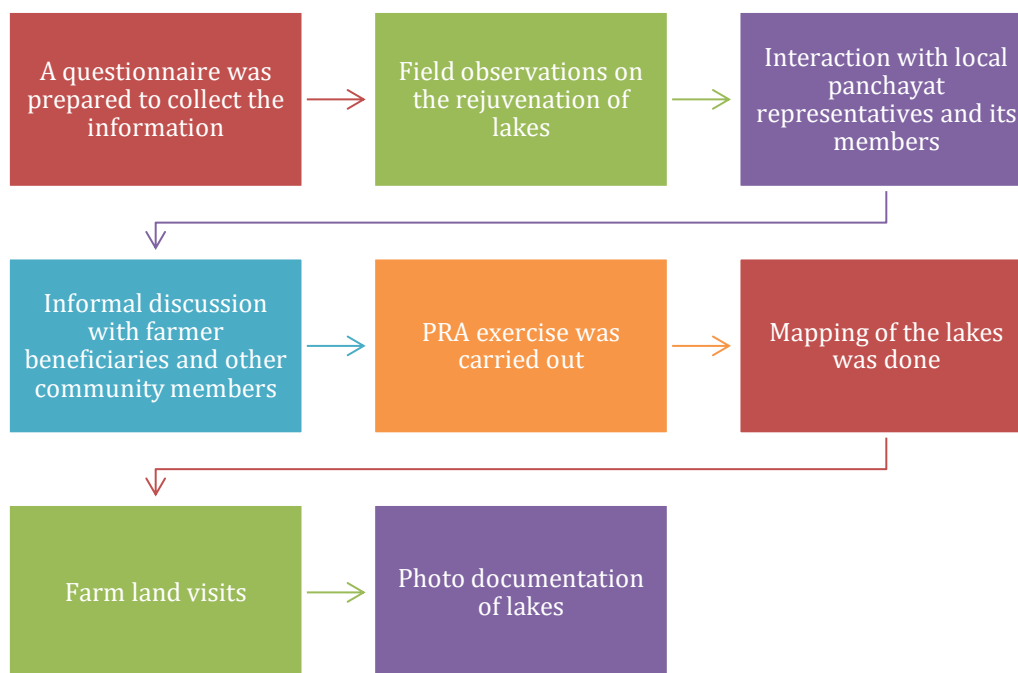
- Historical relevance of the lakes
- Technicalities of the lake
- Role of participatory approach and engagement of various stakeholders
- Ecology and environmental aspects
- Change in the ground water and irrigation
- Improved cropping pattern and yield enhancement
- Socio economic aspects
- People's perception and Sustainability aspects
- Lake ecosystem services



## METHODOLOGY

Of the 54 lakes (13 large lakes and 41 small and medium sized lakes) constructed with the CSR support of HDBFS 10 lakes were randomly selected in 5 taluks spread across 4 districts for the survey assessment. Both qualitative and quantitative information was elicited. Group discussions, transect walks along the lakes and farms and discussions with local people were conducted to obtain an overview of the lake restoration works. Following methodology to collect the information from the visit was adopted:

- A questionnaire was prepared to collect the information
- Field observations on the rejuvenation of lakes
- Interaction with local panchayat representatives and its members
- Informal discussion with farmer beneficiaries and other community members
- PRA exercise was carried out
- Mapping of the lakes was done
- Farm land visits
- Photo documentation of lakes



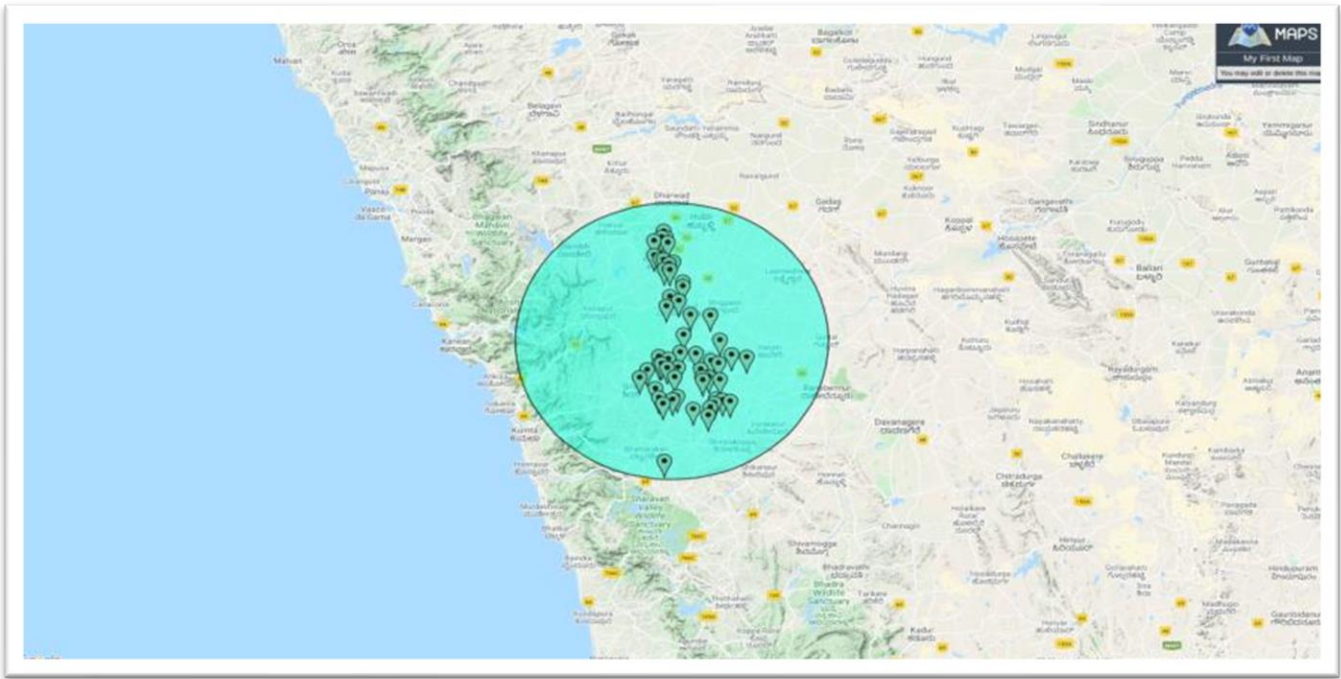
Impact was measured in terms of changes in various indicators because of the tank restoration programme. It is measured across different size classes of holding in order to examine the distributional aspects of the impact. Impact indicators were grouped under economic and ecological categories. Economic impact is measured in terms of changes in area under irrigation, productivity (yield) of land, livestock holding, income and consumptions. Ecological impact is measured in terms of changes in perceived groundwater, soil nutrition, and biodiversity support.

### Details of the lakes that were visited

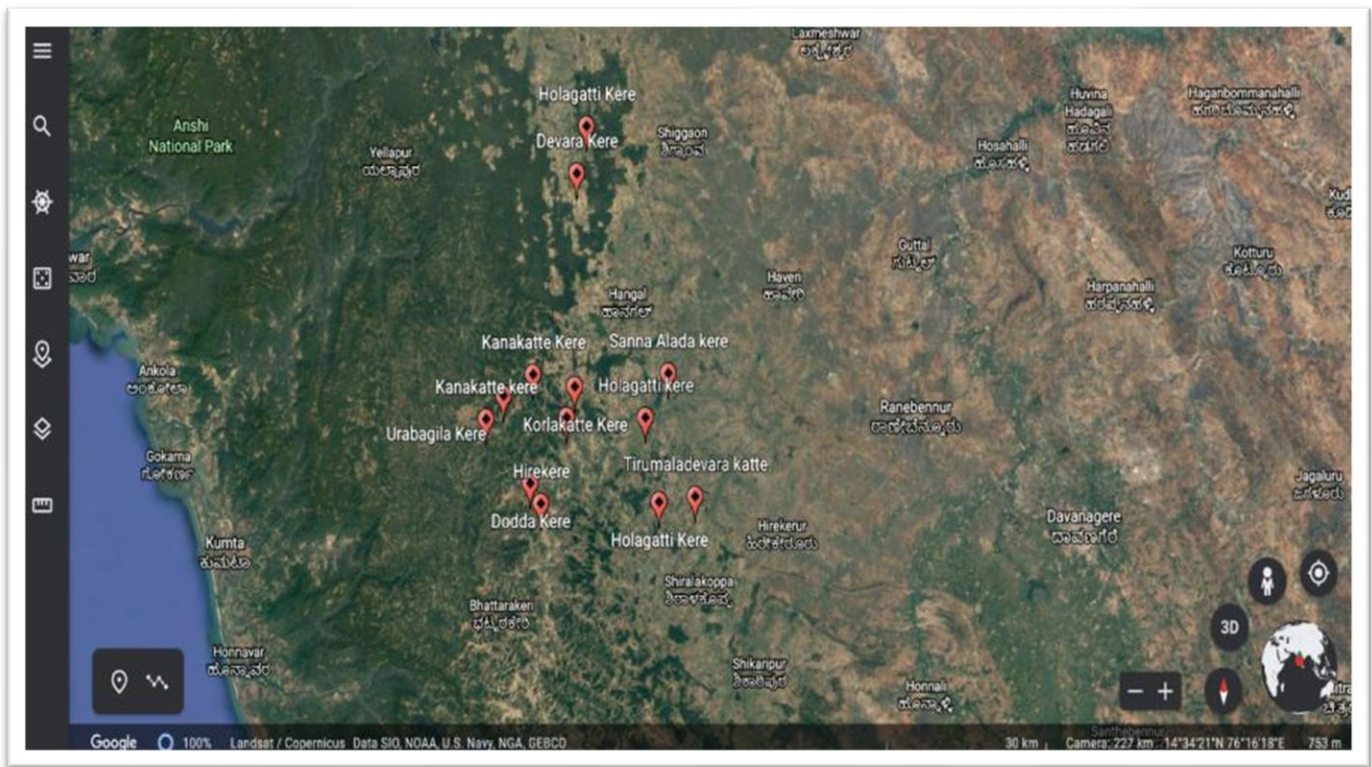
Sl	Lake Name	Village	Panchayat h	Taluq	District	Sy No.	Latitude (N)	Longitude (E)
1	KelsiKattiKere	Andagi	Andagi	Sirsi	Uttara-Kannada	90	14.60584744	75.0194402
2	KanakatteKere	Malanji	Bankanala	Sirsi	Uttara-Kannada	67	14.6643148	74.9609423
3	UrabagilaKere	Gonagatta	Bankanala	Sirsi	Uttara-Kannada	21	14.63543037	74.9093519
4	Gude Lake	Malalagaon	Bislakoppa	Sirsi	Uttara Kannada	8	14.69532619	74.9582967
5	Sanikatti Lake	Danaganahalli	Badanagod	Sirsi	Uttara Kannada	26	14.685436	74.9428775
6	Basavanakatti Lake	Sagaravalli	Mantagi	Hanagal	Haveri	43	14.713931	74.995711
7	Hirekere	Kamarur	Bennur	Soraba	Shivamogga	96	14.48800285	74.9744855
8	DoddaKere	ChikaKalagod	Harishi	Soraba	Shivamogga	7	14.51578522	74.955927
9	Muttalakere	Badamagatti	Yalavatti	Hanagal	Haveri	86	14.875675	75.16306
10	Anegondavana katti Lake	Majjigeri	Bachanaki	Mundgod	Uttara Kannada	117	15.02141667	75.05389167
11	JigaliKere	Aralihonda	Tavarageri	Kalaghatagi	Dharwad	144	15.102095	74.9980716



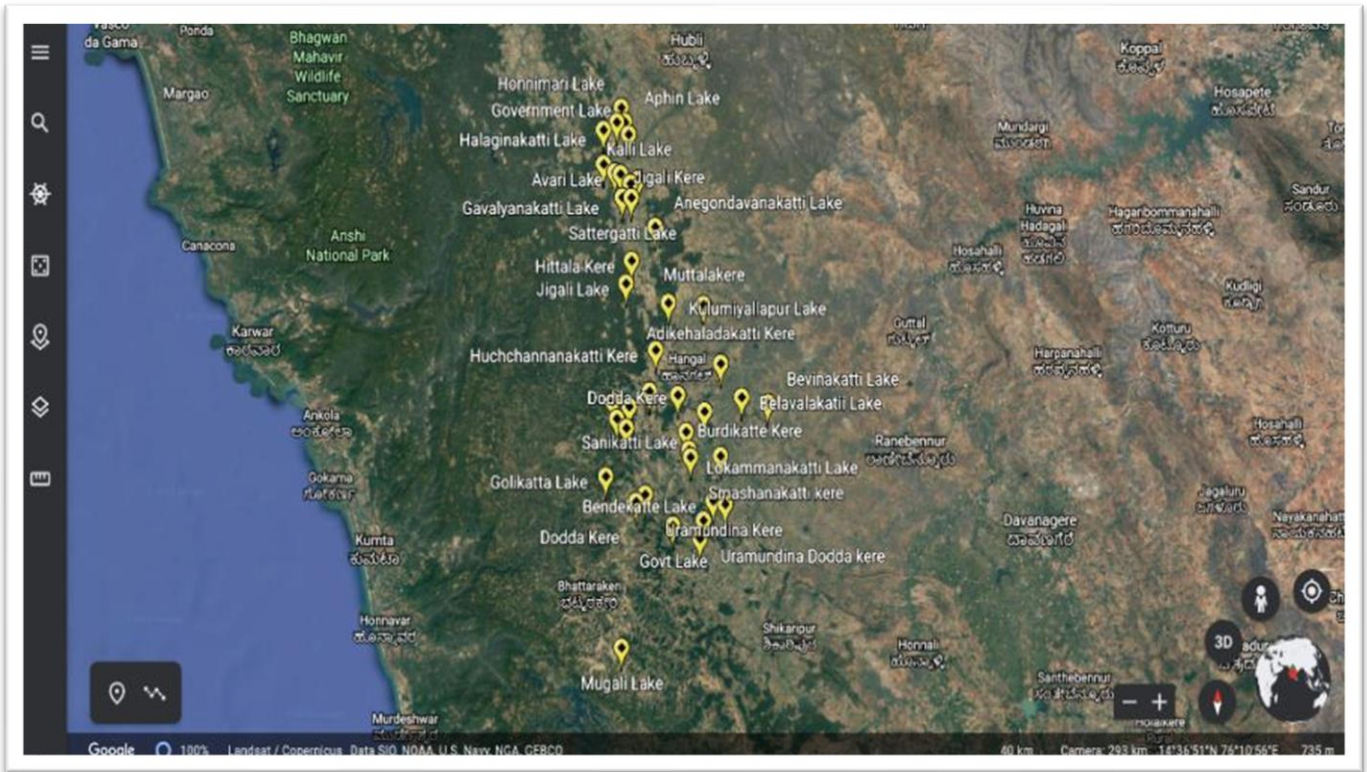
### Location of Lakes and Tanks rejuvenated under the Scheme by Manuvikasa



GPS locations of lakes which are rejuvenated by Manuvikasa



GPS locations of big lakes which are rejuvenated (Google Earth images)



GPS locations of small lakes which are rejuvenated  
(Google Earth images)



## Google maps of lakes visited

1. Aerial view of Kelsi Katti Kere



2. Aerial view of Kanakatte Kere



3. Aerial view of Urabagila Kere



4. Aerial view of Gude Lake



5. Aerial view of Sanikatti Lake



6. Aerial view Basavanakatti Lake



7. Aerial view Hirekere



8. Aerial view of Dodda Kere





9. Aerial view of Muttalakere



10. Anegondavanakatti Lake



11. Aerial view of Jigalikere



## COMMON PROFILE OF THE SAMPLE VILLAGES

There are wide variations between the sample villages regarding their socio-economic features. The average farm size ranges from 1 to 04 acres; the population ranged from 200 to 1500. The proportion of SC / ST and the OBCs in these villages ranged from 50 to 80%. The selection of beneficiary villages was based on larger proportion of socially and economically weak sections as well as the need for the rejuvenation. This is in line with the criterion adopted by the government while implementing programmes such as watershed development. In all these villages, there is no institutional mechanism that exists for tank rejuvenation and hence it is currently unorganized.



## MAIN FINDINGS

Of the 11 lakes visited, following observations are recorded

- Lakes are **rejuvenated taking all engineering aspects** into consideration such as proper mapping, ensuring saucer shaped lake structure, optimum desilting by maintaining the required depth of the lakes, creating strong embankment, letting appropriate outlet for excess water to flow
- **Engaged participatory approach** of involving various stakeholders of the community while planning, executing and post rejuvenation of the lake initiatives
- The beneficiaries **benefitted immensely by way of getting nutrient rich silt** from the lakes to their farmland. Farmers of the opinion that they need not to apply any inorganic nutrients to their soil for the next 4-5 years
- Ecologically, it is noticed that **water storing capacity of the lake has increased by 70%**. At least in four lakes, water was overflowing while three lakes due to scanty rainfall, water collected was less
- An agricultural activity in the farms around the lake is intensified. It is noticed that at least **25% of the change in the cropping pattern**
- At least in two lakes there is considerable change in its ecology and functionality. **Water birds have started roosting** here. **Aquatic plants and insects** are profusely seen.
- Due to intense farming activities, **man days employment has increased** through farm activities in the farm lands nearby lake
- Once the lakes that were forgotten are brought back onto the maps. Lake boundaries are demarcated. **Encroached lakes are evacuated** through community consensus and dialogues.

- Engaged participation has resulted in the **ownership of the lakes by the community**. Due to ownership, the lake sustainability is being assured by the community members
- Interaction with the community members reveals due to use of silt from the lake has increased production of crops thereby **enhancement in the economy** among the farmers
- Socially, the rejuvenation activity has **enabled all types of community members to come together** to support this rejuvenation initiatives irrespective of caste, creed, gender and economic status
- The **support extended by the Panchayat authorities, engineers**, taluk and district administrative indicates the project initiatives as an acceptance for the welfare of the community
- The **lake rejuvenation contributes to Lake / Wetland protection India** by various Acts and Rules which includes: The Indian Fisheries Act - 1897; The Indian Forest Act - 1927; Wildlife (Protection) Act - 1972; Water (Prevention and Control of Pollution) Act - 1974; Water (Prevention and Control of Pollution) Cess Act - 1977; Forest (Conservation) Act - 1980; The Environment (Protection) Act - 1986; Wildlife (Protection) Amendment Act - 1991; National Conservation Strategy and Policy Statement on Environment and Development - 1992; The Biological Diversity Act - 2002; National Water Policy - 2002; National Environment Policy - 2006; Environment Impact Assessment Notification - 2006; Wetlands (Conservation and Management) Rules - 2010, Government of India; National Water Policy - 2012; Wetlands (Conservation and Management) Rules - 2017, Government of India; Karnataka Lake / Tank Conservation and Development Authority Act, 2014.

## OVERALL IMPACT

Change in area under irrigation is the prime indicator of any impact on rural livelihoods, especially where the major livelihood activity is farming. Major benefits are for the farmers having lands in the command area of the tank. Nevertheless, renovation and rehabilitation of the tank would benefit other sections of the society by way of using excavated silt as organic manure, recharge of groundwater, and increased opportunities for employment.

It was observed that the proportion of area under irrigation has increased, though marginally, among all the households in the programme villages after restoration of the tanks. The changes ranged from 50 to 70 per cent in the three programme villages.

Apart from the quantitative changes in the area, qualitative changes in the availability of irrigation in terms of throughout-the-season regular and assured supplies are equally, if not more, important for improving the economic conditions of the farmers. This aspect is reflected in the changes in land productivity.

Major benefits are for the farmers having lands in the command area of the tank. Nevertheless, renovation and rehabilitation of the tank would benefit other sections of the society by way of using excavated silt as organic manure, recharge of groundwater, and increased opportunities for employment. Most of the time, silt removed from the tank bed is disposed as manure to the nearby farms. There was no improper disposal of silt which otherwise created environmental problems. Increasing the full tank level of a tank sometimes may cause submergence of foreshore lands, impact on the downstream use of water in a cascading system, and may cause conflicts. However, no major conflicts were seen.

Tank rejuvenation has led to the self-eviction of encroachment on feeder channels and foreshore areas in some cases Eg Hirekere which is positive. Rehabilitation interventions are expected to contribute to reasonable environmental conservation and improve the productivity of land in the project area.

**Potential long term ecological benefits from tank rejuvenation are:**

- Increased storage capacity and increased quantities of water available for irrigation
- Increased groundwater recharge and groundwater availability;
- Improved soil moisture regime and hence, better productivity;
- Improvement in quantity and quality of drinking water;
- Increased availability of water for livestock;
- Increase in the tree cover and clean environment.
- Positive impact on bio-diversity and soil biota;

**Potential long term economic benefits from tank rejuvenation are:**

- Improved production and higher family income and improved quality of life;
- Equitable distribution of water for command farmers;
- Increased opportunity for gainful employment;
- Reduction in the risk of crop failure;
- Improved nourishment (through fisheries development);
- Improved interaction among different communities;
- Improved livestock and milk production;

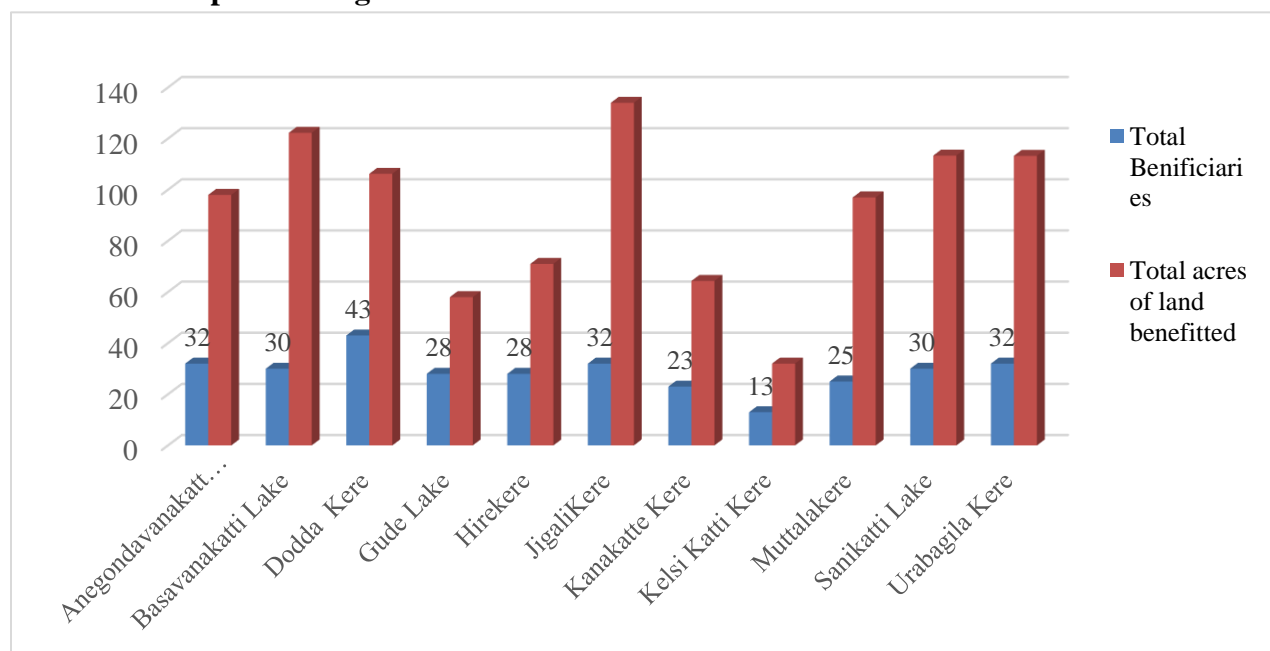


**Table Showing details of the benefits from lake rejuvenation**

Sl No	Lake Name	Latitude	Longitude	Village	Total Beneficiaries	No of Acre benefitted	Excavated in Cubic metres	Additional water storage in Mn litres
1	Kelsi Katti Kere	14.60584744	75.01944019	Andagi	13	32	7564	7.564
2	Kanakatte Kere	14.66431485	74.96094225	Malanji	23	64.33	8550	8.55
3	Urabagila Kere	14.63543037	74.90935188	Gonagatta	32	113.25	5451	5.451
4	Gude Lake	14.69532619	74.95829666	Malalagao n	28	58	3372	3.372
5	Sanikatti Lake	14.685436	74.9428775	Badanago d	30	113.35	5624	5.624
6	Basavanakatti Lake	14.713931	75.04134	Sagaravalli	30	122.26	4400	4.4
7	Hirekere	14.48800285	74.97448553	Kamarur	28	71	4518	4.518
8	Dodda Kere	14.51578522	74.95592695	Chikka Kalagod	43	106.22	7115	7.115
9	Muttalakere	14.875675	75.16306	Badamagatti	25	97	7198	7.198
10	Anegondavanakatti Lake	15.02141667	75.0538917	Majjigeri	32	98	9045	9.045
11	JigaliKere	15.102095	74.9980716	Aralihonda	32	134	12417	12.417
					<b>316</b>	<b>1009.41</b>	<b>75254</b>	<b>75.254</b>

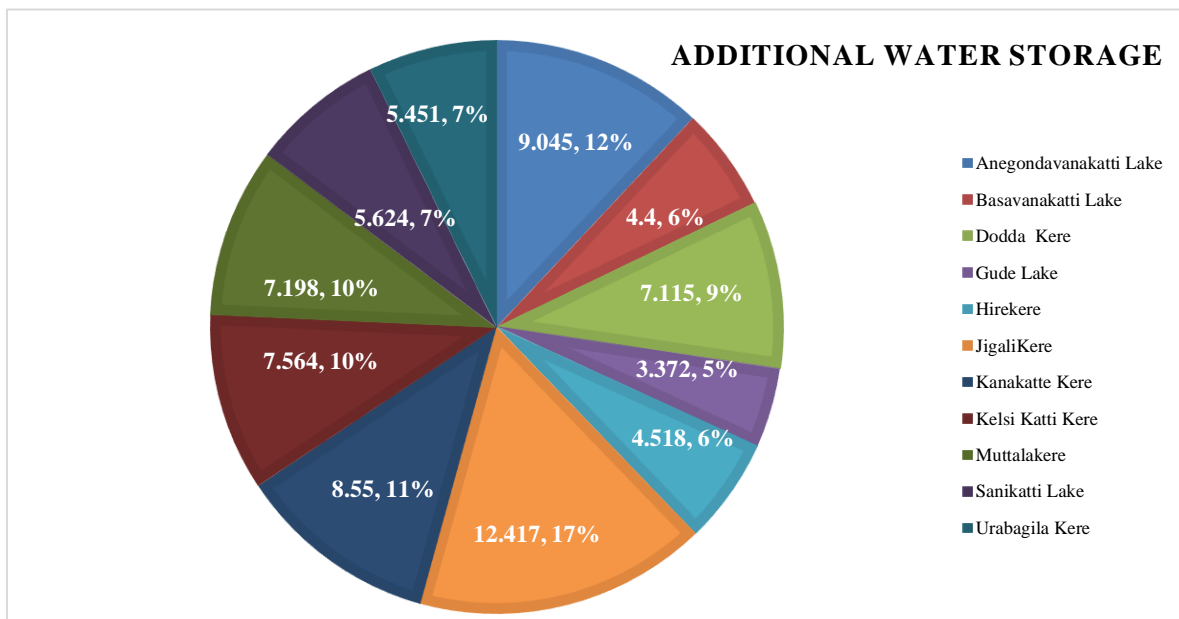
- o Average area of the lake rejuvenated : 5 acres
- o Average depth of the lake : 6 ft
- o Average tractor load of silt taken from the lake : > 100 loads
- o Average number of farmers who have taken up the silt : > 316 farmers

**Graph Showing the Total Beneficiaries vs Area of farmland benefitted**



The data represented above is having two independent variables as the total number of beneficiaries, and the total acres of land that benefitted. The total number of beneficiaries is represented in blue color in the graph varying with numbers. Total acres of land benefitted are represented in magenta color in the graph varying with acres as its unit. Jigalikere is having the highest benefitted land after rejuvenation up to 134ac. Followed by Basavanakatti lake, Sanikatti lake, and Urabagila kere having 122.26ac, 113.35ac, and 113.25ac respectively. Kelsi Katti Kere is having the lowest among all with 32ac of benefitted land. Dodda Kere harbors the highest number of beneficiaries up to 43 with 106.22ac of benefitted land. Followed by Anegondavanakatti Lake, Jigalikere, and Urabagila Kere having 32 beneficiaries each. And Kelsi Katti Keri is having 13 beneficiaries which is the least number in the collected data.

**Pie chart showing additional increase in water storage in mn liters in each lake after rejuvenation program**



The above pie chart represents the additional water storage in mn liters after rejuvenation in all the 11 lakes. There was observed additional 12.417mn liters of water collected in Jigali Kere after the rejuvenation program which is the highest among all the lakes. Followed by, Anegondavanakatti lake which holds additional 9.045mn liters of water after rejuvenation. Additional 3.372mn liters were collected by Gude lake which is the least additional water storage after rejuvenation.



## Application of this Survey

This assessment would provide vital information for development practitioners and policymakers so to understand the cumulative impacts of the rejuvenation lakes; gaps if any; document all innovations adopted that helps in the course correction while implementing such rejuvenation of lakes initiatives. It would also help to prepare an approach paper to influence the policy makers for taking up such comprehensive rejuvenation activities at a large scale using the existing government machinery.



## DISCUSSION

### Historical relevance of the lakes

During the visits to 11 lakes, an effort was made to know the historical aspects of these lakes so as to know by whom and when the lakes were constructed. Incidentally there no evidence or records that could avail the details in this regard. It appears that most of these lakes were constructed either pre-British period or during the British period. This is because the survey and the maps of these lakes referred were that of British era. An effort was made to gather information from the elders of the villages. The eldest person of the nearby villagers who were interacted and asked to talk about the lake and its usage in the past. None of the villagers had any historical evidence to share when the lakes were constructed. However, they had stories to tell how these lakes were the lifeline for their agriculture practices, domestic usage and for their cultural importance in the past. From the information gathered from the villagers, each lake is no less than 100 years old. The oldest villager whom we interacted with was 80 years old. He expressed that the lake has been in existence since his grandparents. Assuming this, the lakes have been in this region and are no less than 150 years old. This information is of quite significance to know how and why these lakes were constructed. It is evident quite way back, people know

1. The significance and the need for lake construction and its usage
2. In spite of getting more rain in these areas the lakes were constructed to hold the rain water to be used during off monsoon season
3. Financial Investments were made to construct these lakes. Then it would have cost hundreds of rupees to construct, today it would require lakhs of rupees

**Outcome:** Historically the lakes were existent and no comprehensive efforts were made to revive them to bring back alive. It's a great effort by MANUVIKASA in this endeavor and has set a bench mark for coming years.

### Lake technicalities

All the lakes that were visited are geographically located at appropriate contours. Each lake has a watershed that feeds to the lake with an outlet at one point. This outlet is connected with the channel that enables the excess water to drain off to the next connecting lake. The water running in the channel is used by the farmers to irrigate their land. Scientific aspects are taken into account while constructing these lakes such as its size, shape and location. The lakes rejuvenated are in a saucer shape with the depth ranging 5 feet to 12 feet. The strong embankment with a masonry work of the lake is a testimony to indicate how good these lakes were planned and constructed. While rejuvenation, the efforts were made to have strengthened embankment and bunds. Today, each lake has a bund with a walking path that facilitating easy maintenance.

Each lake after rejuvenation is inspected by the engineers from the Government and surveyed. This is a testimony that lakes are engineering redrawn on the map and approved by the concerned authority.

**Outcome:** The lakes are rejuvenated keeping engineering and geological aspects in mind. Approval from the concerned authority to this initiative is testimony to the work executed by MANUVIKASA



## Participatory approach of the lake rejuvenation

The approach followed by the MANUVIKASA team was to visit the concerned panchayats and locate the lakes that need to be rejuvenated. Old maps were tracked to locate the lake and were validated by the concerned officials. Upon narrowing the lake to be rejuvenated, a meeting is organized with all the stakeholders. In a participatory approach, consultations are held with community members. An appeal is made in this deliberation on the process that will be adopted by Manuvikas on how lake will be rejuvenated and how community members need to extend their support by arranging their vehicles to lift the dredged silt from the lake. This open deliberation had lot of debates in 70% of the cases. In few there where the issues of lake encroachment, the issue became quite heated up. Due to participatory interaction, a consensus was arrived among the community to resolve such issues. While rejuvenation it was the community members who took care of the labors logistics such as stay and food.

**Outcome:** Due to participatory approach, a community mobilization was able to achieve. Differences were sorted out if any. Common understanding was arrived among the community members thereby not only smoothened the MANUVIKAS efforts and also ensured in effective implementation of lake rejuvenation initiatives.



## Ecological aspects of the Lakes

It was noticed that in all the lakes visited, due to adoption of scientific means of desiltation, the ecology of the lake has improved. This can be attributed to the cleaning of weeds and shrubs that was grown, plugging of lakes leakages if any, strengthening of embankments, desilting to the point without altering lake bed. This is noticed in all the lakes. This intervention has enabled to store optimum quantity of water in the lakes. In two the lakes it was noticed that roosting of birds has started. Aquatic plants and insects are profusely seen. Considering the quality of the water lake, in one lake fish spawns are introduced. None of the lakes had any waste dumps such as domestic and farming except one lake. This is also enabling the ecological health of the lake.

**Outcome:** Ecology of the lake has improved in most of the lake and in few it is changing considerably. Over a period with a protection from community, these lakes would be home to several life forms such as birds, insects, reptiles. The lake would also help in absorption of heat generated in the region. The roosting of birds in the lake do help in the pest control of the agriculture crops in the surrounding region on a long run. There is an indication that at least one or two lakes would turn into congregation of water birds such as egrets, cormorants.



## Change in ground water and irrigation

Though it is too early to say the quantum of recharging of ground water due to lake rejuvenation, from the interactions with the farming community it is noticed the ground water recharging has happened from 3 three lakes. This is evident from the fact that the bore-well near the lakes are not dried up in spite of access extraction ground water. The farmers also opinioned that excess water from the lakes is used for irrigation purpose and due to excess moisture in the atmosphere from lake crops are getting benefitted. Quantum of water collected in all the 13 lakes would be about 75.25 million liters of water. An average of 50 hectares of farming land is benefitted due to water availability.

**Outcome:** From the lake rejuvenation, the evident of ground water recharge is noticed in 6 lakes. While in other lakes, a study needs to be taken up. Nevertheless, lakes are going to increase the ground water and ensure supply of water availability for the lakes.



## Improved cropping pattern and area

Profuse farming activities are taken up in the farms surrounding the lakes. It is noticed that the cropping pattern has changed in these farm lands. Instead of regular crops, commercial crops such as maize, paddy and sugarcane are preferred by the farmers. The farming area is also increased with a hope that water will be available for farming. From four lakes the farmers expressed that they have taken up and or planning to take up three crops in a year. Such a mindset among the farming community is an indication that cropping pattern is changing and willing to extent the farming area.

**Outcome:** Cropping pattern and the cropping area is changing due to lake rejuvenation initiatives. A comprehensive study is required in the endeavor.



### **Socio-Economic aspects of the lake**

The interaction with villagers indicated that the lakes constructed were of great social and economic importance.

Socially and culturally the lakes were of great importance to the villagers. Apart from irrigation, lakes were used for the purpose such as worshipping the water body, creation of temple or installing the deity near lakes. The decapitated condition of the lake discouraged the community members to visit the lakes. Today, the lake revered with great respect and is being looked as sanctity.

Economically, due to harvesting of water from the lake, yields from cropping have increased by one and half fold. Farmers opinioned that they are able to fetch more money from the excess sales of agriculture produce.

**Outcome:** The lake rejuvenation has brought in socio economic changes among the villagers. A detailed study is required in this regard.





## People perception and sustainability aspects

Interaction with various stakeholders was held to give their realistic perception about the lake rejuvenation initiatives. Following are the feedbacks from the people:

- Several initiatives are taken by the Govt and Non-governmental organization to revive the lakes. All their efforts were half-heartedly done and never had logical completion
- The approach adopted by MANUVIKASA in this initiative was quite genuine. Their teams were very supportive and accommodative.
- Their efforts can never be matched with any other Govt schemes
- We want all our other lakes to be rejuvenated so that our economy is sustained for years together
- A demand is created to locate and rejuvenate the remaining lakes



### **Lake Ecosystem services**

The lake rejuvenation is enabling several ecosystem services that can be classified into supporting, provisioning, regulating and cultural services.

**Supporting services:** Ensuring supply of food in terms of agricultural products, creation of habitat for flora and fauna, supporting local biodiversity etc.,

**Provisioning services:** These services include ground water recharging, supply of drinking water, water purification, cooling of temperature and supply of fishes etc.

**Regulating services:** Comprises of water purification, carbon sequestration, clean air, nutrient recycling etc.

**Cultural services** include aesthetic value, recreation, education, and etc.



## CONCLUSION

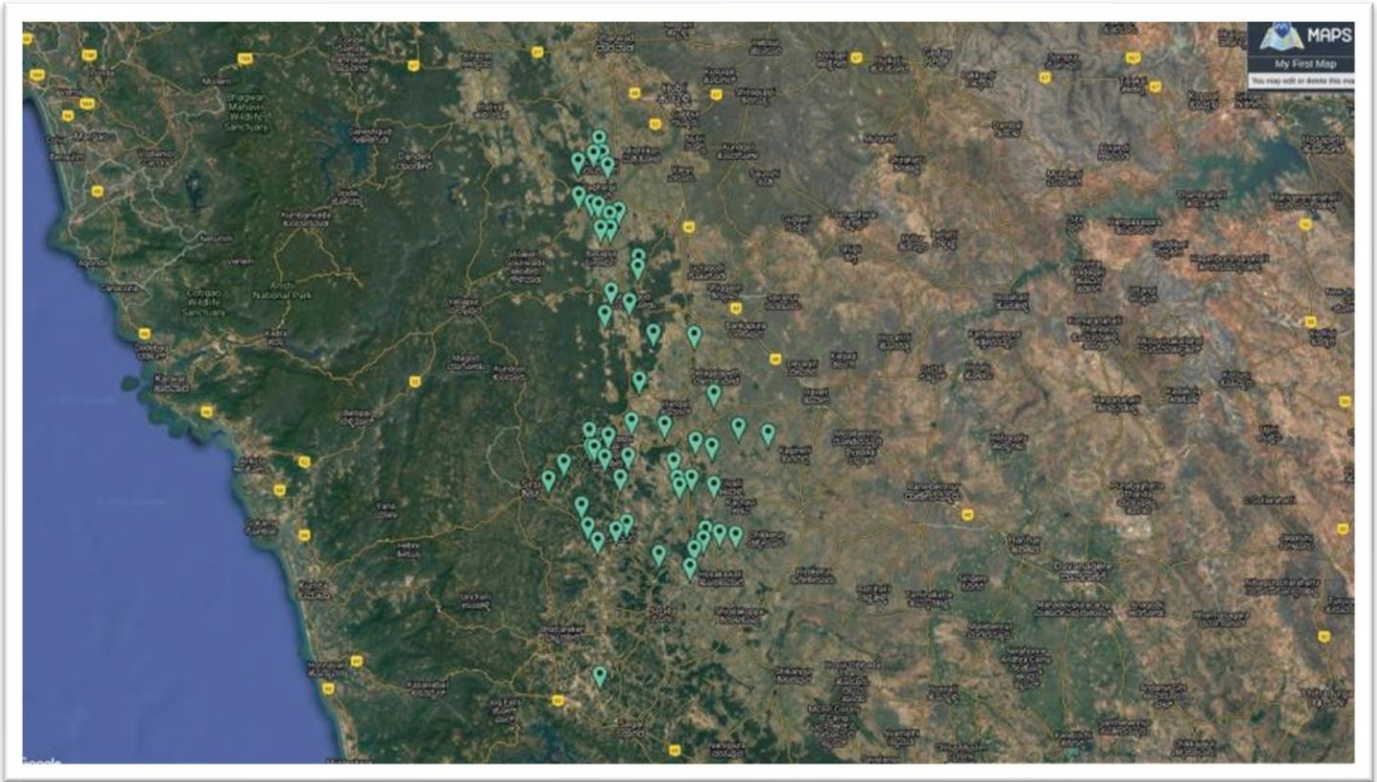
Lakes signify as storage units for water and provide ecosystem services along with opportunities to conserve native biodiversity. Along with this, lakes perform the role of recharging underground water by harvesting rainwater. But the ignorance towards the maintenance of natural lakes leads to eutrophication thereby resulting in minimum services from them. The program of rejuvenation of lakes performed by Manuvikasa has successfully shown the importance of lakes in providing ecosystem services to the local community.

The social surveys carried out in the villages of rejuvenated lakes have given a glimpse of pre-rejuvenation effects and post-rejuvenation benefits among the villagers. The local community could differentiate between the ecological and economic benefits after the rejuvenation of the lake. If all the stakeholders are involved in such programs and acquire knowledge about the outcomes, then there will be utmost support and demand for further work in the surroundings. This program has provided a clear evidence of the importance of a multi-stakeholder partnership.

Although there is a need for further research to assess the success of the project, the support and feedback from the benefits received by the local community stand as great evidence for their excellent work. The gained momentum of the stakeholders towards rainwater harvesting and rejuvenation of lakes by this program presents success and acts as a drive for future such projects.



Map of all the lakes rejuvenated by MANUVIKASA





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