



June 2021

Water Watch

Quality Matters



Urban Vaigai
Under Isolation

Do Tigers save Vaigai? Not completely yes, But Policy decisions on tiger reserve does save Vaigai. Thanks to government for declaring the Srivilliputhur-Megamalai corridor as Tiger Reserve, this will provide protection to Megamalai which is the Vaigai's primary catchment.

It happened at the end of the 18th century when the British started deforesting the Megamalai region which acts as a major catchment for Vaigai. Large parts of virgin forest were destroyed to free land for commercial plantations of cash crops like tea, cardamom, pepper, cinnamon, etc. Consequently, the water flow in the river reduced gradually. This impacts Megamalai forests are in a very bad shape currently, interspersed with numerous encroachments and many private plantations. On February 2021 Megamalai wildlife sanctuary and the adjoining Srivilliputhur wild life sanctuary were clubbed together and the new tiger reserve is spread over 101,657.13 hectares named as Srivilliputhur-Megamalai Tiger Reserve. So, by protecting wild animals, the natural forests, their habitats which act as watersheds, are given protection. This protection facilitates Vaigai to rejuvenate.



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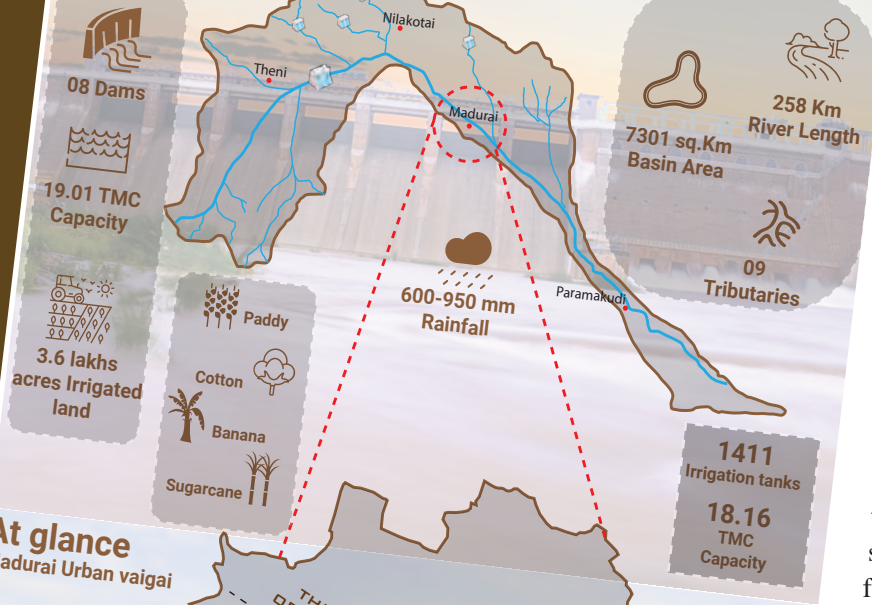
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At glance Vaigai River Basin



At glance Madurai Urban vaigai



“On the river bank of the Vaigai is Kuravamaram, maghizamaram, Kongu, Ven-Kadambam, Maruthamaramam, Senbagamaram... all of these trees are blossoming flowers at Vaigai. These majestic flowers have restricted the visibility of the water stream.” This was a scene viewed by Kovalan, Kannaki while travelling across the River bank of Vaigai. This short description is extracted from the 1400-year-old Tamil literature of Silapathikaram. Not only Silapathigaram, Agananuru, Purananuru, Paripadal, Kalithogai, Thiruvilaiyadal puranam, Madurai Kanchi noted the beauty and the fertility of Vaigai in 2-5 BC itself.

This same traditional living heritage of Madurai City is now full of *Seemai Karuvellam* (Alien species), Water hyacinth (Alien species), sewage, solid waste, C&D waste, slurry, sludge is the face of Vaigai in 2021 AD. According to Darwin Evolution theory, Humans are adaptable but here we have lost beautiful heaven and adapt to the hell for ourselves.

In the Urban Vaigai, the degradation happens when community ownership is restricted. Community ownership is not just a part but it needs to be evolved, safeguarded, preserved, maintained by the community itself. This community ownership progresses very slowly but steadily and sustainably. This magazine is an attempt to record the present status and community perspectives of the Vaigai River in the Madurai city limit in today’s world.

River Vaigai

Under Isolation of Community

DIMENSIONS

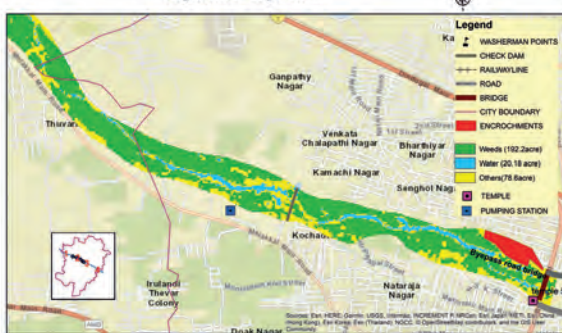
River Ganga which has the highest self-cleansing capacity gets polluted in Kanpur, Varanasi, Lucknow and Patna. River Yamuna is dead in Delhi where the Dissolved Oxygen level is zero. These two scenarios show urban environment is the most contributing factor for river pollution mainly due to untreated sewage & effluents. This is also applicable for a non-perennial rivers like Vaigai, Musi river. Recently Government has initiated the Vaigai Riverfront project under Smart City scheme. At this critical juncture, Centre for Urban water Resources made a field visit starting from the Kochadai pumping station to Viraganoor Regulator to understand the present scenario and to listen to voices at the river bank. For better understanding, we have classified 11 kms of urban flowing into Vaigai river in four segments.

VAIGAI RIVER SEGMENT 1

Background

Segment 1 of Vaigai river has historical Kochadai headworks (pumping station) which was established in 1924 by the British government and at present Kochadai headworks have an average discharge of 20MLD. In 1970 it was modernised and an additional 11.5 MLD capacity was created. This drinking water source location is now with several automobile workshops and water wash units are mounted exactly at the bank of Vaigai river and on the buffer or riparian area of the river which become the sources for Oil and Grease pollutants to the river. In addition to that, Giant borewells at the Vaigai banks are the source of water for several private water tankers. There water loading capacity varies from 6,000 liters to 16,000 litres.

Vaigai River segment -1



Issues

- Intensive extraction of groundwater to meet the demand of commercial buildings inside the city.
- Prosopis juliflora invasion is very high and densified in this region.
- The check dam is almost silted which is now losing its purpose of water stagnation. A considerable area of encroachments is identified while super imposed with Topographic sheets.
- Densified prosopis invasion area reduces the potential ground for the livestock rearers.

Scope of intervention

It is very clear that Prosopis juliflora has affected both hydrology & geomorphology by reducing width of the stream which increases the flow velocity at lowflow. So, reduction of spread in invasion is the need of an hour. Regular desilting the check dam may enhance the purpose of the infrastructure. Policy level intervention for groundwater extraction at ULB is required. Under-utilised compost yard may be revamped which reduces the dumping in the river.

Major livelihoods: Livestock rearers such as goat, cow, buffalo, pig, Thundil Fishing and Firewood collection

PRESENT

VAIGAI RIVER SEGMENT 2



Near Bypass Road Bridge

VAIGAI RIVER SEGMENT 2

Background

Segment 2 of Vaigai river has a Pututhoppu where a belief story has the moral on importance of public works on waterbody through Lord Shiva. Near to Arapalayam, Madurai City's first pumping station was established in 1892 which facilities piped water supply for more than 1 lakh population. Now, this segment is mostly with the grasslands and emerging invasion. This segment is the major point of livelihood for the Washerman (Dhobi) community where around 500 families are staying along the bank. In the smart city project, two-way lanes of the road are created in both side of the bank with a retaining wall.

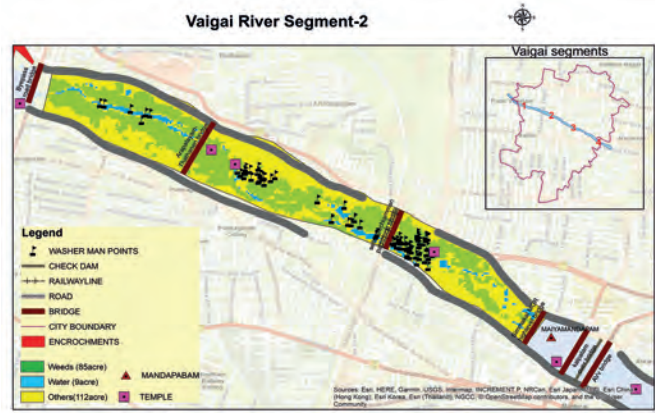
Issues

The iconic Padithurai (access ghats) are replaced by concrete which lost its heritage value. Now these Padithurai are acting as the urinal and way for open defecation in the river. Traditional washerman community loses their access to the river due to the retaining walls. This community is the major stakeholder for this particular segment. Some of the storm water drain is the carrier of sewage. Access to the river for livestock is difficult due to concrete solutions. The dumping of C&D wastes is increasing day by day.

Scope of intervention

The community-level ownership needs to be created by reviving the local festivals and create river-based activity (like river walk) to involve them. Expanding community managed toilets to restrict the defecation in the river is utmost important. Restoration of traditional access to Washerman communities directly reduces the work tragedy. Restricting the dumping of C&D wastes in the bank is required.

Major livelihood: Washerman community (Dhobi), Livestock rearers such as goat, cow, buffalo & donkey, ragpickers or bottle collectors and duck rearers.



VAIGAI RIVER SEGMENT 3



Dhobi spot inside Vaigai

VAIGAI RIVER SEGMENT 3

Background

Segment 3 of river vaigai is flowing to the core city where Mainyamandapam and historically the location of Chithirai function are celebrated here. This segment has the outlet surplus of Sellur Tank Cascade System through Panthalkudi channel and an inlet for Mariamman temple tank through Panaiyur channel. This segment which falls under Smart City -"Area Based Development" is visible where new check dams are installed. This core segment is the major source of sewage inflow through the channels

Issues

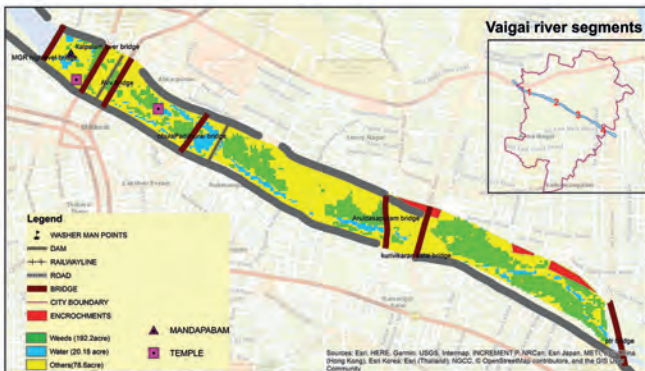
The sudden shrinking of river width from 350 meters to 200 meters increases the velocity of flow and scouring of bed. The higher amount of water hyacinth is at both the check dams which indicates the inflow of sewage to the river where major sources is Panthalkudi channel and other storm water drains. This intensive growth of water hyacinth may lead to water blockage in the Kalpalam lower bridge.

Scope of intervention

Thankfully due to intervention of several stakeholders the invasion in the core city area is limited but still, this area is prone to invasion. The Panthalkudi channel carrier of sewage needs to be minimised by ensuring the UGD for the low and middle-income households. Arresting sewage and continuous removal of water hyacinth at Kalpalam reduces the blockage and ensures the flow which minimises mosquito breeding.

Major livelihood: Livestock rearers, Thundhil & Net Fisherman, Ragpickers or Bottle collectors and Duck rearers.

Vaigai River segment-3





VAIGAI RIVER SEGMENT 4

VAIGAI RIVER SEGMENT 4

Background

Segment 4 of Vaigai river has the 17th century's Thenur mandapam. This segment is densely invaded by the *Prosopis juliflora*. The Two-way lane project is completed where the retaining wall from the road is around 6 feet which completely shatters the visibility of the river. The Viraganoor dam acts as the regulator. The Vandiur surplus channels are connected to the River Vaigai.

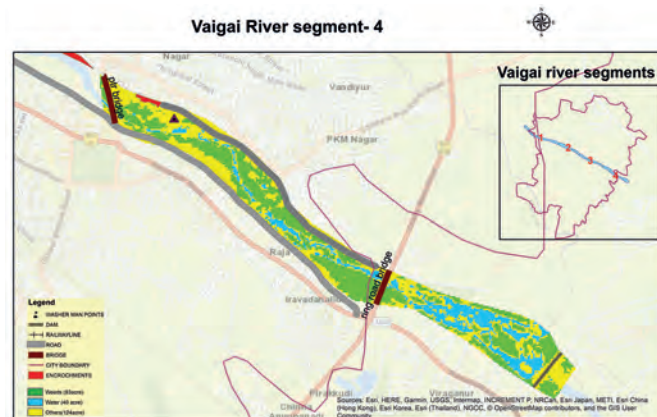
Issues

The ecology of the river is affected due to the severe invasion of *Prosopis Juliflora*. The stream path is quite small and deep. Several sand mining spots are visible in this region.

Scope of intervention

The gated communities are located at the bank, they may also involve in the development process. Controlling the invasion is the need of the hour for this segment.

Major livelihood: Fisherman, Livestock rearers and Raggickers or Bottle collectors.



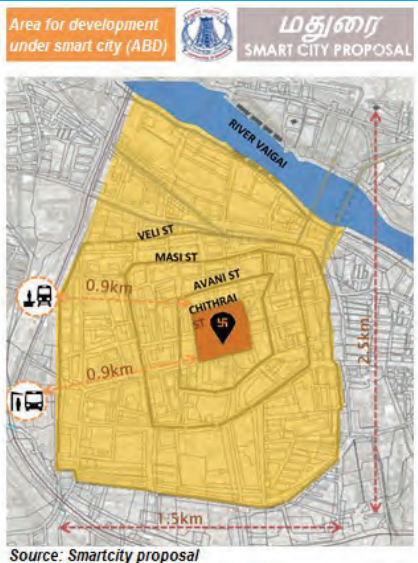
VAIGAI RIVERFRONT DEVELOPMENT PROJECT

Next to water, the most consuming liquid in the world is concrete for infrastructure development. Now this most consumed liquid is changing the face of River Vaigai. This

costly development project has several similarities to Gujarat Sabarmati riverfront development where the final look is fancy by sacrificing the natural way but with regular costly maintenances.

Madurai Corporation is executing Vaigai Riverfront Development Project under the Union Government's Smart Cities Mission at a cost of **₹81.41 crores**. As a whole, Madurai corporation proposed 14 projects at the cost of **₹1892 crore**, one of the projects is riverfront development.

According to the proposal of Smart city stage II submitted by Madurai corporation, the first component is Heritage Preservation and Enhancement. Under this component, "Reviving the cultural significance of water with the temple's rituals and festivities, by improving Vaigai riverfront zones", this particular activity will change the ancient streetscapes with modern amenities.



Source: Smartcity proposal

The whole idea is to mirror Gujarat's Sabarmati riverfront. As part of the beautification works along the riverbanks, the civic body has been conceived to convert the river into a tourist attraction with all basic amenities. The 3.1-km stretch of the river between Raja Mill Road and Kuruvikkar Salai will see a remarkable transformation in a few months as many interesting attractions and features have been planned. Two check dams have already been constructed across the river near A.V. Bridge to help in groundwater recharge and to harvest the sand. Two heritage parks coming up on the northern side of the river. One is planned at Obula Padithurai while the other will be built a couple of hundred metres away from Kuruvikkar Salai. The parks will have a seating facility, walking tracks, playing equipment for children, fountains and sanitation facilities. The development work will start by making the river bed uniform. During the low flow river bed is bumpy and uneven resulting in water flowing only in a part of it. A retaining wall has been constructed on both banks of the river. To decongest traffic in the core city, the Corporation and the State Highways Department are constructing a two-lane road on either side of the river from Arapalayam to Viraganoor Ring Road.



CAUTION ON CONCRETE

Gujarat's Sabarmati riverfront is a costly concrete(material) solution. According to 'Down to Earth', the drought-like condition of the Sabarmati river is intensified by the riverfront development and has resulted in poor groundwater recharge and increased dependency on the already ailing Narmada river.

At Vaigai, retaining walls and the two-lane road construction projects must be made aware of the hydrological handling capacity in small cross-sections of the river to prevent floods and water-related disasters. In some places width of the river has already been reduced from 400 metres to 200 metres. This can increase the velocity of the water that flows in the river and can potentially lead to flood in low-lying areas during heavy rains.

Designs & Plans are only for human

Gap Matters



A cow struggling and bearing the pain to cross the Vaigai riverfront road

A horse fearing to the sudden concrete rise which restricts the river access

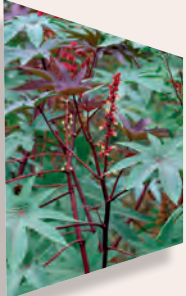


Generally, rivers are the source of biodiversity. They know to create, destroy and regenerate but the anthropogenic activity makes the hydrological, morphological and biological character of the river lose its natural properties. Riparian zones are very rich in species but subjected to strong anthropogenic changes and extremely prone to alien plant invasions, which are considered to be a serious threat to biodiversity.

URBAN ECOLOGY OF VAIGAI

Species 1 - Common name: Seemai Karuvellam; Binomial name: *Prosopis juliflora*

About: *Prosopis juliflora* is a shrub or small tree in the family Fabaceae, a kind of mesquite. It is native to Mexico, South America and the Caribbean. *Prosopis juliflora* has become an invasive weed in several countries where it was introduced. It is considered a noxious invader in southern India.

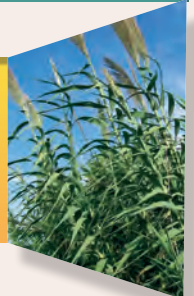


Species 2 - Common name: Castor oil plant; Binomial name: *Ricinus communis*

About: Castor oil plant is a species of perennial flowering plant in the spurge family, Euphorbiaceae. Castor oil has many uses in medicine and other applications. *Ricinus* is extremely allergenic and has an allergy scale rating of 10 out of 10. In areas with a suitable climate, castor establishes itself easily where it can become an invasive plant and can often be found on wasteland.

Species 3 - Common name: Giant Reed; Binomial name: *Arundo donax*

About: Giant reed is adapted to a wide variety of ecological conditions, but is generally associated with riparian and wetland systems. Plants prefer wet drained soils, where they produce dense monotypic stands. Giant reed has strong tolerance to heavy metals.

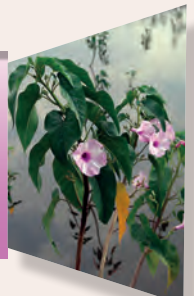


Species 4 - Common name: Crown flower; Binomial name: *Calotropis gigantea*

About: It is a large shrub growing to 4 m tall. It has clusters of waxy flowers that are either white or lavender in colour. The plant has oval, light green leaves and milky stem. It is commonly grown as a weed in wastelands. The leaves are applied on paralysed parts, painful joints. The milk is useful in leprosy and ringworm treatment.

Species 5 - Common name: Ipomea; Binomial name: *Ipomea carnea*

About: *Ipomea carnea* is a highly adaptive plant, which thrives both in inundated as well as dry conditions. It has the capacity to turn a river into the soil, invite other plants and in the process create islands in water bodies. It affects the flow of water.





Ancient Thiruvvedagam Padithurai



The beauty of a river lies in its Padithurai (Access ghat), From Thiruvalluvar to classic music learners, they preferred Padithurai as a divine space. This holy place creates a blessed environment to interact and experience the water with beliefs and emotions. In recent days, the traditional stone masonry Padithurai is replaced by the concrete and that is limited to side access. The entire socio-architecture are replaced now. Due to cultural connectivity loss, this Padithurai is place for urinating and creates access for open defecation and a spot to dump solid wastes.

The Vaigai Riverfront beautification as part of the Vaigai River Front Development programme has paved way for the loss of the city's more than 14 ancient ghats which had a link to ancient civilization. Now, the corporation replaces few of them as concrete mould but the community points that the older ones had the better heritage value. The newer one is like household steps.

The 11-km stretch of the river includes Vilangudi padithurai, Thathaneri padithurai, Arapalayam padithurai, Petchiamman padithurai, Sellur padithurai, Thirumalairayar padithurai, Obula padithurai, Kallukadai sandhu padithurai, Alwarpuram padithurai, Hanumankoil padithurai among others. The most significant of them all are Obula padithurai, Pechiamman padithurai, Thirumalai Rayar padithurai and Anumankoil padithurai. Unfortunately, today, they exist only as the names of the streets corresponding to their Ghats as none of them exists any longer. They were apparently lost around 1980s when the corporation paved a road along the river and the river bed was heavily silted due to the great floods in Vaigai in the year 1979.

History Matters!

Silapathigaram refers to Madurai, as Vizhamali Moothur, which means a city of festivals, which were performed on the ghats of the Vaigai. In the Sangam era literature, Madurai Kanchi, speaks of 'Onam' (*Pudhupunal Neeradai*) being celebrated on the banks of the river. There are references about Padithurai's in Sangam literature like Paripadal and Madurai Kanchi which speaks about their structures and how they sheltered the city during floods. Each Padithurai had a mandapam (a hall constructed of stones) and deities which was used as abode during Chithirai, Putthuthoppu and Kaman festivals.

All civilisation established close to rivers. Very recently, Keeladi (excavation site) proved the level of immersion towards Vaigai river. Now, the replacement of Padithurai will never ever be equal to the ancient Padithurai which is a lost icon of heritage.

PADITHURAI: THE LOST ICON OF HERITAGE



New Puttuthoppu Padithurai



Inside Maiyama Mandapam



36 pillars Maiyama Mandapam



24 pillars Thenur Mandapam

MANDAPAM: VAIGAI'S IDENTITY

River Vaigai had several mandapam where all the rituals and beliefs are related with river which makes it a holy place. At present in Vaigai, only three mandapams are there. Where two mandapams namely Maiyama Mandapam and Thenur Mandapam is located inside the river and another Ramrayar mandapam is located at the bank. Thanks to Hindu religious and charitable endowment department (HR&CE) for restoring the two mandapams inside the river without losing its heritage value.

The east facing Maiyama Mandapam starts its history in 13th century. The recent Maiyama Mandapam renovation were at a cost of 85 lakhs, carried out by fixing new 14 pillars out of 36 pillar mandapam. While the structure is built using stone, the basement was strengthened using stone blocks and bricks. Limestone is used for binding the stones.

The Thenur Mandapam, a 17th century structure constructed in the middle of the river near Vandiyur, was constructed by King Thirumalai Naicker, who had shifted Madurai's famous Chithirai festival from Thenur to the city. King constructed the Mandapam to devote it to the villagers of Thenur. The famous entry of Lord Kallalagar into River Vaigai, a grand event during the Chithirai festival, was conducted in Thenur. The king wanted Kallalagar's entry to be celebrated in a grand manner and shifted it to the city. To appease the villagers, he constructed the Mandapam from where they could witness the festival with special privilege.

Historical identity is not just a tourist place. It speaks our values and social connectivity with water. Let's safeguard and celebrate our history.

CHECK DAM: A RELIABLE SOLUTION

The purpose of the check dam is to retain water upstream so that the water percolates into the ground and recharges the groundwater table. Check dams also serve to trap sediments and pollutants, fortifies local bio-diversity and helps in improving the overall quality of the water. Madurai City Municipal Corporation has already spent around Rs 21 crore for the check dams, which are part of the Vaigai River Front Development project. The check dams not only recharge the water but also helps in improving the deposit of sand along the river

Inside city limit we have 3 check dams - Kochadai, Kalpalam, Ismaiylpuram and one regulator dam at Viraganoor which is just after the city boundary. Of the two check dams, each measuring five feet high, one is coming up a few metres away from AV Bridge towards upstream of the river, whereas the second one is at 500 metres downstream from Obula Padithurai. The check dams can hold water up to an area of one-and-a half kilometres as estimated by corporation. Let us look at each check dams and its status:

Kochadai Check dam

Specification: Kochadai check dam is a permanent RCC structure without sluices. This masonry wall is at a height of 5 feet with 1-meter top crust.

Impact: This stagnation positively impacts by increase in groundwater level. This further creates a considerable increase in water level at infiltration galleries of Kochadai headworks which is a drinking water source to City Corporation and this dam also creates a potential business to the private water tankers.

Present condition: Around 70% of the check dam is heavily silted. The invasion of *Prosopis juliflora* is very densified before and after this check dam. This acts like a Bio-corridor of invasive species.



CHECK DAM: A RELIABLE SOLUTION



Kalpalam Check dam

Specification: Kalpalam Check dam is a permanent RCC structure with four sluices, two at each corner where the level of the check dam is maintained at 5 feet by 1-meter top crust.

Impact: The increase in the surface water level facilitates the water flow in the Paniyur channel which supplies water to the Vandiyur Mariamman Kovil theppakulam. Corporation estimates that after 40 years the natural flow is connected to the temple tank. A regulator was installed at the river to divert water to the channel.

Present condition: strong invasion of water hyacinth indicates mixing of city sewage into the Vaigai river. When there is no water flow, this water spread area becomes the mosquito breeding space.



Ismailpuram checkdam

Specification: Ismailpuram Check dam is a permanent RCC structure with four sluices were two at each corner where the level of the check dam is maintained at 5 feet by 1-meter top crust.

Impact: As per community perspective, this stagnation of water impacts the groundwater conditions.

Present condition: strong invasion of water hyacinth indicates mixing of city sewage into Vaigai river. During no water flow, this water spread area becomes the mosquito breeding space.

Points to remember

The corporation is extending the width of the bund roads to 16 metres from the existing 7 metres and followed by the construction of retaining wall along the entire 10 Km Vaigai. The corporation obtained a 'No-Objection Certificate' from the Public Works Department by ensuring minimum river width of 220 metres.

Public Works Department estimates up to a distance of one kilometer on each side of the river will benefit, once water is stored in the check dams and 25,000 borewells in the area will get recharged.

VOICES OF VULNERABLES

Case 1 : DHOBI is not just occupation it is a lifestyle that started from civilization - Mr.Velusami

Mr. Velusami and his wife Ms.Pandiyammal are based in Karimedu. In their area around 100 families depend on dhobi business. Their primary source of livelihood is River Vaigai. This couple estimates the number of dhobis is reduced to half as compared to 10 years earlier. Daily they start their day at Vaigai around 06:00 am and till noon they wash and iron the clothes at their residences. The government dhobi yard has a minimum supply of water and it is difficult to handle big clothes. Recently, after constructing retaining walls, their regular access path is blocked. Now they and their donkey need to walk for another 2 kms which increases their work drudgery.



Case 2 : Vaigai - a potential space for Livestock

Mr. Sudalaimuthu who is from a traditional goat rearing family of Meenakshipuram. He has around 700 goats with the breeds of Nattuaddu, Velladdu, Madalampadi and Kurumpaddu. Daily he spends 8 hours at river Vaigai to maintain the stock. He faces the difficulty of handling goats in the increased traffic area and also the access. He proudly says that he knows each and every corner of Vaigai. Unfortunately, these marginal stakeholders are not involved in the planning process.

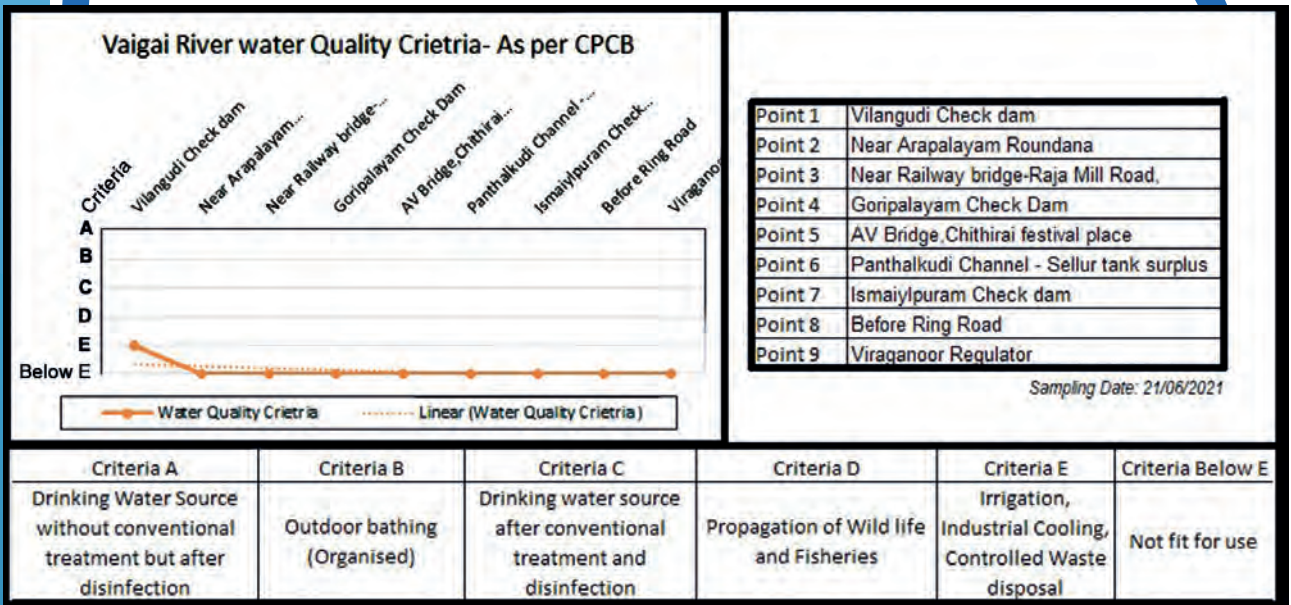


Case 3 : Involving community is necessary

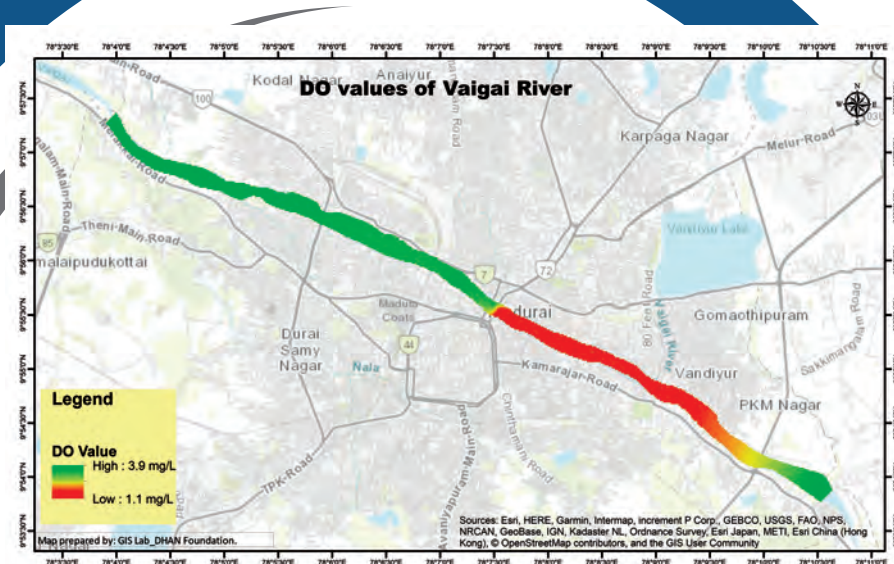
Mr.G.Ganesan, Secretary at K.Pudhur of Vaigai Restoration programme of DHAN Foundation highlights the importance of cleanliness and emphasise that involving the community in every activity by the government is necessary, because they are the direct users.

RIVER VAIGAI WATER QUALITY - AN ALARMING CONCERN

The ambitious mission of the government is not the only Swatch Bharat but also Mission Clean Ganga which is started by Ministry of Water Resources, River Development and Ganga rejuvenation shortly called the Ministry of Jal-Shakthi. The need for this mission is just because of water quality concerns in River Ganga. When a perennial river is struggling for water quality, then think about River Vaigai which is non-perennial and water flow



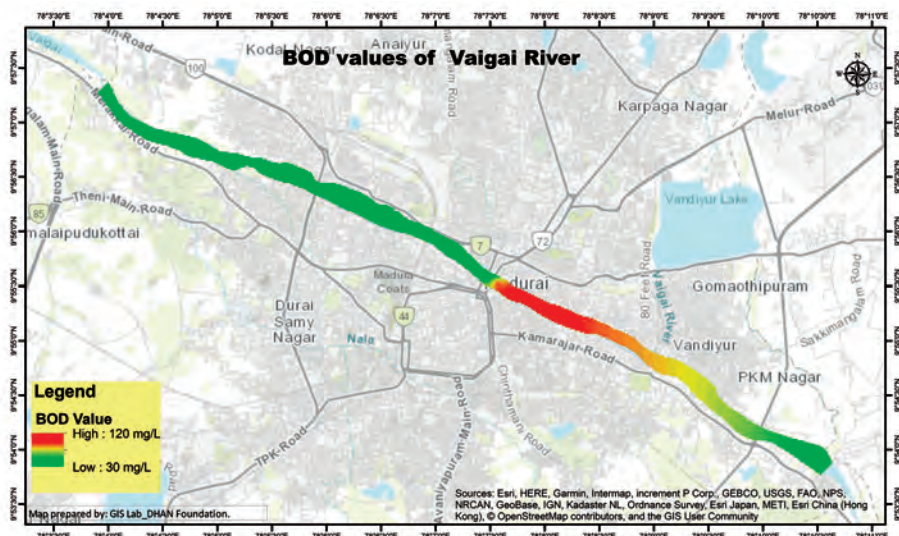
which is roughly less than 10 days in a year. The matter of concern is on Sewage, Solid waste, microscale industries effluents. Rivers in the richer countries have become steadily cleaner but most have nitrate levels four times the norms found in nature. In developing countries, the picture is very different. Nine-tenths of all sewage in developing countries run directly into rivers, lakes and seas without treatment. The quality of natural water in rivers, lakes and reservoirs and below the ground surface depends on several interrelated factors. These factors include urbanisation, amount of water flow, geology, climate, topography, biological processes, land use & sand bed.



To understand the River Vaigai Water quality, CURE attempted water sampling at the 9 critical points of the river flowing inside the corporation boundary. To understand the overall water quality we compared the quality standards with the CPCB water quality criteria's. In the six criteria, each having concern parameters to satisfy the concern use. For instance, in Criteria A, Drinking water sources need to fulfil the conditions like Total Coliforms Organism MPN/100ml shall be 50 or less, pH between 6.5 and 8.5, Dissolved Oxygen 6mg/l or more, Biochemical Oxygen Demand 5 days 20C 2mg/l or less likewise its goes up to Criteria E and Below E. Our samples from the River Vaigai is alarming that 8 out of 9 samples are not fit for use. The physical, Chemical and Biological parameters are distressing. Mostly the river Vaigai is completely alkaline in nature, where the result in the third check dam (Ismaiylpuram Check dam) show the presence of Ammonia, which is the high level of degradation indicator.

The biological parameter determines the health of the river. Oxygen is the most well-established indicator of water quality. Dissolved oxygen is essential for the survival of all aquatic organisms. Moreover, oxygen affects a vast number of other water indicators, not only biochemical but aesthetic ones like odour, clarity and taste. Since our Vaigai is about to die where the DO varies from 1-4 mg/L. If DO is zero then the river is technically dead. The Biological Oxygen Demand- BOD which is an indicator of contamination. In river Vaigai, the result varies from 30-120 mg/L. the Pathalkudi Channel is contributing the maximum contamination to the river. Recently Madurai Corporation installed 2 MLD Sewage Treatment Plant to treat the Panthalkudi Channel which is about to commission. Apart from all, throughout the Vaigai, faecal contamination is very high, even it is at TNTC (Too Numerous To Count).

In the core of the city growth of Water hyacinth in the river indicates the presence of nutrients. Restricting sewage and solid waste into river is the only way to safeguard the non-perennial river Vaigai. This all shows protecting Vaigai is possible through collective action with individual responsibility.



What Next

The collective ‘Humane’ action is an impulsive social response of communities, which is well expressed during disasters such as floods, tsunamis and Pandemics. This was not the case with ‘slow burn disasters’ such as drought and deterioration. The response comes after reaching the pinnacle. Continuous negligence of the slow burn deterioration of the ecosystem might lead to irrecoverable disaster. River Vaigai is one among the deteriorating living heritages of India.

Over a decade, the ‘conscious’ minds either it be the administrators, Judiciary and line departments or the grassroots actors and journalists have attempted to trigger ‘the collective community response’. One such attempt was formation of ‘Vaigai River Rejuvenation Trust’, similar to ‘Chennai River Restoration Trust’, in which District Collector as chair and commissioner as vice chair, inclusive of line departments, civil societies, people representatives, private players, media, etc. Smart city programme and its ‘Vaigai River Front Project’ has opened up greater opportunities to revitalize the ‘Vaigai River Rejuvenation Trust’. Developing ‘integrated rejuvenation plan’ for urban Vaigai, mobilizing funds for implementing the ‘rejuvenation plan’, developing strategies to enrich the community conscious towards their responsibilities in rejuvenation and conservation will be some of the primary objectives of this ‘democratic’, ‘inclusive’ trust.

It’s time to move socio-cultural conscious of urban communities’ towards ‘river Vaigai’ from ‘isolation’ to ‘conciliation’. Revitalizing ‘Vaigai River Rejuvenation Trust’ be its first step...

Baseline Assessment Water and Scenario Analysis

A spatial temporal assessment of the Madurai urban water quality to provide an understanding of the relative condition of water quality in different sources of water supplies such as Corporation water, Groundwater which are all utilised for drinking purpose. In order to cover all four zones, we collected the drinking water sample in the each zone under corporation boundary. The Locations are

1. Sellur - Zone-I;
2. Vandiur - Zone-II;
3. Jaihindpuram - Zone-III;
4. Pasumalai - Zone-IV





Zone 1 - Corporation Water

TOTAL DISSOLVED SOLIDS 266 mg/l 	TURBIDITY 0 NTU 	pH 8.2 	TOTAL ALKALINITY as CaCO₃ 128 mg/l
TOTAL HARDNESS as CaCO₃ 120 mg/l 	CALCIUM (Ca) 24 mg/l 	MAGNESIUM (Mg) 14 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0 mg/l 	NITRATE (NO₃) 5 mg/l 	CHLORIDE (Cl) 40 mg/l
FLUORIDE (F) 0.2 mg/l 	SULPHATE (SO₄) 13 mg/l 	PHOSPHATE (PO₄) 0 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>All the drinking water parameters are within the acceptable limits. Therefore the water is recommended as safe for drinking.</p>			



Zone 1 - Ground Water

TOTAL DISSOLVED SOLIDS 1218 mg/l 	TURBIDITY 0 NTU 	pH 7.7 	TOTAL ALKALINITY as CaCO₃ 448 mg/l
TOTAL HARDNESS as CaCO₃ 440 mg/l 	CALCIUM (Ca) 56 mg/l 	MAGNESIUM (Mg) 48 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0.04 mg/l 	NITRATE (NO₃) 9 mg/l 	CHLORIDE (Cl) 184 mg/l
FLUORIDE (F) 1.4 mg/l 	SULPHATE (SO₄) 76 mg/l 	PHOSPHATE (PO₄) 0.156 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>It is observed that water is hard because of the presence o Magnesium. Total dissolved solids(TDS) exceeds acceptable limit. It does not have direct health effects but solids which cause higher 'TDS' may be harmful to human health. Higher level of fluoride in drinking water may cause bone diseases and dental Fluorosis. This hard water is not recommended for drinking. If there is no other source of drinking water, then it shall be consumed.</p>			



Within acceptable limits



Within Permissible limits



Exceeds permissible limits



Zone 2 - Corporation Water

TOTAL DISSOLVED SOLIDS 168 mg/l 	TURBIDITY 0 NTU 	pH 7.8 	TOTAL ALKALINITY as CaCO₃ 80 mg/l
TOTAL HARDNESS as CaCO₃ 80 mg/l 	CALCIUM (Ca) 16 mg/l 	MAGNESIUM (Mg) 10 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0 mg/l 	NITRATE (NO₃) 2 mg/l 	CHLORIDE (Cl) 28 mg/l
FLUORIDE (F) 0.2 mg/l 	SULPHATE (SO₄) 9 mg/l 	PHOSPHATE (PO₄) 0 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>All the drinking water parameters are within the acceptable limits. Therefore the water is recommended as safe for drinking.</p>			



Zone 2 - Ground Water

TOTAL DISSOLVED SOLIDS 1526 mg/l 	TURBIDITY 0 NTU 	pH 7.4 	TOTAL ALKALINITY as CaCO₃ 628 mg/l
TOTAL HARDNESS as CaCO₃ 300 mg/l 	CALCIUM (Ca) 64 mg/l 	MAGNESIUM (Mg) 34 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0.031 mg/l 	NITRATE (NO₃) 12 mg/l 	CHLORIDE (Cl) 240 mg/l
FLUORIDE (F) 0.6 mg/l 	SULPHATE (SO₄) 94 mg/l 	PHOSPHATE (PO₄) 0.15 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>It is observed that Total dissolved solids(TDS), Total Alkalinity, Total Hardness exceeds acceptable limit. It does not have direct health effects but solids which cause higher 'TDS' may be harmful to human health. This hard water is not recommended for drinking. If there is no other source of drinking water, then it shall be consumed.</p>			



Within acceptable limits



Within Permissible limits



Exceeds permissible limits



Zone 3 - Corporation Water

TOTAL DISSOLVED SOLIDS 409 mg/l 	TURBIDITY 0 NTU 	pH 8.2 	TOTAL ALKALINITY as CaCO₃ 180 mg/l
TOTAL HARDNESS as CaCO₃ 180 mg/l 	CALCIUM (Ca) 40 mg/l 	MAGNESIUM (Mg) 19 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0 mg/l 	NITRATE (NO₃) 5 mg/l 	CHLORIDE (Cl) 68 mg/l
FLUORIDE (F) 0.2 mg/l 	SULPHATE (SO₄) 25 mg/l 	PHOSPHATE (PO₄) 0.07 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR

All the drinking water parameters are within the acceptable limits. Therefore the water is recommended as safe for drinking.



Zone 3 - Ground Water

TOTAL DISSOLVED SOLIDS 1659 mg/l 	TURBIDITY 0 NTU 	pH 7.2 	TOTAL ALKALINITY as CaCO₃ 500 mg/l
TOTAL HARDNESS as CaCO₃ 380 mg/l 	CALCIUM (Ca) 80 mg/l 	MAGNESIUM (Mg) 43 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0 mg/l 	NITRITE (NO₂) 0.042 mg/l 	NITRATE (NO₃) 12 mg/l 	CHLORIDE (Cl) 400 mg/l
FLUORIDE (F) 1 mg/l 	SULPHATE (SO₄) 100 mg/l 	PHOSPHATE (PO₄) 0.078 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR

It is observed that water is hard because of the presence of Calcium and Magnesium. Total dissolved solids(TDS) exceeds acceptable limit. It does not have direct health effects but solids which cause higher 'TDS' may be harmful to human health. Higher level of chloride & fluoride in drinking water may cause bone diseases and dental Fluorosis. This hard water is **not** recommended for drinking. If there is no other source of drinking water, then it shall be consumed.

■ Within acceptable limits
 ■ Within Permissible limits
 ■ Exceeds permissible limits



Zone 4 - Corporation Water

TOTAL DISSOLVED SOLIDS 1302 mg/l 	TURBIDITY 0 NTU 	pH 7.3 	TOTAL ALKALINITY as CaCO₃ 460 mg/l
TOTAL HARDNESS as CaCO₃ 560 mg/l 	CALCIUM (Ca) 112 mg/l 	MAGNESIUM (Mg) 38 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0.16 mg/l 	NITRITE (NO₂) 0 mg/l 	NITRATE (NO₃) 12 mg/l 	CHLORIDE (Cl) 280 mg/l
FLUORIDE (F) 1 mg/l 	SULPHATE (SO₄) 76 mg/l 	PHOSPHATE (PO₄) 0.07mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>It is observed that water is hard because of the presence of Calcium. Total dissolved solids(TDS), Alkalinity,Hardness exceeds permissible limit. It does not have direct health effects but solids which cause higher 'TDS' may be harmful to human health. This water is not recommended for drinking. If there is no other source of drinking water, then it shall be consumed.</p>			



Zone 4 - Ground Water

TOTAL DISSOLVED SOLIDS 1022 mg/l 	TURBIDITY 0 NTU 	pH 7.4 	TOTAL ALKALINITY as CaCO₃ 368 mg/l
TOTAL HARDNESS as CaCO₃ 360 mg/l 	CALCIUM (Ca) 80 mg/l 	MAGNESIUM (Mg) 67 mg/l 	IRON (Fe) 0 mg/l
FREE AMMONIA (NH₃) 0.16 mg/l 	NITRITE (NO₂) 0 mg/l 	NITRATE (NO₃) 9 mg/l 	CHLORIDE (Cl) 220 mg/l
FLUORIDE (F) 1 mg/l 	SULPHATE (SO₄) 63 mg/l 	PHOSPHATE (PO₄) 0.07 mg/l 	WATER IS CRYSTAL CLEAR & FREE OF ODOUR
<p>It is observed that water is hard because of the presence of Calcium. Total dissolved solids(TDS), Alkalinity,Hardness exceeds permissible limit. It does not have direct health effects but solids which cause higher 'TDS' may be harmful to human health. This water is not recommended for drinking. If there is no other source of drinking water, then it shall be consumed.</p>			



Within acceptable limits



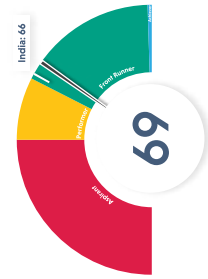
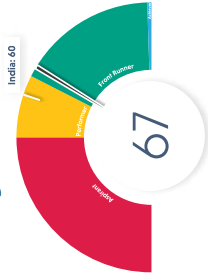
Within Permissible limits



Exceeds permissible limits

TAMILNADU'S PERFORMANCE ON SDG

Reported by - NITI-AAYOG



2020

2019

OVERALL PERFORMANCE

PERFORMANCE BY SDG

SDG	2020	2019	Direction
SDG 1: No Poverty			
Population below poverty line (%)	Null	Null	↔
MPI Head count ratio (%)	17.500	17.500	↔
Households covered by health scheme/insurance (%)	66.4	68.4	↓
MGNREGA - Employment provided against demanded (%)	81.38	84.40	↓
Beneficiaries under PMMWY (%)	Null	Null	↔
Households living in katcha houses (%)	1.50	1.50	↔
SDG 2: Zero Hunger			
Beneficiaries under NSAF (%)	97.98	97.98	↔
Children under 5 years who are underweight (%)	30.80	30.80	↔
Children under 5 years who are stunted (%)	29.30	29.30	↔
Pregnant women (15-49 years) who are anaemic (%)	49.80	49.80	↔
Adolescents (10-19 years) who are anaemic (%)	32.10	32.10	↔
Rice and wheat produced annually (kg/ha) (2019 - rice, wheat and coarse cereals)	3448.32	2547.33	↔
GVA (constant prices) in agriculture (in Lakhs worker)	Null	Null	↔
SDG 3: Good Health and Well-being			
Maternal Mortality Ratio (per 1,00,000 live births)	63	76	↔
Under-5 mortality rate (per 1,000 live births)	30	32	↔
Children (9-11 months) fully immunized (%)	98	98	↔
Notification rate of Tuberculosis per 1,00,000 population	192	142	↔
HIV incidence per 1,000 uninfected population	0.08	0.26	↔
Suicide rate (per 1,00,000 population)	20.60	20.60	↔
Death rate due to road accidents per 1,00,000 population	18.68	18.68	↔
Institutional deliveries out of the total deliveries reported (%)	99.90	71.8	↔
Monthly per capita out-of-pocket expenditure on health (%)	14.40	14.40	↔
Physicians, nurses and midwives per 10,000 population	10	11	↓
SDG 4: Quality Education			
AMER in elementary education (class 1-8)	93.69	87.65	↔
Average annual dropout rate at secondary level (class 9-10)	13.47	22.49	↔
GER in higher secondary (class 11-12)	56.49	56.49	↔
Class 8 students s...-having minimum proficiency level in language and mat...- (%)	69.80	69.80	↔
GER in higher education (18-23 years)	36.20	36.2	↔
Persons with disability (>15 years) having completed secondary education (%)	20.80	20.80	↔
GPI for higher education (18-23 years)	1.02	1.02	↔

PERFORMANCE BY SDG

SDG	2020	2019	Direction
SDG 5: Gender Equality			
Persons (>15 years) who are literate (%)	67.40	67.40	↔
Schools with access to electricity, drinking water (%)	91.52	91.52	↔
Trained teachers at secondary level (class 9-10)	90.96	90.96	↔
Pupil Teacher Ratio at secondary level (class 9-10)	11	11	↔
SDG 6: Clean Water and Sanitation			
Crimes against women per 1,00,000 female population	99.30	94.7	↔
Sex ratio at birth	901	897	↔
Average wage/salary received (Female to male)	0.68	0.59	↔
CrUEL/physical violence by husbands/relatives (per 1,00,000 women)	46.10	46.10	↔
Elected women in state legislative assembly (%)	5.04	5.04	↔
Female to male LFR (15-59 years)	0.52	0.52	↔
Women in managerial positions in listed companies (per 1,000 persons)	128	128	↔
Demand for family planning satisfied by modern methods (15-49 years)	88.20	88.20	↔
Operational land holding gender wise (%)	23	23	↔
SDG 7: Affordable and Clean Energy			
Rural population getting drinking water within premises through PWS (%)	100	100	↔
Rural population having improved source of drinking water (%)	100	99.1	↔
SBMG - Individual household toilets constructed against target (%)	100	100	↔
SBMG - Districts verified to be ODF (%)	100	66.67	↔
Schools with separate toilet facility for girls (%)	96.23	98.53	↓
Industries complying with CPCB waste water treatment norms (%)	98.22	87.03	↔
Ground water withdrawal against availability (%)	65.40	65.40	↔
Blocks/manjals/taluka over-exploited (%)	11.99	15.80	↔
SDG 8: Decent Work and Economic Growth			
Households electrified (%)	100	100	↔
LFR-PNG connections against number of households (%)	120.43	120.43	↔
Annual growth rate of GDP (constant prices) per capita	8.45	8.45	↔
EDORI 2020 Feedback score /2019 Implementation score	48.6	98.28	↔
Unemployment rate (%) (2020 (15-59 years) /2019 (15+ years))	8.80	7.6	↓
LFRP (%) (2020 (15-59 years) /2019 (15+ years))	60.20	53.9	↔

PERFORMANCE BY SDG

SDG	2020	2019	Direction
SDG 9: Industry, Innovation, and Infrastructure			
Regular wage/salaried employees in non-agriculture sector without social security benefits (%)	62.20	62.20	↔
Households covered with a bank account against target (PMJDY)	100	100	↔
Functioning branches of commercial banks per 1,00,000 population	15.08	25.47	↓
ATMs per 1,00,000 population	28.83	28.83	↔
Women account holders in PMJDY (%)	57.45	55.51	↔
SDG 10: Reduced Inequalities			
PMGSY - Habitations connected 2020 - Cumulative progress 2019 - FY 2018-19 progress	99.66	63	↔
GVA in manufacturing to total GVA (current prices) (%)	11.54	11.54	↔
Manufacturing employment as a percentage of total employment	12.86	12.29	↔
Innovation score as per the India Innovation Index	33.23	33.23	↔
Score as per LEADS report	3.22	3.22	↔
Mobile connectors per 100 persons	109.90	Null	↔
Internet subscribers per 100 population	65.61	Null	↔
SDG 11: Sustainable Cities and Communities			
Population in the lowest two wealth quintiles (%)	26	26	↔
Elected women in the State/UT (%) (Lok Sabha elections)	5.88	45.14	↔
Seats held by women in PRLS (%)	26.05	26.05	↔
SCST seats in State Legislative Assembly (%)	1.06	1.06	↔
LFRP - Transgender to male	31.1	31.1	↔
Crimes against SCs (per 1,00,000 SC population)	16.1	16.1	↔
Crimes against STs (per 1,00,000 ST population)	0.30	0.30	↔
SDG 12: Responsible Consumption and Production			
Urban households living in katcha houses (%)	17.37	17.37	↔
Deaths due to road accidents in urban areas per 1,00,000 population	100	95.64	↔
SBMU - wards with 100% door to door waste collection (%)	92	75.94	↔
SBMU - Individual household toilets constructed against target (%)	77.99	77.99	↔
SBMU - MSW processed to total MSW generated (%)	53.15	47.73	↔
SBMU - wards with 100% source segregation (%)	31.11	41	↓
Installed sewage treatment capacity to sewage generated (%)	96.10	96.10	↔
Urban households with drainage facility (%)	100	100	↔

PERFORMANCE BY SDG

SDG	2020	2019	Direction
SDG 13: Climate Action			
Per capita fossil fuel consumption (in kg)	198.40	198.40	↔
Usage of nitrogenous fertilizer out of total NPK (%)	66	67.51	↔
Hazardous waste generated per 1,000 population (Tonnes/Annum)	9.93	7.84	↔
Hazardous waste recycled/utilized to waste generated 2019 - Schedule IV hazardous waste	52.25	17.2	↔
Plastic waste generated per 1,000 population (Tonnes/Annum)	4.94	4.94	↔
BMW treated to total BMW generated (%)	100	100	↔
Grid interactive bio power per 10 lakh population (MW)	5.49	4.92	↔
SDG 14: Life on Land			
Lives lost due to extreme weather events (per 1 crore population)	Null	Null	↔
Disaster preparedness score as per Disaster Resilience Index (shares)	13	13	↔
Share of renewable in total energy mix (including allocated shares)	41.12	40.98	↔
CO ₂ saved from LED bulbs per 1,000 population (Tonnes)	6.07	6.34	↓
DALY rate attributable to air pollution (per 1,00,000 population)	2710	2710	↔
SDG 15: Life on Land			
Forest cover (%)	18.36	18.22	↔
Tree cover (%)	2.24	2.38	↔
Area covered under afforestation schemes (%)	4.37	4.37	↔
Degraded land over total land area (%)	28.85	28.85	↔
Increase in area of desertification (%)	-1.63	-1.63	↔
Wildlife crime cases 2020 - per mha of protected area 1 2019 - absolute number of cases	5	3	↔
SDG 16: Peace, Justice, and Strong Institutions			
Murders per 1,00,000 population	2.30	2.17	↔
Cognizable crimes against children per 1,00,000 population	37.70	32.10	↔
Victims of human trafficking per 10 lakh population	8.86	11.80	↔
Missing children per 1,00,000 child population	29.62	29.62	↔
Courts per 1,00,000 population	1.17	1.17	↔
Cases under PCA and related IPC per 10 lakh population	4.75	1.50	↔
Births registered (%)	100	97.24	↔
Population covered under Aadhaar (%)	103	100.16	↔

Meteorological Updates

Rainfall Data

Average Annual rainfall for Madurai: 840mm

June 2021 - Rainy days

Date	Intensity(mm/d)
06/06/2021	5.6
24/06/2021	13.2
Actual Rainfall	70.5 mm
Normal Rainfall	63 mm
(Includes Drizzle)	

Temperature Data

	Average Temperature
High	37 °C
Low	29 °C

Source: World Weather Online.com



*Behaviour change is a Way !
Community Ownership is a Key !*

We sincerely acknowledge the Laboratory

Water Quality Testing Laboratory
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The DHAN Academy
T. Malaipatti, Thenkarai (BO)
Mullipallam (SO), Melakkal via
Madurai 625 207.

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For Suggestion/Comments please write us on

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