

**Identification of Ecologically Sensitive Areas for Ban
on
“Use and Throw Plastics”
and
Identifying Alternatives for the Same**

by

Ligy Philip, B.S. Murty and V.R. Muraleedharan

**Department of Civil Engineering
Center for Technology and Policy (CTaP)
Indo-German Centre for Sustainability (IGCS)**

Indian Institute of Technology Madras, Chennai



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Team Members:

Ms. D. Sudha, Project Officer, IGCS

Mr. R. Babu, Project Associate

Mr. R. Gopinath, Project Associate

Mr. A. Devan, Project Associate

Mr. M. Hariharan, Project Associate

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EXECUTIVE SUMMARY

It has been well established that indiscriminate use of “use and throw plastics” which are non-biodegradable has been causing severe health and environmental hazards. The Government of Tamil Nadu vide G.O. Ms.No.92, Environment and Forests (EC-2) Department dated 10.08.2011, constituted an “Expert Committee” to check the Health and Environmental Hazard in the use of plastics and to find the ways and means to intensify plastic awareness camps. Some of the main recommendations with regard to Policy / Legal aspects are:

1. Adoption of “throwaway plastic (avoidance) policy”
2. Legislation for manufacturing of carry bags of thickness of not less than 50 microns and with minimum size of 8 x 12 inches
3. Banning throwaway plastics in mass gathering functions
4. Declaring all the Government offices as “throwaway plastic free zone”

In this context, Tamil Nadu Pollution Control Board has decided to identify sensitive ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on use and throw plastics. It has constituted an expert committee with the following terms of reference:

1. To identify sensitive, ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on the use of use and throw plastics.
2. To suggest alternatives to replace the use and throw plastics in the ban inflicted areas
3. To specify duties and responsibilities of enforcing authorities in the event of ban on use and throw plastics in the state of Tamil Nadu in accordance with Environment (Protection) Act, 1986 as amended.

The committee requested IIT Madras to undertake the activities under terms of References 1 and 2. The objectives of the work were: (i) To identify sensitive, ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on the use of use and throw plastics and (ii) to suggest alternatives to replace use and throw plastics in the ban inflicted areas. Following methodology was adopted for achieving the objectives:

1. Detailed information was collected from secondary sources on: (i) the ecologically sensitive areas; (ii) how other state Governments have imposed the ban; (iii) the experience of some cities in Tamil Nadu in implementing such bans and (iv) tourist places.
2. Literature review on alternative materials and best practices from other states and countries was conducted.
3. Site-visits were made to 12 representative locations (tourist places; ecologically sensitive places; religious shrines etc.) by the project team and information was gathered regarding ground

realities. These locations are: (i) Mamallapuram, (ii) Palani, (iii) Kancheepuram, (iv) Nagoor, (v) Velankanni, (vi) Thanjavur, (vii) Trichy, (viii) Thiruchendur, (ix) Kodaikanal, (x) Hogenakkal, (xi) Pichavaram and (xii) Yercaud.

4. A brain storming session was conducted at IIT Madras, along with academics working in the area of environment, non-governmental agencies working towards betterment of ecology, government officials who are already involved in this type of work, researchers who are working on the alternative materials, ecological experts, vendors, manufacturers and other stakeholders.

Based on the study, recommendations are being made here for: (i) the list of use and throw plastic items to be banned; (ii) possible difficulties that may be encountered, if any, due to ban by the people and by the government and (iii) list of alternative materials to the banned items.

List of Use and Throw Plastic Items to be Banned

- **CARRY BAGS**
- **WATER SACHETS**
- **CUTLERY (PLATES, SPOONS, FORKS, CUPS, GLASSES Etc.)**
- **STRAWS**
- **PACKAGING FOR PARCEL FOOD**
- **BUTTER PAPER USED ON PLATES**
- **BANNERS**
- **FLAGS**
- **NON-WOVEN POLYPROPELENE BAGS**
- **THERMOCOL GLASSES**
- **THERMOCOL PACKAGING ITEMS**
- **LAMINATED PLASTIC ITEMS**

Willingness of People

In general, it is found that people are willing to change to alternative material, provided appropriate and economically viable alternatives are suggested and made easily available. Many people are quite aware of negative impacts of plastics on environment, especially the aesthetics of the surroundings. They certainly would like to live in a cleaner and more pleasing place. One would wish that people should also be changing their life style a little bit and generate less plastic waste. Most people are not truly aware of

how plastic causes irreversible damage to environment and ecology, and in turn, their own survival. They are not aware of the ill effects on their own health. That is why they are looking for “easy solutions”, which do not demand too much of a “life style change” from their part. This makes them demand for cheap plastic items from shop keepers instead of bio-degradable materials. A massive and innovative campaign should be made to make common person aware of ill-effects of plastic.

Challenges for the People due to Ban

Following key points emerged from the field studies and interviews with a wide cross section of stake holders, which includes common persons, vendors, managements of establishments, NGOs etc.

- I. People will find it difficult to lead their lives without easily available use and throw plastics in the immediate aftermath of plastic ban because the ban will obviously require the people to change their lifestyles.
- II. The field survey has clearly brought out the apprehensions among the people, especially small and marginal vendors, regarding the cost of alternatives. Many of the vendors are afraid that they may lose significant business because of the higher cost of alternatives.
- III. Street vendors would be most affected because alternatives to use and throw plastics will be costlier, and most of the street vendors operate on low budgets. Also, their lowincome group clients may not be willing to accept the extra cost of alternative materials.
- IV. Ready availability of alternative material, especially proper packaging substitutes for liquids and hot foods might be a challenge. Presently, alternative bio-degradable materials are made for niche clientele. There are not many manufacturers, located at different places in the state. Therefore, supply of alternative materials in the market may fall short of meeting the demand.
- V. It may be difficult to suggest alternatives for all places, based on locally available material. If the alternatives are not locally available, then people will face problems.
- VI. The manufacturers / vendors are expecting some sort of a financial assistance from the government in terms of no-GST, low interest loans, subsidies etc. to switch over to alternatives. If they do not get some sort of a support from the government, they might view the ban as “unfair” and may not cooperate with the government in implementing the ban.
- VII. It appears that there is no cooperation and understanding between consumers and vendors/retailers. Many vendors have complained that it is the users who are demanding the items made of plastic. Similarly there is a blame game amongst the managements of tourist places / religious places, local vendors and the tourists. These differences would increase once the ban is imposed.

Challenges to the Government to implement the ban

- I. Initially there will be protests, resistance and non-cooperation, especially from trade unions, vendors associations, and of course plastic manufacturers.
- II. It will be difficult for the government to identify and crack down on all manufacturing units engaged in the production of banned items.
- III. It will be difficult for the Government to completely control the infiltration of illegal plastics from neighboring states.
- IV. There will be problems with regard to availability of manpower and finances to monitor the sale and usage of banned items, laxity on the part of managements of tourist places / religious places etc. to implement the ban, and accordingly take punitive actions.
- V. It is easier said than done as far as Information Education Campaign (IEC) on ill-effects of plastics is concerned. There will be significant problems with regard to changing the mindset of people through awareness campaigns. A lot of thought should go into this aspect in order to make the ban effective.
- VI. Finding economically viable alternatives based on locally available material could pose challenges for implementation.
- VII. Establishing new manufacturers and suppliers of alternative materials to cater to the increased demand for such material may pose a big challenge
- VIII. Empowering local governing bodies for implementing the ban and at the same time curb corruption could pose a challenge.
- IX. Imposition of severe punitive measures for effective implementation of the ban may lead to more non-cooperation from the people.

Suggestions for Effective Implementation of Ban

Following suggestions are made for effective implementation of ban on the “use and throw plastic items”:

- 1. The manufacturing of banned items within the state should be stopped.** There should not be any option left but to use alternative material. Therefore, banning of manufacture of “use and throw plastic items” listed above is essential.
 - Large industrial manufacturers of the banned items come under the control of Pollution Control Board. Hence, it is their responsibility to control and regulate manufacturing of these items.
 - Small-scale and cottage industries come under the purview of local bodies. Hence local bodies should control/regulate these manufacturers. Support is needed from the Electricity Board too in order to take action on such manufacturers by the local body.

2. **The sale of use and throw plastics should be strictly banned** at the entry points to eco-sensitive areas, tourist areas and religious shrines.
3. **Clear and unambiguous instructions should be issued regarding the items which are banned and the material of which the items are made of.** Vendors and people should be educated on this issue. It has been found that in many places, plastic lined / coated items and differently looking material but made of plastic are being sold as “non-plastic” items.
4. **The entry of banned items into the state from neighboring states through various routes should be restricted** by establishing check posts and empowering the persons manning the check posts to impose the ban.
 - “Power to enforce and fine the offenders” should be given to local government authorities.
 - People may not take their local authorities seriously. Therefore, the above enforcement by local authorities should be supported by periodic raids by authorities at a higher level either from district head quarters or from the state capital and imposition of fines.
5. **Punitive actions that will be taken if the ban is violated by any manufacturer, vendor or user should be clearly spelt out.** Also, the empowerment of officials to impose the ban should be clearly spelt out. Ban on the use and throw plastics exist in many towns, but there appears to be ambiguity regarding which official is responsible for which task of enforcing the ban. This ambiguity should be removed.
6. **State agencies should provide awareness programme or training on the legal acts to the local body.** By-laws have to be made clearer to the local body representatives in order to take action on the violators.
 - Many local bodies have no clear information on the banned items. For Ex: they do not know that plastic bags below 50 microns are banned by the government. They are under the impression that all-kinds of plastic bags have to be banned. They also are unaware that poly-propylene bags (non-woven plastic bags) are also not allowed. They allow such usage as they think they are cloth bags and can be allowed to use. Awareness programs should be conducted.
7. **A web site and a phone number should be provided where any person who becomes aware of violation of ban by any vendor / manufacturer can report the violation.** Social media groups can be formed with the help of local governments for monitoring the enforcement of ban and empower the people to report.
8. **There should be legal provision to close and seal the shop if any vendor is found violating the ban.**
 - There should be legal provision to cut the electric power supply to plastic manufacturing units which are producing banned items.
9. **Massive awareness creation among the citizens against the use of “use and throw plastics” should be taken up through posters, street plays, FM Radio, TV channels, Movie Theaters,**

Railway stations, Bus Stations etc. Place posters, hoardings, notice-boards at all the important places of the area. Local NGOs should be co-opted in taking up these awareness campaigns. Industrial houses can be encouraged to either provide funds for or take up awareness campaigns as part of their CSR activities.

- Educate people to carry cloth bags. People should be made aware that they also have a responsibility to completely avoid the usage of use and throw plastics.
- Include a chapter on “Story of Plastic”, describing the “ill-effects of use and throw plastic” in school curriculum, which is due for revision shortly.
- Besides banners and sign posts, videos made by Tamil Nadu Pollution Control Board on plastic waste should be played continuously on CCTVs located at the entrances to religious shrines, tourist spots and ecologically sensitive areas.
- Information Education Campaigns should not only emphasize the ill-effect of plastics on environment but also should highlight the effects of use and throw plastics on the public health through diseases such as dengue and contamination of groundwater.
- People should also be educated and made aware that recycling is not possible for many plastic items.

10. Provide incentives to “wards” in any city which are making good progress in the non-usage of one time use plastics, by reducing local taxes.

- Provide some green badges labeled, “**GREEN CITIZEN**” for general public, “**GREEN VENDORS/RETAILERS**” for vendors/retailers, “**GREEN TOURIST**” for the tourists etc.

11. It is important to **strategically instruct theAssociations** so that the ban is implemented and followed **uniformly** across all vendors. Vendors associations in each town and village should be co-opted into making the ban effective by encouraging them to take collective action.

12. Manufacturers for alternatives to plastics should be identified and supported in terms of (i) training, (ii) establishing markets, (iii) financial support through low interest rate loans etc.

- Sale of the identified alternatives to use ad throw plastic can be made GST free in order to bring down the cost.
- Entrepreneurs, vendors, restaurant owners, authorities of religious shrines, general public etc. should be encouraged to identify and switch over to alternatives for use and throw plastic at different levels of economy.
- Encourage Self Help Groups to make alternative items using locally available material and the traditional methods which were existent before use and throw plastic items flooded the market.

13. The enforcement to switch over to alternatives should be very strict with regard to educational institutions, commercial establishments, tourist places, religious shrines (temples, dargahs, churches etc.) because it is not difficult to control the entry of use and throw plastic in such places. The onus for implementing the ban should be on the management of these

establishments. The security provided at the entry points could be trained to check visitors and not allow banned plastic items within the premises.

- Only items made of non-plastic and bio-degradable materials should be used in all government functions and the **Government should show the way by practice**
- The enforcement should be very strict with regard to **wedding reception and other function halls**. Permission to operate such facilities should be taken away by the TNPCB in case of violation.
- Like zero liquid discharge policy for gated communities and high rise apartment blocks, policy of making these communities responsible for the management of solid waste generated by them should be framed.

14. Arrange several plastic collection bins and 'No-plastic' signage at the entry points of tourist places. If necessary, **provide alternative paper bags/cloth bags/bio-degradable bags** to the tourists at a price.

- All local governing bodies should identify some earmarked areas for solid waste collection and proper segregation, instead of dumping in road sides and other sensitive areas
- There should be continuous follow up activities with regard to plastic ban activities.
- Improvement in the general solid waste management cannot be over emphasized. There should be as much recycling as possible. Frequency of garbage collection should be increased.

15. Competitions should be held by the Government to identify and develop local and traditional alternatives to “use and throw plastics”. School and college students and even general public should be encouraged to participate in these competitions. Awards may be given at district and state levels. Start-up companies which are prepared to manufacture alternate materials to replace use and throw plastics should be provided incentives. All efforts should be made to reduce the cost of bio-degradable bags.

- Incentives in the form of awards should be provided to “Plastic Free Panchayats (PFP)”, similar to the awards given to ODF Panchayats.

16. Cooperation between different government agencies, NGOs, local trader and restaurant associations, and local citizens should be ensured by arranging regular coordination meetings.

17. Experience from places where ban on plastic usage has been effective should be used to build up new strategies for better implementation.

18. The government should prepare a clear road map for implementation of the ban on use and throw plastics and communicate this clearly to all local bodies and make it integral to Information and Education Campaigns to prepare people to accept the ban.

List of Alternative Products

The following are a list of alternatives that could be used in the place of plastics. However, **priority shall be given to locally available alternative materials and traditionally used techniques before going for other options.**

Comparison Table

S. No	Alternative	Suitable replacement for	Probable Users
1	Paper products	• Plastic bags • Plastic plates • Plastic cups	• Small vendors • Consumers while carrying things from home • Bags could be used for carrying lighter and dry things
2	Leaf products	• Plastic plates • Plastic cups • Plastic bags from consumers end	• Small vendors • Consumers while carrying things from home
3	Bio-degradable bags	• Plastic bags • Plastic packaging	• Small vendors • Consumers • While carrying things from home for heavy weights
4	Cloth bags	• Plastic bags	• Retail shops • Medium to high end shops • Consumers
5	Products from Coconut, kora grass, screw-pine	• Plastic cups	• Medium to high end hotels/restaurants
6	Earthen products	• Plastic plates • Plastic cups	• Small vendors • Medium to high end hotels/restaurants
7	Bamboo products	• Plastic plates • Plastic cups • Plastic bags for carrying small items like puja items	• Small vendors
8	Stainless steel products	• Plastic plates • Plastic cups	• Small vendors • Medium to high end hotels/restaurants

9	Jute bags	Plastic bags from high end retailers and consumers	- Retail shops - Medium to high end shops - Consumers
10	Glass products	- Plastic plates - Plastic cups	- Medium to high end hotels/restaurants - Consumers
11	Edible cutlery	- Plastic plates - Plastic cups	- Medium to high end hotels/restaurants - Consumers
12	Ceramic ware	- Plastic plates - Plastic cups	- Medium to high end hotels/restaurants - Consumers
13	Hemp products	Plastic bags from high end retailers and consumers	- Medium to high end retailers - Consumers

Addresses of Possible Suppliers of Alternative Items

Sl.no	Name	Address	Email ID & Contact Details
1	Mrs.Regina violet Rosaline	No:2/189, mariammankovil street Nallicherry Post ChembanarKovil via Mayavaram - 609308	9786393281
2	Mr.SibiChelvan	Regeno Ventures Pvt Ltd Chinniyampalayam, Coimbatore, Tamil Nadu 641012	svc@regeno.in 9500237777
3	Mr.Ravi	Meenakshi Mud Pot Supply, Gandhi Road, Velacherry, Chennai - 42	8939014155
4	Mr.RAMU	S.R. Palm Leaf Plate Hogenakkal - 636810	9445554817
5	Mr.RAVI RAJ	R.K. Palm Leaf Plate Hogenakkal - 636810	9600290004

Chapter-1: Introduction

1.1 Preamble

It has been well established that indiscriminate use of “use and throw plastics” which are non-biodegradable has been causing severe health and environmental hazards. The Government of Tamil Nadu vide G.O. Ms.No.92, Environment and Forests (EC-2) Department dated 10.08.2011, constituted an “Expert Committee” to check the Health and Environmental Hazard in the use of plastics and to find the ways and means to intensify plastic awareness camps.

The committee in its report, submitted in November 2012, observed the following:

1. Plastic chemicals (EX: phthalates, plasticizer, stearic acid etc.) have a tendency to get bio accumulated. They are hormone mimicking chemicals which may cause reduction in the fertility rate. Several chemicals such as styrene, plasticizers, anti-oxidants, acetaldehyde tend to migrate from the plastic containers into the food being carried by them.
2. The seven categories of plastic viz., PET, HDPE, PVC, LDPE, PP, PS and others cause varying health effects including skin problems. They are also suspected to be carcinogenic.
3. Due to their non-biodegradable nature, these plastics tend to exist along the road side and other open spaces in tourist areas, residential areas, temple areas and other mass gathering locations, severely affecting the aesthetics of the place.
4. Most of the time the plastic waste is finding its way into sanitary and storm sewers and blocks the passages. This not only affects the functioning of the drains but also causes water stagnation, which results in the spread of diseases.
5. Non-recyclable plastic waste gets mixed with the Municipal Solid Waste (MSW) and makes it unfit for composting.
6. The plastic wastes tend to get embedded at different depths in soil due to long term disposal and cause reduction in rainfall infiltration and thus groundwater recharge.

Some of the main recommendations with regard to Policy / Legal aspects are:

1. Adoption of “throwaway plastic (avoidance) policy”
2. Legislation for manufacturing of carry bags of thickness of not less than 50 microns and with minimum size of 8 x 12 inches

3. Banning throwaway plastics in mass gathering functions
4. Declaring all the Government offices as “throwaway plastic free zone”

In this context, Tamil Nadu Pollution Control Board has decided to identify sensitive ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on use and throw plastics. It has constituted an expert committee with the following terms of reference:

1. To identify sensitive, ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on the use of use and throw plastics.
2. To suggest alternatives to replace use and throw plastics on the ban inflicted areas
3. To specify duties and responsibilities of enforcing authorities in the event of ban on use and throw plastics in the state of Tamil Nadu in accordance with Environment (Protection) Act, 1986 as amended

The committee requested IIT Madras to undertake the activities under terms of References 1 and 2.

1.2 Objective and Scope

- To identify sensitive, ecological and tourist attracting places in Tamil Nadu for the implementation of complete ban on the use of use and throw plastics.
- To suggest alternatives to replace use and throw plastics in the ban inflicted areas

The scope of the work includes the following:

- Identify the ecologically sensitive areas from secondary data
- Verifying the selected location
- Consultation with ecological experts
- Consultation with stake holders to finalize the list of sensitive areas
- Identify alternatives for plastics in selected areas.

1.3 Methodology

Following methodology was adopted for achieving the objectives:

1. Detailed information was collected:
 - a) On the ecologically sensitive areas from secondary sources such as: (i) The Gazette of India for western ghats, (ii) reports prepared by the Institute for Ocean Management, Anna University Chennai on coastal zone management, (iii) Reports

prepared by the Department of Environment, Government of Tamil Nadu on the state of environment and (iv) other reports available in open literature. For example, detailed information on all wild life sanctuaries and national parks in Tamil Nadu is available from the Department of Environment. Similarly, information on areas identified by Govt. of India as ecologically sensitive in Western Ghats is available from The Gazette of Govt. of India.

- b) Information on how the other state Governments (Ex: Karnataka) have imposed the ban on certain types of plastics in designated areas will be collected. Some towns and panchayats in the state of Tamil Nadu have imposed restriction on the usage of plastics. Information on their experience in implementing such bans will be collected.
 - c) Information on tourist places was collected from the Department of Tourism.
2. Literature review on alternative materials and best practices from other states and countries was conducted.
 3. Site-visits were made to a few of the representative locations by the project team and information was gathered regarding ground realities.

Information was collected regarding:

- (i) The extent of usage of use and throw plastics in the area,
 - (ii) Effect of these plastics on the ecology and environment of the area,
 - (iii) Availability of any local alternatives for the items made of use and throw plastics,
 - (iv) Possible difficulties that may be encountered by the population if such ban is imposed,
 - (v) Possible difficulties that may be encountered by the implementing agencies while imposing the ban,
 - (vi) Readiness of the people to shift to the usage of alternative materials etc.
4. A brain storming session was conducted at IIT Madras, along with academics working in the area of environment, non-governmental agencies working towards betterment of ecology, government officials who are already involved in this type of work, researchers who are working on the alternative materials, ecological experts, vendors, manufacturers and other stakeholders.

Based on the above activities and the outcome thereof, recommendations are being made in this report for: (i) the list of use and throw plastic items (Ex: plates, advertisement banners etc.) to be banned; (ii) enumeration of possible difficulties that may be encountered, if any, due to ban by the people and by the government, and (iii) list of alternative materials for the banned items.

Chapter-2: State Profile

2.1 Geographic Profile of the State

Tamil Nadu is the southernmost state of the Indian peninsula and spread over 1,30,058sq km. It lies between $8^{\circ} 5''$ to $13^{\circ} 35''$ N and $76^{\circ} 15''$ to $80^{\circ} 20''$ E and accounts for about 4 percent of the total area of the country.

Tamil Nadu is bounded by the Eastern Ghats on the north, by the Nilgiri, the Anamalai Hills, and Kerala on the west, by the Bay of Bengal in the east, by the Gulf of Mannar and the Palk Strait on the southeast, and by the Indian Ocean on the south. The southernmost tip of the Indian Peninsula is Kanyakumari which is the meeting point of the Arabian Sea, the Bay of Bengal, and the Indian Ocean.

Tamil Nadu has number of rivers that are relatively small and not perennial. Barring the hills, the climate of Tamil Nadu can be classified as semi-arid tropic monsoonic. The maximum temperature in the plains is about 45°C in the summer and the minimum goes to about 10°C during the winter; the normal rainfall in the state is about 950mm with an average number of 50 rainy days.

Analyzing the land use pattern of the state, it is found that 43% of Tamil Nadu's geographical area is under agriculture with a per capita figure of 0.0982 ha. of agricultural land. The topography of Tamil Nadu broadly consists of the coastal plains in the east; uplands and hills as one proceeds westwards; the plains account for more than half the area of the state.

The western, southern and the north western parts are hilly and rich in vegetation. The Western Ghats and the Eastern Ghats meet at the Nilagiri hills. The Western Ghats traverse the entire western border with Kerala, effectively blocking much of the rain bearing clouds of the south west monsoon from entering the state. The eastern parts are fertile coastal plains and the northern parts are a mix of hills and plains. The central and the south central regions are arid plains and receive less rainfall than the other regions.

Tamil Nadu has the country's third longest coastline at about 906.9 km (563.5 mi). The coast is home to some of the unique ecosystems viz., mangroves, corals, reefs, pearl banks etc. The coastal stretch has been breeding lands to variety of aquatic and migratory bird life too.

2.2 Tourism in the State

Tamil Nadu has been the top tourism destination for both domestic and international tourists since 2014, and the number of tourists visiting the state has been rapidly increasing over time. It is a state with several distinguished tourism genre. It has beautiful hill-stations, verdant vegetation sandy beaches, mammoth monuments, timeless temples, fabulous wildlife, scintillating sculptures and reverberating rural life. It has picturesque spots, continuing heritage, cultural confluence and aesthetic magnificence. The state also has UNESCO notified heritage sites and around 420 historic sites under the management of Archaeological Survey of India.

List of most popular tourist places in Tamil Nadu *(from Tamilnadutourism.org)*

Wildlife sanctuaries

1. Mudumalai Sanctuary
2. Vallanadu Sanctuary
3. Gulf of Manner Marine Nat'l Park
4. Viralimalai Sanctuary
5. Point Calimere Sanctuary
6. Mukkurthi Nat'l Park
7. Indira Gandhi Nat'l Sanctuary
8. Mundantharai Sanctuary
9. Mayura Thottam
10. Kalakkadu Sanctuary
11. Sirivilliputhur Sanctuary
12. Vedanathangal bird Sanctuary
13. Guindy Nat'l park
14. Chinnar wildlife sanctuary
15. Sathyamangalam wildlife sanctuary

Hill-stations

1. Annamalai hills
2. Kolli hills
3. Ooty
4. Kodaikanal
5. Yelagiri
6. Yercaud

Religious places

7. Madurai
8. Kancheepuram

9. Chidamabram
10. Rameswaram
11. Kumbakonam
12. Thanjavur
13. Thiruvannamalai
14. Thirparankundram
15. Tiruchendur
16. Palani
17. Swamimalai
18. Kanyakumari
19. Melmaruvathur
20. Mahabalipuram
21. Namakkal
22. Parthasarathi temple and Kapaleeswara temple in Chennai
23. Sriperumbudur
24. Thiruchirapalli
25. Srirangam
26. Sirivilliputhur
27. Vellankanni
28. Nagore darga

Waterfalls

1. Courtallam
2. Hogenakkal
3. Thiruparappu
4. Monkey falls
5. Thirumurthi Malai
6. Akasa Gangai
7. Papanasam

Beaches

1. Marina (Chennai)
2. Elliots (Chennai)
3. Thiruvannamiyur (Chennai)
4. Tiruchendur
5. Rameswaram
6. Kanniyakumari
7. Mahabalipuram
8. Poompuhar

9. Nagapattinam

UNESCO sites

1. The Great Living Chola temples at Thanjavur, Darasuram and Gangai kondachola puram
2. Monuments at Mamallapuram
3. Nilgiris Heritage Train
4. Western Ghats

Number of tourists to different places of Tami Nadu State is given Tables 2.1 and 2.2 (Mahamad S., Latha G., Manikandan N., Chandrasekar V., "A study on Tourists inflow into Tamil Nadu", International Journal of Geomatics and Geosciences, 5(2), 2014)

Table-2.1: Domestic Tourist Arrivals in Select Districts of Tamil Nadu

S.No	Districts	Domestic Tourists 2001	Domestic Tourists 2006	Domestic tourists 2011
1	Chennai	4361559	7312540	15944360
2	Vellore	30514	51058	1002384
3	Kancheepuram	1381906	2354635	6785520
4	Thiruvallur	663914	826806	2308096
5	Cuddalore	262309	331594	2524587
6	Udhagamandalam	1836685	3386549	7560651
7	Thanjavur	988609	1745603	3515617
8	Nagapattinam	624785	994610	3374030
9	Madurai	2323432	4000476	8827226
10	Dindugal	3009119	3259126	14426441
11	Ramanathapuram	1553784	2434661	4004654
12	Tirunelveli	485472	639683	8884051
13	Thoothukudi	1324918	1798399	7646187
14	Kanniyakumari	1423195	1552726	4462426
15	Tiruchirappalli	1177074	1954136	3309706
16	Selam	692196	1051489	4451939
17	Dharmapuri	45942	216175	883744
18	Coimbatore	1002593	1515374	3882226
19	Tiruvannamali	624037	3789081	4412876

Table-2.2: Foreign Tourist Arrivals in Select Districts of Tamil Nadu

S.No.	Disruict	Foreign Tourists 2001	Foreign tourists 2006	Foreign tourists 2011
1	Chennai	300979	564780	1159076
2	Vellore	2442	8600	20467
3	Kancheepuram	109389	182158	448443
4	Thiruvallur	7433	13326	20783
5	Cuddalore	7848	12409	25335
6	Udhagamandalam	62958	117699	443630
7	Thanjavur	29401	49625	100443
8	Nagapattinam	4447	9833	18264
9	Madurai	63685	99970	250272
10	Dindugal	50541	85991	554231
11	Ramanathapuram	5421	7849	23674
12	Tirunelveli	2844	3145	1771
13	Thoothukudi	7173	53861	33044
14	Kanniyakumari	51209	81639	150102
15	Tiruchirappalli	47508	1992	197237
16	Selam	2320	3265	2228
17	Dharmapuri	520	9356	8643
18	Coimbatore	12594	21341	63244
19	Tiruvannamali	4361	8822	62371

2.3 Eco-sensitive Areas (ESA) and their Importance

Ministry of Environment and Forest (MoEF) had set up an Expert Committee with Dr. Pronab Sen of the Planning Commission as its Chairman to frame parameters for designation of areas as Ecologically Sensitive Areas (ESAs).

The High Level Working Group has identified approximately thirty-seven percent the Western Ghats as ecologically sensitive which covers an area of 59,940 sq km of natural landscape of Western Ghats and represents a continuous band of natural vegetation extending over a horizontal distance of 1,500 km and is spread across six states of Western Ghats region namely, Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu and includes Protected Areas and World Heritage Sites of Western Ghats and the High Level Working Group has recommended prohibition or regulation of identified projects and

activities in the Ecologically Sensitive Area which have maximum interventionist and destructive impacts on ecosystems. The report by the committee defines 'ecological sensitivity / fragility' as:

“the imminent possibility of permanent and irreparable loss of extant life-forms from the world, and of significant damage to the natural processes of evolution and speciation”.

The committee accounted for the loss of potential bio-resources as well that need to be preserved for future generations while describing biodiversity loss. The following definition was proposed by the Care Earth organization while studying the ecologically sensitive areas in Western Ghats (<http://www.moef.nic.in/downloads/public-information/Annexure-VI-ESAs.pdf>):

“An ecological sensitive area (ESA) is a bio-climatic unit (as demarcated by entire landscapes) in the Western Ghats wherein human impacts have locally caused irreversible changes in the structure of biological communities (as evident in number / composition of species and their relative abundance) and their natural habitats”.

Pronab Sen committee proposed criteria for designating an area as ecologically sensitive under the following three categories:

- Species-based criteria: These consider endemism, rarity, presence of endangered species, centers of evolution of domesticated species and centers of lesser known food plants.
- Ecosystem-based criteria: These consider corridors for migratory species, specialized habitats and breeding sites, intrinsically low resilient areas, sacred groves and frontier forests, wetlands and grasslands.
- Geomorphologic features-based criteria: These include uninhabited islands, steep slopes, origins of rivers, upper catchment areas, not-so-steep slopes and high-rainfall areas.

The report also emphasized that besides the criteria dealing with ecological sensitivity, the protection provided by the EPA should address other environmental concerns. Care Earth organization proposed criteria under the broad categories of: (i) Biological-cultural (richness; rarity; biological productivity; extent of aquatic habitats; cultural significance); (ii) Geo-climatic (steep slopes; high altitudes; high rainfall areas) and (iii) people perceptions.

Eco-sensitive zones:

National wildlife Action plan (2002-16) indicates that “Areas outside the protected area network are often vital ecological corridor links and must be protected to prevent isolation of fragments of biodiversity.”

Section 3 of the EPR, 1986 states that the central government has all powers to take all measures to prevent, control the environmental pollution and protect the environment. Purpose of designating Eco-sensitive zones around National parks and Sanctuaries is to conserve the natural ecosystem prevailing in the areas. The Eco-sensitive zones (ESZ) are designated regulatory areas and the width/stretch of the zone is dependent on the existing conditions in the locality. It is suggested the zone might go up to 10km around the ESAs. The basic aim is to regulate certain human activities around the ESAs and minimize the negative impacts on the fragile ecosystems.

Eco-sensitive areas in Tamil Nadu (www.tnenvis.nic.in)

Tamil Nadu ranks 14th among all the States and Union Territories of India in terms of protected area. There are 12 wildlife sanctuaries and 12 bird sanctuaries, 5 National Parks, 4 Tiger Reserves, 4 Elephant Reserves and 3 Biosphere Reserves for in situ conservation of wild fauna and flora (Fig 2.1)

One sixth of landmass of Tamil Nadu is covered with forests according to State of forest report 2013. The recorded forest area is 22, 877 km² which constitutes 17.59% of the geographical area of the state. Reserved Forests comprise 19,388 sq.km, Protected Forests 2,183 sq.km and Unclassified Forests constitute 1306 sq.km

Gulf of Mannar situated in the southeastern coast of India extending from Rameswaram in the north to Tuticorin in the south is the first marine Biosphere Reserve not only in India, but also in South and Southeast Asia. The Biosphere Reserve comprises 21 islands with estuaries, mudflats, beaches, forests of the near shore environment, including marine components like algal communities, sea grasses, coral reefs, salt marshes and mangroves. Among the Gulf's 3600 plant and animal species, there are the globally endangered species Sea Cow (*Dugong dugong*) and six mangrove species endemic to peninsular India.

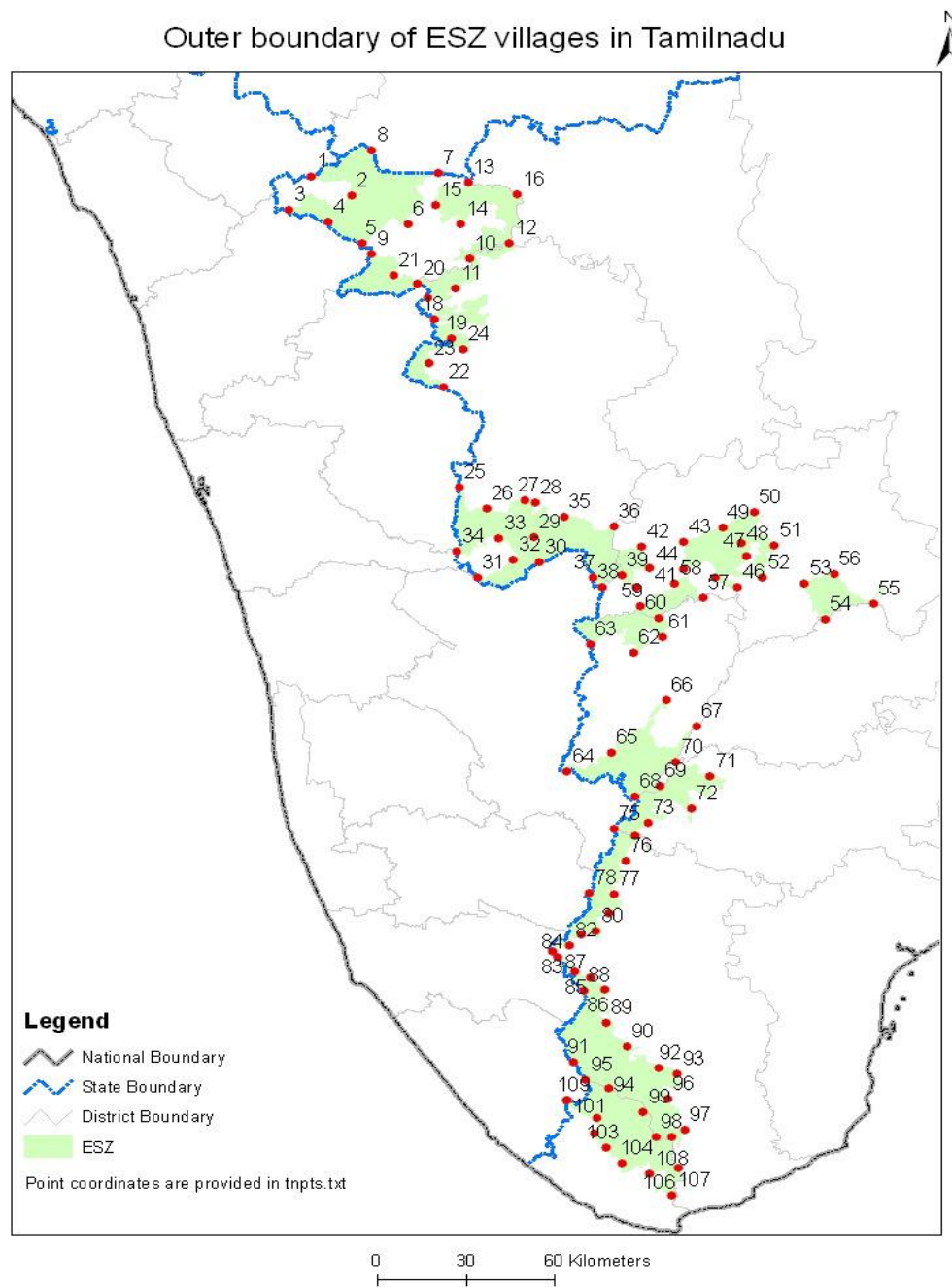


Fig. 2.2: Map showing Eco-sensitive areas in the Western Ghats

Chapter-3: Plastic Ban

Plastic is being used across the world in various levels of the industry since 1950s. Its usage has been proved feasible, economical and effortless in almost all the streams of life. Hence, it has become so widespread that now most of the earth is filled with plastic. Oceans are filled with plastics. Plastics are non-degradable. They take hundreds of years to degrade, thus leading to serious environmental impacts affecting the wildlife and human-life. Millions of wild animals are killed because of plastic each year around the world because their stomachs get filled with plastic. The toxics from plastics enter humans too through the food chain.

Drainage systems are choked by plastics causing urban flooding across the world. They clog agricultural drains. They provide ideal breeding ground for mosquitoes.

3.1 Environmental issues: (source: CPCB PWM ANNUAL REPORT 2013)

Indiscriminate littering and unskilled recycling/reprocessing and non-biodegradability of plastic waste raises the following environmental issues:

- During polymerization process fugitive emissions are released.
- During product manufacturing various types of gases are released.
- Indiscriminate dumping of plastic waste on land makes the land infertile due to its barrier properties.
- Burning of plastics generates toxic emissions such as Carbon Monoxide, Chlorine, Hydrochloric Acid, Dioxin, Furans, Amines, Nitrides, Styrene, Benzene, 1, 3-butadiene, CCl₄, and Acetaldehyde.
- Lead and Cadmium pigments, commonly used in LDPE, HDPE and PP as additives are toxic and are known to leach out.
- Non-recyclable plastic wastes such as multilayer, metalised pouches and other thermoset plastic poses disposal problems.
- Sub-standard plastic carry bags, packaging films (<40μ) etc. pose problem in collection and recycling.
- Littered plastics give unaesthetic look in the city, choke the drain and may cause flood during monsoon.
- Garbage mixed with plastics interferes in waste processing facilities and also causes problems in landfill operations.

- Recycling industries operating in non-conforming areas are posing threat to environment to unsound recycling practices.

In view of all the different hazards caused by plastic usage, many countries across the world have come up with plastic management and plastic ban strategies to regulate its usage.

3.2 Countries Implementing the Ban

- Bangladesh:** Bangladesh was the first to impose a nation-wide ban on plastic bags in 2001 because of flooding concerns with bags clogging drainage systems. The ban was imposed as a substitute for putting in place an effective waste management system.
- China:** China, in connection with Olympics of 2008, had banned ultra-thin plastic bags and a charge for thicker ones. Estimates show that around 60% reduction was found in the plastic bag usage.
- California, USA:** The state has banned single-use plastic bags in 2016, charged for the thicker ones and, there has been a drastic decrease in the plastic usage since then. A year later, it was also observed that the beaches had lesser plastic waste during a clean-up drive.
- Ireland:** Ireland has levied Plastic Bag Tax in 2002, and has seen gradual decrease in plastic usage. It was the first country to charge the consumers directly for plastic usage.
- Denmark:** Denmark has initiated charging the plastic bags in 1994 making it the first country to charge plastic bag makers based on the weight of the bag.
- Kenya:** Kenya banned plastic bags in 2017, to avoid mosquito breeding which caused deadly malarial outbreak in the country. Violators are charged with a huge fine and imprisonment upto 4yrs. It is the world's toughest law.
- Rwanda:** Rwanda has been plastic bag free since 2008. The country completely banned plastic bags when other countries around the world started imposing taxes on plastic bags. Offenders smuggling plastic bags can even face jail time.
- Bans or taxes have since been adopted in various countries/places across the world viz., England, Australia, Italy, Canada, Mexico, Rwanda, UAE, South Africa, Tanzania, France and various cities and states of U.S.A

All the above cases show a successful reduction in single use plastics after the ban/taxes/charges.

3.3 Indian Scenario of Plastic Waste

Of India's annual waste generation of 62 million tonnes, 5 million is plastic waste generated by India's cities. The national capital Delhi generates over 689 tonnes of plastic waste in a day, followed by Chennai at 429.30 tonnes and Mumbai at 408 tonnes. Among states, Maharashtra tops the list of plastic waste producers, with 4.6 lakh (4,69,098) tonnes per year, followed by Gujarat at 2.6 lakh (2,69,000) and Tamil Nadu at 1.5 lakh (1,50,323) tonnes. (Fig 3.1)

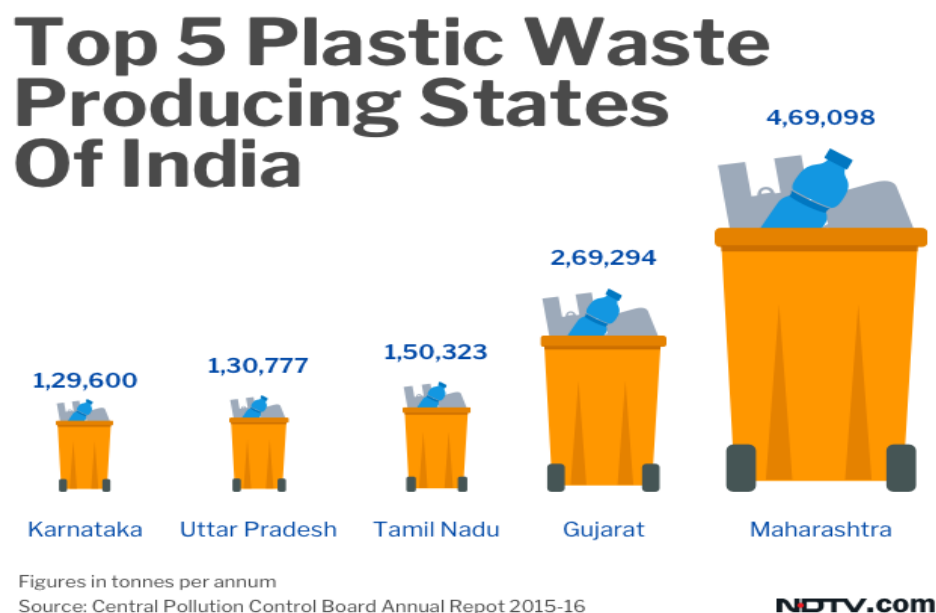


Fig 3.1: Top 5 plastic waste generating states in India (source: swachhindia.ndtv.com)

3.4 Plastic Waste (Management and Handling) Rules, Government of India

The Plastic Waste Management Rules, 2016, was notified by the Ministry of Environment, Forest and Climate Change, Government of India.

As per the rules,

- i. carry bags and plastic packaging shall either be in natural shade which is without any added pigments or made using only those pigments and colorants which are in conformity with Indian Standard: IS 9833:1981 titled as "List of pigments and colorants for use in plastics in contact with foodstuffs, pharmaceuticals and drinking water"

- ii. Carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness.
- iii. plastic sheet or like, which is not an integral part of multilayered packaging and cover made of plastic sheet used for packaging, wrapping the commodity shall not be less than fifty microns in thickness except where the thickness of such plastic sheets impair the functionality of the product
- iv. plastic material, in any form including Vinyl Acetate - Maleic Acid - Vinyl Chloride Copolymer, shall not be used in any package for packaging gutkha, pan masala and tobacco in all forms
- v. Carry bags made from compostable plastics shall conform to the Indian Standard: IS 17088:2008 titled as Specifications for Compostable Plastics
- vi. the local body shall be responsible for the development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of the plastic waste.
- vii. The persons engaged in manufacture of carry bags, recycle plastic bags, multilayered packaging, recycling or processing of plastic waste shall obtain registration certificate from the State Pollution Control Board. The role of SPCB is to enforce the provisions of these rules relating to registration, manufacture and disposal of plastic wastes.

3.5 States Implementing the Ban

As on date, 18 states of India have implemented the plastic ban in their respective administrative areas, Maharashtra being the latest. Brief of notifications issued by few states are given below:

- i. **Haryana:** As per Government Notification on 3rd Feb, 2010, "No person shall manufacture, stock, distribute, sell or use carry bags made of virgin or recycled plastic of thickness less than 40 microns and size less than 12" x 18" in the State. Further, in the areas having special historical, religious and ecological significance, use of all types of plastic articles such as carry bags (irrespective of thickness and size), plates, cups, tumblers, spoons, forks and straw shall be totally banned. Littering of plastic articles such as carry bags, plates, cups, tumblers, spoons, forks and straw at public places such as parks, playgrounds, recreational places, tourist centers, religious places etc., shall not be permitted. Recycling - Recycling of plastics shall be undertaken strictly in accordance with the BIS standards. Manufacturing of carry bags and containers made of plastic shall be in accordance with the BIS standards and the plastic ban regulation. Manufacturing units violating the rules would be fined between Rs 25,000 and Rs 50,000 for first

offence and license would be cancelled for subsequent offence. Retailers/vendors would be fined between Rs 2500 to Rs 5000 and littering person would be fined between Rs 250 to Rs 500.”

- ii. **Rajasthan:** Government issued a notification on July 21, 2010 directing that *“no person including a shop keeper, vendor, wholesaler or retailer, trader, hawker or rehriwala etc. shall use plastic carry bags for supply of goods and further directs that no person shall manufacture, store, import, sell or transport carry bags in state of Rajasthan with effect from 1st August 2010”*.
- iii. **Punjab:** Government issued a notification on 18th February 2016 (No. 5/18/2016-4lg4/692717/1) to *“completely prohibit to manufacture, stock, distribute, recycle, sell or use of plastic carry bags in the jurisdiction of all the Municipal Corporations, Municipal Councils and Nagar Panchayats in the State of Punjab, with effect from the 15th April, 2016, under sub-section (2) of section 7 of the Punjab Plastic Carry Bags (Manufacture, Usage and Disposal) Control Act, 2005 [Punjab Act No. 17 of 2007]”*.
- iv. **Karnataka:** Government issued a notification on 11.03.2016, *“in exercise of powers conferred under section 5 of the Environment (Protection) Act, 1986, imposing ban on manufacture, supply, sale and use of plastic carry bags, plastic banners, plastic bantings, flex, plastic flags, plastic plates, plastic cups, plastic spoons, plastic cling films and plastic sheets used for spreading on dining tables, including the above items made of thermocol and plastic which uses plastic micro beads, in the entire state”*.
- v. **Maharashtra:** In-line with Maharashtra Plastic Carry Bags (Manufacture and Usage) Rules, 2006, the State Government of Maharashtra has authorized regulations for manufacture, usage, sale, storage, transport of the products made from plastic and thermocol etc. which generate non-biodegradable waste. The notification dated **23rd March, 2018** is called ***“the Maharashtra Plastic and Thermocol Products (Manufacture, Usage, Sale, Transport, Handling and Storage) Notification, 2018***

As per the notification, there is a ban in the entire State of Maharashtra for manufacture, usage, transport, distribution, wholesale and retail sale and storage, import of the following items:

(a) Plastic: Material which contains as an essential ingredient a high polymer such as polyethylene terephthalate, high density polyethylene, vinyl, low density polyethylene, polypropylene, polystyrene resins, poly styrene (thermocol), non-oven polypropylene, multi layered co extruder, poly propylene, poly terephthalate, poly amides, poly methyl methacrylate, plastic micro beads, etc.

(b) Plastic sheets: Sheet made of plastic.

(c)Plastic bags: Bags made from plastic material, used for the purpose of carrying or dispensing commodities which have handle or without handle and also includes bags made from non-woven polypropylene and constitute or form an integral part of the packaging at manufacturing stage or is an integral part of manufacturing.

(d) Disposable products manufactured from plastic and thermocol (polystyrene): Products such as single use disposable dishes, cups, plates, glasses, forks, bowls, containers, disposable dish/ bowl used for packaging food in hotels, spoon, straw, non-woven polypropylene bags, cups/ pouches to store liquid.

(e) Packaging: Material made of plastic to wrap or store the products, packaging of food items and food grain material etc.

(f) Plastic and thermocol used for decoration purpose.

The notification is explicit about non-applicability of the regulations to the following items. **Regulations shall not be applicable to the following items:**

(a) Plastic bags or plastic used for packaging of medicines

(b)Compostable plastic bags or material used for plant nurseries, horticulture, agriculture, handling of solid waste. However, bags / sheets utilized for this purpose shall be prominently printed with “Use exclusively for this specific purpose only”. The

manufacturers or seller of compostable plastic carry bags shall obtain a certificate from the Central Pollution Control Board before marketing or selling for this purpose.

(c) Plastic and plastic bags for export purpose only, manufactured in the Special Economic Zone and export oriented units etc.

(d) The plastic cover / plastic to wrap the material at the manufacturing stage or is an integral part of manufacturing. Guidelines to recycle or reuse such plastic should be printed prominently on the cover and material.

(e) Food grade virgin plastic bags not less than 50 micron thickness used for packaging of milk. However, on such plastic bags used for this purpose, should be clearly printed with the price for buy back which should not be less than Rs.0.50 to develop buy back system for recycling. To develop collection mechanism and ensure proper recycling of such used bags, milk dairies, retail sellers and traders will buy back such used milk bags with predefined buy back price printed on it. Milk dairies, retail sellers and traders will ensure that such buy back mechanism and collection and recycling system shall be establish within three months from the date of publication of this regulation. However, Milk Dairy and distributors shall make efforts to develop alternative system with glass bottles or any other environmental friendly material for distribution of milk.

(f) Use, sale, storage and manufacture of PET or PETE bottles made up of high quality food grade virgin Bisphenol-A free material having liquid holding capacity not less than 0.5 liters and printed on it with predefined buy back price.

- PET or PETE bottle manufacturers, producers, sellers and traders under 'Extended Producers and Sellers/Traders Responsibility' will develop "Buy Back Depository Mechanism" with a predefined buy back price printed specifically on such PET or PETE bottles and also set up collection centres, reverse vending machines, crushing machines with linkages established with recycling units of adequate capacity and number to collect and recycle such PET or PETE bottles within three months from

the date of publication of this notification at strategic places including malls, multiplexes, hotels, shops, tourist places, beaches, forts, public places etc.

- Traders / sellers will buy back such used PET/ PETE bottles with predefined buy back price printed on such bottles.
- PET / PETE bottles having liquid holding capacity 1 liter or more and of less than 1 liter will be printed on the body of the bottle with predefined buy back price of Rs. 1/- and Rs.2/- respectively.
- However, there will be ban on usage, purchase, sale, distribution and storage of PET / PETE bottles having liquid holding capacity less than 0.5 liters in the State.

Applicability to persons:

These regulations are applicable to every person, body of persons, government and non-government organization, educational institution, sports complexes, clubs, cinema halls and theaters, marriage/celebration halls, industrial units, commercial institutions, offices, pilgrimage organisers, pilgrimages and religious places, hotels, dhabas, shopkeepers, malls, vendors or sellers, traders, manufacturers, caterers, wholesalers, retailers, stockiest, businessmen, hawkers, salesmen, transporters, market, producers, stalls, tourist places, forests and reserved forests, eco-sensitive areas, all sea beaches, all public places, bus stands, railway stations in the State of Maharashtra.

3.6 Status of Plastic Waste Management in Tamil Nadu

The estimated plastic waste generation in the State during 2015-16 is approximately 1,50,323 tons/annum. There are 301 registered plastic manufacturing/recycling units, 5 compostable units in the State. There are 112 unregistered plastic manufacturing/recycling units present in the State. The plastic waste is partially used for co-processing. During 2015-16, approximately, 26.8 tons of grinded plastic waste is used for road construction. There is partial ban on plastic carry bags in some places of the State. SLA Body has not been formed yet by State Government. There are a total 22 violations of PWM Rules reported during 2015-16.

Some of the bans in existence in the state are given below:

- i. As per the order issued by the **Tiruchirapalli City Corporation**, sale of plastic bags, non-recyclable plastics and use and throw cups will not be allowed in the city limits.

Manufacturing, storing and selling of plastic bags less than 50 microns is also banned. The ban is effective from 26th January, 2018.

- ii. **Coimbatore City Municipal Corporation** has introduced Bio-compostable bags within the city limits in November, 2017 in a bid to make city plastic free.
- iii. The **Chennai Corporation** has announced a fine of Rs 100 on those found violating plastic ban on Marina Beach in December, 2010.
- iv. The **Niligiris district** has imposed a blanket ban on Plastics from January 15, 2018, as per a press release. Plastic and foil-lined paper plates, styrofoam/thermocool plates and cups, polypropylene carry bags, packing bags, bed sheets, hats, caps, plastic gloves, water packets, silver foil covers, plastic and foil gift wrap, laminated brown covers, bakery boxes, cling wrap and plastic water bottles below one litre are banned.
- v. **Kanyakumari** has also been plastic free district from April, 2010. It has been a huge success too.
- vi. The **Vellore Corporation** has banned the use of disposable plastic cups and plastic covers in hotels, tea and coffee stalls, shops and marriage halls, with effect from September 10.
- vii. Many town panchayats across the state have banned plastic usage from August 15, 2015.

Chapter-4: Field Reports

4.1 Selection of Places for Field Study

The IIT Madras team has identified 12 places across the state based on various factors to conduct a field study on the feasibility and rationale for imposing ban on single use plastics in the state. Criteria for selecting the cases for field study are:

- i. Covering each tourism category
- ii. Small area of control
- iii. Ease of accessibility, administratively and geographically
- iv. Popular destination among the foreign and domestic tourists
- v. Ease of implementation through control at few entry/exit points

Table 4.1: Summary of Places for Field Study (Fig 4.1)

S. No	Place	Category	Geographical area	Tourist popularity 2014 (report)
1	Mahabalipuram	Historic	13 sq km	12295394
2	Kanchipuram	Religious	11.6 sq km	14901230
3	Yercaud	Hill-station(ESA)		9335888
4	Hogenakkal Falls	Waterfalls(ESA)		14505323
5	Pichavaram Mangroves (Eco-Sensitive Area)	Mangroves(ESA)	11.0 sq km	691243
6	Thanjavur	UNESCO site		13565975
7	Tiruchendur	Religious(Coastal ESA)	11.0 sq km	15605372
8	Palani	Religious	7 sq km	13005644
9	Kodaikanal	Hill-station (ESA)	21.45 sq km	13515409
10	Thiruchirapalli	City/Tourist place	147 sq km	11638830
11	Vellankanni	Religious	5.5 sq km	75,05,175
12	Nagore	Religious		5867411

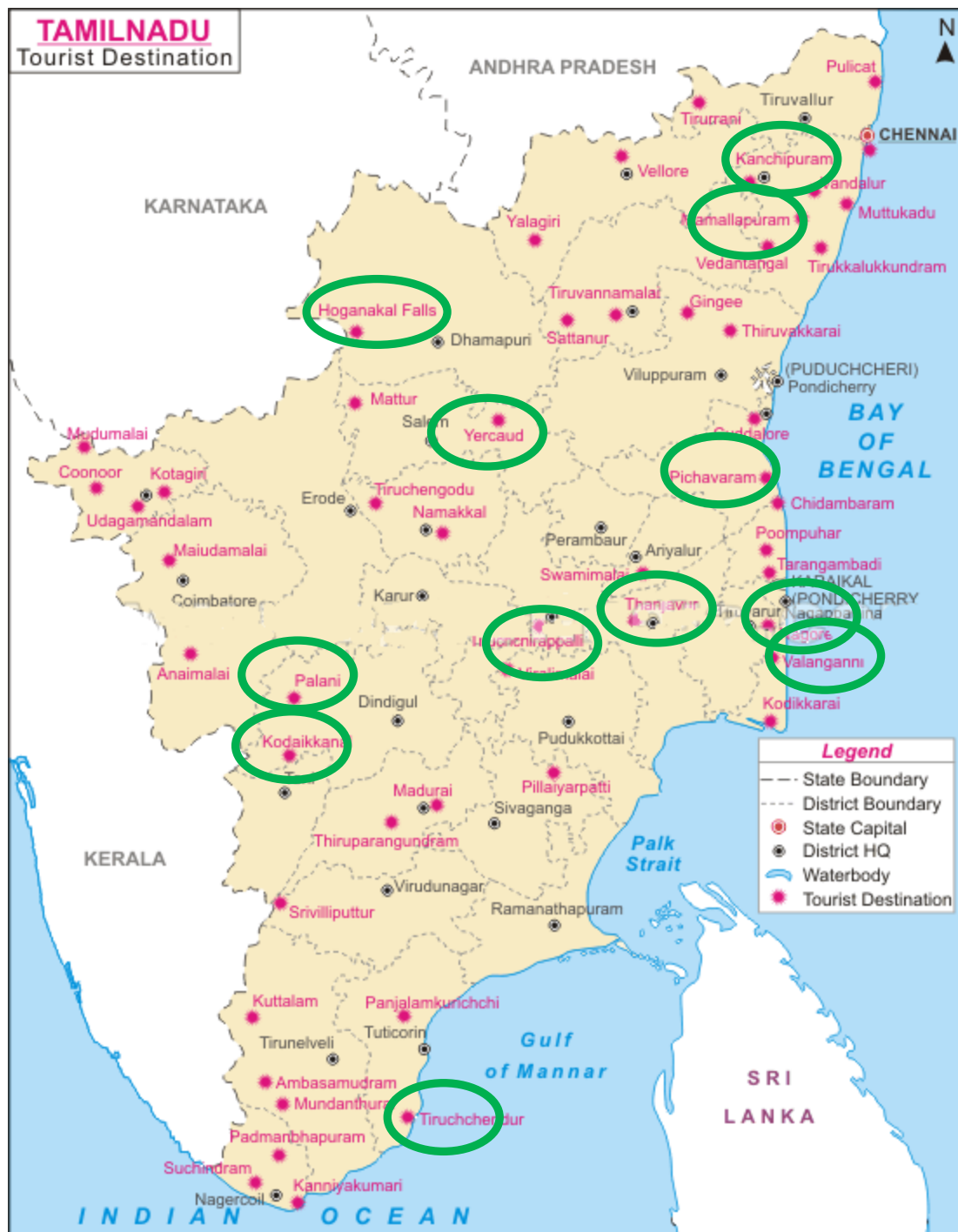


Fig 4.1: Map showing the 12 case-study places

4.2 Field Report-Mamallapuram

Information Based on Secondary Sources

City Profile:

Mahabalipuram also known as Mamallapuram (Fig. M1) is a town panchayat in the district of Kancheepuram and is located 62 km South of Chennai, and at 67 km from the district headquarters, Kanchipuram. The town has a geographical area of 13 sq km. Mahabalipuram has a tropical climate. The average annual temperature is 28.4 °C with variations during summer and winter seasons and the average rainfall is 1219 mm.

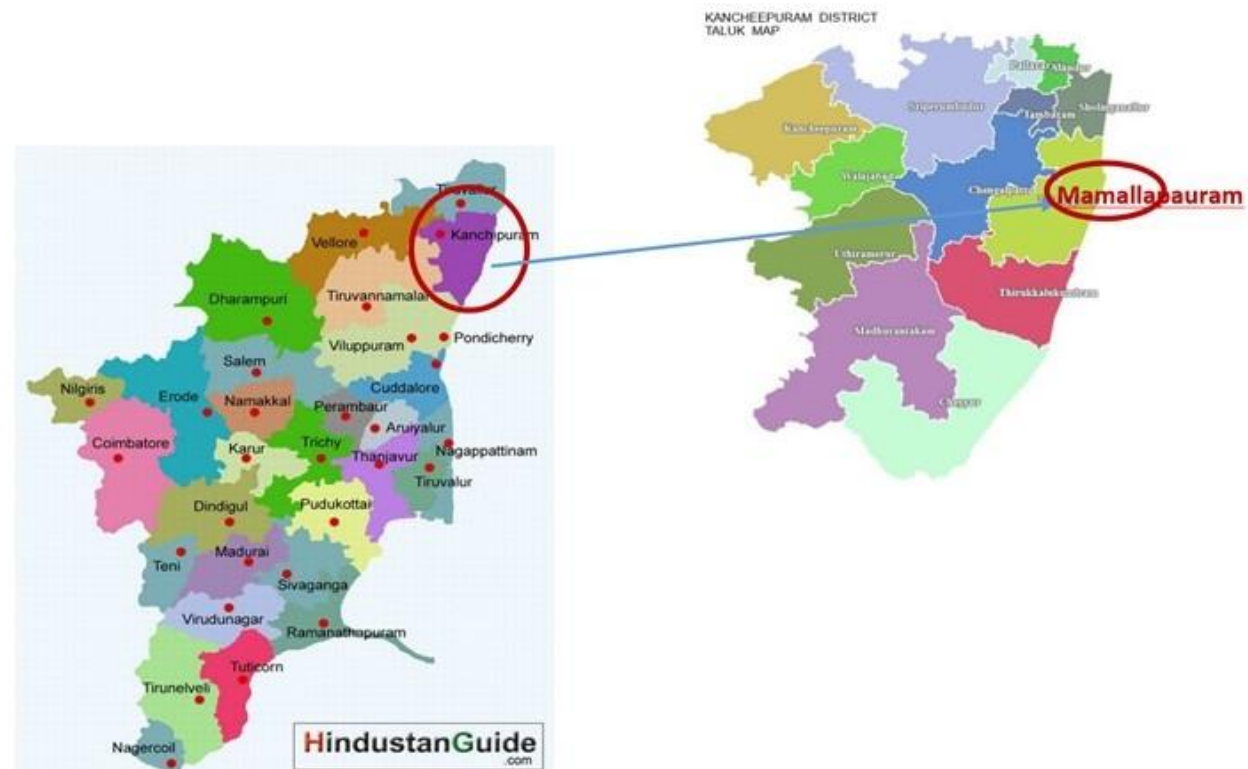


Fig M1: Location map of Mahabalipuram

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.kanchi.tn.nic.in/kpmmaps.html>

Demographic Profile:

The Mamallapuram Town Panchayat has population of 15,172. Literacy rate in the town is 85.52%, higher than the state average of 80.09%. Male literacy is around 91.27 % while female literacy rate is 78.97%. Mamallapuram town is administratively divided into 15 wards.

Tourism:

This place is famous for its monuments (Fig M2). Almost all of the monuments are carved out of granite and it is known especially for its (i) Temples in the form of *Chariots* called rathas, (ii) mandapams (cave sanctuaries), (iii) the “*Seven Pagodas*”, (iv) huge open-air reliefs such as the famous and excellent 100-feet- long “*Descent of the Ganges*”/ “*Arjuna Penance*”, and (v), “*The Shore Temple*”, with innumerable glorious sculptures of Lord Siva. Mahabalipuram was included in the World Heritage Monuments list of 1984 by UNESCO.

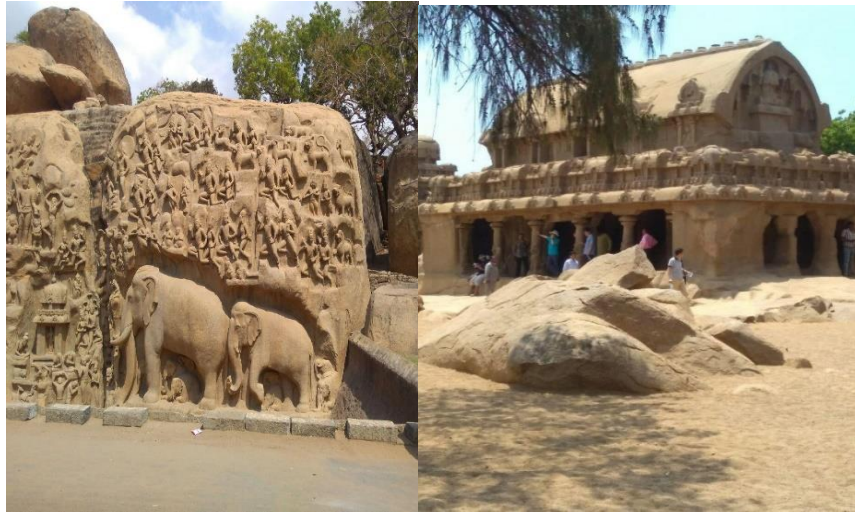


Fig M2: Ancient monuments in Mahabalipuram

Sculpture and Art college, Sculpture Workshops and handicrafts attract millions of tourists throughout the year. According to Tamil Nadu Tourism report 2014, 12295394 tourists have visited Mahabalipuram. It is the **top most (1st)** place among foreign tourists and **14th visited** among domestic tourists in the state of Tamilnadu.

Solid Waste Management

The solid waste management in the town is managed by Hand-in-Hand, an NGO with head-office based in Chennai. Hand-in-hand works in the town regarding the solid waste collection, transportation, recycling and disposal. They have organized many awareness campaigns in the town regarding waste segregation and waste management. The town produces 8 tons of solid waste every day and out of this 3 tons is biodegradable waste. Hand-in-Hand introduced source segregation and almost 75% of the town is covered by the source segregation program. The bio-degradable waste is sent to either vermin-composting or bio-metahanation plants. Following information is retrieved from a report from their website (<http://www.hihindia.org/our-success-story/mamallapuram>):

“On an average 3 metric tons of food waste is generated per day from the hotels in Mamallapuram. In association with the Mamallapuram Town Panchayat we installed a bio-methanation plant to efficiently manage bio-degradable waste, especially food waste, generated by the hotels in Mamallapuram.

A 100 cu.m bio-methanation plant with a capacity of handling 500 to 800 kg of food waste every day has been installed. The food waste is converted to methane which is in turn converted to electricity. A 12.5 KVA generator which runs exclusively on biogas has also been installed. The generator has a capacity to produce electricity at 10 KW per hour.

The bio-methanation plant in Mamallapuram is a model project that demonstrates reduced dependency on conventional energy sources. It serves as a demonstration unit for other local bodies to replicate for resource recovery and proper management of organic waste, particularly food waste.”

Field-Visit Findings

The field team visited the town panchayat office and found that the solid waste management in the city is taken care by ‘Hand-in-hand India’ organization. The waste is collected from all the places in the town (Fig M3). The residents of the town have started segregation of waste at source (Fig M4). Hand-in-Hand charges from residences/commercial users/hotels/restaurants for garbage clearance, every month. Charges for commercial users depend on the quantity of waste generated from them.



Fig M3: waste collection truck



Fig M4: segregated waste

Visit to the tourist spots of Mamallapuram showed that the premises locations, under the control of Archaeological Survey of India i.e., *the Five Rathas, Arjuna’s Penance and the Shore temple*, are kept clean and maintained well. The ASI has put up appropriate signboards near the entry points and entry is through tickets (Fig M5). However, garbage is seen around the premises which are also under the

control of ASI like the *Krishna's butter ball* (Fig M6) but there is no restriction on entry through tickets. The main problem appears to be uncontrolled entry points to these premises.



Fig M5: Signboards near ASI monuments



Fig M6: Situation outside and inside *Krishna's butter ball* campus from (left to right)

Discussions with the vendors around the tourist spots revealed that the vendors are willing to use alternatives/ recyclables but are hesitant to take on the burden of the high price of the alternatives. However, there is a positive note. One vendor has successfully replaced his paper cups and plates with leaf plates and cups. This has reduced his profit margin but he was willing to accept the reduction in profit.

KEY OBSERVATIONS – MAMALLAPURAM

- Non-governmental organizations such as Hand-in-Hand can be co-opted for the Solid Waste Management and implementation on ban of use and throw plastics.
- Hand-in-Hand has undertaken lot of awareness campaigns in the town on waste segregation and avoiding plastic usage in order to make the solid waste management successful.
- Garbage is being dumped openly in few of the tourist places because of lack of proper control at the entry points.
- ASI managed locations are kept clean and free of any kind of garbage.
- The residents and the business community are all effectively segregating (credit to hand-in-hand) and disposing their garbage properly through Hand-in-Hand.
- There are food vendors who are willing to forego some of the profit and replace the use and throw plastic items with slightly costlier environmentally friendly alternatives.

4.3 Field Report-Kancheepuram

Information Based on Secondary Sources

City Profile:

Kanchipuram is located at 12.98°N and 79.71°E, 72 km south-west of Chennai on the banks of the Vegavathi River, a tributary of the Palar River (Fig K1). The town is governed by Special Grade Municipality. It has an area of 36.14 sq km and is divided into 51 wards.

Kanchipuram generally experiences hot and humid climatic conditions throughout the year. Temperatures reach an average maximum of 37.5 °C between April and July, and an average minimum of 20.5 °C between December and February. The city receives an average of 1064 mm of rainfall annually, 68% of which falls during the northeast monsoon

Demographic Profile:(source: www.census2011.co.in)

The Kancheepuram Municipality has population of 164,384 of which 81,992 are males while 82,392 are females as per report released by Census of India in 2011. Population of 'children with age of 0-6' is 15955, which is 9.71 % of total population of Kancheepuram. Sex Ratio is of 1005 against state average of 996 while child Sex Ratio is around 956 compared to Tamil Nadu state average of 943. Total literacy rate in Kancheepuram town is 88.06 %, higher than state average of 80.09 %. Male literacy is around 92.91 % while female literacy rate is 83.25 %.

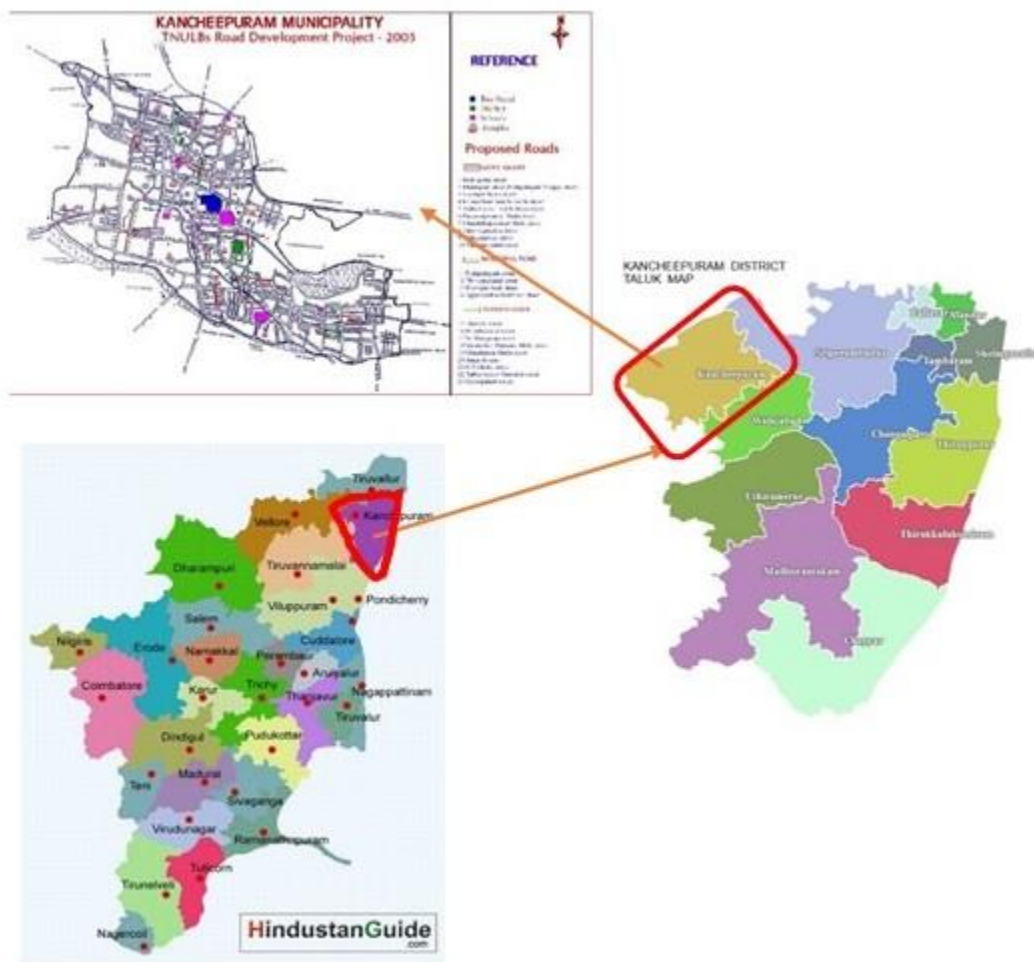


Fig. K1: Location map of Kancheepuram

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.kanchi.tn.nic.in/kpmmaps.html>
- Kanchi town map taken from <http://123.63.242.116/kancheepuram/abt-wardmap.htm>

Tourist Profile:

Ancient Kanchipuram, the city of thousand temples, is one of the seven most sacred pilgrim centres for the Hindus. There now remain about 126 temples in Kanchi and a few more in its outskirts. The city was the capital of the Early Cholas as far back as the 2nd century BC and a Pallava capital between the 6th and 8th centuries. The following is the description of few prominent temples in Kanchi. Few prominent temples in the town are:

Kamakshi Amman Temple: The Kamatchi Amman koil is one of the important temples of the town and is dedicated to Goddess Parvati in the form of Kamakshi or the Goddess of Love. The sanctum sanctorum of this temple can be reached by passing through a large mandapam (hall) with ornate pillars.

Kailashnatha Temple: The Kailashnatha temple dedicated to Lord Shiva is the oldest temple of Kanchi. It can also be described as the worthy successor of the rock temples at Mahabalipuram. The eighth century remains of murals within the temple are an indication of the magnificence of the original temple.

Vaikuntha Perumal Temple: The Vaikuntha Perumal temple is dedicated to Lord Vishnu and was built shortly after the construction of the Kailashnatha temple. The covered passages inside the outer walls of this temple are supported by lion pillars. The main shrine dedicated to Lord Vishnu is on three different levels and contains the images of Lord Vishnu in standing, sitting and reclining postures.

Silk City:

Apart from its various temples, Kanchipuram is also famous for specialized silk saris known as “Kanchipuram silk saris”. Kancheepuram has thousands of handlooms and skilled weavers that make its silk sarees one of the best in the entire world. About 75% of the city's population are associated with the handloom industry either directly or indirectly. The Silk Industry is entirely made up of Handloom weavers and merchants.

According to Tamil Nadu Tourism report 2014, **14901230** tourists have visited Kanchipuram. It is the **7th most visited** place among domestic tourists and **3rd most** among foreign tourists in the state of Tamilnadu.

Solid Waste Management:(http://123.63.242.116/kancheepuram/sal_solidwastemanagement.htm)

Kancheepuram town generates around 55.0 tonnes of waste every day at a rate of 350 grams per capita per day. The higher per capita waste generation rate is attributed to the Weaver's area and Dying Units

of the town. Managed by the Health department of the local body, the waste is collected by 12 vehicles from 5 major collection points of the town on a regular basis. On average 45.50 tonnes **(80% of total generated)** of waste is being collected from all the 6 health zones/Divisions.

Compost Yard:

There are two municipal Compost yards for dumping the garbage, one at Tiruveethipallam 3 km away from the town on the southeast direction and another at Arapanancheri 5 km from the town in the northeast. The areal extent of these two sites are 3.03 ha (7.5acre) and 1.5 ha(3.8 acre) respectively. The composition of waste is: Biodegradable – 56%; Paper-10%; Plastic-11%; Glass-2% and others-21% (Pynthamail, S.R. and Joshua, A, “Study on the composition of municipal solid waste in Kanchipuram municipality”, International Journal of Applied Bioengineering, 5(1), January 2011, 40-43). In another study carried out from nearby Sriperumbudur municipality, it was found that 83% of plastic waste was made of carry bags (Lavanya et al., Municipal solid waste management in Sriperumbudur, Kanchipuram District, International Journal for Research in Applied Science & Engineering Technology, 4(2), 2016).

Bio-degradable bags

Kancheepuram municipality has now joined hands with *Regeno Ventures* (Chinniyampalayam, Coimbatore, Tamil Nadu 641012; <http://www.regeno.in>), a Coimbatore based company that manufactures compostable bags. In February 2018, an event was organized by the municipality where samples of the bags were distributed among the major vendors/hoteliers/stakeholders etc. of the town. The bags are biodegradable and bio-compostable and can be recycled with paper. Though they look like plastic bags, they contain no polyolefin and, instead, are made from vegetable starch and other natural extracts, with maize, tapioca and vegetable oil being the base materials. The specialty of the bags is that they can be dissolved in water at a high temperature. The bag costs minimum of Rs 3 for small size and increases with size and holding capacity of the bag.

Field-Visit Findings

I. Sri Kachebeswara Temple

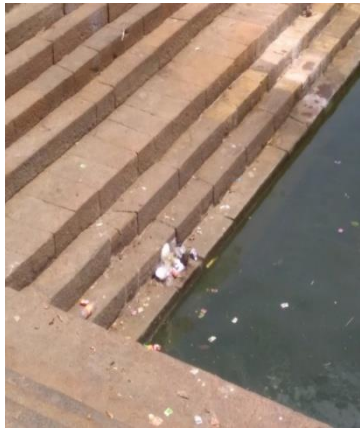
Visit to the temple shows that the temple premises are not kept clean (Fig. K2). The main entrance and the temple well are points of littering and garbage disposal. The temple tank and the temple compound outside the main deity temple are also filled with litter from the religious offerings and food offerings for the fishes in the temple tank.



Garbage disposal in temple well



Temple entrance



Temple tank with plastics



Remains of puja in temple

Fig. K2: Premises of Kachebeswara Temple

Discussion with the temple management officials:

Visiting IIT Madras team had discussion with temple management official. It was informed that the temple management has put up a notice board with general information on how and why to avoid plastics near the entrance of the Temple. Of the 3 entrances to the temple, 2 are currently in use. There is no security guard at the entrance and so there is no check on the visitors. Most of the people who are offering food to the fish in the temple tank litter around the tank. The management has a plan to appoint a person in future to check for plastic carry bags, water bottles etc., from the visitors.

A retired Government official also suggested that the Government should take action on the plastic bag manufacturers. Violators should either be penalized or punished.

II. Kamakshi Amman Koil

The team had a discussion with the security near the temple and found that all three entrances of the temple are guarded by security persons. However, there are no proper instructions to the security personnel regarding plastic ban and its usage. Hence, they do not check for plastics from the visitors. Discussions with the temple management officials have revealed that the temple management is planning to take over the shops near the temple premises after renovating the temple. This may take around 6 months. The management felt that implementation of 'No-Plastics' campaign would be easier and effective after the management takes over shops.

- III. IIT Madras team found similar views when they visited **Varadarajaswami temple** and **Kumarakottam Murugan Temple**. Though the temple premises has a signage on 'No-Plastic' (Fig. K3), the rules are not followed much by anyone.



Fig. K3: Signage on Murugan temple wall

- IV. **Kailasanth temple** is the only campus with a difference, as the temple is under the management of Archaeological Survey of India (ASI). The temple is well maintained and the securities follow strict rule of not allowing plastics inside the premises.
- V. Discussions with vendors near all the 4 temples (Fig. K4) indicated that the plastic ban can be effectively implemented if there is strict enforcement and if the violators are fined. The imposition of **fine and the suggested alternatives must be uniform** for all the shops. Individual consumers also must be made aware of the plastic ban in order to reduce the usage of bags because customers demand bags to carry the material to houses. Though few vendors started to use recyclable bags, they reverted to plastic bags as **micro-cloth bags are priced high and many other vendors have been using plastic bags**. The micro-cloth bags are priced anywhere from

Rs.132 to Rs.150 per kg and with print Rs.190 per kg while plastic carry bags are priced substantially less. Almost all the vendors informed that they would responded **positively to the idea of ban on one-time use of plastic** if they are given an **economical and viable alternative**.



Fig K4: Discussions with different vendors

VI. Discussions at the Municipal Office

The Local Government is trying to implement the plastic ban in the town (Fig K5). However, there is a lack of manpower to follow-up on its initiatives. Officials have felt that the ban would be successful if there is proper follow-up. The government had organized a campaign on ‘No-Plastic-Kanchipuram’. It has also recently organized an event where they promoted bio-degradable bags. Officials also suggested that if the government decides to subsidize the recyclable bags or reduce GST on Bio-degradable bags, then people would be willing to use them as alternatives to plastic.



Fig K5: Banner on ‘No-Plastic Bags’ put up in the Municipal Office

KEY OBSERVATIONS – KANCHEEPURAM

- Kailashnath temple premises under ASI are better managed and cleaner than other temples.
- Though some temples have put up boards regarding 'Avoid Plastics' not much follow-up action has been taken up.
- Vendors are not using alternatives to plastic as they are much costlier and are afraid of losing business. Reduced cost of bio-degradable bags or other economical alternatives might encourage people to use them.
- There are cases where banned bags (< 50 microns thickness) are being sold illegally.
- Plastic carry bags are banned in the weekly market (*santhai*) in Panapakkam and the ban is being successfully implemented. This indicates that it is important to strategically instruct the associations so that the ban is implemented and followed uniformly across all types of vendors.
- Earlier 'No-plastic Kanchipuram' campaign could initiate the process of plastic free lifestyle. However, this lasted only for few initial days.
- The municipality has taken up few initiatives. Continual follow-up from the government side can improve the 'plastic ban' programme.
- Volunteers are ready to help the government officials in the efforts to impose the ban on use and throw plastics.

4.4 Field Report - Palani

Information Based on Secondary Sources

Town profile:

Palani is a popular religious tourist place in Dindugul district of Tamilnadu. It is located about 100 km, South-east of Coimbatore, 100 km north-west of Madurai, and 60 km west of Dindigul (Fig P 1)

Demographic Profile(source: www.census2011.co.in)

The town is governed by Palani Municipality and is administratively divided into 33 wards spread over 6.63 sq km. The town has population of 70467 of which 34827 are male while 35640 are female, as per report released by Census India 2011.

Population of children with age of 0-6 is 6467 which is 9.17 % of total population of Palani. Sex Ratio is of 1023 against state average of 996. Literacy rate is 78.95 % lower than state average of 80.09 %. Male literacy is around 83.56 % while female literacy rate is 74.45 %.

Tourism:

Palani Murugan temple is one of the very famous temples in South India. Thousands of devotees visit the temple every day. The number reaches to lakhs during festive seasons. The temple is located on top of a hill and there are three ways to reach the top viz., Winch system, Cable car system and by foot.

According to Tamil Nadu Tourism report 2014, **13005644** tourists have visited Palani. It is the **13th most visited** place among domestic tourists and **12th most** among foreign tourists in the state of Tamilnadu.

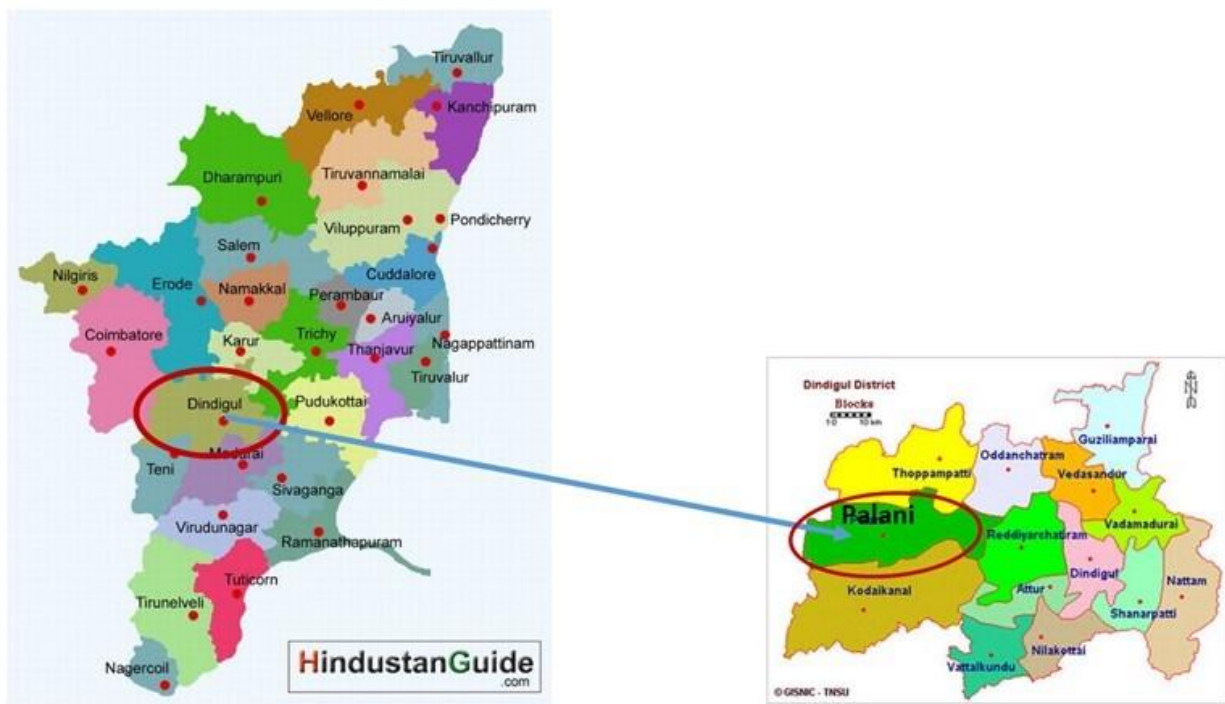


Fig. P 1: Location map of Palani

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://dindigul.nic.in/map.html>

Solid Waste Management(Source: paper collected from Municipality)

Around 41 MT of waste is generated in the town every day of which 20 MT (48%) is collected is Bio-degradable. Quantity of recyclable waste is 4.7 MT (11.46%), inert waste is 15.3 MT (37.31%) and on-site compost park waste is 1 MT (2.43%).

Field Observations

The field team visited Dandayuthapani temple. The premise was found to be relatively clean and well-maintained. There are dust-bins placed every 5m distance (Fig P2) and there are cleaning staff continuously working in the temple and its surroundings on the hill. Most of the waste collected from the temple campus is bio-degradable. May be around 10% is plastic waste. RO water units within the campus also reduces the need of carrying water bottles. The temple management is planning to install more such RO plants within the premise. There are different information boards within the campus to avoid plastic bags and bottles and to avoid flammable items inside the temple (Fig P4).



Fig P2: Dustbins placed inside the temple campus



Fig P3: RO water unit



Fig P4: Information boards placed inside the temple campus

The temple management has sub-contracted the maintenance like cleaning work (Fig P5), Free Meals Hall, Hill-Steps cleaning, Toilets cleaning, Waste transportation to panchayat etc., to a private firm named, Padmavathi Manpower services. Every month, mass cleaning activity is conducted along the hill slopes. Apart from the people working for the temple, NGOs, volunteers too participate in these activities (Fig P6)



Fig P5: Waste collected in the temple



Fig P6: Hill cleaning activity

Services like temple security, temple transport facilities, (Winch/Rope way), *Prasadam* preparation etc., to another firm named Aravindh Associates. There are 8 stalls inside the temple premise. Plastic bags are not used in these stalls. However, the cloth bags are too costly that visitors are not willing to buy. Micro-cloth bags cost Rs 10 and stick cloth bags cost Rs 20 (Fig P7). When spoke to the temple management about it, the representative said that the cost of bags is decided by the private sub-contractor and not temple management. Though the stalls are not maintaining plastic bags, they are selling *prasadam*s in plastic bags. (Fig P8) When asked about it, the management showed positive sign to change the plastic packaging to suitable alternate packing.



Fig P7: Different bags at the stalls in the temple campus



PLASTIC PET BOTTLE – Rs. 35

ALUMINIUM TIN – Rs. 40

Fig P8: Prasadam bottles

The field team spoke to a representative from Aravinth Associates, to know their views on plastic ban. There was an opinion that plastic waste generated on the hill-top is because the visitors carry them from vendors down-the-hill and to stop that, vendors down-the-hill need to use cloth bags. It is not practical to check all the people visiting the temple on the hill, as the number of visitors is in thousands.

The temple management has future plans to set-up 3 cloak-rooms near all the 3 entrance ways (Winch, cable car and steps) down-the hill, for the tourists to keep their plastic things before starting to climb the hill for temple *Darshan*. The team had also visited few other important temples in Palani and observed that almost all of them are neatly maintained. There are dustbins properly set-up and used in the temples. Once the dustbins are full, municipality pick-up truck collects the garbage and transports it to the dump yard.

Though the vendors near the temples are using cloth bags, they are keeping plastic bags also. They say that most of the customers do not wish to buy cloth bags to carry their purchases. The vendors charge Rs 5 extra for cloth bags. So for those customers, the vendors use plastic bags. (Fig P9)



Fig P9: Cloth bags and plastic bags with a vendor

Hotels and street-side food stalls, though use banana leaves for dine-in, plastic sheets are used for packaging purpose as they do not have any other alternative material. (Fig P10)



Fig P10: Kitchen of a hotel

Talking to the government officials at the municipality, the team understood that there has been a plastic ban in Palani on 9/6/2017, published in Dindigul Gazette. They have undertaken awareness programmes, distributed pamphlets and posters all over the town. However, they lack manpower to do regular follow-ups on the plastic ban. They are planning for efficient solid waste management system through bio-gas plant and Micro-composting. (Fig P11)



Bio-Methanation plant



Waste segregator



Micro-compost yard

Fig P 11: Installed equipment for SWM

Swachh Bharat programme animators are presently involved in creating awareness on waste segregation and plastic usage reduction among the residents of Palani. Every Monday plastic waste is segregated from the week's waste. Plastic bottles thus segregated are sold to recyclers and the money is

then shared among the sweepers. Other plastic waste is sold to nearby cement factories or used in laying roads. They felt that the municipality may get powers to fine plastic manufacturing units once the state government issues GO on plastic ban. They also said that they do not have authority to control temple and its premises. They have issued notice to the temple authority to implement waste processing as they are Bulk Waste Generators, and as per law, Bulk-generators are responsible for their solid waste management.

Going around the town, the team has observed few places where the drainage is blocked because of accumulated plastic waste. (Fig P12)



Fig P12: Plastic waste blocking drainage

Gandhi Market

Team observed that almost all the shops/vendors/retailers in this market use plastic bags (Fig P14). Though there are wholesale shops supplying plastic bags with more than 51 microns, (Fig P13) only few buyers are available as they are costly than normal bags. Talking to the vendors revealed that there are no alternatives for plastic in packaging sector. So, if the government shows alternatives, all are ready to use. They also suggested that manufacturing units should be controlled, if plastic ban needs to be implemented successfully.



Fig P 13: Plastic bag-51 microns



Fig P 14: Vendors

KEY OBSERVATIONS – PALANI

- There is a confrontation between two management authorities, the temple authority and Town Panchayat.
- Already Plastic Ban in place. Pamphlets distributed in the town.
- People use plastic items as they don't have alternatives
- Willing to accept alternatives if easily available and economical

4.5 Field Report - Yercaud

Information Based on Secondary Sources:

Town profile:

Yercaud is a hill-station in Salem district of Tamilnadu (Fig Y1). Located at an elevation of 1515 m, the Taluk of Yercaud has an area of 382.67 sq km including reserve forest. Yercaud has also a Panchayat Union with its Head Quarters at Yercaud and its Jurisdiction is the same as for Yercaud Taluk (www.salem.nic.in/)



Fig. Y1: Location map of Yercaud

Sources for figures above:

1. State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
2. District map taken from <http://www.salem.tn.nic.in/images/ablkmap.gif>

Demographic Profile (source: www.census2011.co.in):

The Yercaud Census Town has population of 11,582, of which 5,868 are males while 5,714 are females as per report released by Census India 2011. Population of children with age of 0-6 is 1106 which is 9.55 % of total population of Yercaud(CT). Literacy rate of Yercaud town is 83.17 %, higher than state average of 80.09 %.

Tourism:

Yercaud is one of the low-cost hill stations in India. According to Tamil Nadu Tourism report 2014, **93,35,888** tourists have visited Yercaud. It is the **17th most visited** place among domestic tourists and **20th most visited** among foreign tourists.

Yercaud Plastic Ban:

The panchayat has banned plastic usage from April, 2018 (Fig Y2).



Fig Y2: Notification on plastic ban and signboard

Field Observations

‘No-plastic’ sign board and awareness paintings have been put up all over Yercaud town after the notification on ‘plastic-ban’ in April, 2018 (Fig Y3). Cloth bags were also distributed free of cost to a few vendors in Yercaud.



Fig Y3: Signage across Yercaud

Discussions with a few vendors, has revealed that they have been using cloth carry bags for the last one month (Fig Y4) because the plastic ban initiative is recent and the panchayat officials have been insisting not to use plastic carry bags. However, the bags are costly and they vary from Rs 3 to Rs 10 depending on the size. Silver color sheets are being used in the place of usual plastic spreads in street hotels. This material is similar to material used in railway stations and restaurants to pack hot liquid food items such as sambar etc. They appear to be plastic, as claimed by one of the wholesale vendor.



Fig Y4: Vendor shops

A visit to Aquarium under the Panchayat shows that there is garbage in the premises. The garbage is collected and put in the backyard (Fig Y5).



Fig Y5: Aquarium Premises



Fig. Y6: Deer Park Premises

Case is same with Deer park under Forest department. Waste is collected, dumped behind the park and burnt when the garbage piles up (Fig Y6). The same situation was observed in almost all the tourist spots in Yercaud (Fig Y7).



Boat house-premises



Gent's seat view point



Yercaud lake surroundings



Botanical Garden

Fig Y7: Garbage dumps at several locations

Discussions with Officials:

Officials of horticulture department informed that the waste collected in rose garden and botanical garden is mostly garden waste and so they burn it. However, IIT Madras visiting team found few plastic items thrown by the tourists coming inside after buying from the street shops just outside the parks. The department is planning to install an RO plant inside the gardens in order to reduce the number of water bottles being brought into the premises by the tourists.

Panchayat officials informed that that daily 4 tons of solid waste is collected in the whole of Yercaud panchayat of which 500 kg is plastic waste. Of these 500 kg, 50% is Water and Cool drinks bottles; 40% is Plastic carry bag; 5% is plastic tumblers; and 5% is other plastic material. Yercaud Panchayat has severe shortage of manpower and transport vehicle for effective solid waste management in the town. They have been maintaining the same number of staff for SWM for almost 15 years even though the population, tourist inflow, development activities and consequently the garbage quantity have increased. Only recently, they have recruited few temporary staff. There used to be a dump yard within Yercaud town(Fig. Y 8) but because of protests from the local people, the dump yard has been shifted to another place which is very far from the town. Thus making it difficult to make frequent rounds to the dump yard.



Fig Y8: Old dump yard site in Yercaud

KEY OBSERVATIONS – YERCAUD

- Already the Plastic Ban is being implemented. It has been initiated a month ago in April 2018.
- There appears to be no cooperation between Panchayat, forest department, TTDC and horticulture department. Cooperation between these agencies is essential for better results.
- Frequency of garbage collection by the Panchayat is not sufficient for the amount of garbage generated on a daily basis. This is due to manpower and vehicle shortage. Also, the new dump yard is located far away.
- Community is unaware of pollution due to garbage burning.
- RO plant inside gardens – an useful idea.

4.6 Field Report –Hogenakkal

Information Based on Secondary Sources

Town profile:

Hogenakkal is a beautiful waterfall in river Kaveri, falling from an altitude of 750 ft. It has Melagiri Hills in its backdrop. It is also called as *Marikottayam* by the people of Tamil Nadu. Hogenakkal is located in Dharmapuri district of Tamilnadu (Fig H1). At this place river Cauvery enters into Tamil Nadu from Karnataka. Hogenakkal is located 180 km from Bangalore and 46 km from Dharmapuri. Hogenakkal village comes under Koothapadi panchayat village within the Pennagaram sub-district of Dharmapuri district.

Tourism:

Hogenakkal is popular for its locally made boat rides. The boats, called Theppa or Parisal, are made of bamboo and are generally oval in shape. According to Tamil Nadu Tourism report 2014,

14505323 tourists have visited Hogenakkal. It is the **8th most visited** place among domestic tourists and **17th most among** foreign tourists in the state of Tamil Nadu.

Field-Visit Findings

The IIT Madras field team had in-depth discussions with several vendors. It has been estimated that more than 500 shops are around the Hogenakkal Falls area. Usage of carry bags and other 'single-use' plastic items like glasses, cups, plates and water bottle is very common in this area (Fig. H2). Most of the vendors are aware of the issues related to plastic usage, but they are not aware of the alternatives and the non-plastic usage. People just throw whatever trash they have into the water during their boat ride (Fig H3).



Fig. H1: Location map of Hogenakkal

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <https://www.mapsofindia.com/maps/tamilnadu/tehsil/dharmapuri.html>



Fig H2: Vendors near Hogenakkal falls

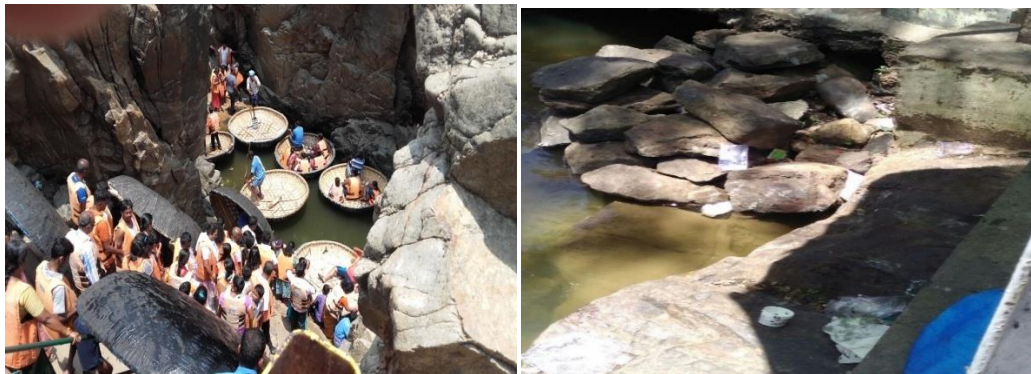


Fig H3: Hogenakkal falls, water with plastic waste

A walk around the falls area revealed that there are no proper dustbins for the visitors near the falls. So there are heaps of garbage all around (Fig H4). The surroundings, the places where fresh fish is cooked and sold to the tourists, are full of garbage, mostly plastic plates, glasses, cups, plastic bags, water bottles, paper plates etc. (Fig H5). People perform pujas/rituals/funerals along the riverbed and leave the remains on the banks of the river (Fig H6). An NGO, Kaveri Nadi Neer Meetpu Arakattalai, linked to a nearby ashram, is trying to clean the river banks.



Fig H4: Garbage thrown around



Fig H5: Eating place near the falls



Fig H6: Banks of the river, upstream

TTDC, Fisheries Department and Koothapadi Panchayat are using leaf plates in their facilities. Most of the plastic usage is for plastic cups, glasses, bottles and plastic spreads in street-side hotels, although a few street-side hotels are using banana leaves. Also, most of the packaging material is plastic.

People are collecting and burning the garbage on a daily basis because the Panchayat staff comes every day to collect the garbage but does not cover full area of the falls. The Panchayat is unable to do

anything better than this because its office is located around 20 km away and also, they are understaffed.

Crocodile Farm

Crocodile farm is being managed by the Forest department. Though the campus is maintained neatly, the garbage is collected and dumped on the backside of the farm (Fig H7). However, the forest department takes clean-up drives in the village and its surrounding areas sometimes (Fig H8).



Crocodile Farm Entrance



Inside crocodile farm



Crocodile farm campus backside

Fig H7: Crocodile Farm area



Fig H8: Forest department clean-up drive

Aquarium

Aquarium is another tourist spot near Hogenakkal falls. The aquarium is managed by the Koothapadi Panchayat and the premise is well maintained. (Fig H9)



Fig H9: Aquarium in Koothapadi

Other locations

The garbage pile-up can be seen around many other tourist places like, Hanging Bridge, Herbal Garden, Kaveri Amman Temple etc. In some areas the garbage is also sometimes burnt. (Fig H10).



Fisheries department Trolley

Fish Market



Garbage burnt near Fish market



View from hanging bridge



Inside herbal garden

Fig H10: Garbage dumping in other areas

Local Eco-preneurs

There are several small-scale industrial units which make plates of different sizes from dried palm leaves and supply these plates in the nearby towns (Fig H11).



Fig H11: Small-scale industries making plates from dried palm leaves

KEY OBSERVATIONS – HOGANEKKAL

- The waterfalls and surrounding area is full of garbage. Several boatmen from the Boatmen Association are volunteering to collect the garbage around the falls. They charge Rs. 10 from each boat, apart from the boat ride charges collected by the panchayat. Tourists/vendors near the area are responsible for the garbage pile-up
- Garbage is not cleaned regularly. There are no dustbins near the area. Riverside used for religious/cultural purposes is not maintained properly. Hanging bridge area, herbal gardens are all full of garbage. Aquarium and Herbal garden are maintained by Panchayat. Panchayat has put up a board of “no plastics”. Dust bins are provided only near the garden.
- Few shops in the area are using bio-degradable leaf plates.
- Crocodile farm under Forest Department is clean. However, the waste from the campus is simply burnt outside.
- There is no cooperation between different departments.
- Forest department has put up boards along the road from the check post to the Hogenakkal entrance. They conduct regular clean up drives. Vendors are not aware of alternatives to use and throw plastics.
- Koothapudi Panchayat has conducted an awareness campaign back in the year 2009. They had distributed steel tumblers. They conduct raids, but very infrequently due to lack of manpower. Also, there are no follow up actions.
- A positive aspect is the presence of small-scale industries which make plates from dried palm leaves. Thus a nucleus exists for encouraging setting up more such units in the area to cater to the increased demand. 12” plates cost Rs. 3.60 while 6” plates cost Rs. 1.00.

4.7 Field Report - Pichavaram

Information Based on Secondary Sources

Pichavaram Profile:

Pichavaram mangrove is located 200 km south of Chennai, in Cuddalore district of Tamil Nadu (Fig. P1). It is the world's second largest mangrove forest. The mangroves of Pichavaram are distributed in three Reserve Forests with a total area of 1357.72 ha. Excluding the lagoons and waterways, mangrove vegetation occupies an area of 475 ha. Pichavaram mangroves are considered among the healthiest mangrove occurrence in the World. Pichavaram consists of a number of islands interspersing a vast expanse of water covered with green trees. (Source: Cuddalore district report (2015-16))



Fig. P1: Location map of Pichavaram

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://cuddalore.tn.nic.in/images/maps/4.jpg>

Pichavaram mangrove forest is located between two prominent estuaries. It lies in between the Northern Vellar and Southern Coleroon estuarine systems and along with Killai lagoon, is referred to as the Vellar Coleroon estuarine complex. The Mangrove wetlands provide an important ecological asset and an invaluable economic resource to the coastal communities. It is also rich in fishery resources. Annually about 245 tons of fishery produce is harvested from this mangrove wetland, of which prawns alone constitute 208 tons (85%) of the catch. The people belonging to 17 hamlets of five revenue villages utilize the fishery and forestry resources of the mangrove wetlands. A total number of 1,900

fishers are annually dependent on the fishery resources for their livelihood; some 1,000 fishers fish seasonally in the mangrove waters. Some 800 to 900 cattle graze the mangrove wetlands seasonally (Source: http://www.townpanchayat.in/killai/town_profile#). These mangroves **attract an appreciable bird population** of residents, local migrants and true migrants. One can view snipes, cormorants, egrets, storks, herons, spoonbills and pelicans. At the mangroves, so far, 177 species of birds belonging to 15 orders and 41 families have been recorded (source: <https://tamilnadu-favtourism.blogspot.com/2009/10/pichavaram-pichavaram-second-largest.html>)

Pichavaram Dawn Festival:

The Tamilnadu Tourism Development Corporation and the District Administration of Cuddalore District conducts an eco-tourism festival named "Dawn Fest" (Vidiyal Vizha) at Pichavaram. Dawn fest offers a unique experience of local beauty and local cultures and traditions to international and domestic tourists. According to Tamil Nadu Tourism report 2014, **691243** tourists have visited Pichavaram and the tourist inflow has only been increasing over years.

Administration and Maintenance of Pichavaram:

Pichavaram Mangroves are maintained by Tamilnadu Tourism Development Corporation and State Forest Department. TTDC is involved in providing recreational activities like boat ride to the incoming tourists and the also in maintaining the Pichavaram Tourist Campus. Forest Department is responsible for the maintenance of Mangroves. Pichavaram administratively comes under Killai Panchayat, which takes care of providing services to Pichavaram and surrounding villages.

Degradation of Mangrove Forests (Source: MSSRF Report, 2010):

People have arrested the inflow of tidal waters after clearing the mangrove vegetation and have used the land for farming or construction of buildings. Cattle grazing is one of the major causes for the destruction of mangroves in Pichavaram of Tamil Nadu. Unscientific management of Pichavaram mangrove forests over the years also has significant negative impact on the mangroves.

Field-visit Findings

There is only one small shop which provides eatables and water bottles within the Pichavaram Boat campus. Most people purchase water bottle from here before going on the boat ride. The shopkeeper does not use any kind of plastic bags, apart from which come along with packing of the consumables. As, there are no shops within the campus, tourists generally carry their own food.

TTDC jurisdiction is limited to Boat-house campus. Dustbins are provided near the shop and throughout the premises. Most of the tourists use these bins and also staff is provided to maintain the cleanliness of

the campus. TTDC has put up '**Avoid Plastics**' sign boards within the campus (Fig P2). However, the entire waste is collected and kept in a corner or is dumped outside the premises until the workers from Killai Panchayat come and collect the waste (Fig P3). Pichavaram Boat-House garbage (under TTDC) is collected fortnightly by the nearby Killai Panchayat. They charge Rs 1000 per clearance and this amount is costly for the department. So they are called once in two weeks.

TTDC also has displayed "**Avoid Plastic**" Board near the Boat House. The TTDC Boat drivers are trained to instruct tourists not to throw any waste into the forest. The boat driver collects water bottles or any waste from the tourists while on the ride. A TTDC employee felt that **for better implementation** of plastic ban, **local villagers or self-help groups** could be employed, which could benefit them too. Tourist entry points could be used to check the tourists for any kind of plastic items.

Killai Panchayat conducts **awareness programs** once in six months. School students collect 'use and throw' plastics within the Killai town. The **panchayat** has been constantly working on '**Single use plastic ban**'. Though the local vendors of Killai town used recyclable carry bags for few months on suggestions from Panchayat, they discontinued the usage as the **recyclable bags** are **costly**. The vendors are ready to use recyclable/bio-degradable/reusable bags if offered at **nominal price**. Consumers also must be educated to **CARRY OWN BAG** for shopping or purchasing.



Fig P2: Dustbins and signboards in the premises



Inside the Campus

Outside Compound wall

Fig P3: Dumping along the wall of the premises

A discussion with a forest department official indicates that the mangrove areas are managed by Forest Department. **Once in six months** Forest Dept. organizes **cleaning campaign** through School & College NCC students. The collected garbage is **burnt**. In case of any film shootings, the crew has to collect and dispose off the entire waste, else they would be fined. However, the local villagers also dump wastes including plastics regularly into the mangroves.

The forest department has also recently taken up boat-ride along the mangroves. Thus, now both the departments have two areas where the boat-rides for the tourists are operational. The red coloured flags show the delineated boundaries between for boat rides. (Fig P4). Though there are proper instructions, the field staff had still found bottles at various locations in the mangroves (Fig P5). It was also found out that there are few islands within the mangroves which could be illegally accessed and one can find illegal waste dumping on those islands too.



Fig P4: Boat rides by TTDC& TNSFD



Fig P5: bottle inside mangroves

KEY OBSERVATIONS – PICHAVARAM

- There is a confrontation between two management authorities, the tourism department and the forest department. Cooperation between these two agencies is essential for effective implementation of ban on use and throw plastics
- The charges paid to the panchayat for garbage collection are not affordable by the TTDC department.
- Though there are proper instructions, the field staff had found waste bottles at various locations in the mangroves.
- The forest department though organizes garbage picking up from the mangroves, they sometimes burn the collected garbage, which needs to be re-looked into.
- There are illegal prawn cultivations within the area. Chemicals used in prawn cultivation has degraded the water quality apart from other activities.
- It has been observed as there are not many shops inside the premises. Therefore, ban can be effective if restrictions are put on the plastic items that the tourists carry into the campus.

4.8 Field Report-Thanjavur

Information Based on Secondary Sources

Town profile:

Thanjavur is a famous ancient tourist place in the district of Thanjavur of Tamilnadu. The city is also the district headquarters. It is at 314 km south-west of Chennai and 56 km east of Tiruchirappalli (Fig Th1).

Demographic Profile (source: www.census2011.co.in)

The town is governed by Municipal Corporation and is administratively divided into 51 wards spread over 33.3 sq km. Thanjavur city has population of 2,22,943 of which 109199 are male while 113744 are female, as per report released by Census India 2011.

Population of children with age of 0-6 is 19860 which is 8.91 % of total population of Thanjavur. Sex Ratio is of 1042 against state average of 996. Literacy rate is 91.27 % higher than state average of 80.09 %. Male literacy is around 94.80 % while female literacy rate is 87.92 %.

Tourism:

The Chola Capital city, Thanjavur, formerly also known as Tanjore, is an important center of South Indian religion, art and architecture. UNESCO designated world heritage sites are in and around Thanjavur.

According to Tamil Nadu Tourism report 2014, **13565975** tourists have visited Thanjavur. It is the **10th most visited** place among domestic tourists and **8th most** among foreign tourists in the state of Tamilnadu.



Fig. Th1: Location map of Thanjavur

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <https://www.mapsofindia.com/maps/tamilnadu/tehsil/thanjavur.html>



Fig Th 2: Thanjavur Big Temple

Solid Waste Management

About 110 metric tons of solid waste is generated in the city and 100% is cleared daily by the municipal corporation staff. Women self-help groups are involved in solid waste management process. At the city dump yard, there are people, on contract, who segregate and recycle few recyclable materials. Around 30-4-% of the waste generated is plastic waste. (Fig Th 3, 4)



Fig Th3: Corporation dump yard



Fig Th4: Segregated recyclable waste

In the year 2016, the Municipal Corporation of Thanjavur had framed *bye-laws on Plastic wastemanagement* under its administrative area. The bye-laws clearly identifies and instructs the responsibilities of waste generator, manufacturer, Importers, producers of plastic and, local governing body or Gram Panchayat within the limits of Thanjavur City Municipal Corporation.

Field Observations

DIVAS is an NGO based in Thanjavur and a subsidiary of Rotary club of Thanjavur. DIVAS group has been working on ‘**plastic-free zone**’ in the Big Temple premises. The group has conducted mass rallies for plastic free big temple in the year 2017 and also distributed cloth bags to many of the residents of Thanjavur. (Fig Th5). The activity was also supported by the district administration too.



Fig Th 5: Cloth bag distribution in Thanjavur

They have put up boards near the big temple saying ‘No to Plastics’. (Fig Th6)



Fig Th 6: Boards near Thanjavur Big Temple

DIVAS have also appointed few transgender women volunteers to check and educate the visitors about the ‘No- plastic’ campaign.

However, the entire programme is mostly inside the Big Temple campus. Outside, the team did not come across any vendors who do not use plastic carry bags in their shops.

Campaigning is being done by the NGOs and government employees on waste segregation and 'Clean Thanjavur' programmes as a part of Swach Bharat Abhyaan since 2016.

4.9 Field Report – Thiruchendur

Information Based on Secondary Sources

Town profile:

Tiruchendur is a panchayat town at the southern tip of India, in Thoothukudi district of Tamil Nadu (Fig. T1). The Tiruchendur Town Panchayat is spread over 11.0 sq km. Maximum temperature here reaches up to 34.7°C and minimum temperature goes down to 24.1°C. Annual average rainfall of the city is 634.7 mm.

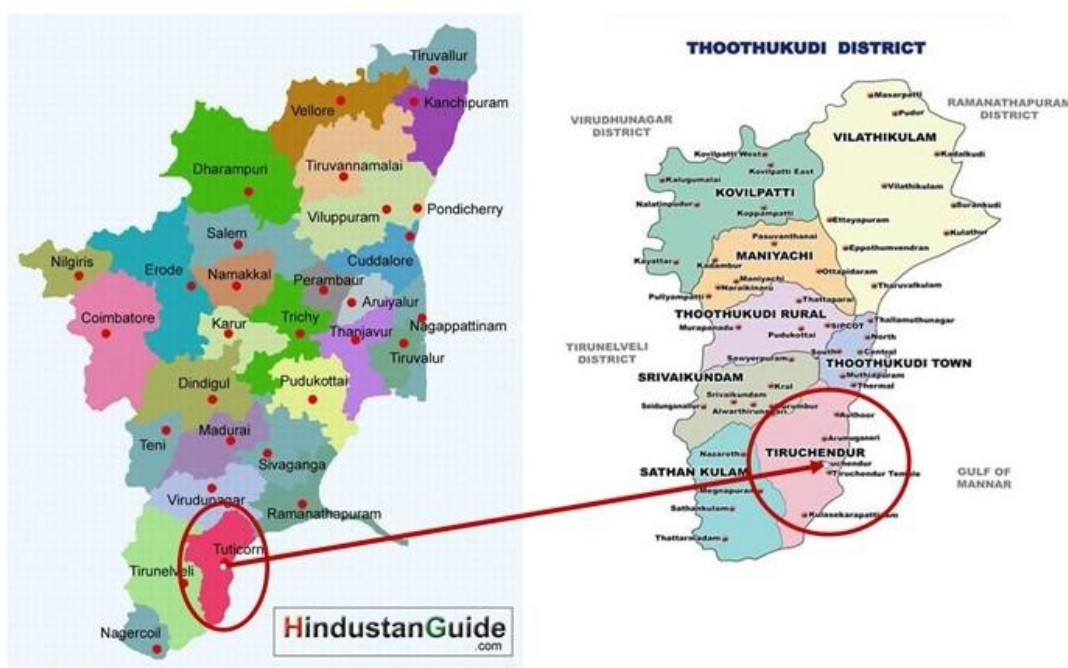


Fig. T1: Location map of Tiruchendur

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.thoothukudilive.in/city-guide/about-thoothukudi>

Demographic Profile (source: www.census2011.co.in)

The town is administratively divided into 21 wards. The Tiruchendur Town Panchayat has population of 32,171 of which 15,973 are males while 16,198 are females as per Census 2011. Literacy rate is 91.38 % which is higher than state average of 80.09 %.

Tourism:

Thiruchendur is one of the major pilgrim centres of South India. It is home to Thiruchendur Murugan Temple, one of the ancient Hindu temples dedicated to Lord Muruga. According to Tamil Nadu Tourism report 2014, **15605372** tourists have visited Tiruchendur. It is the **7th most visited** place among domestic tourists and **3rd most** among foreign tourists in the state of Tamilnadu.

Murugan Temple:

This is the only shore temple of Lord Muruga (Fig. T2). This ancient temple was not affected even during Tsunami of 2004. This Temple is situated at a distance of 40 km from Thoothukkudi. The nine storied tier temple tower of height 157 feet belongs 17th century A.D.



Fig T2: Murugan Temple

Valli cave:

Valli's Cave is a tourist destination and is also known as Dattatreya's Cave. The Cave is located under the sandstone cliff, overlooking the sea. It is located on the sea shore in the northern part of Thiruchendur

Murugan Kovil. Visiting Valli Cave, taking sea-bath, and bathing in Nazhikkinaru are part of the pilgrimage.

Field-Visit Findings

Murugan Temple:

The field team had a discussion with the officials at the temple office. It is understood that the temple management maintains the temple premises and all related services. They do not involve local government in any of its works. Solid waste management in and around the temple premises is handled by a private firm (Padmavathi Group) on contract basis. Temple premises is regularly cleaned by them. The solid waste thus collected is dumped in a yard at Ranimaharajapuram. The waste collected from the temple premises is not segregated and nothing is recycled. Temple management has put up 'Avoid Plastics' boards within the temple premises and have also instructed the vendors to avoid plastic. But the instructions are not followed by anyone. Garbage can be seen all over the place.



Fig T3: Garbage inside and outside the Temple

The above pictures show the difference between solid waste management 'inside and outside' the temple. Outside waste management is done by the Town Panchayat.

Valli Cave Temple:

Valli cave premises are maintained with dustbins. The temple also has a sign of 'No-Plastic' near the entrance of the temple (Fig T4).



Inside the Valli cave



Outside the Valli cave

Fig T4: Valli cave temple premises

Discussions with the Fishermen:

The IIT Madras team had discussions with the people from Fishermen Community (Fig T5). They found out that most of the waste on the beach is thrown by the tourists. Waste is also **dumped** in the water from the **ships passing** along the coast of the town. Panchayat workers come weekly twice for garbage collection which is **not sufficient** for the large quantity of waste generated (Fig T6). As beach area is generally used for sleeping in the night, most of the times, the fishermen either **throw the garbage into the sea, dump it at some other place or burn it**. The people from the community are not aware that the garbage they throw into the sea pollutes the sea and burning of waste is not correct.



Fig T5: Discussion with Fishermen



Fig T6: Garbage on the beach of Tiruchendur town

Discussions with Town Panchayat Officials:

The field team had also visited the Town Panchayat office to get a view from the government side. They found that the Panchayat office has issued notification on '**Plastic Ban**' in the year **2014** and also distributed pamphlets regarding the ill-effects of plastic usage (Fig. T7)



Fig T7: Pamphlets issued by the Panchayat

The Panchayat **frequently organizes meetings with local leaders of *Viyabarigal sangam*** instructing about non-plastic usage. There are 4 associations in the town. Panchayat officers randomly visit shops located in the Thiruchendur Panchayat area and fine Rs 200 per shop, if any banned item is found. There was also an incident where the **local vendors have protested against the fine collection** by blocking roads. The ban, however, did not get the desired result. Lack of cooperation from Murugan Temple

Management and absence of local NGOs to work on the 'No-plastic usage' campaign are hindering their implementation process.

The town Panchayat is planning to make changes in coming three months. They are planning to make **Cloth Bags through Magilar Kulu (Self-Help Groups)** and other such local groups. The Panchayat has displayed a board to segregate waste as a part of Swach Bharat scheme within its compound (Fig. T8). An Ex-counsellor of the Town Panchayat has been working voluntarily to create awareness among the vendor associations and general public regarding how to Avoid Plastics in daily usage.



Fig. T8: Board at Panchayat office

Discussions with a Vanigar sanga Leader

Leader of one of the vendor associations has informed that though the government officials have been arranging meetings to create awareness on how to avoid plastics, they are unable to suggest an economic alternative for plastic. This is the main issue for the vendors. Discussions with few vendors around the town also indicated similar views on plastic ban.

KEY OBSERVATIONS – THIRUCHENDUR

- Plastic ban is already notified. Pamphlets have been distributed in the town. However, the implementation is not effective. There is a confrontation between the temple authorities and Town Panchayat officials. Cooperation between these two agencies is essential for effective implementation.
- Frequency of garbage collection by the Panchayat is not sufficient for the amount of garbage generated on a daily basis.
- Fisherman community is unaware of pollution due to garbage burning.
- Different vendor associations are engaged by the Panchayat in discussions, which is a good strategy. However, vendors are neither willing to pay fines nor willing to ban plastic items as they do not have alternatives.
- Panchayat is planning to create alternative by encouraging Self-Help Groups to make cloth bags.

4.10 Field Report - Kodaikanal

Information Based on Secondary Sources

Town profile:

Kodaikanal is a hill-station in Dindigul district of Tamilnadu (Fig KO1). Located at an elevation of 2133 m, it has a geographical area of 21.65 sq km (www.dindigul.nic.in). It is a special grade municipality with 24 wards.



Fig. KO1: Location map of Kodaikanal

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.kodaikanal.tn.nic.in>

Demographic Profile (source: www.census2011.co.in):

The Kodaikanal Municipality has population of 36,501 of which 18,216 are males while 18,285 are females as per report released by Census India 2011. Population of children with age of 0-6 is 3893 which is 10.67 % of total population of Kodaikanal.

Tourism:

Kodaikanal is also referred to as the "Princess of Hill stations" and has a long history as a retreat and popular tourist destination. Kodaikanal was established in 1845 as a refuge from the high temperatures and tropical diseases of the plains. Much of the local economy is based on the hospitality industry serving tourism. According to Tamil Nadu Tourism report 2014, **13515409** tourists have visited Kodaikanal. It is the **11th most visited** place among domestic tourists and **7th most** among foreign tourists.

Solid Waste Management (http://123.63.242.116/kodaikanal/sal_solidwaste.htm)

Kodaikanal Municipality town generates 14 MT of solid waste per day of which 12.00 MT (80%) is being collected, transported and disposed daily, which works to per capita generation of 300 gm/day. The Urban Local Body also carries out weekly mass waste cleaning program to clear the left out wastes by utilizing extra vehicles trips in the town. The total garbage collected constitutes 50% of the domestic wastes, 43% commercial wastes and 7% of construction wastes.

Plastic Ban

The municipality has banned plastic usage in the year 2015 and since then there are regular follow-ups, awareness campaigns, proper signage and announcements in the town. The ban is being successfully implemented with cooperation from local people, NGOs, volunteers, associations, hoteliers etc. The government has instructed all the shops to sell only one-litre water bottles, use cloth/paper bags, collect trash and hand over to the municipality. They also maintain a phone number, where people can call and complain about garbage in their locality, if not being cleared.

Field Observations**Kodaikanal Lake:**

Kodaikanal lake boat house is a prominent tourist point. The surroundings of the lake are well-maintained and clean. However, use and throw plastics are found at a few locations near the banks of the lake. Although the lake is cleaned twice a week, it is polluted as it receives drainage from upstream (Fig KO2).



Fig KO2: Kodaikanal lake

The lake surroundings are cleaned by private staff and volunteers from the town. Boat house management is under TTDC and they constantly announce on the mikes about avoiding plastics and

avoid littering. SMILE trust, an NGO in Kodaikanal, has distributed buckets to all the boat operators to collect waste from the tourists riding in the boat (Fig KO3).



Fig KO3: Bins being handed over to boatmen

Bryant Park:

Bryant Park is also a tourist point in the town. Bryant park is under Horticulture department. Though the vicinity of the park is generally maintained well by the staff park, only part of the waste is handed over to the municipality. Part of the waste (mostly garden waste) collected is dumped in the backyard and burnt whenever the garbage piles up (Fig. KO4). Along with this waste sometimes they also throw plastic and other such waste collected in the park.



Fig KO4: Bryant Park backside

Coaker's Walk:

Coaker's Walk is a market place in Kodaikanal (Fig KO5). A trip to the place revealed that all the shops (around 30 of them) are given bins to collect wastes at their shops and handed over to the municipality. The shopkeepers were also instructed not to use plastic bags. Hence they are using cloth bags/paper bags or micro-cloth bags (Fig KO6).



Fig KO5: Coaker's Walk



Fig KO6: Shops with non-plastic bags

IIT Madras Field team found that vendors in Kodaikanal use paper bags for packing except for one litre water bottles and items that come pre-packed. Sellers and buyers in the weekly *Santhai* (Sunday Market) also do not use any plastic bags.

TASMAC shop:

TASMAC shop is on the outskirts of Kodaikanal. The campus has waste comprising mostly plastic cups, plastic water bottles and water packets. The waste is burnt once it is piled up (Fig KO7).



Fig KO8: Garbage from TASMAC shop

SMILE Trust:

SMILE Trust is an NGO that has been working on reducing plastic waste in Kodaikanal in cooperation with the government officials in the town. Discussions with a representative of the group revealed that there are groups of volunteers, NGO representatives and government officials in the city for better implementation of SWM in the town. Each volunteer of the trust has been given responsibility for approximately an area of 20m x 20 m. The volunteers look after the waste management and related

issues in their respective areas. The NGO also coordinates with local associations, clubs etc., and acquires extra dustbins and extra workers for the maintenance of the town during summer vacation as the crowd is more and waste generated is also high. The NGO is also involved in producing different types of cotton bags for both ladies and gents thus encouraging tourists and local people to carry their own bags and avoid plastic bags. Different types of dust bins in usage in the city and the sign board across the town are shown in Figs. KO8 and KO9, respectively.



Fig KO8: Different types of bins across the town



Fig KO9: Different types of signage board across the town

Discussions with Government Officials:

In a meeting with the Municipal Officials, the team found that Kodaikanal does not have a separate dumping yard. The waste collected from the town is sent to Panchampatty dump yard in Dindigul district. The municipality now has plans to send plastic waste to cement industries located nearby.

The forest department has put up check points to check the tourists for any kind of plastic bags. Plastic items are not allowed into some of the important tourist places like Moier Point, Pericham Lake, Pillar Rock, pine forest, Mannavakkam Grassland and Guna Cave. All these places are under the control of Forest department. The forest department has private staff to collect garbage and has a private vehicle to transport the garbage to the municipal dumping yard. They have also built a building using waste plastic water bottles which is now a tourist attraction.

KEY OBSERVATIONS – KODAIKANAL

Kodaikanal is a good example where plastic ban has been implemented more effectively over a period of 2 years, as compared to other places visited by the IIT Madras team. It is one of the best examples where there is a good cooperation between government, NGOs, shopkeepers, hoteliers and local people. This has resulted in successful implementation of Plastic ban and better solid waste management in the town.

4.11 Field Report - Trichy**Information Based on Secondary Sources****Town profile:**

Tiruchirappalli, also called Trichy, is one of the major cities in Tamil Nadu located in the district of Tiruchirappalli. It is the administrative headquarters of Tiruchirappalli District. It is located 322 km South of Chennai and 374 km North of Kanyakumari. (Fig Tr 1)



Fig. Tr 1: Location map of Trichy

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.tiruchirappalli.nic.in/maps/Blocks.gif>

Demographic Profile(source: www.census2011.co.in)

The city is governed by Municipal Corporation and is administratively divided into 65 wards spread over 167.23 sq km. Trichy city has population of 847387 of which 418400 are male while 428987 are female, as per report released by Census India 2011.

Population of children with age of 0-6 is 79,723 which is 9.41 % of total population of Trichy. Sex Ratio is of 1025 against state average of 996. Literacy rate is 91.38 % higher than state average of 80.09 %. Male literacy is around 94.85 % while female literacy rate is 88.01 %.

Tourism:

Srirangam temple (Fig Tr2) and Rockfort temple are the two major tourist attractions of the city. It is also an important educational hub of the state.

According to Tamil Nadu Tourism report 2014, **11638830** tourists have visited Thiruchirapalli. It is the **15th most visited** place among domestic tourists and **5th most** among foreign tourists in the state of Tamilnadu.

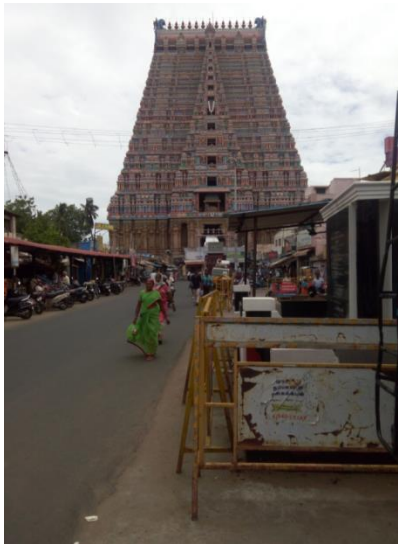


Fig TR 2: Srirangam Ranganathaswamy Temple

Solid Waste Management

(<http://cma.tn.gov.in/tiruchirappalli/en-in/Pages/Solid-Waste-Management.aspx> and other news clippings available online and field discussions)

Municipal Corporation daily carries out door to door collection of waste from residences and other small waste generators during day-time and collects bulk waste during the nights. An average 450 tons of waste is collected from the city by the Municipal Corporation, of which approximately 4 tons is of plastic carry bags. Collection efficiency is around 95 %.

The Trichy Corporation commenced de-centralisation of solid waste collection and disposal by establishing a micro compost centre at Pookollai near Gandhi Market in 2016. It has set up 28 such centres since then covering around 55 of the total 65 wards in the city. The main objective of micro-compost centres is to prevent domestic waste from reaching the corporation's 47-acre dump yard at Ariyamangalam.

Each of the 28 units is provided with compost pits with water facility, shredding machine and incinerator to identify, segregate and process biodegradable and non-biodegradable waste. Biodegradable waste would be converted into compost in 45 days and subsequently sold to farmers and residents interested in terrace gardening at free of cost.

The non-biodegradable waste segregated would be sold to scrap dealers for a price, which would be distributed among sanitary workers. Micro-compost yards already are believed to have brought down

50% of the city's daily domestic waste heading to the corporation's massive dump yard in Ariyamangalam through de-centralised waste collection and disposal.

Presently, Bio-Waste collected from market areas are directly sent to Corporation processing yard. Four dry resource centers organized one in each zone to collect and store the dry waste such as paper, plastics and wooden waste.

Two plastic shredding machines were procured and training imparted to the women Self-help Group members as well as to the sanitary workers. Shredded plastics is in progress and it is being used for road laying works. (Fig TR3)



Fig TR 3: An information board on decentralized Micro-composting inside Corporation building



Fig TR 4: Thennur Solid Waste Management Yard

Field Observations

Trichy Corporation has banned plastic carry bags with less than 50mm thickness from 26th January, 2018. Since then Corporation employees have conducted raids on retailers, wholesale shops etc., and collected fines from the violators. The plastic bags ceased from such raids are collected and sent to nearby cement factory once in 2-3 months.

Talking to a representative from Gandhi Market Fruit Merchants' Association, the team found that the association has given instructions to all its members not to use any type of plastic bags. Corporation officials have provided dustbins to all the retailers, vendors and shopkeepers of the market area. Anyone found littering would be fined up to Rs 2000 by the officials. Toll-free numbers are provided across the city for garbage collection. In general, the waste of the market is cleaned twice a day.

However, few members of the Trader's union suggested that though they agree to the plastic ban, they need cheaper and suitable alternatives to be used in place of the banned plastic bags.

Rockfort Temple

Waste management and maintenance inside the temple premises has been outsourced to a private firm. Around 300 kg of garbage is collected every day most of which is left over puja material. Persons are appointed at the entrance of the temple to check the visitors for any kind of plastic bags. Boards of 'No-plastic' have also been placed within the temple premises and surrounding areas. The temple management shops use cloth bags for any kind of sales from the shop. (Fig TR 5)



Fig TR 5: Cloth bags at temple managed shop

Ranganatha swamy temple, Srirangam

The premises of Ranganatha swamy temple is also well-maintained and plastic-free. Temple management has outsourced waste management to a private contractor. Around 1 ton of waste is generated every day from the temple premises, only around 10% of it is plastic waste. However, there is no check on plastic carry bags near the entrances of this temple. Only signage boards are provided around the temple premises. Most of the plastic waste is generated by tourists outside the city, who are unaware of the plastic ban.

The field team spoke to vendors around other temples of the city and found that most of the vendors use cloth bags and bamboo baskets. However, they use plastic carry bags too for the people.

KEY OBSERVATIONS – TRICHY

- **The city is well-maintained. Its decentralized waste management technique has become a success story across the state. However, the plastic ban is only 6 months old. Present status is it is successfully being done in most of the city.**
- **It is not successful in Srirangam because of more tourists.**
- **The Corporation Health Officer suggested that they should be empowered to check vehicles entering city carrying one time use and through bags and other plastic items, manufactured outside the district. Rules and regulations should be framed such that with police protection the corporation can effectively arrest inflow of banned plastic items at Check posts.**
- **Efforts on awareness creation seemed to have led to effective waste segregation at household level. Discussion with waste collection teams gives an impression that more than 70% of the domestic waste is segregated. About 10 lakh houses have been given two bins (for waste segregation) free of cost. Vendors around city bus stand said that the waste collection teams visit three times a day – as this spot generates much wastes.**

4.12 Field Report - Velankanni

Information Based on Secondary Sources

Town profile:

Velankanni Town Panchayat was constituted as special Grade Panchayat in the year 1985 in Nagapattinam district and has 15 electoral wards. It is located 350 km south of Chennai and 14 km south of Nagapattinam on the Coramandel coast of the Bay of Bengal (Fig V1).



Fig. V1: Location map of Velankanni

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.nagapattinam.tn.nic.in/images/taluks.jpg>

Demographic Profile (source: www.census2011.co.in)

The town is administratively divided into 15 wards spread over 5.5 sq km. Velankanni Town Panchayat has population of 11,108 of which 5,327 are males while 5,781 are females as per report released by Census India 2011. Literacy rate of Velankanni city is 84.99 %, higher than state average of 80.09 %.

Tourism:

The town is home to one of the most visited Roman Catholic Latin Rite shrines called the Basilica of Our Lady of Good Health (Fig V2). According to Tamil Nadu Tourism report 2014, **75,05,175** tourists have visited **Velankanni**. It is the **19th most visited** place among domestic tourists and **14th most** among foreign tourists in the state of Tamilnadu.



Fig V2: Velankanni Church

Solid Waste Management:

Presently organic waste is being collected and processed through aerobic windrow (input 3.80 MT and output 0.90 MT) and vermin composting has started recently. Of the total waste of 4.0 MT collected per month, 1.70 MT has sale value. There is a plastic waste shredding machine which is shredding 150 kg of plastic waste per month. Out of 5.960 T/day waste generated, 1.0 T/day waste is processed for composting; 2.10 T/day is processed for recycling and 2.20 T/day is processed for dumping. It has been reported that 10% of the solid waste is plastic. 31% of waste is generated in residential areas and 59% waste is generated in commercial and public places. 45 Self Help Group members are active in the town. Velankanni town Panchayat has already prepared a comprehensive proposal for the improvement of solid waste management through resource recovery. Part of the strategy is educate people to refuse the use of plastic carry bags, cups, disposables etc.

Field Observations

Vellankani church compound is maintained well by the church maintenance staff but the parking area is full of 'use-and-throw' plastic items (Fig V3). The garbage collected from the church area is dumped in a corner bin within the old church campus. (Fig V4). Around 5 tons/day of waste is collected from the church premises. During church festival, the crowd is more hence the waste collected is around 10 tons/day of which around 70% is plastic. The garbage collected is dumped in the Panchayat Garbage

dump yard. Although Shrine Management personnel claimed that the shrine guest house area is maintained properly, a visit to the area of Shrine pilgrimage Guest House showed that the area is not clean. One can see a lot of plastic waste in this area (Fig V5). This indicates that even though the management maintains dustbins and cleans the compound frequently, the visitors or the pilgrims are not being responsible enough.



Fig V3: Parking Area



Fig V4: Church Area



Fig V5: Shrine pilgrimage Guest House

The shop, within the campus, managed by the Shrine Management does not have any plastic bags. They use paper bags for all purchases (Fig V6).



Fig V6: Shrine shopping centre

However, discussion with several vendors across the town it reveal that majority of the vendors use 'Single-use plastics' either as packing materials or carry bags, plastic glasses, cups, plates etc. (Fig V7). Though they are aware of the plastic ban and ill effects of plastic, they do not want to use alternatives as they are too costly. Some of the vendors have tried alternatives from Nagapattinam but have discontinued because of cost and **unavailability** of material.



Fig V7: Different types of plastic used

A meeting with the officials at Vellankanni Special Grade Panchayat revealed that the Panchayat had passed a resolution on 15th August, 2015 against plastic usage in the Panchayat. The panchayat had a board displaying the ill-effects of plastic usage (Fig V8).



Fig V8: Boards displayed at the panchayat office

Panchayat officials also conducted awareness campaigns across the town on waste segregation, solid-waste management, 'plastic-free Velankanni' programmes in 2017. They have also distributed cloth bags as part of 'plastic-free Velankanni' (Fig V9). However, there is inadequate manpower at the panchayat office to follow-up on these programmes.



Fig V9: Bag and awareness camps by the panchayat office

Solid waste scenario

Solid waste is collected on a daily basis, as claimed by the panchayat officials (Fig V10). Around 10 tonnes of garbage is collected from the town per day, which is then dumped at a garbage yard (Fig V11). There is no waste segregation till date but the panchayat is planning for proper solid waste management system in near future. Panchayat collects varying fee for solid waste collection from residential and commercial areas.



Fig V10: Waste collection by the panchayat office



Fig V11: Dump Yard-Vellankanni

Despite the above measures, the drains are filled with the plastic garbage. The beach area is full of garbage, TASMAC shop locality is full of waste water packets (Fig V12). The water packets from the TASMAC shop are collected and given for recycling to waste collecting shops.



Fig V12: Garbage at different places in the town

KEY OBSERVATIONS – VELANKANNI

- Drains, beach area and few parts of the town are full of garbage
- Panchayat had passed a resolution on 15th August, 2015 against plastic usage.
- It has also taken up few initiatives like cloth bag distribution, awareness programmes etc.
- ‘Plastic-free Velankanni’ campaign could initiate the process of plastic free lifestyle but only for few initial days. Continuous follow-up from the government side would improve the ‘plastic ban’ programme. Lack of adequate manpower might be reason for lack of follow-up programmes.
- Vendors, even if they wish to, are unable to use alternatives for plastic as they are much costlier.

4.13 Field Report - Nagoor

Information Based on Secondary Sources

Town profile:

Nagoor is a small village along the shores of Bay of Bengal in Nagapattinam district of Tamil Nadu (Fig N1). The village is famous for Nagoor Dargah. Tourists come from all over the country to pay their respects at the Dargah.

Demographic profile (www.census2011.co.in):

Nagore village has a population of 1341 of which 664 are males while 677 are females as per Population Census, 2011. It has a total of 363 families residing. It is administered by Nagapattinam Municipality. In 2011, literacy rate was 85.51 %, which is higher as compared to 80.09 % of Tamil Nadu.

Tourism:

The major tourist attraction in Nagore is the Nagore Dargah. The five centuries old Dargah is visited by tourists of all faiths from across the world. According to Tamil Nadu Tourism report 2014, **5867411** tourists have visited Nagore. It is the **22nd most visited** place among domestic tourists and **23rd most** among foreign tourists in the state of Tamilnadu.



Fig. N1: Location map of Nagore

Sources for figures above:

- State map taken from <http://www.in4india.com/states-of-india/tamilnadu/statemap/>
- District map taken from <http://www.nagapattinam.tn.nic.in/images/nagapattinam2.jpg>

Field-visit Findings

IIT Madras team visited Nagoor Dargah and found that both outside and inside of the Durgah premises are kept clean. There was a waste segregation awareness board put up near the office (Fig N2). It is understood during discussions with a retired Tahsildar from Nagoor that the garbage from inside the Dargah and also from surroundings is collected twice a day and is dumped in Melavanjoor dump yard. On an average around 5 tons/day of waste is collected.

As per the data given by Nagapattinam municipality, the composition of solid waste is as follows: Bio-degradable waste – 65%; Rags-15%; Plastic-10%; Others-10%. The field team had spent some time with a waste collecting shop owner. The shop collected waste from nearby areas and Karaikal Wine shop. The shop owner claims that the plastic items form an average of 50% of the entire waste collected from different areas.



Fig N2: Waste segregation board near Dargah Office

Discussions with Self-Help Group members

IIT Madras team had discussions with a member of a Self-Help Group member. They were informed that the SHG conducted group discussions about 'use & throw carry bags' within the groups. SHGs are very well aware of environmental problems caused due to non-recyclable carry bags. However, the group members lack proper training regarding alternatives such as the paper bags. SHGs are looking for someone who can help them in this regard.

Discussions with vendors

IIT Madras team had discussions with a few street vendors in the village. These discussions revealed that though the vendors are aware of the ban on plastic usage, they are continuing with usage of plastic

because the alternatives are too costly. Few of them have started to provide bamboo baskets (Fig. N3) for carrying puja material. However, this initiative was not successful because bamboo baskets are costly (around Rs 80 per 100 baskets). Some vendors also felt that there should be strict punishment from the Nagapattinam Municipal Authority to achieve a change in the attitude of vendors and consumers.



Fig N3: Bamboo basket

Discussions with a member of Trader's Association

The IIT Madras team was informed that the association members discussed about 'use & throw carry bags'. A meeting for free plastic zone in Nagoor was also conducted last year in association with Lions Club to educate the members on demerits of plastic bags. There was also a rally on the same issue. However, many traders, especially the street vendors and fish vendors, are still using plastic carry bags. Textile shops and hotels are using plastic material as per government norms. However, small vendors could not afford the price of alternatives and therefore are not interested in adopting the alternatives. There has been a suggestion on continual follow-up from the government side by putting up signage, boards, awareness camps etc. Municipal Authority and State govt. should take stringent action against 'single use carry bags'.

Discussions with a Social Workers and Nagapattinam Municipal Officials

Discussions with a retired Tahsildar revealed that municipality is unable to clean the streets and collect the garbage regularly because of shortage of manpower. Dust bins are not placed in all the wards. Hence garbage can be seen everywhere in the village. Nagoor Residents are not aware of waste segregation. However, the officials claimed that Nagoor village residential areas are cleaned every day and enough sweepers are deputed to Nagoor village. Solid waste collection in the rest of the village was done by Nagapattinam Municipality every day in the morning hours. They allege that the tourists throw plastic carry bags in the streets of the village. Regular meetings were held with Nagoor Residents and Traders to create awareness for wet waste and dry waste. It appears that though the municipality is trying to create awareness, the residents are not co-operating with them. IIT Madras team found that all the village drains are filled with plastic waste (Fig N4).



Fig N4: Open drains filled with plastic waste

Melavanjoor Garbage Yard

This garbage yard is located in Melavanjoor village towards Karaikal Highway. Nagoor village garbage is dumped here. There is no solid waste management facility. Waste is often burnt spreading smoke in the surrounding areas (Fig N5)



Fig N5: Melavanjoor Garbage Yard

Major Issue

It was also found that Karaikal Private Port imports coal from different countries and dumps the coal in an open area inside the port. The coal dust spreads out to the whole of Nagoor village and the health of the residents is severely affected due to this. **Hence, the citizens are more worried about pollution due to coal dumping than pollution due to plastics.**

KEY OBSERVATIONS – NAGOOR

- Entire Nagoor village has open drainage system. All the drains are completely filled with carry bags and garbage.
- The famous Nagoor Dargah is kept clean inside. But the garbage collected from here is simply sent to Melavanjoor garbage yard, where it is burn along with garbage from other places.
- The municipal authority collected approximately 4 Tons of garbage daily of which 50% is carry bag waste.
- There is no cooperation between the villagers and the municipal authorities.
- Nagoor village is highly polluted due to coal dust. The people of Nagoor village are deeply concerned about the health problems caused by the coal dust filled air. Once the government solves this problem, the residents are likely to support all kinds of activities related to waste.

Chapter-5: Way Forward

5.1 Items to be Banned

Through the field study, the team found that in almost all the places around 12% to 20% of solid waste collected is plastic waste. Of this, around 50% is plastic bags, 20% is water bottles, water packets, plastic cups and glasses, 20% is plastic plates, spoons, straws and plastic packaging materials while the remaining is from other plastic items like flex boards, plastic rolling sheets etc.

SUGGESTED PLASTIC AND OTHER ITEMS TO BE BANNED

- **CARRY BAGS**
- **WATER SACHETS**
- **CUTLERY (PLATES, SPOONS, FORKS, CUPS, GLASSES Etc.)**
- **STRAWS**
- **PACKAGING FOR PARCEL FOOD**
- **BUTTER PAPER USED ON PLATES**
- **BANNERS**
- **FLAGS**
- **NON-WOVEN POLYPROPELENE BAGS**
- **THERMOCOLE GLASSES**
- **THERMOCIOLE PACKAGING ITEMS**
- **LAMINATED PLASTIC ITEMS**

In our view, the main things that are to be banned immediately are plastic carry bags, plastic water sachets, plastic cutlery (plates, spoons, cups, glasses, straws etc.). We also suggest ban on plastic used in restaurants for covering the plates and packaging of “take away food”. All these items are thrown around by the users, difficult to collect and even if collected these items are rejected by recyclers because they contain sticky and oily leftover food. Plastic banners and plastic flags should also be banned since their presence in environment causes many problems, while it is not too difficult to find alternative material such as cloth for making these. Non-woven polypropylene bags, use and throw items made of thermocole and laminated plastic items should also be banned because these cannot be

recycled and they go directly to either unscientific dump yards or engineered landfills, whose number is not many in the state.

5.2 Willingness of People to Change

In general, it is found that people are willing to change to alternative material, provided appropriate and economical alternatives are suggested and made easily available. Many of the people, except in few places, are more or less aware of negative impact of plastics on environment, especially the aesthetics of the surroundings. They certainly would like to live in a cleaner and more pleasing place to live in. That is why they do complain a lot about municipalities not clearing the solid waste more frequently, or if it is not cleared, they are encouraging burning of it. This is the reason why they are putting the onus of clearing the solid waste, including the plastic waste, on the Government. However, one would wish that people should also be changing their life style a little bit and generate less plastic waste.

Most of the people are not truly aware of how plastic causes irreversible damage to environment and ecology, and in turn, their own survival. They are not aware of the ill effects on their own health. That is why they are looking for “easy solutions”, which do not demand too much of a “life style change” from their part. This makes them demand for cheap plastic items from shop keepers instead of bio-degradable materials. A massive and innovative campaign should be made to make common person aware of ill-effects of plastic.

- **People are more willing to change now than before**
- **People expect Government to “take care” because they are already paying taxes!**
- **Mindset of people need to be changed to “own” the plastic ban program as their “responsibility”**
- **Massive and innovative IECs from now until December 31, 2018**

The field study has strongly indicated that people are more ready now than a couple of years ago in terms of accepting the ban on use and throw plastics. However, there is a long way to go for changing the perceptions. This is clear from the fact that in many places implementation of “segregation at source” concept itself has met with severe challenges. There is a dire need to change the peoples mindset. It is suggested to mount an innovative Information Education Campaign to convince them to own the plastic ban and become partners with the Government in the effective implementation.

5.3 Challenges to the People due to Ban

Following key points emerged from the field studies and interviews with a wide cross section of stakeholders, which includes common persons, vendors, managements of establishments, NGOs etc.

- I. People will find it difficult to lead their lives without easily available use and throw plastics in the immediate aftermath of plastic ban because the ban will obviously require the people to change their lifestyles.
- II. The field survey has clearly brought out the apprehensions among the people, especially small and marginal vendors, have regarding the cost of alternatives. Many of the vendors are afraid that they may lose significant business because of the cost of alternatives.
- III. Street vendors would be most affected because alternatives to use and throw plastics will be costlier, and most of the street vendors operate on low budgets. Also, their low income group clients may not be willing to accept the extra cost of alternative materials.
- IV. Ready availability of alternative material, especially proper packaging substitutes for liquids and hot foods might be a challenge. Presently, alternative bio-degradable materials are made for niche clientele. There are not many manufacturers, located at different places in the state. Therefore, supply of alternative materials in the market may fall short of meeting the demand.
- V. It may be difficult to suggest alternatives for all places, based on locally available material. If the alternatives are not locally available, then people will face problems.
- VI. The manufacturers / vendors are expecting some sort of a financial assistance from the government in terms of no GST, low interest loans, subsidies etc. to switch over to alternatives. If they do not get some sort of a support from the government, they might view the ban as “unfair” and may not cooperate with the government in implementing the ban.
- VII. It appears that there is no cooperation and understanding between consumers and vendors/retailers. Many vendors have complained that it is the users who are demanding the items made of plastic. Similarly there is a blame game amongst the managements of tourist places / religious places, local vendors and the tourists. These differences would increase once the ban is imposed.

5.4 Challenges to the Government to implement the ban

- I. Initially there will be protests, resistance and non-cooperation, especially from trade unions, vendors associations, and of course plastic manufacturers.
- II. It will be difficult for the government to identify and crack down on all manufacturing units which are producing banned items.
- III. It will be difficult for the Government to completely control the infiltration of illegal plastics from neighboring states.
- IV. There will be problems with regard to availability of manpower and finances to monitor for sale and usage of banned items, laxity on the part of managements of tourist places / religious places etc. to implement the ban, and accordingly take punitive actions.
- V. It is easier said than done as far as Information Education Campaign (IEC) on ill-effects of plastics is concerned. There will be significant problems with regard to changing the mindset of people through awareness campaigns. A lot of thought should go into this aspect in order to make the ban effective.
- VI. Finding economically viable alternatives based on locally available material could pose challenges for implementation.
- VII. Creating new manufacturers and suppliers of alternative materials to cater to the suddenly increased demand for such material may pose a big challenge
- VIII. Empowerment of the local governing bodies for implementing the ban and at the same time curb corruption could pose a challenge.
- IX. It may be required to impose severe punitive measures to impose the ban for it to be effective. However, this may lead to more non-cooperation from the people.

5.5 Suggestions for Effective Implementation of Ban

Following suggestions are made for effective implementation of ban on the “use and throw plastic items”:

1. The manufacturing of banned items within the state should be stopped. There should not be any option left but to use alternative material. Therefore, banning of manufacture of “use and throw plastic items” listed above is essential.
2. Large industrial manufacturers of the banned items come under the control of PCB. Hence, it is their responsibility to control and regulate manufacturing of these items.

3. Small-scale and cottage industries come under the purview of local bodies. Hence local bodies should control/regulate these manufacturers. Support is needed from the Electricity Board too in order to take action on such manufacturers by the local body.
4. The sale of use and throw plastics should be strictly banned at the entry points to eco-sensitive areas, tourist areas and religious shrines.
5. Clear and unambiguous instructions should be issued regarding the items which are banned and the material of which the items are made of. Vendors and people should be educated on this issue. It has been found that in many places, plastic lined / coated items and differently looking material but made of plastic are being sold as “non-plastic” items.
6. The entry of banned items into the state from neighboring states through various routes should be restricted by establishing check posts and empowering the persons manning the check posts to impose the ban.
7. “Power to enforce and fine the offenders” should be given to local government authorities.
8. People may not take their local authorities seriously. Therefore, the above enforcement by local authorities should be supported by periodic raids by authorities at a higher level either from district head quarters or from the state capital and imposition of fines.
9. Punitive actions that will be taken if the ban is violated by any manufacturer, vendor or user should be clearly spelt out. Also, the empowerment of officials to impose the ban should be clearly spelt out. Ban on the use and throw plastics exists in many towns, but there appears to be ambiguity regarding which official is responsible for which task of enforcing the ban. This ambiguity should be removed.
10. State agencies should provide awareness programme or training on the legal acts to the local body. By-laws have to be made clearer to the local body representatives in order to take action on the violators.
11. Many local bodies have no clear information on the banned items. For Ex: they do not know that plastic bags below 50 microns are banned by the government. They are under the impression that all-kinds of plastic bags have to be banned. They also are unaware that poly-propylene bags (non-woven plastic bags) are also not allowed. They allow such usage as they think they are cloth bags and can be allowed to use. Awareness programs should be conducted.
12. A web site and a phone number should be provided where any person who becomes aware of violation of ban by any vendor / manufacturer can report the violation. Social media groups can be formed with the help of local governments for monitoring the enforcement of ban and empower the people to report.
13. There should be legal provision to close and seal the shop if any vendor is found violating the ban.

14. There should be legal provision to cut the electric power supply to plastic manufacturing units which are producing banned items.
15. Massive awareness creation among the citizens against the use of “use and throw plastics” should be taken up through posters, street plays, FM Radio, TV channels, Movie Theaters, Railway stations, Bus Stations etc. (Figs. 5.1). **Place posters, hoardings, notice-boards at all the important places of the area (Fig 5.2).** Local NGOs should be co-opted in taking up these awareness campaigns. Industrial houses can be encouraged to either provide funds for or take up awareness campaigns as part of their CSR activities.



Fig. 5.1. Example of awareness campaigns



Fig. 5.2. Examples of Posters

16. Educate people to carry cloth bags. People should be made aware that they also have a responsibility to completely avoid the usage of use and throw plastics.
17. Include a chapter on “Story of Plastic”, describing the “ill-effects of use and throw plastic” in school curriculum, which is due for revision shortly.
18. Besides banners and sign posts, videos made by Tamil Nadu Pollution Control Board on plastic waste should be played continuously on CCTVs located at the entrances to religious shrines, tourist spots and ecologically sensitive areas.
19. Information Education Campaigns should not only emphasize the bad effect of plastics on environment but also should highlight the effect of use and throw plastics on the public health through diseases such as dengue and contamination of groundwater.
20. People should also be educated and made aware that recycling is not possible for many plastic items and
21. Provide incentives to “wards” in any city which are making good progress in the non-usage of one time use plastics by reducing local taxes.

22. Provide some green badges labeled, “**GREEN CITIZEN**” for general public, “**GREEN VENDORS/RETAILERS**” for vendors/retailers, “**GREEN TOURIST**” for the tourists etc. (Fig 5.3)

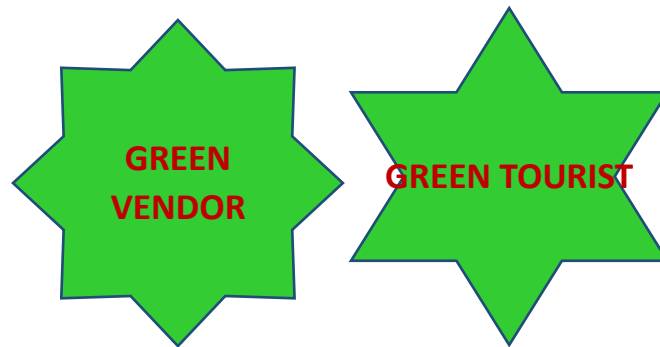


Fig 5.3: Examples of badges

23. It is important to strategically instruct the **Associations** so that the ban is implemented and followed **uniformly** across all vendors. Vendors associations in each town and village should be co-opted into making the ban effective by encouraging them to take collective action.
24. Manufacturers for alternatives to plastics should be identified and supported in terms of (i) training, (ii) establishing markets, (iii) financial support through low interest rate loans etc.
25. Sale of the identified alternatives to use and throw plastic can be made GST free in order to bring down the cost.
26. Entrepreneurs, vendors, restaurant owners, authorities of religious shrines, general public etc. should be encouraged to identify and switch over to alternatives for use and throw plastic at different levels of economy.
27. Encourage Self Help Groups to make alternative items using locally available material and the traditional methods which were existent before use and throw plastic items flooded the market.
28. Only items made of non-plastic and bio-degradable materials should be used in all government functions and the Government should show the way by practice.
29. The enforcement to switch over to alternatives should be very strict with regard to educational institutions, commercial establishments, tourist places, religious shrines (temples, dargahs, churches etc.) because it is not difficult to control the entry of use and throw plastic in such places. The onus for implementing the ban should be on the management of these establishments. The security provided at the entry points could be trained to check visitors and not allow banned plastic items within the premises.
30. The enforcement should be very strict with regard to wedding reception and other function halls. Permission to operate such facilities should be taken away by the TNPCB in case of violation.

31. Like zero liquid discharge policy for gated communities and high rise apartment blocks, policy of making these communities responsible for the management of solid waste generated by them should be framed.
32. Arrange several **plastic collection bins** and **‘No-plastic’ signage** at the **entry points of tourist places** (Fig 5.4). If necessary, **provide alternative paper bags/cloth bags/bio-degradable bags** to the tourists at a price.



Fig 5.4: Examples of signage near Tourist Entry points

33. Competitions should be held by the Government to identify and develop local and traditional alternatives to “use and throw plastics”. School and college students and even general public should be encouraged to participate in these competitions. Awards may be given at district and state levels. Start-up companies which are prepared to manufacture alternate materials to replace use and throw plastics should be provided incentives. All efforts should be made to reduce the cost of bio-degradable bags.
34. Incentives in the form of awards should be provided to “Plastic Free Panchayats (PFP)”, similar to the awards given to ODF Panchayats.
35. Cooperation between different government agencies, NGOs, local trader and restaurant associations, and local citizens should be ensured by arranging regular coordination meetings.
36. There should be continuous follow up activities with regard to plastic ban activities.

37. Improvement in the general solid waste management cannot be over emphasized. There should be as much recycling as possible. Frequency of garbage collection should be increased.
38. Experience from places where ban on plastic usage has been effective should be used to build up new strategies for better implementation.
39. Arrange **collection points/recycling points** at major locations for plastic bag disposal in **town/local level** for local people(Fig 5.5)



Fig 5.5: Garbage collection bins and collection points at community/town level

40. The government should prepare a clear road map for implementation of the ban on use and throw plastics and communicate this clearly to all local bodies and make it integral to Information and Education Campaigns to prepare people to accept the ban.

5.6 List of Alternative Products

The following are a list of alternatives that could be used in the place of plastics. However, **priority shall be given to locally available alternative materials and traditionally used techniques before going for other options.**

Paper products

Paper products are cheaper and easily available alternatives for most of the plastic-usages like carry bags, glasses, cups, plates. Paper products could be made from recycled paper. They don't require much technology. They can be recycled easily too.

Demand for paper might result in more cutting of trees, which again is not a ECO-FRIENDLY method. The recycling process might cause other pollutions like air, water etc.



Leaf products

Leaf products made from palm leaves, banana leaves, jackfruit leaves, beetel-nut leaves etc. can be used as alternatives. This material is bio-degradable, easily made at even household level, uses dried leaves so trees would not be affected much. Cost will be however a little more than plastic and paper.



Bio-degradable bags

Biodegradable plastics are made from all-natural plant materials. These can include corn oil, orange peels, starch, and plants.



Their drawback may be that they may not decompose unless they are disposed of properly. The natural breakdown of the plastic will not occur if it is simply tossed in a landfill with other trash.

Cloth bags

Cloth bags are reusable bags with more strength to carry things, groceries etc. Though they are costly, the cost would be one-time investment as they stay strong for long duration.



Jute bags

Jute bags are reusable bags with more strength to carry things, groceries etc. Though they are costly, the cost would be one-time investment as they stay strong for long duration



Bio-degradable cutlery

Plates, cups made from fresh and dried local leaves like Banana leaf, Banyan leaf, Palm leaf etc. Use local traditional techniques to substitute plastic. Use bamboo straws for one-time use and stainless straws as reusable alternative for plastic straws. Drinking cups could be substituted by earthen, glass or paper cups

Products from Coconut, kora grass, screwpine etc.



Earthen products



Bamboo products



Reusable cutlery



Stainless steel products



Glass products



Ceramic ware

Edible cutlery

This cutlery is made from a dough, which is a mixture of sorghum, rice and wheat flours, kneaded with hot water. The products are baked in moulds. Edible cutlery contains no chemicals, additives or even preservatives. They are 100% natural and baked products. They are 100% vegan as well and are 100% degradable



Hemp products

Hemp is known to be three times as strong as cotton, biodegradable and very durable. It is one of the fastest growing plants and can be explored for other alternative uses too.



Ecaware



A larger systemic approach is needed in every habitation:

- **Better Solid Waste Management practices** will help in **preventing litter** which is one of the main causes where plastic affects the environment/drainage/wild-life etc.
- **Segregation at source** reduces the quantity of plastic ending up in the landfill or open dump yard. Successful **source segregation increases the success of plastic recycling**.

Comparison Table

S. No	Alternative	Suitable replacement for	Probable Users	Advantages	Disadvantages
1	Paper products	• Plastic bags • Plastic plates • Plastic cups	• Small vendors • Consumers while carrying things from home • Bags could be used for carrying lighter and dry things	• Recyclable • Compostable • Easily made • Easy to carry • Easily available • Cost is less	• Trees need to be cut to create paper. This is the major disadvantage. • Process of recycling

					consumes lots of energy, might pollute air, water and land also during the process • Strength is very less • Cannot carry liquids
2	Leaf products	• Plastic plates • Plastic cups • Plastic bags from consumers end	• Small vendors • Consumers while carrying things from home	• Recyclable • Compostable • Easily made • Easy to carry • Easily available • Cost is less	• Cannot carry hot items also for a long time • Cannot carry liquids for a long time • Plate costing Rs 4 for a minimum size of 8" • Cups cost Rs 1/piece of a 2.5" size
3	Bio-degradable bags	• Plastic bags • Plastic packaging	• Small vendors • Consumers • While carrying things from home for heavy weights	• Recyclable • Compostable • Easily made • Easy to carry • Easily available • Cost is less • Can be better alternative for plastic bags in terms of usability	• Compostable only in specific machines • If not recycled properly, would end up in land-fills for many years • Approx. Rs 3/piece of a medium sized bag
4	Cloth bags	• Plastic bags	• Retail shops • Medium to high end shops • Consumers	• Recyclable • Reusable • washable • Compostable • Easily made • Easy to carry • Easily available	• Relatively costly • Approx. Rs 30/piece for a medium sized bag
5	Products	• Plastic cups	• Medium to high	• Recyclable	• Relatively

	from Coconut, kora grass, screw-pine		end hotels/restaurants	• Reusable • washable • Compostable • Easy to carry	costly • A coffee cup of normal size costs around Rs 100/piece
6	Earthen products	• Plastic plates • Plastic cups	• Small vendors • Medium to high end hotels/restaurants	• Recyclable • Reusable • Washable • Compostable • Easy to carry • Easily available	• Relatively costly • Clay Tea cups cost around Rs 3 per piece
7	Bamboo products	• Plastic plates • Plastic cups • Plastic bags for carrying small items like puja items	• Small vendors	• Recyclable • Reusable • Washable • Compostable • Easy to carry • Easily available	• Relatively costly • Bamboo plates Rs 4-8 per plate depending on the size • Bamboo basket around Rs 50 for a medium sized basket
8	Stainless steel products	• Plastic plates • Plastic cups	• Small vendors • Medium to high end hotels/restaurants	• Recyclable • Reusable • Washable • Compostable • Easy to carry • Easily available	• Relatively costly • Medium plates cost around Rs 100
9	Jute bags	• Plastic bags from high end retailers and consumers	• Retail shops • Medium to high end shops • Consumers	• Recyclable • Reusable • Washable • Compostable • Easy to carry • Easily available	• Relatively costly • Approx. Rs 70/piece for a medium sized bag
10	Glass products	• Plastic plates • Plastic cups	• Medium to high end hotels/restaurants • Consumers	• Recyclable • Reusable • Washable • Compostable • Easily available	• Relatively costly • Small sized plate costs around Rs 30/piece • Need extra care to handle
11	Edible	• Plastic plates	• Medium to high	• Recyclable	• Very costly

	cutlery	• Plastic cups	- end hotels/restaurants • Consumers	• Reusable • Washable • Compostable • Easy to carry	• An edible spoons costs Rs 4/piece
12	Ceramic ware	• Plastic plates • Plastic cups	• Medium to high end hotels/restaurants • Consumers	• Recyclable • Reusable • Washable • Compostable • Easy to carry • Easily available	• Very costly • Around Rs 100/piece for a medium sized plate
13	Hemp products	• Plastic bags from high end retailers and consumers	• Medium to high end retailers • Consumers	• Recyclable • Reusable • Washable • Compostable • Easy to carry	• Very costly • Approx. Rs 700/piece for a medium sized bag

List of Possible Suppliers of Alternative Items

Sl.no	Name	Address	Email ID & Contact Details
1	Mrs.Regina violet Rosaline	No:2/189, mariamman kovil street Nallicherry Post Chembanar Kovil via Mayavaram - 609308	9786393281
2	Mr.Sibi Chelvan	Regeno Ventures Pvt Ltd Chinniyampalayam, Coimbatore, Tamil Nadu 641012	svc@regeno.in 9500237777
3	Mr.Ravi	Meenakshi Mud Pot Supply, Gandhi Road, Velacherry,Chennai - 42	8939014155
4	Mr.RAMU	S.R. Palm Leaf Plate Hogenakkal - 636810	9445554817
5	Mr.RAVI RAJ	R.K. Palm Leaf Plate Hogenakkal - 636810	9600290004

ANNEXURES-I

List of Villages falling in Eco-sensitive Area in Tamil Nadu as designated by MoEF in the Gazette Notification on Sep 4th, 2015:

District	Taluk	Village Name
Coimbatore	Coimbatore North	Thadagam R.F.
Coimbatore	Coimbatore North	Anaikatti (North)
Coimbatore	Coimbatore North	Anaikatti (South)
Coimbatore	Coimbatore North	Veerapandi
Coimbatore	Coimbatore South	Boluvampatti (Block I)
Coimbatore	Coimbatore South	Booluvampatti(Block II)
Coimbatore	Mettupalayam	Odanthurai R.F.
Coimbatore	Mettupalayam	Jaganarai Slopes R.F.
Coimbatore	Mettupalayam	Kallar R.F.
Coimbatore	Mettupalayam	Hulical Drug R.F.
Coimbatore	Mettupalayam	Pillur Slope R.F.
Coimbatore	Mettupalayam	Nellithurai And Sundapatti R.F
Coimbatore	Mettupalayam	Kandiyur R.F.
Coimbatore	Mettupalayam	Nilgiri Eastern Slope R.F.
Coimbatore	Mettupalayam	Melur Slope R.F.
Coimbatore	Mettupalayam	Anaikatti North R.F.
Coimbatore	Udumalaipettai	Anamalai R.F.
Coimbatore	Udumalaipettai	Anamalai R.F.
Coimbatore	Udumalaipettai	AmravathiRf/AnamalaiRf
Coimbatore	Udumalaipettai	Amaravathi R.F.
Coimbatore	Udumalaipettai	Kudiraiair&Kukkal R.F.
Coimbatore	Udumalaipettai	Kudiraiair&Kukkal R.F.
Coimbatore	Udumalaipettai	Manjampatti R.F.
Coimbatore	Valparai	Valparai (Tp)
Coimbatore	Valparai	Valparai (Tp)
Coimbatore	Valparai	Area Under Forest
Coimbatore	Valparai	Valparai (Tp)
Coimbatore	Valparai	Area Under Forest
Coimbatore	Valparai	Valparai (Tp)
Coimbatore	Valparai	Valparai (Tp)
Dindigul	Dindigul	Kannivadi (Tp)
Dindigul	Dindigul	Adalur
Dindigul	Dindigul	Kannivadi (Tp)
Dindigul	Dindigul	Erukkalmalai R.F.
Dindigul	Dindigul	Sirumalai

Dindigul	Kodaikanal	Pachalur
Dindigul	Kodaikanal	Vadagouchi
Dindigul	Kodaikanal	Periyur
Dindigul	Kodaikanal	Kilakkuchettipatti
Dindigul	Kodaikanal	Kookkal
Dindigul	Kodaikanal	Thandigudi
Dindigul	Kodaikanal	Kamanur
Dindigul	Kodaikanal	Adukkam
Dindigul	Kodaikanal	Vellagavi
Dindigul	Oddanchatram	Vadagadu
Kanniyakumari	Agastheeswaram	Thekkumalai Rf.(West And East)
Kanniyakumari	Kalkulam	Veerapuli R.F.
Kanniyakumari	Kalkulam	VeerapuliExtn. (Old Kulasekarapuram)
Kanniyakumari	Kalkulam	Surulacode
Kanniyakumari	Kalkulam	Velimalai Forest
Kanniyakumari	Thovala	Veerapuli R.F.
Kanniyakumari	Thovala	Asambu R.F.
Kanniyakumari	Thovala	Poigaimalai R.F.
Kanniyakumari	Thovala	Azhagiapandiapuram (Tp)
Kanniyakumari	Thovala	Azhagiapandiapuram (Tp)
Kanniyakumari	Thovala	AsambuRf
Kanniyakumari	Thovala	ThadagamalaiRf
Kanniyakumari	Thovala	Velimalai R.F.
Kanniyakumari	Thovala	Thadagamalai R.F.
Kanniyakumari	Thovala	Chiramadam
Kanniyakumari	Thovala	Aralvaimozhi (Tp)
Kanniyakumari	Thovala	Thovala
Kanniyakumari	Thovala	Thekkumalai West
Kanniyakumari	Thovala	Thekkumalai East
Kanniyakumari	Vilavancode	Kilamalai R.F.
The Nilgiris	Coonoor	Burliyar
The Nilgiris	Coonoor	Coonoor
The Nilgiris	Gudalur	Mudumalai
The Nilgiris	Gudalur	Nellakotta
The Nilgiris	Gudalur	Srimadurai
The Nilgiris	Gudalur	Gudalur (Tp)
The Nilgiris	Gudalur	O' Valley (Tp)
The Nilgiris	Kotagiri	Nilgiri Eastern Slopes
The Nilgiris	Kotagiri	Nandipuram
The Nilgiris	Kotagiri	Aracode
The Nilgiris	Kotagiri	Konakarai
The Nilgiris	Kotagiri	Kadinamala
The Nilgiris	Kotagiri	Kengarai

The Nilgiris	Kotagiri	Jackanarai
The Nilgiris	Kundah	Mulligoor
The Nilgiris	Kundah	Kilkunda (Tp)
The Nilgiris	Kundah	Melkundah
The Nilgiris	Kundah	Kinnakkorai
The Nilgiris	Kundah	Kilkunda (Tp)
The Nilgiris	Panthalur	Nelliyalam (Tp)
The Nilgiris	Udhagamandalam	Masinagudi
The Nilgiris	Udhagamandalam	Ebbanad
The Nilgiris	Udhagamandalam	Kukkal
The Nilgiris	Udhagamandalam	Sholur (Tp)
The Nilgiris	Udhagamandalam	Naduvattam (Tp)
Theni	Andipatti	Megamalai
Theni	Bodinayakanur	Ahamalai
Theni	Bodinayakanur	Bodi Hill North
Theni	Bodinayakanur	Kottagudi
Theni	Uthamapalayam	Erasakkanayackanur Hills
Theni	Uthamapalayam	SuruliRf .
Theni	Uthamapalayam	KoothanatchiyarRf
Theni	Uthamapalayam	Highways (Tp)
Theni	Uthamapalayam	VannathiparaiRf
Theni	Uthamapalayam	PandarathuraiRf
Theni	Uthamapalayam	MelagudalurRf
Tirunelveli	Ambasamudram	Papanasam R.F.
Tirunelveli	Ambasamudram	Dharmapuramatam
Tirunelveli	Ambasamudram	SingampattiZamindar Forest
Tirunelveli	Ambasamudram	PapanasamRf/Manimutharu (Tp)
Tirunelveli	Ambasamudram	TherkuViravanallur R.F.
Tirunelveli	Nanguneri	Kalakadu(R.F)
Tirunelveli	Nanguneri	Vadagarai
Tirunelveli	Shenkottai	Achampudur (Tp)
Tirunelveli	Shenkottai	Puliyarai R.F (Part)
Tirunelveli	Shenkottai	Achampudur (Tp)
Tirunelveli	Shenkottai	Achampudur (Tp)
Tirunelveli	Shenkottai	Puliyarai R.F.(Part)
Tirunelveli	Sivagiri	Sivagiri Reserve Forest
Tirunelveli	Tenkasi	Krishnapuram R.F.
Tirunelveli	Tenkasi	Vairavankulam R.F.
Tirunelveli	Tenkasi	Kadayanallur Upper Slopes
Tirunelveli	Tenkasi	Kadayanallur Upper Slopes/KambaneriPudukudi
Tirunelveli	Tenkasi	Courtallam Slopes R.F.
Virudhunagar	Rajapalayam	Settur RF
Virudhunagar	Rajapalayam	Sappaniparambu (R.F)

Virudhunagar	Rajapalayam	Kollankondan R.F.
Virudhunagar	Rajapalayam	KothankulamRf
Virudhunagar	Rajapalayam	Settur RF
Virudhunagar	Srivilliputhur	Khansabpuram (Unnipath RF)
Virudhunagar	Srivilliputhur	Srivilliputtur RF
Virudhunagar	Srivilliputhur	Khansabpuram(Khansapuram RF)
Virudhunagar	Srivilliputhur	Pudupatti RF
Virudhunagar	Srivilliputhur	Sundarapandiyam(R.F)
Virudhunagar	Srivilliputhur	Srivilliputtur R.F.
Virudhunagar	Srivilliputhur	VenkateswarapuramRf
Virudhunagar	Srivilliputhur	Venkateswarapuram R.F.
Virudhunagar	Srivilliputhur	Pillaiyarnatham R.F.
Virudhunagar	Srivilliputhur	ValaikkulamRf
Virudhunagar	Srivilliputhur	Valaikkulam R.F.

Latitudes and Longitudes of prominent points on the outer boundary of Eco-sensitive area in Tamil Nadu

Point	Latitude	Longitude
1	76.3587	11.5908
2	76.484	11.5287
3	76.2936	11.4753
4	76.4141	11.4403
5	76.5232	11.3701
6	76.6616	11.4376
7	76.7509	11.6147
8	76.5443	11.6855
9	76.5505	11.3356
10	76.8576	11.3275
11	76.8158	11.2267
12	76.979	11.3812
13	76.8468	11.5823
14	76.8278	11.4419
15	76.7466	11.5029
16	77.0007	11.545
17	76.7311	11.1922
18	76.7516	11.119
19	76.8047	11.0562
20	76.6974	11.2378
21	76.6218	11.263
22	76.7846	10.8908
23	76.7399	10.9689
24	76.8442	11.0219
25	76.8403	10.5569
26	76.9277	10.4858
27	77.0441	10.517
28	77.0779	10.508
29	77.0757	10.3926
30	77.0957	10.3096
31	76.9054	10.2526
32	77.0137	10.3166
33	76.9682	10.3876
34	76.8399	10.3396
35	77.1681	10.4634
36	77.3215	10.4354
37	77.2622	10.262
38	77.2896	10.231
39	77.3497	10.2701
40	77.3928	10.2299
41	77.4353	10.2976
42	77.4089	10.3664
43	77.5377	10.3861
44	77.5389	10.2938
45	77.6344	10.2687

Point	Latitude	Longitude
46	77.7063	10.2348
47	77.7317	10.3423
48	77.7157	10.3833
49	77.6559	10.4359
50	77.7524	10.4886
51	77.8165	10.3799
52	77.7829	10.2681
53	77.9114	10.2525
54	77.9753	10.1325
55	78.1257	10.1882
56	78.0026	10.2859
57	77.6005	10.1977
58	77.5129	10.2443
59	77.4065	10.1677
60	77.4647	10.129
61	77.4792	10.0654
62	77.3904	10.0104
63	77.2568	10.0352
64	77.1946	9.6102
65	77.3288	9.6757
66	77.4932	9.8542
67	77.5872	9.7667
68	77.4037	9.5274
69	77.4791	9.5639
70	77.5272	9.6455
71	77.6318	9.5993
72	77.5755	9.492
73	77.4443	9.4418
74	77.4065	9.3953
75	77.3412	9.4186
76	77.379	9.3137
77	77.3457	9.2004
78	77.2709	9.2035
79	77.3292	9.138
80	77.2939	9.076
81	77.247	9.0632
82	77.2143	9.0252
83	77.161	9.0076
84	77.1764	8.988
85	77.2291	8.9406
86	77.3238	8.8819
87	77.2808	8.9206
88	77.2584	8.878
89	77.329	8.772
90	77.3955	8.6927
91	77.2315	8.6385
92	77.494	8.6214

Latitudes and Longitudes of prominent points on the outer boundary of Eco-sensitive area in Tamil Nadu – Contd.

Point	Latitude	Longitude
93	77.5498	8.6042
94	77.34	8.5533
95	77.271	8.5808
96	77.5213	8.5209
97	77.5746	8.4171
98	77.4866	8.3937
99	77.448	8.4753
100	77.3076	8.4547
101	77.215	8.5113
102	77.2993	8.4024
103	77.3391	8.3529
104	77.3883	8.303
105	77.5358	8.3922
106	77.5572	8.2926
107	77.5406	8.1984
108	77.4718	8.2709
109	77.215	8.5113