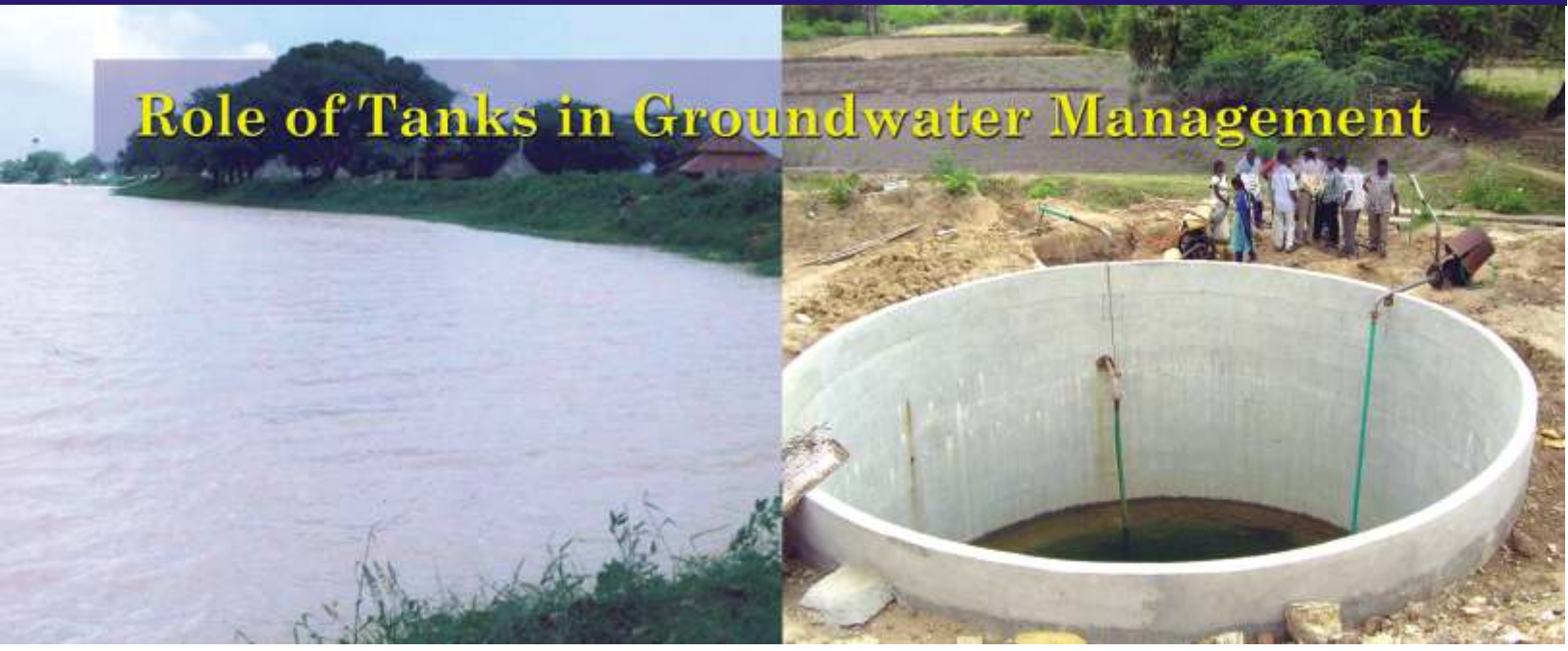
Policy Brief 3



Restoring Tanks for Groundwater Recharge

Executive Summary

Groundwater is precious, finite but a rechargeable resource. Effective rainwater harvesting measures have to be undertaken by people as was traditionally practised. Tanks play a dual role: they not only provide water for direct irrigation but also help in recharging the groundwater. Over a period of time tanks have not been taken care of sufficiently. Reasons are many: with the availability of free electricity and usage of electric pumps by the individual farmers, there is no incentive to maintain the traditional water bodies. The dependability on tank water is declining due to availability of groundwater and its easy extraction by using powerful electrical gadgets. Better-off farmers who can afford to have their own wells resort to pumping out more water from the tank command area, but other small and marginal farmers who are dependent only on tank irrigation are affected most as the traditional tank management has become defunct.

There is an urgent need to restore the existing tanks to their former purpose and potential. Judicious use of groundwater and surface water should be advocated keeping in mind the long-term implication of over exploitation of groundwater. Short-term gains should not dictate the long-term ill effects of indiscriminate exploitation of groundwater. On the basis of successful tank rehabilitation programmes of DHAN Foundation across several districts that helped in restoring and recharging the groundwater and the subsequent seminar, which addressed many issues, many recommendations emerged which are discussed in this policy brief. The recommendations have been listed department-wise, which need to be deliberated further.

The following recommendations emerged at the end of the seminar:

Existing Policy/Practice/Status	Policy/Practice change
Public Works Department (PWD)/Rural Development Department (RDD)	
The Tamil Nadu Groundwater (Development and Management) Act, 2003 is in place but not yet implemented. Groundwater Authority is yet to be constituted. Rules for the Act have to be framed for action.	Groundwater conservation has become an urgent need. Acts in existence should be enforced with consistent follow-up. There should be a separate Regulatory Government Body for protecting, preserving and renovating all tanks. Sand quarrying in river beds should be further controlled by substituting alternate materials like quarry dust, fly ash etc., in place of sand used for construction. Seawater intrusion in coastal areas is a serious issue affecting groundwater. Scientific measures should be adopted to check the intrusion and prevent groundwater contamination through regulation of groundwater extraction and supplementing rain or tank water recharge. Construction of community wells has to be facilitated to make farming a profitable venture for the poor and marginal farmers. New private wells may be permitted only selectively. Steps should be taken to recharge existing wells/bore wells instead of digging new wells. Regulatory structures in the tanks should be repaired expeditiously to economise water use. Pilot projects have to be initiated.
The Groundwater (Development and Management) Act, 2003 does not contain provision for rainwater harvesting and for groundwater recharge.	The model bill formulated by Ministry of Water Resources, Government of India contains provision for groundwater recharge. Similar provision may also be incorporated in the Tamil Nadu Act.
Presently there is no policy to enumerate the tanks and their condition periodically.	A policy has to be evolved to enumerate the existing and defunct tanks periodically once in ten years. Scientific methods such as High-resolution satellite imagery and Aerial Photographs should be well utilised for proper inventory and documentation. The reasons for the disuse/non-existence of tanks should be recorded for further research/study and ground verification. All tanks should be enumerated and "Codified". Descriptive memoirs should be made available in the web site after proper verification of tank parameters to ensure accuracy and transparency in order to facilitate their rehabilitation as per design standards.

Existing Policy/Practice/Status	Policy/Practice change
Government does not lay enough emphasis to educate the people about the conservation of Common Property Water Resources.	All types of media should be used for sensitising the people on the importance of preserving Common Property Water Resources.

Rural Development Department (RDD)

No clear-cut policy and target exist with regard to renovation of drinking water ponds/structures and minor irrigation (MI) tanks.	There should be a drinking water *Oorani* in every village. Either a new one should be constructed or the existing one should be renovated on a scientific basis to provide clean drinking water. It would compliment hand pumps. All MI tanks need rehabilitation in a phased manner within a period of 15–20 years under NREGA or other appropriate schemes. Community wells should be built in the vicinity of tanks, but no more private wells should be permitted. *Ooranis* should be given priority in places where the groundwater is saline or unsafe to drink such as Ramanathapuram district in Tamil Nadu and Nalgonda district in Andhra Pradesh.

Agriculture and Agricultural Engineering Departments

Schemes relating to farm ponds and watersheds have to be intensified.	Formation of farm Ponds by farmers to be encouraged through provision of bank loans. Percolation ponds are to be encouraged. Micro watersheds should be developed with the local community planning and implementing it and the Government and local Panchayats only facilitating the works.

PWD, RDD, Agriculture Department and Pollution Control Board

There is very little coordination between the Public Works, Rural Development and Agriculture Departments and the Tamil Nadu Pollution Control Board. The Pollution Control Board does not take pollution of village tanks seriously.	The concerned Govt. departments should strictly prevent pollution of existing tanks in a coordinated manner in order to prevent groundwater pollution.
Only sporadic budget provisions are made for tank restoration programmes.	A separate long-term financial provision should be made for the tanks every year in order to rehabilitate all of them over a specified period of 15 to 20 years. Government should consult the local farmers/civic bodies/farmers' federations before preparing development plans concerning tanks and other Water Resource Development structures.

Existing Policy/Practice/Status	Policy/Practice change
PWD/RDD	
Right to share income arising from the management of tanks by Water Users' Association is not defined.	Maintenance of tanks should be entrusted to the WUAs/ Village Panchayats and income from tank complexes should be used for maintenance of the tanks All usufruct and fishery rights in tanks should be given to Water Users' Organisations/Tank Farmers' Associations on a specific shared basis with local Panchayats.
TWAD	
There is no integration among TWAD, RDD and Village Panchayat for implementing water recharge structure schemes (PMGY, NABARD) for balancing drinking water and irrigation needs.	Government should implement the National Water Policy with adequate infrastructure to recharge groundwater and providing safe drinking water at affordable cost to every village, through proper co-ordination among the implementing agencies.
NGOs	
Very little effort is being put in by the NGOs to renovate or conserve the common property resources.	NGOs should be encouraged to educate the rural masses regarding the importance of rehabilitation and maintenance of tanks for augmenting water resources and for sustained ecological balance. Competent NGOs also could be given the responsibility for rehabilitation of small-scale water bodies like tank irrigation and drinking water pond systems.
Department of Education	
The current curriculum does not lay adequate emphasis on the importance of tanks and other water resources in the syllabus at the school/college level.	Water security and small-scale water bodies should be introduced at school level to awaken the students' awareness level and in turn public interest through the students.
Revenue Department	
As a number of Government departments deal with encroachments independently, coordination between the executive officials has been rather difficult or absent.	Eviction of encroachers should be given top priority and all the concerned departments need to work in a coordinated manner to eradicate and prevent encroachment in water bodies.

The brief reinforces the follow-up action required through initiating processes and mechanisms among relevant State Government Departments, Academic/Research Institutions/NGOs.

Role of Tanks in Groundwater Management

I. Background

Water is life. Water is precious and every drop counts. It is one of the most important natural resources for plant, animal and human life. Out of the total water resources available in the world, 97.5% is saline and only 2.5% is fresh water: greater portion of this fresh water (68.7%) is in the form of ice and permanent snow cover in the Antarctica, Arctic and mountainous regions, 29.9% exists as fresh groundwater and the rest is available in lakes, rivers, atmosphere and vegetation (http://cgwb.gov.in/secr/mass_aware_prg.htm). The crisis about water resources development and management arises because most of the water is not available for use and secondly it is characterised by its highly uneven spatial distribution. As such the importance of water is getting recognised and greater emphasis is being laid on its economic use and better management.

The Groundwater Year Book (2005–2006) (http://cgwb.gov.in/secr/reports_page.htm) states that the water level showed a decline with respect to either the previous year or the mean of last 10 years. Groundwater recharge may be augmented through rainwater harvesting and conserving it in tanks and ponds. The fate of groundwater has been dramatically described by Edward Luce (2007) in his recent book "In Spite of the Gods–The Strange Rise of Modern India" analysing the contradictions faced by India. He says that "The water table in the village (in Kolar District) had dropped from 40 feet below the surface in the 1960s to more than 600 feet under ground. The natural wells on which the poorer farmers rely are useless at such depths. The ancient habit of harvesting rainwater as it falls and feeding it through hundreds of channels into tanks has also disappeared. It is a story that is repeated across India".

Groundwater is one of the most precious natural resources. It has played a significant role in upgrading and maintaining India's economy and standard of living. Besides being the primary source of water supply for domestic and many industrial uses, it has been the single largest sustainable source for irrigation. About 90% of water supplies for domestic use in rural areas, 50% of water for use in urban and industrial areas and 50% water requirements for irrigation in agriculture are being met from groundwater (http://cgwb.gov.in/secr/mass_aware_prg.htm).

Water Resources of Tamil Nadu

Tamil Nadu State is the southern most State in India having a total area of 1,30,058 sq.km. and it receives an average annual rainfall of 995 mm. Nearly 73% of the total area of the State is occupied by a variety of hard and fissured crystalline rocks like charnockite, gneisses and granites. The depth of open wells varies from 6 to 30 m below ground level, whereas the depth of bore wells generally varies from 30 to 200 m. Cauvery, the major river basin of Tamil Nadu with a catchment area of 81,155 sq.km. and the other medium river basins with a total catchment area of 48,348 sq.km. contribute to groundwater recharge. The total replenishable groundwater resource is 12.30 cu. km/year in the Cauvery basin.

Water Demand and Balance

The total water potential for the state of Tamil Nadu is 28,463 mcm. The possibility of increasing the water potential of Tamil Nadu in future is remote. The water potential is therefore assumed to remain constant at the present level. The total water demand of various sectors is calculated by Institute for Water Studies, Chennai and is presented in Table 1.

Table 1: Water demand for Tamil Nadu (in mcm)

Sector	1994	1999	2004	2014	2044
Domestic	905.15	1001.51	1088.21	1345.98	1793.67
Agriculture	29037.06	29079.47	29079.47	27807.85	26905.46
Industries	461.46	635.99	808.54	1307.20	2196.63
Livestock	387.04	387.04	387.04	387.04	387.04
Hydropower	34.37	60.29	66.47	63.27	78.27
Environmental needs	28.00	28.00	28.00	28.00	28.00
Total	**30853.08**	**31192.30**	**31457.73**	**30944.43**	**31389.07**
Total Water Potential	28463	28463	28463	28463	28463
Total Demand	30853	31192	31458	30944	31389
Deficit	2390	2729	2995	2481	2926

Source: Water Resources Plan of Tamil Nadu–Draft Final Report, IWS, Chennai (http://www.tnenvis.nic.in/docu/EnvStat2005.pdf)

When the total water potential available is only 28,463 mcm and there is no scope for increasing or developing additional water potential, only the demands have to be restricted or the available water has to be allocated rationally. The demand for water under domestic and industry sector seems to increase over the period (1994–2044). Industries have to play a major role in judicious use of water and steps should be taken by the industries for recycling and reusing the available precious water resource. There may be some scope of minimising the use in each sector by improving the efficiency of water usage, particularly in irrigation and agricultural sectors. This savings can be used partly to meet the increasing demand from the other sectors.

The scenario of Groundwater in Tamil Nadu: Rainfall is the chief source for recharge of groundwater. The rainwater, which falls on the earth, percolates downwards through weathered mantle or fissured rocks and accumulates as groundwater.

In Tamil Nadu, hard rock formations occupy 73% of the total geographical area and sedimentary rocks and alluvial formation occupy the remaining area. Groundwater is extracted from these rocks and aquifers by means of Dug/Tube/Bore wells. With rapid growth of population in the State, demand for water for various uses has risen manifold, which has increased the stress on groundwater resources.

The over-extraction of groundwater leads to declining groundwater levels, thereby rendering existing wells out of use and necessitating deepening of existing wells, which leads to increased pumping costs. In parts of Coimbatore, Salem and Namakkal districts, groundwater levels have gone down to uneconomic levels due to over-extraction. In coastal areas of Minjur, north of Chennai, over-extraction of groundwater has caused landward movement of seawater. In urban areas, due to rapid growth of urbanisation and consequent shrinkage in open land, natural recharge to groundwater is reduced considerably.

Annual Replenishable Groundwater Resource in Tamil Nadu–23.07 bcm/Yr

Net Annual Groundwater Availability–20.76 bcm/Yr

Annual Groundwater Draft–17.65 bcm/Yr.

In a number of areas in the State, groundwater extraction exceeds annual recharge.

(source: http://cgwb.gov.in./gw_profiles/St_TN.htm)

The Policy note of PWD (2007) on groundwater provides the status of areas covered under Panchayat Union Blocks in Tamil Nadu as follows:

Sl. No.	Category	Nos.
1	Over exploited Blocks	138
2	Critical Blocks	37
3	Moderately conserved Blocks	105
4	Safe Blocks	97
5	Saline water Blocks	8
	Total	**385**

Groundwater Quality Problems: Declining groundwater levels cause huge environmental, social and economic costs and they can lead to (i) Salinisation of aquifer (ii) Pollution of aquifers (iii) Increased cost of pumping (iv) Abandonment of wells.

Contaminants	Districts affected in parts
Salinity	Nagapattanam, Pudukottai, Ramananthapuram, Vellore, Dharmapuri, Salem, Trichy, Coimbatore
Fluoride	Dharmapuri, Krishnagiri, Salem, Vellore, Villupuram, Sivagangai, Tiruchirapalli, Pudukottai

(Source: http://cgwb.gov.in./gw_profiles/St_TN.htm)

In Tamil Nadu, studies carried out showed that small-land holders suffered most from poor quality water and falling well yields. Larger farmers were able to dig new wells or able to deepen existing wells. Over extraction has a far-reaching economic and environmental effect. Water contained in the aquifers seep into rivers and other water bodies as sub-surface flow, thus sustaining wetlands and native vegetation. Groundwater sources are also easily polluted by overuse of pesticides, fertilizers and industrial wastes. The coconut water was found to contain 0.2% residual chromium (IWMI Water Policy Briefing, Issue 14, September 2005). Likewise in Bangladesh, arsenic in groundwater threatens the lives of millions. The unregulated pumping of

groundwater in areas around tanks is depleting the tank storage and is eroding the traditional practice of collective participatory water management.

Haphazard disposal of untreated industrial and domestic wastes leads to seepage of these wastes underground also resulting in groundwater pollution. Discharge from Vaniyambadi industrial area into Palar River, which has no perennial surface flow, has caused groundwater pollution over a long stretch of the river. Instances of groundwater pollution have also been reported from Ambattur, Madhavaram and Manali in and around Chennai as well as Cuddalore and Pondicherry regions. In Kangeyam, Dharapuram and Vellakoil of Erode district, Tiruppur in Coimbatore district and Karur in Karur district, effluents from dyeing industries have resulted in the deterioration of groundwater quality (http://cgwb.gov.in/secr/mass_aware_prg.htm).

There is a demand driven exploitation of groundwater resources. Tamil Nadu, North Gujarat and most of Punjab and Haryana are states relying on groundwater but have limited stocks. Appropriate policy intervention is lacking. Before the situation worsens, corrective mechanisms have to be placed in order to set things right. We need to develop a mindset where resources are managed rather than exploited. A study report by IWMI (Water Policy Briefing, Issue 4, June 2002) points out that the number of overexploited Blocks continues to grow at the rate of 5.5% per annum and by 2018, roughly 36% of India's Blocks will face serious water scarcity problem.

Current problems associated with groundwater in India are the direct result of the failure or neglect to follow an integrated approach to natural resources use and management. Groundwater management should be taken as a part of sustainable and equitable management of natural resources. Considering the imperative need to conserve groundwater resources for sustainability and meeting the growing needs of the generations to come, we need to develop our water resources and watersheds intensively.

II. Sectoral Review Analysis

National Water Policy 2002: National Water Policy focuses on efforts to develop, conserve, utilise and manage water resources in a sustainable manner. It stresses governance on a national perspective. One-sixth area of the country or roughly 55 mha is drought prone. Out of 40 mha of the flood prone area in the country, on an average, floods affect an area of around 7.5 mha per year. Management of droughts and floods has to be co-ordinated and guided at the national level. The development and over exploitation of groundwater resources in certain parts of the country have raised the concern and need for judicious and scientific resource management and conservation.

Production of food grains has increased from around 50 million tonnes in the fifties to about 208 million tonnes in the Year 1999–2000. This will have to be raised to around 350 million tonnes by the year 2025 AD.

National Water Policy was adopted in September 1987. Since then, a number of issues and challenges have emerged in the development and management of the water resources. Therefore, the National Water Policy (1987) has been reviewed and updated in the year 2002. The success of the National Water Policy will depend entirely on evolving and maintaining a national consensus and commitment to its underlying principles and objectives. To achieve the desired objectives, State Water Policy backed with an operational action plan should be formulated in a time bound manner.

The Tamil Nadu Farmers Management of Irrigation Systems Act, 2000: The purpose of this Act is to empower farmers' organisation in the management and maintenance of the irrigation system through fair and equitable distribution of water among its users, inculcating a sense of ownership and promoting efficient utilisation of water to achieve optimum agricultural production.

The Tamil Nadu Farmers Management of Irrigation Systems Act, 2000 is a community-oriented piece of legislation within the area of operation notified by the Government. The progressive part of this Act is that it provides adequate space to the Water Users' Associations to be involved in a big way in the management and maintenance of tanks covered by the Act. But the Act does not cover the thousands of tanks vested with Panchayat bodies. It is also felt that there is too much of official control over the Water Users' Associations contemplated under the Act.

Another disturbing clause in this Act is, after the commencement of the Act, farmers' associations already existing in the area will cease to exist. The activities of the Water Users' Association formed under this Act will be under the control of the PWD and the Government. Government can appoint a commissioner with the powers to revise the decisions taken by Water Users' Association.

The Tamil Nadu Groundwater (Development and Management) Act, 2003: An ordinance to protect groundwater resources, to provide safeguard against hazards of over exploitation, to ensure its planned development and proper management in the state of Tamil Nadu was issued in 2003. This ordinance was later replaced by an Act. Even though the ordinance was issued in 2003, it is yet to be brought into force by issuing the required notification under Section (1) Chapter III of the Act. The Act contemplates the creation of "Tamil Nadu Groundwater Authority" as a regulatory body. The creation of authority has to be notified by the Government. It is necessary to issue the notification to bring into force the provisions of the Act and create "Tamil Nadu Groundwater Authority" and the date and areas to which the provisions are applicable.

One significant omission is that the Act does not contain provision for rainwater harvesting and for groundwater recharge. This is essential to improve the depleting groundwater level. The model bill formulated by Ministry of Water Resources, Government of India in January 2005 contains provision for groundwater recharge. Similar provision may also be incorporated in the Tamil Nadu Act.

The Tamil Nadu Act also does not contain any provisions for registration of Drilling Agencies. This provision is essential to monitor and control the activities of Drilling Agencies.

A provision for registration of the use of new wells in non-notified areas may be incorporated in the Tamil Nadu Groundwater (Development and Management) Act, 2003.

Based on a presentation made by M. S. Vani (2007) on "Sustainable Groundwater Legislation" at the Workshop on "Water and Law" the following is the summary of her recommendations on the importance of groundwater legislation.

Purpose of Groundwater Law: The problems that emerge from current approaches and practices in groundwater use suggest the following solutions.

1. Groundwater management should be based on planning that takes into account the totality of environmental conditions prevailing in any given location. It should be a component of integrated natural resource management.
2. Management, including regulation should be decentralised. There should be thus a combination of macro planning with micro-governance, involving local decision-making and regulation.
3. There should be a clear definition of rights that would satisfy the requirements of sustainability as well as equity.
4. Rights should be adequately protected by regulation through suitable institutional frameworks that give representation to all stakeholders.
5. There should be appropriate institutions and processes for effective and speedy dispute resolution and conflict management.

The purpose of groundwater law therefore should be to provide the framework of rights, institutions, mechanisms and processes to enable a management paradigm based on the above parameters.

Participatory approach is very essential for the integrated management of natural resources. Natural resources sector in India lacks a management paradigm that is ecologically, socially, economically, politically and technologically sound. Decentralised governance of groundwater management is necessary. "Watershed approach" is the most appropriate model for the governance of natural resource in India, which permits the integrated decentralised development and management of natural resources (unpublished work, Vani, 2007).

Irrigation Potential and Utilisation in Tamil Nadu

Tamil Nadu with a geographical area of 1,30,058 sq.km. ranked eleventh in size among the Indian States. The net area sown in Tamil Nadu is about 55 lakh ha of which about 30 lakh ha get irrigation

facility from canals, tanks, wells, tube wells and other sources. There are 66 major and medium reservoirs, 39202 tanks, 12,611 km length of canals and 18,39,754 wells in the State.

It is to be noted that the state's irrigation potential is minor irrigation based with a share of (62%) 24 lakh ha and the rest (38%) 15 lakh ha potential is apportioned between major and medium schemes. Out of the total minor irrigation potential, about two-third i.e., 15.0 lakh ha is from groundwater sources and the rest from surface sources.

Development of Irrigation Potential and Utilisation (ultimate)

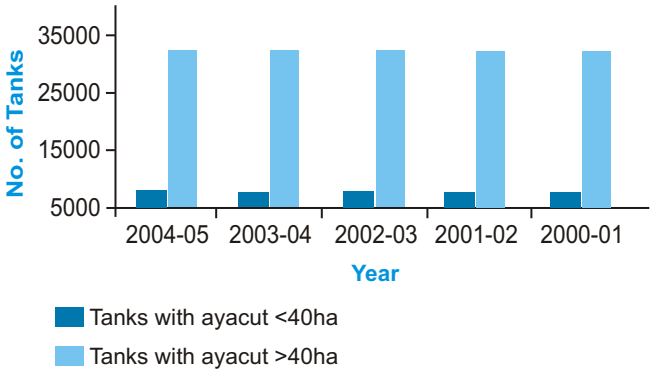
(lakh ha)

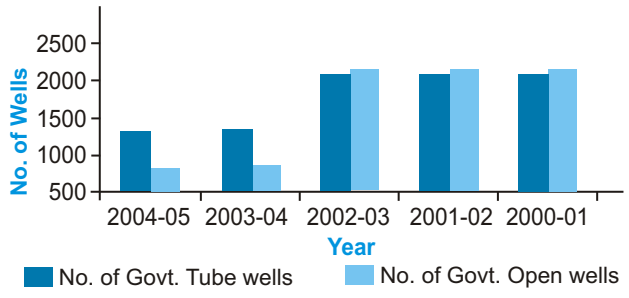
Sector	Surface Water	Ground-water	Total
Ultimate irrigation potential	24	15	39
Major and medium schemes	15	-	15
Minor	9	15	24
Utilisation as of 1994	24	12	37
Balance to be tapped	Nil	2	2

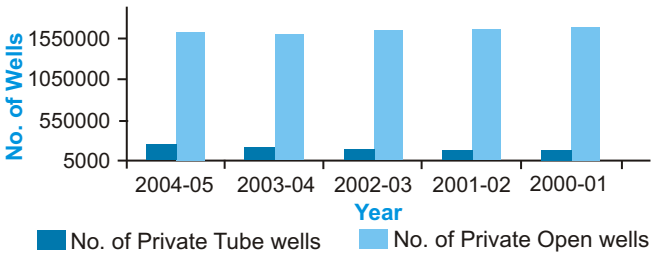
Source: IX Five-year plan 1997–2002, State Planning Commission, Chennai

Among irrigation sources, wells irrigate 48% of the total area while canals irrigate 29% and tanks 22.9%. Years back each of these sources was contributing 33 1/3% and the present pattern shows that the groundwater sources are being tapped fast and the commandability of the tank irrigation is on the decrease due to siltation and encroachment of the tank foreshore. It has to be construed that to sustain the existing irrigation potential the watersheds/catchments have to be adequately conserved.

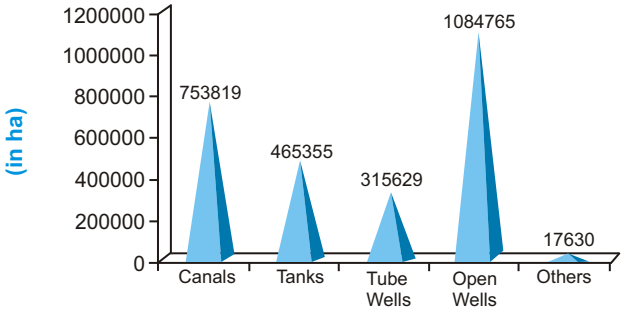
Sources of Irrigation







Source wise Net Area Irrigated 2004-05



(Source: Department of Economics and Statistics, Season Crop Report 2004–05, Government of Tamil Nadu)

As per Season Crop Report, 2004–2005, the net area irrigated by tube wells and open wells was 14,00,394 ha as compared to 4,65,355 ha by tanks. Since the state has already harnessed maximum surface water potential through major and medium irrigation schemes, the only way by which additional acquisition of rain water can be done is to revive traditional water bodies like tanks and ponds to harvest the monsoon rains in surface storage to ensure the water security of rural areas.

The investment on rehabilitation and renovation of tanks becomes crucial in order to ensure water security in rural areas. Investment on rehabilitation of an existing tank with proven hydrology is much less as compared to constructing a new tank (it costs just 20% of the value of constructing a new tank).

Groundwater and Irrigation: Groundwater is the most democratic source of water available for improving livelihoods, household food security and reducing poverty in rural areas. Careful research and analysis has revealed that in comparison to

surface-water irrigation, groundwater irrigation covers more land and is expanding, creates more wealth, and has a greater impact in terms of poverty reduction.

Groundwater sustains almost 60% of the country's irrigated land (21 mha of land is irrigated by surface water as against 27 mha by groundwater). Number of wells has increased in the last 40 years, from less than one million in 1960 to more than 19 million in the year 2000. For example, in 1993 groundwater use generated Rs. 132 billion, while surface water generated only Rs. 115 billion, but in 1970, groundwater use generated only Rs. 21 billion as against Rs. 77 billion from surface water (IWMI, Water Policy Briefing, Issue 4, June 2002).

In groundwater irrigation, crop production is higher per unit of water used as compared to surface-water irrigation. Hence farmers invest more in high yielding seed varieties, fertilizers, and pest control. Farmers can use groundwater at their will depending upon their requirements.

Small farmers represent 29% of the total agricultural area. Small farms account for 38% of the net area irrigated by wells and 35% of the tube wells fitted with electric pump sets. IWMI in it's study indicated that farmers and entrepreneurs have invested around US$ 12 billion in groundwater pump structures as against US$ 20 billion of public money spent on surface water irrigation schemes over the last 50 years in India (IWMI, Water Policy Briefing, Issue 4, June 2002).

Because of private, informal sector participation, there is the tendency for over-exploitation of groundwater and the effects have been catastrophic. Population density and agriculture demand drive accelerated groundwater usage ignoring the quantity of present supply or the availability of surface water for groundwater recharge.

The spread of Green Revolution caused mushrooming of groundwater structures across the country. Hence, there is an urgent need to manage the precious resource judiciously. The contribution of groundwater for irrigation in Tamil Nadu is 45%.

Tank Irrigation: Tanks, Ponds and *Ooranis* besides providing water for irrigation and domestic purpose are the main sources of recharging groundwater. In the absence of tanks and ponds a major portion of the surface flow will be washed as run off. In this context it is very essential to rehabilitate and maintain tanks and small water bodies. Most of the area under tanks and ponds lies in the Southern States of Andhra Pradesh, Karnataka and Tamil Nadu. These States, along with West Bengal, Rajasthan and Uttar Pradesh, account for 62% of total area under tanks and ponds in the country.

As per minor irrigation census carried out in 1987, there are about 1.5 million tanks in various States. (source:http://wrmin.nic.in/development/default6.htm). The States of Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and West Bengal have greater density. In spite of addition of new tanks during the period from 1962–1963 to 1985–1986, the area under irrigation came down from 4.8 to 3.1 mha. It clearly indicates that maintenance of the tanks has been neglected and their capacity has been reduced due to weed infestation, encroachments and siltation. It has been estimated that about 1.7 mha of net area has been lost under tank irrigation due to drying up of tanks and encroachment of the foreshore area. Rehabilitation and modernisation of the tanks are getting the active consideration of the Government of India and the concerned States.

The share of tank irrigated area in India has declined from 16.51% of total irrigated area in 1951–1953 to 5.18% in 1999–2000, whereas the share of groundwater irrigation has increased from 30.17 to 55.36% during the same period (as quoted in Palanisami, 2006).

IWMI–Tata Water Policy Programme survey of 51 villages in Tamil Nadu's Palar basin found several cases of better-off farmers closing the sluice gates of tanks, to ensure that the impounded water constantly recharge their wells. This harmed poorer farmers. Basin-wise joint management of surface and groundwater resources is necessary to ensure that they are used efficiently and equitably. It is important that the relationship between surface water and groundwater is considered in tank rehabilitation projects as well as in general irrigation management (IWMI, Water Policy Briefing, Issue 14, September 2005).

Vaidyanathan and Janakarajan (1989) are of the opinion that tank as an important source of irrigation is losing its place. Wells located in the

tank commands are quite significant in number and they in turn derive most of the supplies through recharge from the tanks. There is also a positive correlation between the rapid growth of well irrigation and decay of tank irrigation systems such as tanks (Janakarajan, 1993). A direct relation exists between well density in the command area and the disintegration of tank irrigation system.

Palanisami (2006) also states that there is declining interest on tanks among the farmers who own wells in the command area because they are in a position to sell water to farmers who do not own wells. This conflict of interest comes in the way of proper upkeep of tank structures.

Farmers who were utilising the Tank and Pond water for irrigation purposes gradually started switching over to lift irrigation using electrical pumpsets with free electricity supply. The farmers were using groundwater only from shallow wells 20–35 feet deep for their farming needs. They did not pay any attention to maintenance of regulatory tank structures, silt removal from inlet channels and tank bed and clearance of weeds from supply and distribution channels. The traditional water managers "Neerkattis" were getting sidelined. As silt started building up, there was no inflow into the tanks. The local influential people started encroaching tank beds and feeder channel areas and government also utilised the defunct tanks for construction of government buildings. These interventions further reduced the efficiency of tanks as recharge structures.

As the recharging efficiency of the tanks declined the wells around the tank were not giving enough yields. Instead of devoting their attention to tank maintenance the farmers resorted to deepen bore wells as the groundwater level started falling down. The rich farmers were spending about Rs. 20,000/- every other year for deepening their wells by 3' to 5'. The poor farmers could not afford such a heavy expenditure and started migrating to nearby urban areas for their livelihood. The government totally ignored tanks and ponds while spending more money for reservoirs and canal irrigation. During drought years, there is misery abound, as people are left with no water for drinking, leave alone irrigation water. The livestock also lost their drinking water sources.

In Tamil Nadu, there are around 39,000 tanks, which during the 1970s irrigated a net area of about 0.9 mha and it has come down to 0.52 mha by the year 2000. Paddy accounts for about 77% of the total grain production from tank irrigation. The average paddy yield is 3.17 t/ha. Since it is not possible to carry out secured paddy cultivation only under rainfed conditions, irrigation is a must (Anbumozhi et al., 2002). Tanks provide a good supplementary source of water beside seasonal rains. However their water use efficiency has come down. There are many constraints that impair the irrigation efficiency of tanks and crop production in the tank command area. On an average, about 26–30% of the tank water spread area has been encroached by the farmers and others. There exists a close correlation between tank capacity, catchment area and cultivated area. The storage capacity of tanks is greatly reduced by siltation. One estimate by Government of India records that about 30% of the total tank storage has been lost by siltation (GOI, 1994).

Comprehensive development in the rehabilitation of tanks and small water bodies like ponds and treatment of their catchment areas with soil and water conservation works like field bunds, gully plugs and check dams should go hand in hand in order to keep up the tank systems performance efficiency.

Need for Conjunctive use of Tank and Well Water: There are around 1.6 million wells irrigating about 1.4 mha of cropped area in Tamil Nadu. Conjunctive use of groundwater and tank water will significantly enhance the rice yield in tank command area. It has been found that on an average 8–14 wells are available in system tanks as compared to 10–22 wells in rainfed tanks. The recharge from the tanks will benefit several thousands of wells if the tanks are made functional with greater storage.

There is ample scope for tank irrigation, as this is a profitable technology in economic, environment and social terms. If the management of tanks is done carefully by paying adequate attention to tank rehabilitation, maintenance and effective utilisation of tank and groundwater, we can ensure much better crop production besides augmenting groundwater recharge.

Water Policy experts and resource managers often advocate improving irrigation efficiency. Water use trends have also changed over the years with changes in the cropping pattern. Multiple uses of

water are not adequately recognised due to the prevailing sectoral approach to water management. There is an intimate connection between groundwater and surface water. When these two resources are managed conjunctively this would provide synergic effect.

III. Restoration of Tanks for Groundwater Recharge–DHAN's Experience

About fifteen years back DHAN Foundation intervened to enhance the farmer's awareness about the importance of maintenance of the local tanks and ponds, which were the traditional sources of irrigation earlier. Dhan Foundation helped the farmers to establish Tank Users' Associations and started reviving the Tanks through community participation. The farmers contributed 25% of the cost while government contributed 75% of the cost towards restoration of the tanks. The very next rainfall after the restoration works brought copious water into the tanks, recharging the nearby wells and farmers started raising one primary and one secondary crop through tank water supplementing the rainfall. Farmers started realising the ecological importance of the maintenance of local tanks, and word spread to other villages about the success stories and presently more and more villages are turning their attention to the restoration and maintenance of their local tanks.

The main impediment in the restoration process is the encroachments in the defunct tank beds, bunds and inlet channels. As the encroachers are influential at various levels, the restoration process is rather slow as it takes time to bring enough pressure on the encroachers to vacate the encroached lands. There is a ray of hope now as the local affected farmers know how to move the government machinery through their "Tank Users Association" and persevere to impact the decision making process of the government machinery. In a landmark judgement (Intellectuals Forum, Tirupathi vs State of A.P. and others {2006(2) A.L.T. 67 S.C.}), the Supreme Court has clearly spelt out as follows: "Communal Property—Tank is a communal property—State Authorities are trustees to hold and manage such properties for the benefit of the community—They cannot be allowed to commit any act or omission which will infringe the right of the community and alienate the property to any other person or body".

IV. Success Stories of Groundwater Recharge

A few classic cases are described below to illustrate how the local Farmers' Associations revived their tanks and ponds by bestowing their attention to rehabilitate their tanks and watercourses by adopting participatory approach.

THENI DISTRICT	
Before tank rehabilitation	**Present Status**
Fifty years back, Cumbum valley in Theni district was very fertile and the local farmers were raising two crops, utilising the water in the tanks and from the shallow open wells around the tanks. The groundwater was at a depth of 20–35'. Gradually when farmers switched over to electric pumpsets, the groundwater level started receding to 200 to 300' below ground level. Most of the Blocks are designated as gray or black by groundwater wing of PWD. Out of 36	During 1998, Silamalai village farmers mobilised Rs. 50,000 as their contribution out of Rs. 1,99,000 estimated for restoration of the Silamalai Tank. The construction works of Silamalai and two more tanks were completed by community participation in 2000. There was immediate response when monsoon started and groundwater level rose by 20'. A community well was also dug downstream of the tank. The depth of water in the well was 30' and it supplied drinking water. In Kurinjiappagoundan tank, groundwater level rose by 15'. Farmers who had removed the pumpsets a number of years back have started refitting the pumpsets, as there was enough water in the open and shallow wells. There is paddy cultivation now by 20 farmers and rainfed lands

Before tank rehabilitation	Present Status
tanks, only 6 tanks were providing irrigation water for one or two months. Large-scale migration, ecological imbalance arising from fertile lands turning into permanent fallows and unemployed youth turning into criminals and other social discomforts resulted because of the tanks going dry due to lack of maintenance.	are now getting water from their rejuvenated wells as the groundwater level is comfortable. These changes were possible because of the restoration of the tanks with consequent recharge of groundwater in all the nearby wells. Rasingapuram tank, Nimminayabbapatti, Adhikankulam are the names of a few more tanks, which have been renovated with people's participation ending the misery of local farmers by improving the groundwater level in these areas.

KANCHIPURAM DISTRICT

Issues	Remedial measures taken
Seawater intrusion would cause major ecological imbalance in the coastal areas of Kancheepuram district due to excessive pumping of groundwater	Educating people about the long term consequences of seawater intrusion and the necessity of government restriction to dig bore well in the 10 km belt from the seashore are the felt needs. Strict enforcement of the groundwater regulation is necessary to realise the objectives of the Government.
Encroachment is another problem, which causes poor maintenance of tanks.	Gradual removal of encroachments by peoples' organisations with the help of Govt. authorities.
Shortage of drinking water in Thirukalukundram.	Restoration of existing *Ooranis* and provision of filter arrangements are essential to ensure protected drinking water

RAMNAD DISTRICT

Issues	Present Status
Ramnad is a water starved district because of its geographical location and being in the rain shadow area of Western Ghats. Further the groundwater is mostly saline. Shallow wells and ponds storing rain water can supply quality water. Desalination plants could not solve the problem.	Ponnakkaneri tank in Mudukulathur block in Ramnad District was renovated through peoples' participation in 1996. There is a dramatic change in the quality of groundwater from saline to potable. There are 25 Tanks, which have been restored by people themselves (contributing 25% of the total cost), which are serving the needs of drinking water either from the ponds directly or through the open wells recharged by the renovated tanks. There are similar success stories coming from the villages viz., Meeanankudi, Sathankudi, Kandankari, Paduwarrendhl and Pappankulam, where desilting of the *Ooranis* have solved the water scarcity problem.

MADURAI DISTRICT	
Issues	**Remedial measures taken**
Decline in agricultural activity.	In 1994, dilapidated Kumarasamudram tank was given a new life because of the restoration efforts taken by Tank Farmers' Association. A community well was also constructed by the farmers' association. Farmers are now raising two crops by practicing conjunctive use. Construction of a community well and later rejuvenation of the local tank in Vandakacholan kanmoi brought cheer to local people as water is available and brought additional income as there is provision for rearing fish. Land use has drastically changed; farmers have started planting coconut saplings in the tank bund.

An investigation on Groundwater Recharge due to Percolation Ponds by Thiruvenkatasamy and Sakthivadivel (1989) reported that there is a positive influence due to construction of percolation pond in the zone of influence. The groundwater recharge due to pond ranges from 47.0 to 68.9% of its stored volume. The increase in the water level in the wells varies from 1.0 to 4.0 m. The zone of influence varies from 1.65 to 2.8 km downstream of the pond. Construction of percolation ponds stabilises the area irrigated by the wells in the zone of influence and creates additional water potential to increase irrigation ranging from 40 to 60% of the area already irrigated.

V. Seminar

A seminar on the theme "Tankfed Irrigation and Groundwater Development" was organised at Chennai. Water experts, Senior Govt. officials, Farmers, experienced Engineers, Academia and DHAN field executives shared their experiences regarding Tankfed irrigation and recharging of groundwater.

VI. Recommendations and Way Forward

The following recommendations were proposed at the seminar:

- There is an urgent need to constitute the "Tamil Nadu Groundwater Authority", which will be the apex body to safeguard, protect and manage the finite groundwater resource judiciously.
- All irrigation tanks (small and big) need to be enumerated immediately. Steps should be taken to rehabilitate all the old tanks and restore them to their former potential.
- Steps should be taken to evict the encroachers from the tank complexes. This would facilitate greater water availability in the tanks, which would boost groundwater recharge, finally leading to more prosperity among the villagers.
- There is ample scope for tank-based agriculture. This is a profitable venture and if the tanks are managed through Water Users' Association by paying adequate attention to tank rehabilitation, we can ensure better crop production.
- Many good field practices have proved that water stored in the tanks have indirectly recharged groundwater. Judicious use of groundwater and surface water will help to increase agricultural productivity.
- Steps should be taken to recharge groundwater by using various rainwater-harvesting structures (e.g. farm ponds, percolation ponds, check dams, individual and community rooftop rainwater harvesting structures).
- Farmers need to be educated about the danger of over-exploitation of groundwater and its ill effects. This can be done through mass awareness programmes. Proper agricultural extension services should be carried out and the media has to be influenced to educate farmers about crop diversity based on available ground and surface water.
- Steps should be taken to install community wells in the water spread area and to provide supplementary irrigation to poor farmers during critical periods of crop growth.

Way Forward

Groundwater is an integral part of the environment, and hence cannot be looked upon in isolation. No single action whether community based, legislation, traditional water harvesting systems, or reliance on market forces will by itself alleviate the crisis in India. The effective answer to the freshwater crisis is to integrate conservation and development activities—from water extraction to water management—at the local level; making communities think and involving them fully is therefore critical for success. All this will ultimately pave the way for combining conservation of the environment with the basic needs of the people.

Policy recommendations for integrated management of groundwater and surface water:

- Groundwater resources should be mapped and monitored.
- Farmers should be encouraged to sustainably preserve these traditional water resources.
- Availability of good quality groundwater should be taken into account when allocating irrigation water at system and distributary levels.
- Steps should be taken to prevent further salinisation of freshwater resources by improving the irrigation efficiency measures and regulating water use.

Recent research shows that groundwater irrigation has become more reliable than the prominent surface irrigation as the primary source of food production and therefore income generation in many rural areas.

Renovation of tanks in forest areas in drought-prone regions will have a significant impact on wildlife and forest cover. Similarly, in some urban cities there is a need to regenerate groundwater aquifers because of the high degree of dependence on them for drinking water. Rainwater/roof water harvesting schemes have been taken up in many cities and even made compulsory in some of them. Temple tanks need to be renovated and urban wetlands protected. All these will contribute to a substantial rise in the groundwater level and a reduction of salt-water ingress. Community awareness and management of freshwater resources should be enhanced. The government should implement effective groundwater legislation and NGOs should foster self-regulation by communities and local institutions. Environmental restoration should be promoted along with household water security.

References

Websites visited: (a) http://wrmin.nic.in/ (b) http://cgwb.gov.in/ (c)http://www.iwmi.cgiar.org/

Anbumozhi, V. K.; K. Matsumoto and E. Yamaji (2002). Sustaining Agriculture through Modernisation of Irrigation Tanks: An Opportunity and Challenge for Tamil Nadu, India. Agricultural Engineering International: the GIGR Journal of Scientific Research and Development. Manuscript LW 01 002. Vol.III.

GOI (1994). Agricultural Statistics at a Glance, Government of India, New Delhi.

Janakarajan, S. (1993). In Search of Tanks. Economic and Political Weekly. 28:6.

Palanisami, K. (2006). Sustainable Management of Tank Irrigation Systems in India. J. Dev. Sus. Agr. 1:3440.

Thiruvenkatasamy K. R. and R. Sakthivadivel (1989). An Investigation on Groundwater Recharge due to Percolation Ponds. A Research Report submitted to Department of Science and Technology, Government of Tamil Nadu, by Centre for Water Resources, Anna University, Chennai.

Vaidyanathan, A. and S. Janakarajan (1989). Management of Irrigation and its Effects on Productivity Under Different Environmental and Technical Conditions. A Research Report submitted to the Planning Commission, Government of India, by MIDS, Chennai.

Vani, M. S. (2007). Sustainable Groundwater Legislation. A paper presented at the workshop on "Water and Law" organised by "Centre for Policy and Research", New Delhi, March 19 and 20, 2007.

Why this Policy Brief?

DHAN Foundation is involved in Natural Resources Management focusing mainly on Community based Development and Management of Water Resources in South India. The initiatives taken so far have reached several villages through rejuvenating water bodies benefiting thousands of families, by working closely with the community. DHAN has gained valuable experience over the past two decades. DHAN believes that for better management of water resources, certain changes in the present policies and practices are needed. Hence it has now been decided to come out with Policy Briefs to disseminate the changes needed in specific sectoral issues. This will facilitate Administrators and Field level Organisations in their attempts of better management of scarce water resources.

Policy Brief 3 focuses on precious groundwater resource, which is a finite commodity. Tanks play a critical role; they not only provide water for irrigation but also help in recharging the groundwater. There is an urgent need to restore the tanks to their former potential. There is ample scope for tank-based agriculture. Judicious use of groundwater and surface water will help to increase agricultural productivity. Farmers need to be educated about the danger of over-exploitation of groundwater and its ill effects. Sharing of water from the community wells will help poor farmers during critical periods of crop growth. Community participation will ensure that resources can be managed in sustainable way, which would pave the way for equitable income generation and integrate conservation and development.

About DHAN Foundation

DHAN Foundation is a grassroots development organisation and was initiated with the objective of bringing highly motivated and qualified young professionals to the development sector for new innovations in development programmes and for upscaling development interventions to eradicate poverty. The Foundation works towards bringing significant changes in the livelihood of the poor through innovation in themes and institutions.

The approach of the Foundation is to promote people's organisation and their networks aiming at improving the livelihoods of poor communities by organising development works around themes. These people's organisations would sustain themselves and excel in long run. Presently DHAN Foundation is working on the themes namely Community Banking, Conservation of Tanks, Information and Communication Technology for Poor, Rainfed Farming and Panchayats.

About the Centre for Policy and Planning

The Centre for Policy and Planning of DHAN Foundation provides support to the programmes and institutions of the DHAN Collective so that they evolve, develop and modify their policies and fulfil their aims. It shapes the sectoral policies to practice at the grassroots. DHAN Foundation as a member of many policy-making bodies on Micro Finance and Water Conservation strongly advocates pro-poor policies. The Centre takes up policy study and initiating research on Micro Finance, Water Conservation, Rainfed Farming, Panchayat Raj Institutions and Disaster Mitigation. As a resource centre, it organises many capacity building events and training programmes for Bankers, Government officials and representatives of NGOs within and outside the country.

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