



REDUCING MARINE PLASTIC POLLUTION FROM LAND-BASED SOURCES: STRATEGIES TO REDUCE SINGLE-USE PLASTICS



Norwegian Embassy
New Delhi

REDUCING MARINE PLASTIC POLLUTION FROM LAND-BASED SOURCES: STRATEGIES TO REDUCE SINGLE-USE PLASTICS



Norwegian Embassy
New Delhi

Disclaimers:

The contents and opinions are solely that of the author and do not reflect the views or policies of Ministry of Environment, Forest and Climate Change, Government of India. Reference herein to any specific commercial product, company, service, manufacturer or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favor.

The contents of this report do not necessarily reflect the views or policies of United Nations Environment Programme (UNEP) or contributory organizations. All material in the document may be freely quoted, with acknowledgment of the source. Mention of a commercial company or product in this report does not imply endorsement by UNEP.

© Maps, photos and illustrations as specified

Acknowledgment:

We sincerely thank the Ministry of Environment, Forest and Climate Change - Government of India, the Norwegian Embassy - New Delhi and UNEP for their support on this project under the India Norway Marine Pollution Initiative. We also thank UNEP reviewers for their comments and valuable insights, but they do not necessarily endorse its conclusions.

Lead Author and Project Management:

Chandra Bhushan (President and CEO, iFOREST)

Research and Drafting Support:

Apurupa Gorthi (Programme Associate, iFOREST)

Technical Review Committee:

Llorenç Milà i Canals, Head of the Secretariat - Life Cycle Initiative, UNEP

Claudia Giacobelli, Programme Management Officer, UNEP

Callum Sweeney, UNEP

UNEP India Country Office Team

Cover Photo:

Khadi Ganiev, istockphoto.com

Layout & Design:

Raj Kumar Singh (Graphic Designer, iFOREST)

TABLE OF CONTENTS

<i>List of Figures</i>	<i>vi</i>
<i>List of Tables</i>	<i>vi</i>
<i>List of Maps</i>	<i>vi</i>
<i>Abbreviations</i>	<i>vii</i>
Key Messages	8
Key Recommendations	9
Introduction	11
I. State of Research and Knowledge on Marine Litter	12
II. Institutional Capacity on Marine Plastic Litter	18
III. Marine Plastic Litter and SUP Management in India	21
IV. State of SUP Bans	23
V. Policy Recommendations and Strategies to Limit SUPs in Marine Litter	29
References	31

LIST OF FIGURES

Figure 1: Types of research institutions in marine litter	18
Figure 2: Plastic consumption in India (1990-2018)	22
Figure 3: Various legislations tackling plastic waste in India	22
Figure 4: Most common SUPs banned by states/UTs	23
Figure 5: SUP item-wise compliance with Guidelines for SUPs issued in 2019 by MoEFCC	25
Figure 6: Trend in SUP ban implementation timeframe	25
Figure 7: Types of plastic products exempted from ban	26
Figure 8: Enforcement agencies for the SUP ban	26

LIST OF TABLES

Table 1: Extended Producers Responsibility provisions	27
---	----

LIST OF MAPS

Map 1: Marine plastic litter on beaches or shorelines	13
Map 2: Marine plastic litter floating on the water or in the water column	14
Map 3: Marine plastic litter on sea floor/seabed.....	15
Map 4: Marine plastic litter ingested by biota.....	16
Map 5: Distribution of research institutions on marine litter across India	19
Map 6: Status of ban on plastic carry bags	24

ABBREVIATIONS

AICPML	All India Coordinated Project on Marine Litter	SDG	Sustainable Development Goals
CEE	Centre for Environment Education	SICOM	Society of Integrated Coastal Management
CIFRI	Central Inland Fisheries Research Institute	SPCB	State Pollution Control Board
COVID-19	CoronaVirus Disease 2019	SUP	Single Use Plastics
CSIR	Council of Scientific & Industrial Research	SW	South west
CSMCRI	Central Salt and Marine Chemicals Research Institute	ULB	Urban Local Bodies
CUSAT	Cochin University of Science and Technology	UN	United Nations
EPR	Extended Producer Responsibility	UNEA	United Nations Environment Assembly
EU	European Union	UNEP	United Nations Environment Programme
FTIR	Fourier Transform Infrared	UNEP-IOC	United Nations Environment Programme-Intergovernmental Ocean Commission
g	grams	UT	Union Territory
GOI	Government of India		
ICAR	Indian Council for Agricultural Research		
INCOIS	Indian National Center for Ocean Information Services		
IR	Infrared		
kg	kilogram		
km	kilometers		
km ²	square kilometers		
L	liters		
m	meters		
m ²	square meters		
m ³	cubic meters		
mm	millimeter		
MP	Microplastics		
MPPs	Microplastic Pellets		
MoEFCC	Ministry of Environment, Forest and Climate Change		
MoU	Memorandum of Understanding		
MPL	Marine Plastic Litter		
MSSRF	M S Swaminathan Research Foundation		
MT	Million Tonnes		
NCSCM	National Centre for Sustainable Coastal Management		
NGOs	Non-government organisations		
PAHs	Polycyclic Aromatic Hydrocarbons		
PCC	Pollution Control Committee		
PE	Polyethylene		
PP	Polypropylene		
PWM	Plastic Waste Management		
SACEP	South Asia Cooperative Environment Programme		

Key Messages

- Marine plastic pollution is a growing problem on India's coasts and oceans. Studies indicate that microplastics have entered the food chain and are now found in water, salt, and marine organisms, including fish of commercial importance.
- There is a notable lack of studies on marine litter, especially on floating debris, on seafloor/seabed and ingested by biota. There is a lack of comparable datasets to monitor the quantities, types, and sources of plastics in the marine environment.
- With rapid increase in plastic use across India, there is a need for continuous monitoring and analysis of marine plastic litter. While a general understanding on the scale of the issue exists, there is both a need for current data as well as analysis on the sources, pathways and polymer types commonly found.
- There is no dearth of institutions to undertake the research on marine litter. There are at least 31 research/academic institutions that have worked in the past or have current programs on marine litter and have the capacity to undertake research on various aspects of marine plastic litter.
- Most research institutions on marine litter are public universities and central government research institutes. Tamil Nadu on the East Coast and Kerala on the West Coast host the greatest number of institutions, consequently, the number of studies focusing on these states are higher.
- Global studies have attributed land-based plastics as the primary source of marine plastic litter, and single-use plastic (SUPs) products as a significant source of this problem.
- In India, SUPs account for 33-42% of all the plastics consumed, and they are a major component of plastic waste.
- While there are both central and state level legislations for plastic waste management, there is a lack of seamless infrastructure to manage land-based plastics (better solid waste management systems, extended producer responsibility (EPR), recycling), thereby increasing marine litter accumulation.
- Reducing plastic pollution is a key priority for India, indicated by the Central Government's intention to phase-out SUPs by 2022.
- An analysis of states/UTs SUP ban notifications or executive orders issued between 2016 and 2019 showed that in most cases, there were significant design flaw which led to poor enforcement. These include unrealistically short timeframes for ban, lack of clarity on banned items, restricted jurisdiction of the ban and lack of enforcement capacity to implement the SUP bans.
- Promotion of alternatives to SUPs and support to SUP manufacturers to shift to alternatives has not been addressed by any states/UT.
- Most states/UT have used multiple agencies for enforcement, leading to poor coordination and accountability.
- The infirmities in the regulations and execution strategies have further been compounded by the Coronavirus disease (COVID-19) crisis, which has increased the usage of SUPs and has simultaneously weakened the implementation of the SUP ban across states/UTs.

Key Recommendations

A. Strategies to enhance knowledge

- i. Increase the body of research on marine plastic pollution. Some areas of research can be:
 - (1) linkages between inland sources and marine litter,
 - (2) impact evaluation of marine plastic on ecosystem health, human health and fishery activities,
 - (3) regional studies to capture temporal and spatial variation of marine plastic pollution.
- ii. The top priorities for future research have been identified as:
 - (1) Litter source evaluation, chemical composition, transportation, and distribution modelling,
 - (2) Impact of litter on marine food web,
 - (3) Improvement of instrumentation capacity and advanced techniques in marine litter assessment.
- iii. Use standardised research methodologies to facilitate long-term monitoring of marine ecosystems. Adopting United Nations Environment Programme-Intergovernmental Ocean Commission (UNEP-IOC) (2009) proposed operational guidelines for beach, benthic and floating litter in quantification surveys can help standardise methods and units.
- iv. Build capacity among institutions to conduct high quality research. This can be achieved through providing financial assistance to improve/acquire specific instrumentation, training in advanced techniques and creating a greater workforce to carry out large-scale surveys.
- v. Institute an All India Coordinated Project on Marine Litter (AICPML), coordinated by the Marine Litter Cell, Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. AICPML's focus will be on coordinating and strengthening capacities of marine research institutions.
- vi. Setup a knowledge platform to compile, manage and share existing information on marine litter. A key consideration for the long-term success of this effort is ensure dedicated staff (database managers, subject-knowledge experts, software engineers, data scientists) and consistent funding. Increase the body of research on marine plastic pollution.

B. Strategies to improve land-based management of SUPs

- i. India should develop a National Plastic Strategy horizon to support an environmentally responsible plastic industry, reduce SUPs, improve waste management, and reduce plastic pollution, including marine pollution.
- ii. A ban on SUPs must be complemented by economic and market instruments such as taxes, subsidies, other fiscal mechanisms; standards, certifications, labelling; EPR provisions; and waste management strategies.
- iii. State and city governments should be involved in the implementation and monitoring of the SUP bans through action plans. A key focus of these action plans should be on evidence-based policy making through the collection of information on the successes and gaps during the implementation of the bans.
- iv. Information, education and communication should form the core of India's plastic strategy. These campaigns should aim to orient consumers on the list of banned SUPs as well as the need and importance of such a ban.

-
- v. The EPR in India can be augmented by adopting upstream and downstream strategies. The upstream strategies will address components of circularity like material design, sustainable alternatives, design for reuse, and recycling by creating mandatory requirements or targets to replace SUPs. Downstream EPR will create and enforce a financial structure for companies for compliance with EPR (as already being done by the latest guidelines under the PWM (Amendment) Rules 2022).
 - vi. A sound waste management ecosystem, including segregation, collection, and recycling, is crucial for managing SUPs and in turn limit the accumulation of marine litter. Solid Waste Management and Plastic Waste Management (PWM) Rules need to be revisited, setting practical goals and targets for improving segregation, recycling, and municipal waste disposal.
 - vii. Promotion of SUP alternatives should be an integral part of the SUP ban implementation strategy. Existing plastic manufacturers should be compensated and encouraged to move to alternative industries. Simultaneously, local and small-scale manufacturers need to be supported through procurement measures or financial incentives.
 - viii. Building capacity among stakeholders in the plastics value chain is the need of the hour. These capacity building exercises must include policy instruments, EPR and its implementation, and strengthening infrastructure on PWM for better channelization of resources.
 - ix. During emergencies like the COVID-19 pandemic, coordination between government agencies such that any measure to safeguard the public does not contradict an existing plastic legislation is a necessity. To this end, there is scope for the plastic legislation to incorporate exceptions valid under extraordinary circumstances (e.g., pandemic, natural disaster etc.) to prevent indiscriminate use of SUPs.

Introduction

Marine litter is a growing global environmental problem with millions of tonnes of plastics, processed timber, metals, glass, rubber, paper, and textiles ending up in the oceans every year across the world. Among these, plastics (and microplastics)¹ have been recognised to be the most significant pollutant accounting for about 80% of all marine debris.² Given the diffused source of litter and its transboundary nature, the problem is difficult to tackle and is increasingly becoming a crisis affecting marine ecosystems, public health, as well as the economy.

India is the twelfth largest contributor of marine litter and under business-as-usual is projected to become the fifth largest contributor by 2025.³ Global studies have shown that a significant portion of plastic waste generated on land ends up in the oceans due to mismanagement. To this end, even in India a major source of the litter can be attributed to the huge amount of plastic waste that is generated in the country daily (nearly 26,000 tonnes per day, as per Government of India estimates), and is poorly managed (only 60% of the generated waste is recycled).⁴

Previous studies have shown that land-based plastics are the primary sources of marine plastic litter, and SUPs⁵ have emerged as a significant source of this problem.⁶ In 2018-19, SUPs constituted between 33% to 42% of India's annual plastic consumption. As a result, reducing plastic waste, especially SUPs, is a key priority for India.⁷ Currently, almost all states and UTs have some form of rules to ban the use of various SUP products. While the motivation has been to reduce SUP demand and usage to improve waste management, a significant outcome of this effort will be to limit the accumulation of SUPs in the marine environment.

This policy brief on reducing marine plastic pollution from land-based sources, focuses on the current state of knowledge and institutional capacity on marine plastic litter and the strategies to reduce marine litter by developing a comprehensive approach to reduce the demand and usage of SUPs. This is the first step to develop an integrated approach to reduce marine plastic litter.

I. State of Research and Knowledge on Marine Litter

Plastic waste has become ubiquitous in marine ecosystems. Considering the potential severity of the crisis, the issue of marine litter has gained prominence in global policy platforms. The Sustainable Development Goals (SDG) have highlighted the significance to 'conserve and sustainably use the oceans, sea, and marine resources for sustainable development' (SDG 14) and have set targets for countries to 'prevent and significantly reduce' marine pollution by 2025 (Indicator 14.1).

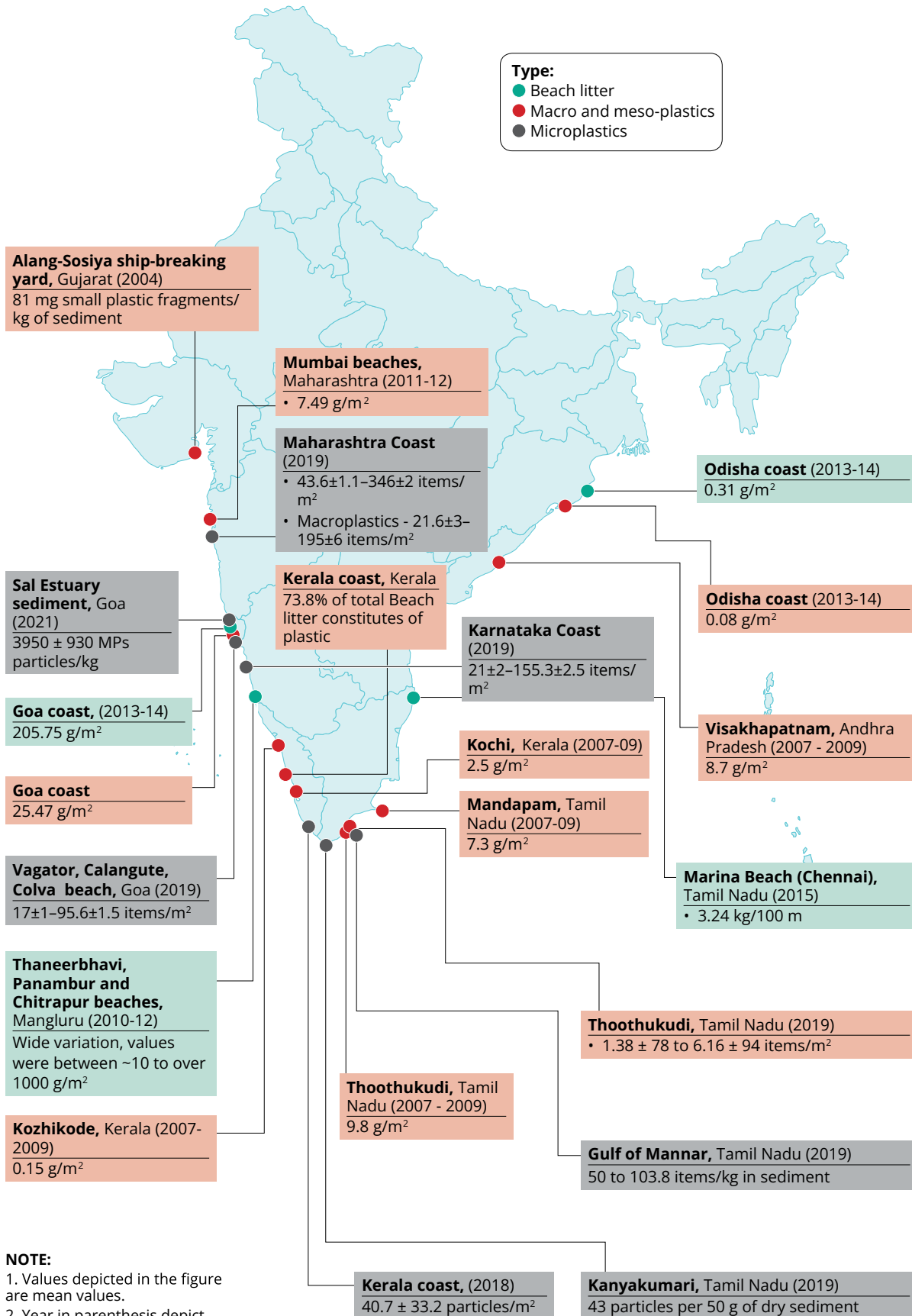
The SDG indicator for reporting on marine plastic litter is Indicator 14.1.1.b. The floating plastic debris density can be assessed by estimating the marine plastic litter in four categories (or fates):⁸

- On beaches or shorelines (beach litter)
- Floating on the water or in the water column
- On the seafloor/seabed
- Ingested by biota (e.g., sea birds).

The state of knowledge on the marine plastic litter in India has been assessed as per the above-mentioned categories and are summarised in *Maps 1, 2, 3, and 4*.

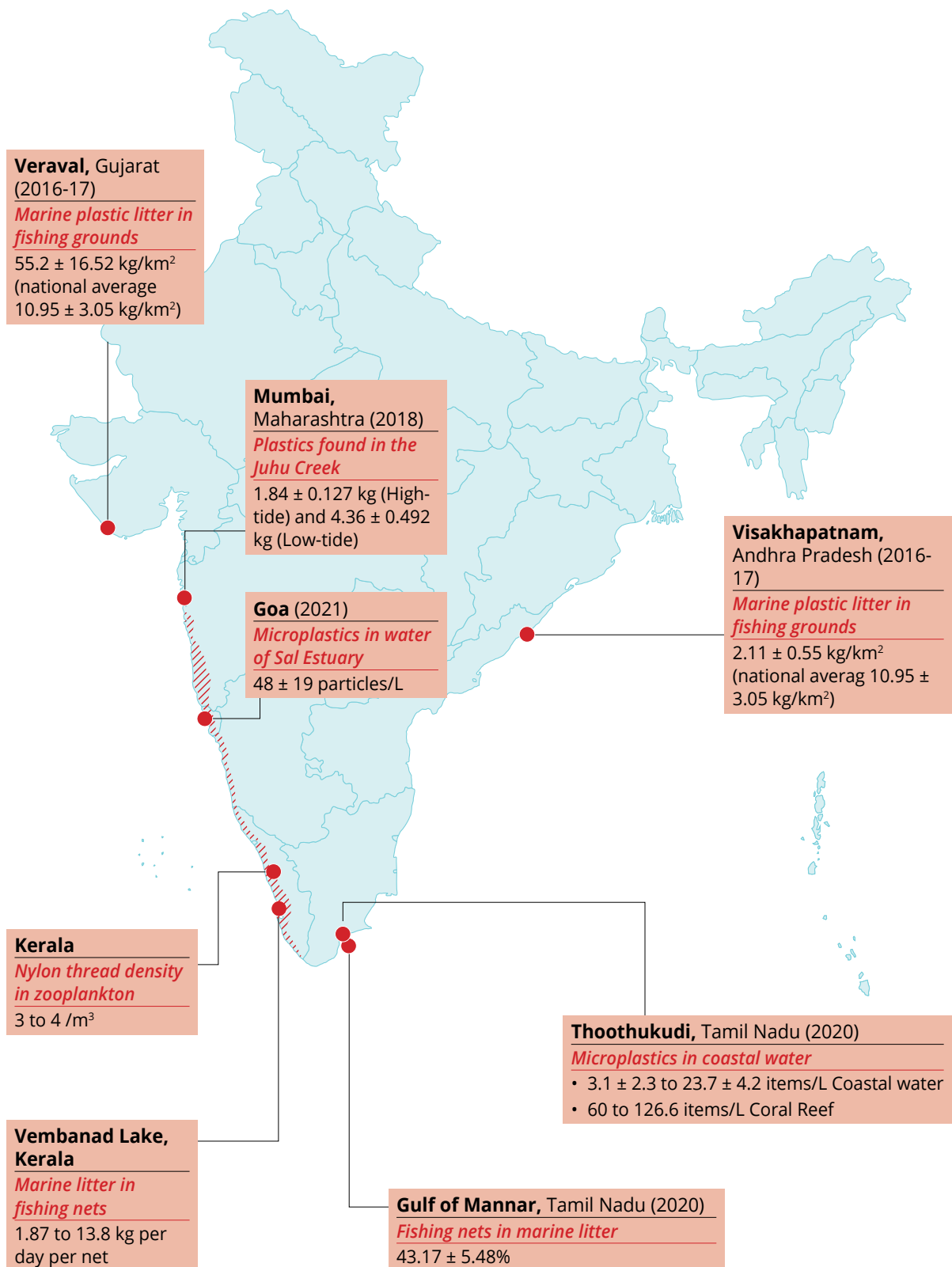
- **Beach and shoreline litter:** There are few All-India studies on beach litter. The last extensive survey was by Kaladharan et al. (2017) in 2013-2014 and thus may not be representative of current reality wherein the use of plastic has increased.⁹ There are a greater number of data points and studies along the western coast relative to the eastern coast. Plastic litter along the beaches of the western coast are significantly higher than those along the east coast. Further, tourism and recreational activities were commonly indicated to be the major source of plastic litter. Studies with focus on limiting/better managing marine plastic litter have emphasised on the need for adoption and implementation of plastic waste management rules through modernising the management systems and applying better enforcement mechanisms.^{10, 11} Finally, even among the studies available, comparison was difficult due to lack of standardisation in methodology and units. Standardisation of units and methodologies can be useful to monitor and compare the status of marine plastic litter.
- **Floating litter:** It is evident from literature that a common source of floating litter in the form of plastic fragments, pellets, fibres or even microplastics, is fishing activities. However, there is a definite paucity of data on floating litter.¹² *Map 2* summarises some findings on floating litter.
- **Litter in seabed/seafloor:** Current studies focus on the accumulation of plastic fragments as well as microplastics in coral ecosystems (*see Map 3*). Based on this the deep sea has been found to be a substantial sink for microplastics, with live corals acting as substrate for debris. However, there is scope for more studies on litter in deep sea and the fate of plastics in these environments.
- **Litter ingested by biota:** A distressing outcome of plastics in marine environments has been their entry into the food chain in the form of invisible particles of microplastics. Various studies conducted along the coast of Tamil Nadu have found presence of microplastics in edible oysters, clams and various types of fish species (*see Map 4*).^{13, 14, 15} Another study evaluated that the salt in Thoothukudi (Tamil Nadu) contained microplastics. Based on this analysis, on an average people consume approximately 216 particles of microplastics per year via sea salt, and 48 particles of microplastics per year via bore-well salt, if on an average, the daily salt intake of the person was 5g.¹⁶

Map 1: Marine plastic litter on beaches or shorelines



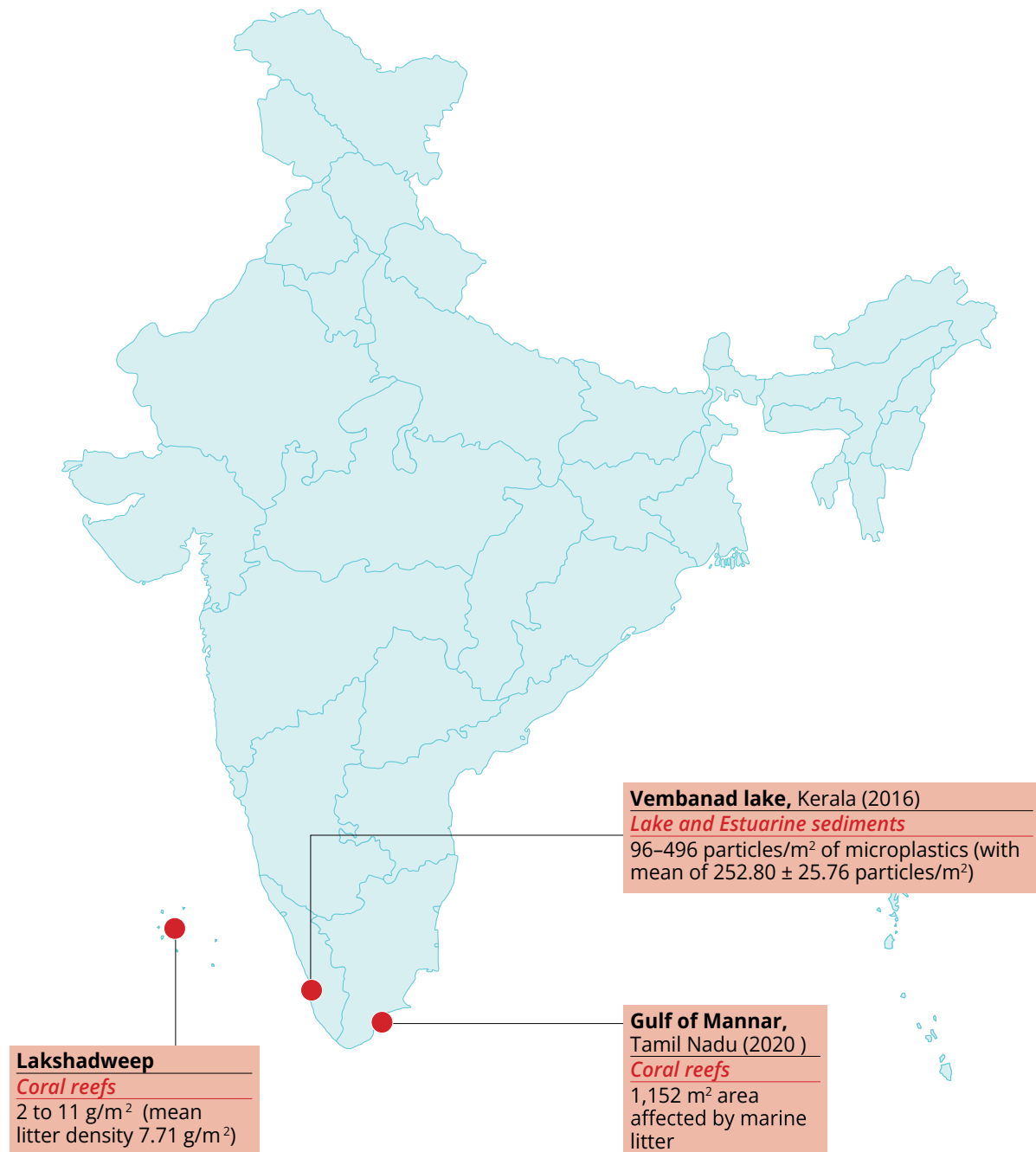
NOTE:
 1. Values depicted in the figure are mean values.
 2. Year in parenthesis depict the year of sample collection
 Source: iFOREST (2020)

Map 2: Marine plastic litter floating on the water or in the water column



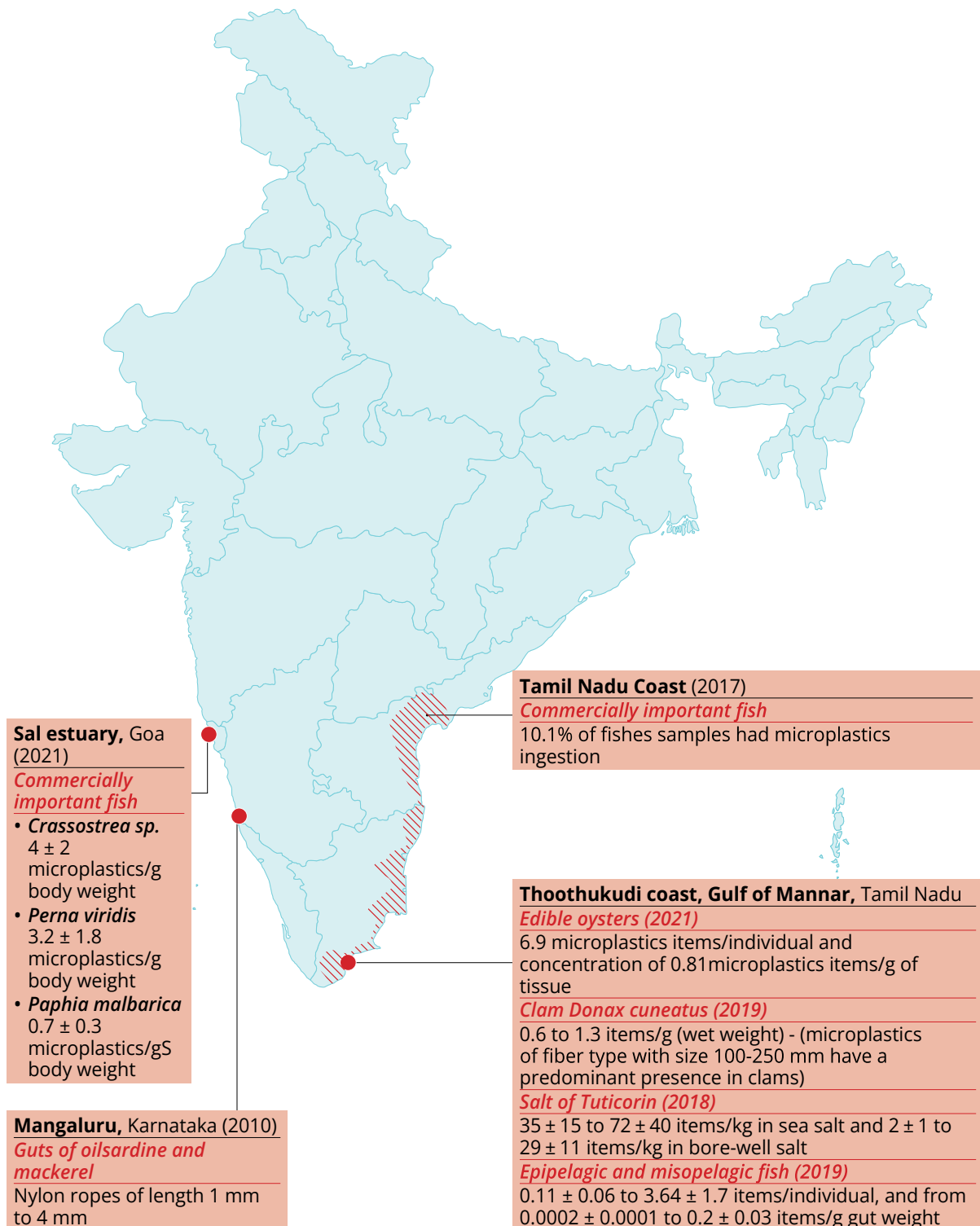
Source: iFOREST (2020)

Map 3: Marine plastic litter on sea floor/seabed



Source: iFOREST (2020)

Map 4: Marine plastic litter ingested by biota



Source: iFOREST (2020)

There is substantial scope for further research on marine litter. Existing studies indicate that marine plastic litter is a growing issue for human health and environmental quality. While there are several studies on beach litter, there is scope to make these a periodic assessment, all-India studies with standardised protocols such as the UNEP-IOC 2009 guidelines. There is also a need to expand the scope of studies beyond beach litter, into seafloor and floating litter studies. There need to be greater number of studies on marine plastics implications on human health.

Box 1: Three major causes of marine plastic litter

Studies done over the last 10 years indicates that the major source of marine plastic litter in India are coastal sources (tourism & recreational activities), fishing and from the inland rivers. Acting on these three major sources will be crucial in reducing marine plastic litter. The findings of the studies are summarized below:

1. Tourism & Recreational activities

Studies along the coast of India have found significant presence of plastic litter in beach debris, more so in beaches with tourism or recreational activities. A comparative study of plastic litter along the coastline of India found that coast of Odisha had the least amount of beach litter (0.31g/m²), whereas the beaches of Goa with greater tourist inflow had the highest litter (205.75g/m²). Similarly, a 2016 study in Marina Beach, a tourist and recreational centre in Chennai, contained 3.24kg/100 g of plastic litter.¹⁷ Microplastics in tourist beaches (150 particles/50g of dry sediment) of Kanyakumari were higher than harbours (99 particles/50g of dry sediment).¹⁸ Mandvi beach in Gujarat was found to be littered with pouches of tobacco products (gutkha), food wrappers, plastic straws, cutlery, and plastic fragments of various dimensions and thickness, suspected to accumulate from recreational and tourism activities.¹⁹

2. Fishing

A study (2002) in Greater Nicobar established that the plastic debris found in the marine environment was not of local origin. Improper handling of solid waste from fishing was attributed to be one of the sources of marine plastic litter.²⁰ An extensive survey (2018) on microplastics in 25 locations along the Tamil Nadu coast, found that beaches closer to the river mouth had higher abundance of microplastics influenced by tourism and fishing activities.²¹

It was evident that fishing contributed more to floating litter than to beach litter. A survey (2020) in fishing grounds of Veraval, Gujarat found 55.2±16.52kg/km² of plastic litter in the trawl site.²² The same study found plastic litter quantities to be 2.11±0.55kg/km² in the trawl grounds of Visakhapatnam, Andhra Pradesh and estimated the national average at 10.95±3.05kg/km².²³ In the Gulf of Mannar 43.17±5.48% of the marine litter consisted of fishing nets.²⁴ With respect to quantification of plastic litter on the sea floor/seabed, a study (2020) concerning coral reefs of Gulf of Mannar estimated that about 1152m² of reef area was affected by marine debris.²⁵ A chief pollutant here was abandoned fishing nets, constituting close to 50% of the marine debris in this area.

3. Plastics from rivers

A study on Chitrapur and Tannirbavi beaches Mangaluru, Karnataka with mean litter values of mean values of 901.5g/m² and 689.8g/m², respectively²⁶ suggested that two rivers (Nethravathi and Gurupur) discharging into the marine ecosystem made a significant contribution to the plastic litter pollution in the beach.²⁷ Similarly, in water channels along the south Juhu creek, substantial quantities of plastic debris was transported into the sea, indicating that water channels connected to the sea mostly transport macro- and meso- plastics that disintegrate to form microplastic in due course of time.²⁸ Post-flood debris, following the 2015 flood in Chennai, contributed significantly to beach litter Elliot and Thiruvanmiyur beaches constituted of plastic items including plastic bags (28.3%), bottle and caps (13.84%), straws (12.83%) and food wrappers (8.97%).²⁹

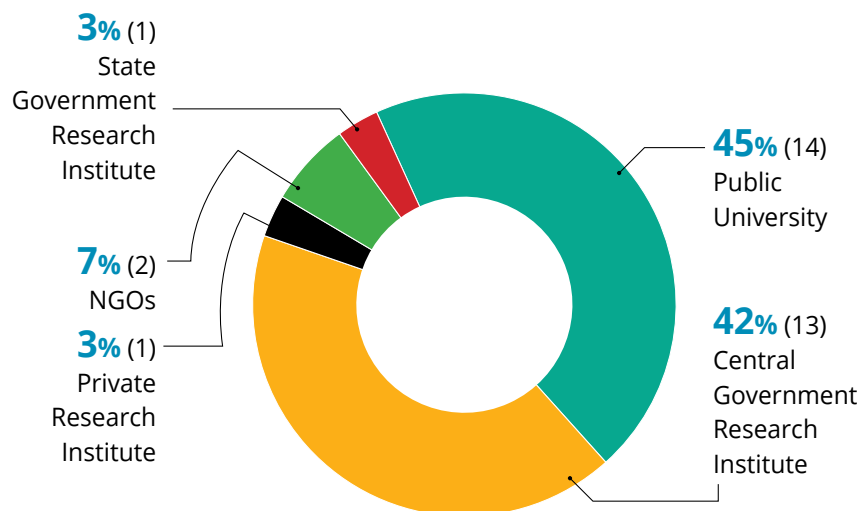
Tinnakkara island (west coast) and Chennai (east coast), found white and yellow plastic pellets to be the most common type of marine plastic litter.³⁰ The number of pellets found in Tinnakkara island (603 pellets) was three-fold higher than those on Chennai coast (201 pellets), although the former is in a relatively remote oceanic location with no plastic manufacturing. This vast difference was attributed to a possible international tanker route ship accident and/ or unintentional release.³¹

II. Institutional Capacity on Marine Plastic Litter

India has 31 research institutions located along coastal states studying various aspects of marine litter. These institutions either had a dedicated department/centre for marine and coastal management, a research programme on marine litter or scholarly publications on marine litter. Figure 1 depicts the affiliations of the institutions with a large majority of the institutions being public universities or central government research institutions.

The engagement of private or state government supported research institutes is limited (Figure 1). The two non-governmental organisations (NGO) working on the issue are primarily engaged in awareness raising and capacity building.

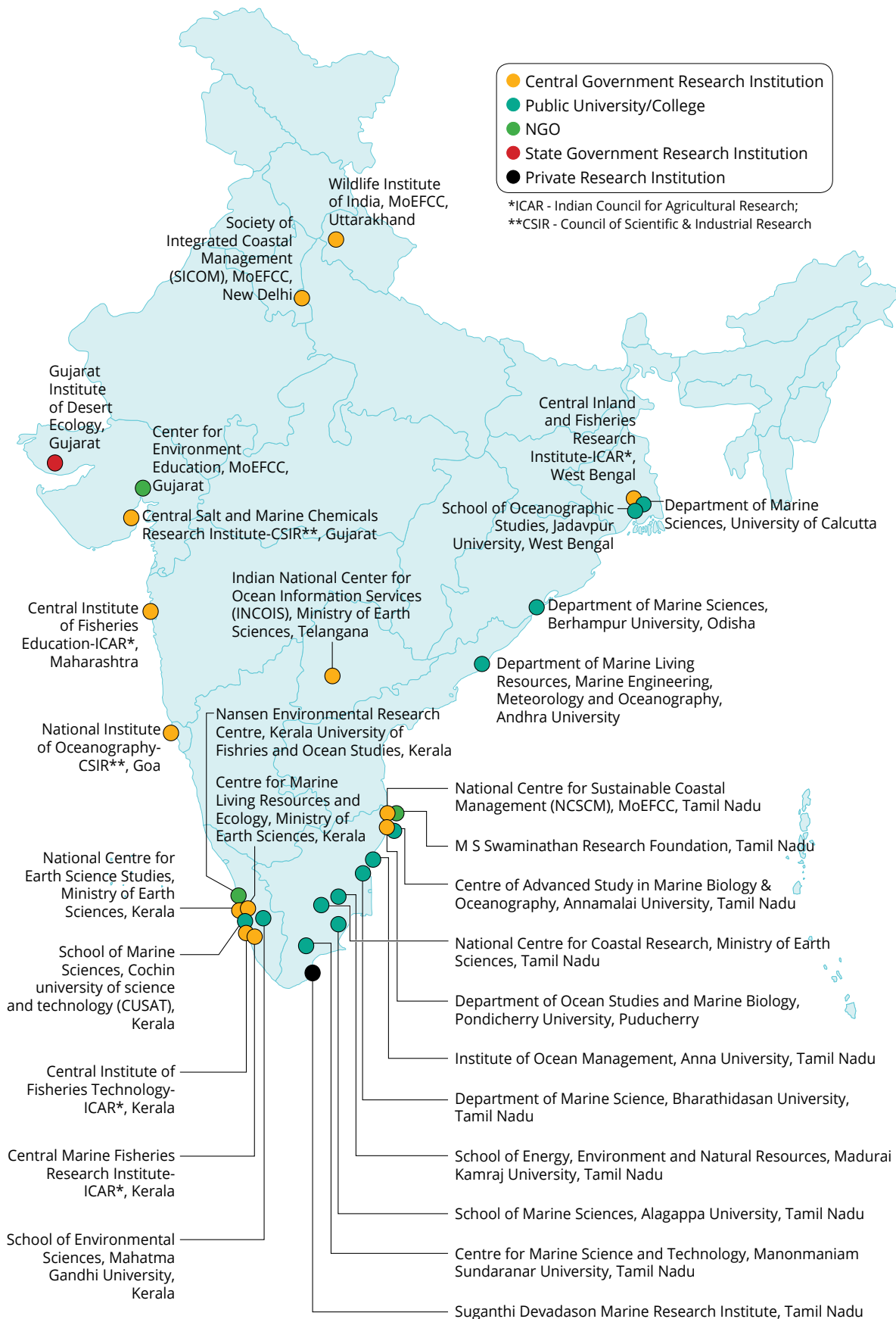
Figure 1: Types of research institutions in marine litter



Source: iFOREST (2020)

With respect to location, most of the institutions are concentrated in the coastal states (Map 5). Tamil Nadu (10) and Kerala (7) have the maximum number of research institutions. Overall, 16 institutes are located on the west coast, 12 on the east coast, and three in non-coastal states with research programmes in coastal areas (Map 5).

Map 5: Distribution of research institutions on marine litter across India



Source: iFOREST (2020)

The engagement of these institutions on marine litter/marine pollution is primarily related to their affiliation. The universities are engaged in the capacity of both research and teaching, while the central government research institutions are mostly committed to research. Institutions, such as Centre for Environment Education (CEE), M S Swaminathan Research Foundation (MSSRF) and Society of Integrated Coastal Management, established by the MoEFCC are involved in capacity building.

The existing/ongoing research projects by the institutions include the following:

- (i) Evaluating the abundance and composition of beach-litters;
- (ii) Assessment of the level of macro and micro-litter contamination in the sea;
- (iii) Quantification of microplastics in marine biota;
- (iv) Assessment of microplastics in Coastal and Estuarine habitats;
- (v) Assessment of macro and microplastics in inland water; and,
- (vi) Impact of plastic pollution on marine life.

Future priority research areas of these institutions, as evaluated based on their responses (obtained from seven institutions) are as follows:

- Litter source evaluation, chemical composition, transportation, distribution and modelling;
- Impact of litter on marine food web;
- Improvement of specific instrumentation capacity and advanced techniques for marine litter assessment;
- Practical mitigation and management plans to prevent plastic litter intrusion into the food web;
- Modelling the spatial distribution and dispersion of marine litter; and,
- Economic impacts of marine litter on the coastal communities.

There is a need to build the capacity of these institutions to generate knowledge and find solutions to reduce marine plastic litter.

III. Marine Plastic Litter and SUP Management in India

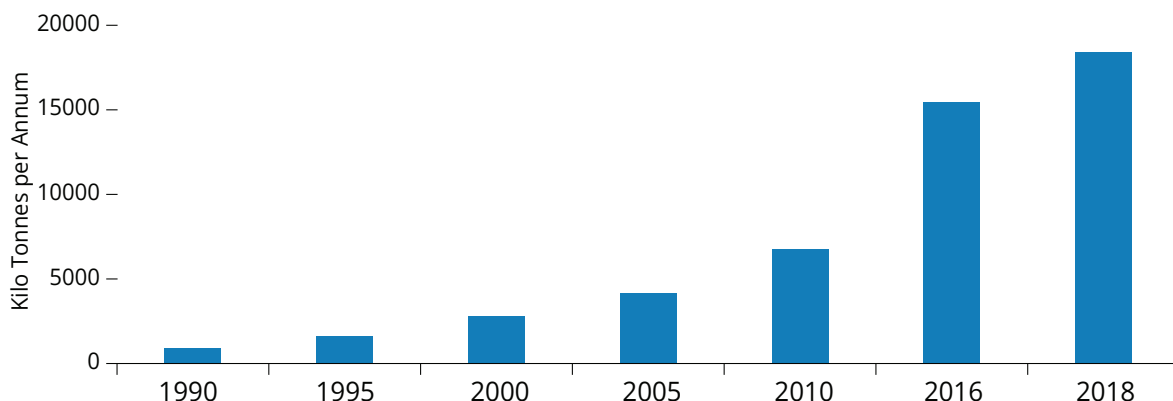
Land-based plastics are the primary sources of marine plastic litter, and SUPs have emerged as a significant source of this problem.^{32, 33} SUPs are products made of plastics that are used only once before they are discarded. SUPs have also emerged as an inextricable part of our daily lives and more so during the COVID-19 pandemic. Reducing plastic waste, especially SUPs, is a key priority for the Government of India.³⁴

Plastic consumption in India has grown from 0.9 Million Tonnes (MT) in 1990 to 18.45 MT in 2018 – a 20-fold growth in the last 28 years. In 2018-19, India produced 17 MT and consumed 18.45 MT plastics (see *Figure 2: Plastic consumption in India (1990-2018)*).³⁵ Based on the different types of plastic material used for SUP production, the SUP consumption in India in 2018-19 is estimated to be between 33-42% of total plastic consumption (6.0 – 7.7 MT/annum). The plastic waste generation is estimated at anywhere between 3.36 MT³⁶ to 9.4 MT³⁷ per year. SUPs, therefore, constitutes a major part of the plastic waste generated in the country.



Creativecommons

Figure 2: Plastic consumption in India (1990-2018)



Source: Indian Plastic Industry Report, 2019, PLASTINDIA Foundation, 2019

Reducing the use of SUPs is widely recognised as an essential part of the plastic waste management in India. Over the past two decades various legislations have been introduced to ban the production and consumption of various SUPs (Figure 3).

Figure 3: Various legislations tackling plastic waste in India

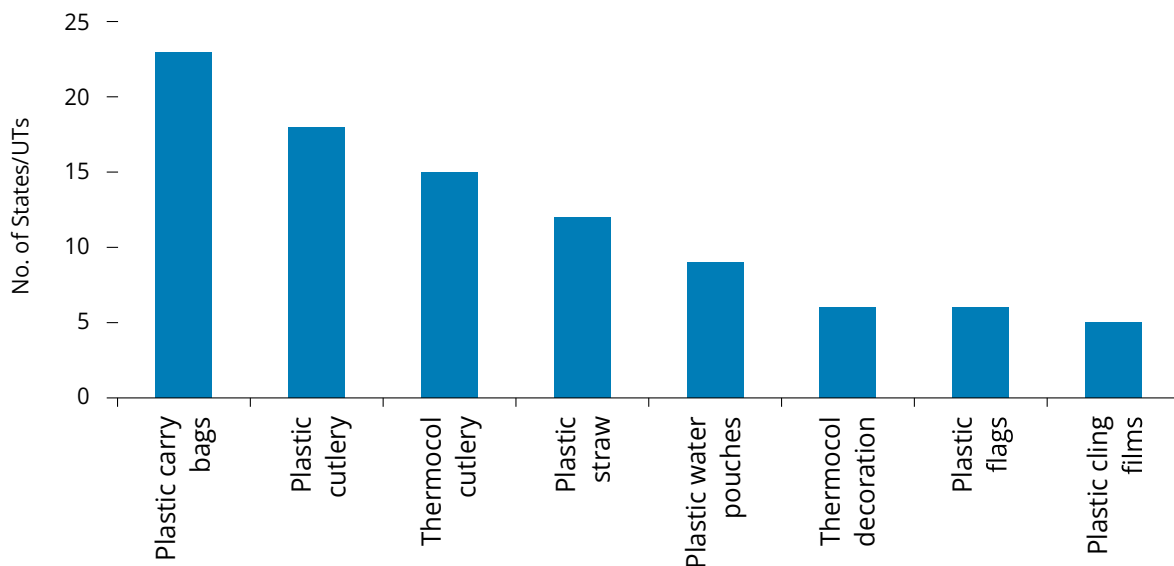


The most comprehensive among these is the PWM, 2016 which was distinctive in that it assigned responsibilities to every stakeholder in the plastic supply chain.³⁸ However, other than a ban on single use carry bags, these rules did not have any provision for managing other types of SUP waste. On 5th June 2018, Prime Minister Narendra Modi pledged to phaseout all SUPs by 2022, thus bringing to the spotlight the menace of SUPs. As of today, 30 states and UTs across the country have notified state-wide SUP bans of various degrees, 25 of which came between 2016 and 2020. In 2019, the MoEFCC issued a set of 'standard guidelines' to states and UTs for SUP. Despite a wide variation in SUP bans, all 36 states and UTs in India have some form of a ban on single-use plastic carry bags (*as depicted in Map 3*). Most recently, Draft Plastic Waste Management Rules, 2021 have been released for public comments wherein a definition for SUPs as well as a phaseout timelines for limited number of SUPs have been introduced.

IV. State of SUP Bans

Between 2016 and 2019 all states and UTs in India introduced some form of a ban on one or more SUP product(s). The state/UT imposed bans on SUPs offers an opportunity to examine regulation of SUP and opportunities to improve plastic legislation in India. To this end, this report focuses on state/UT imposed SUP bans between 2016 and 2019 to understand gaps and challenges in their design and implementation. Further, an in-depth examination of five states/UT, namely, Maharashtra, Kerala, Odisha, Sikkim, and Delhi was undertaken through stakeholder consultations and a detailed review of all the bans introduced in the state/UT history. It is important to note that these consultations and associated analyses were conducted between September 2020 and January 2021, well before the current SUP ban was announced. Thus, while some of the lessons in the report may be used to design any future plastic legislation, it is not a commentary on the SUP ban of 1 July 2022.

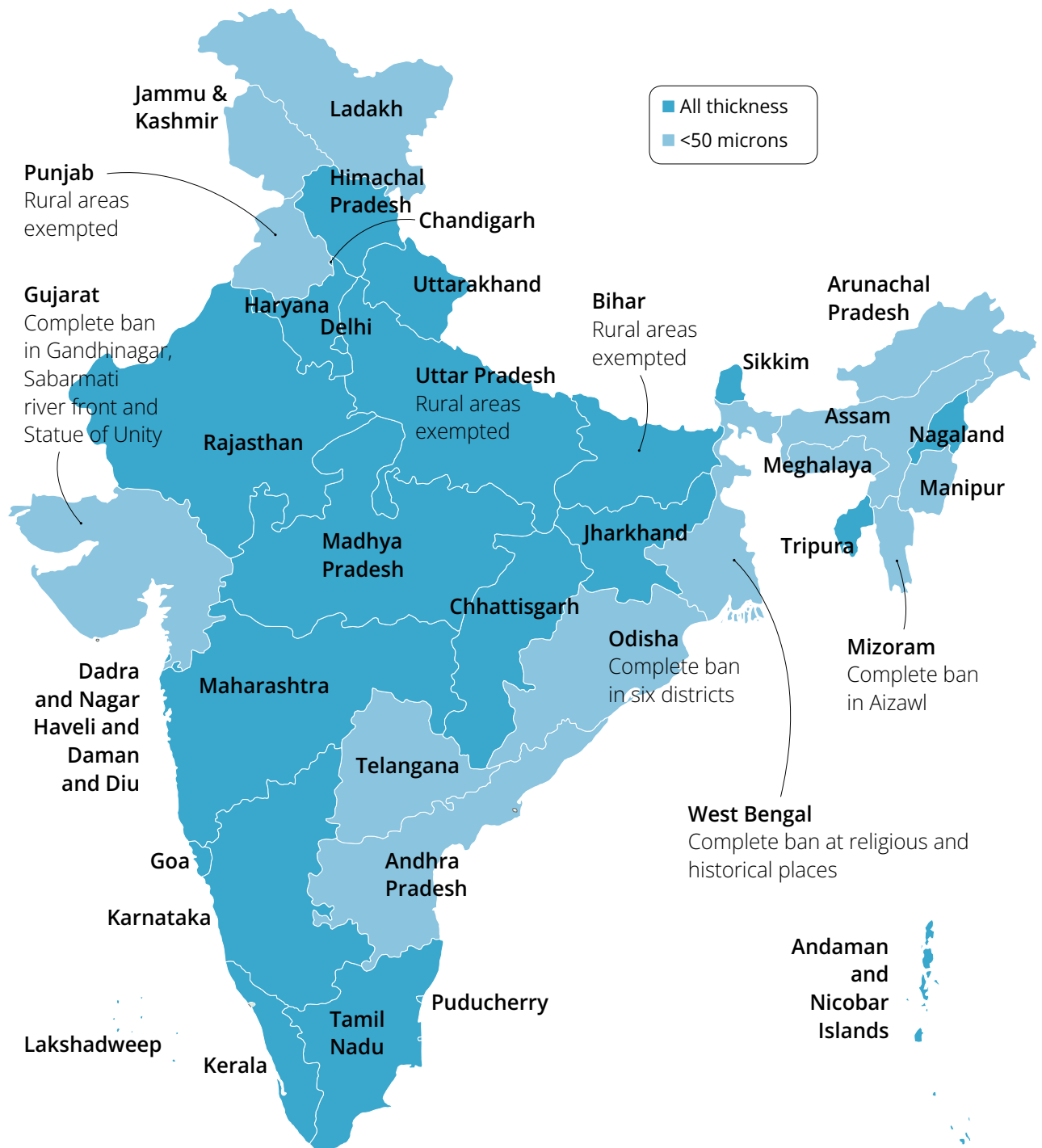
Figure 4: Most common SUPs banned by states/UTs



Source: iFOREST (2020)

A total of twenty-five states/UTs have issued gazette notifications and five have issued executive orders on banning SUPs. However, some of the major plastic producing states – Gujarat, Andhra Pradesh and Telangana – have not imposed any ban on SUPs, other than those under PWM Rules, 2016. Twenty-three states/UTs have a complete ban on plastic carry bags irrespective of thickness and eighteen states/UTs have banned plastic cutlery. The most commonly banned SUP product has been plastic carry bags as depicted in Figure 4 and Map 6.

Map 6: Status of ban on plastic carry bags

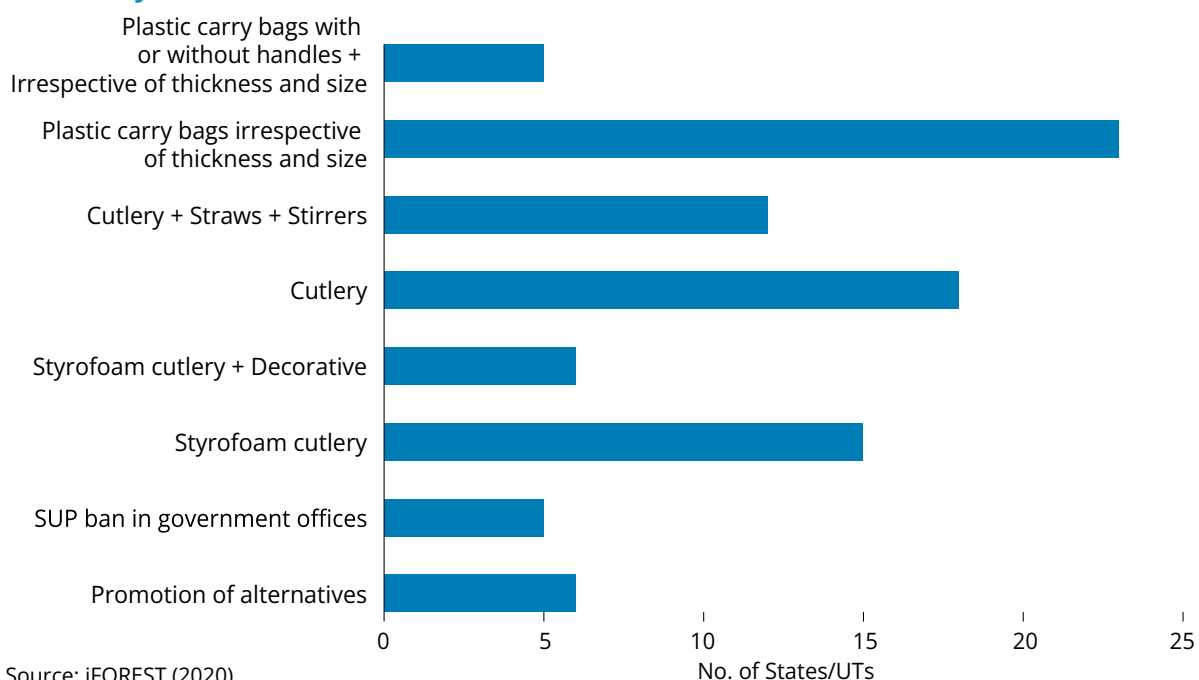


Complete ban refers to a ban of plastic carry bags of all thickness. Many states/ UTs imposed bans only on plastic carry bags of <50 microns thickness.

Source: iFOREST (2020)

Fourteen states/UTs defined banned SUP items as per the Guidelines for Single-Use Plastics (2019) issued by the MoEFCC to state governments. The Guidelines suggested the ban of all plastic carry bags irrespective of thickness and size, and with or without handles; all plastic cutlery; and all Styrofoam cutlery and decorative items. The number of states/UTs that have placed a ban on various types of SUP products based on the 2019 Guidelines for SUPs issued by MoEFCC has been depicted in Figure 5. As already observed above, plastic carry bags were the most commonly banned SUP product by states/UTs.

Figure 5: SUP item-wise compliance with Guidelines for SUPs issued in 2019 by MoEFCC

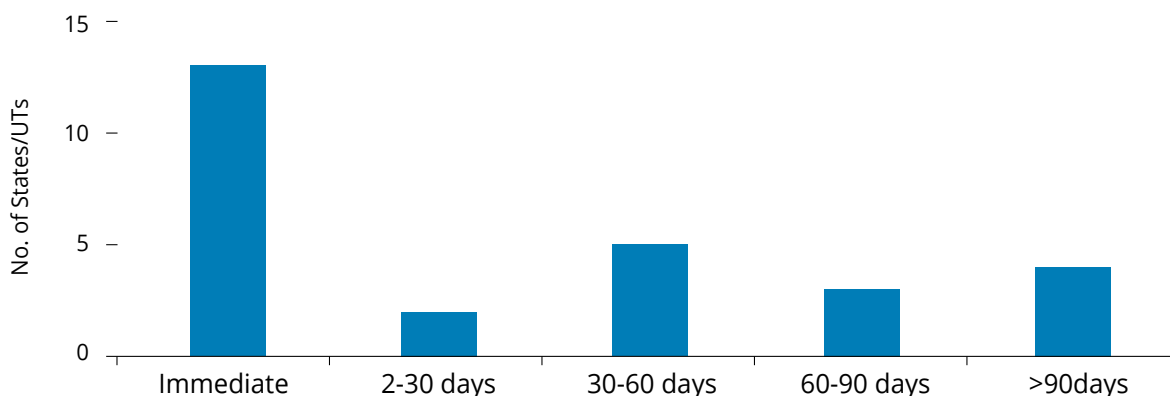


Source: iFOREST (2020)

Key drawbacks with existing SUP bans

Most states/UTs provided a very unrealistic and short timeframe (0 – 30 days) to implement the SUP ban (see Figure 6). An immediate enforcement of bans does not give adequate time for businesses to move to alternatives. Global best practices suggest that without providing adequate time for the market and users to adapt, the SUP ban is likely to fail. This seems to have happened in the country.

Figure 6: Trend in SUP ban implementation timeframe*



Note: 'Immediate' also includes those states that did not specify any timeframe.

*Two states and one UT opted for phase-wise implementation of the ban and these are not included in the above plot.

Chandigarh - Phased implementation (Immediate to 90 days)

Maharashtra - Phased implementation (Immediate to 30 days)

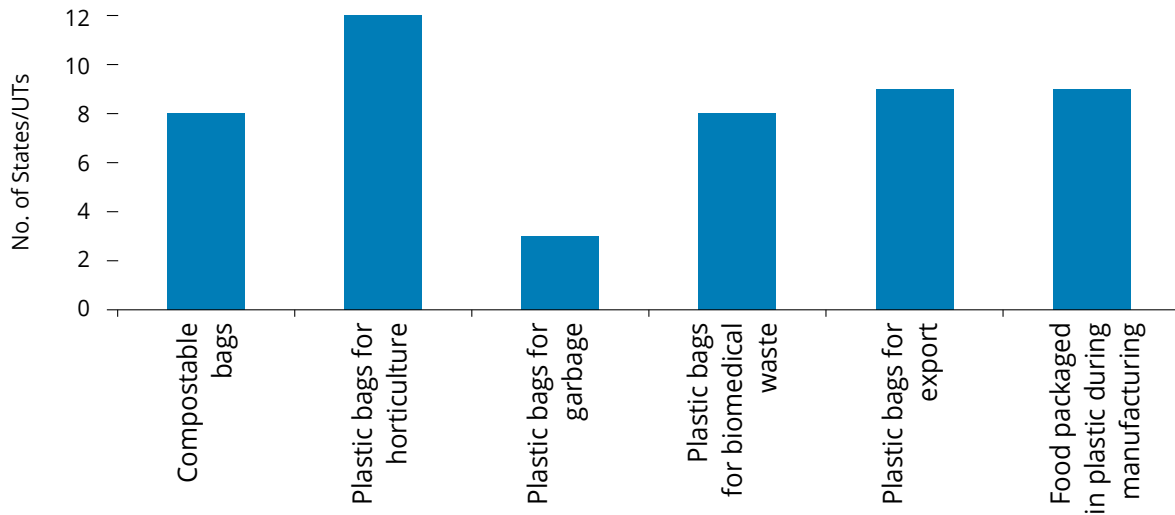
Uttar Pradesh - Phased implementation (30-75 days)

Source: iFOREST (2020)

While most states/UTs imposed a complete ban in their jurisdiction, some big states have imposed the ban in specific areas. States like Bihar, Punjab and Uttar Pradesh have exempted rural areas from the ban and Gujarat and Odisha have imposed ban in only few cities. Exemptions granted to jurisdictions have made enforcement very difficult.

Exemption to products in similar SUP category have also led to poor enforcement. Some of the commonly exempt SUPs were plastics used for food packaging, compostable bags and plastic bags for horticulture, garbage storage and disposal, biomedical waste, and export (see Figure 7).

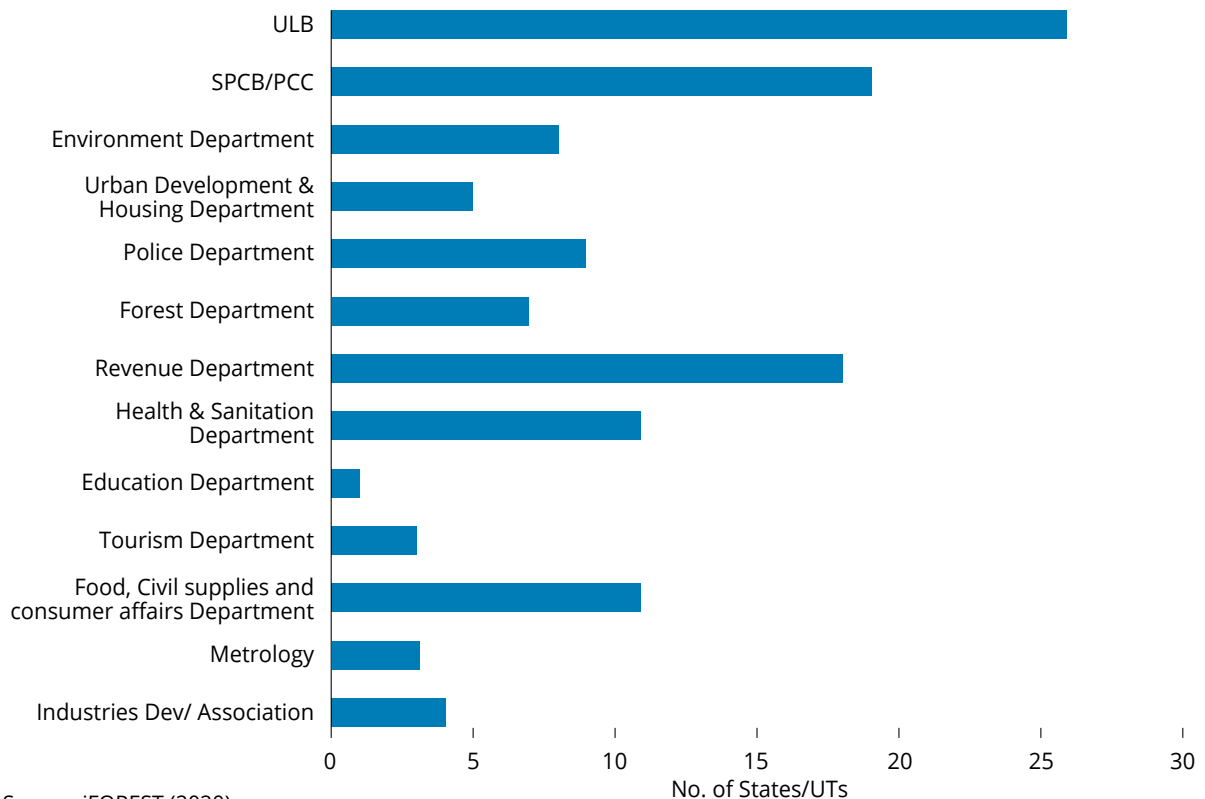
Figure 7: Types of plastic products exempted from ban



Source: iFOREST (2020)

The enforcement of the ban became challenging both due to lack of sufficient workforce dedicated to the SUP ban as well as due to the involvement of multiple agencies that created issues with accountability and coordination. The government departments typically involved in the ban implementation were urban local bodies (ULB), State Pollution Control Board (SPCB)/Pollution Control Committee (PCC), and the revenue department (see Figure 8).

Figure 8: Enforcement agencies for the SUP ban



Source: iFOREST (2020)

Both EPR and promotion of alternatives to SUPs were absent in both the ban notification and implementation efforts of the majority of states/UTs. Only three states, Kerala, Maharashtra and Odisha, had any provisions for EPR (see Table 2).

Table 1: Extended Producers Responsibility provisions

Kerala	Branded plastic juice packets, PET juice bottles (all sizes) and drinking water bottles of 500 ml and above will be covered under EPR. Branded items/products which come with plastic packaging will be dealt with the EPR guidelines.
Maharashtra	PET bottles manufacturers to develop “Buy Back Depository Mechanism” with a predefined buy back price of H2/- and H1/- for bottles having liquid holding capacity of 1L or more and of 0.5L respectively. Milk dairies, retail sellers and traders to ensure buy back mechanism of milk plastic bags (not less than 50 microns), the bags should be printed with the buy back price and it should not be less than H0.50/-.
Odisha	Manufacturers and producers of PET bottles for drinking water and soft drinks shall take back the waste through the same retail sales network under mutually agreed terms and conditions based on EPR agreement.

Source: iFOREST (2020)

The infirmities in the regulations and execution strategies have further been compounded by the COVID-19 crisis, which has increased the usage of SUPs and has simultaneously weakened the implementation of the SUP ban across states/UTs.

Gaps and challenges

Based on the in-depth study of Kerala, Maharashtra, Delhi, Sikkim and Odisha it became evident that the SUP bans were implemented in fits and starts without any long-term strategy. It was further found that the SUP bans were largely unsuccessful in the states. Some of the main challenges in the implementation were as follows:

- **Arbitrary list of SUP items:** States/UTs used an arbitrary list of SUPs, without assessing their contribution to the plastic waste problem. Further, the procedures followed to arrive at the current list of SUP items banned were also unclear.
- **Enforcement agencies:** ULBs and SPCBs are two main implementation agencies for the SUP ban, however both faced major challenges. These ranged from lack of sufficient workforce to the absence of a dedicated personnel/department for SUP ban management. An additional issue reported was that of ambiguities in the ban notifications which either led to confusion or excessive use of power by authorities during enforcement drives.
- **Lack of alternatives:** In addition to lack of alternatives, emergence of non-woven polypropylene bags and fraudulent compostable plastic bags posed a major challenge in banning carry bags. With polypropylene bags, that are quite rampant, there is a lack of awareness both among the public and in some cases authorities on their ill-effects.
- **Absence of a waste management system:** Relative success with the SUP was observed in Kerala and Sikkim where long-term strategies and a robust waste management system exist. On the other hand, enforcement of ban in states/UTs with poor waste management systems has been unsuccessful.
- **Non-robust EPR:** EPR was largely unsuccessful in the states, owing to several gaps in implementation. A critical need for EPR is a functional waste management system, facilitating proper segregation of solid waste. There is a further need to overhaul the EPR system as the

existing system neither incentivises nor has any penalty provision – deterring any accountability in its implementation. EPR in its current form is also wholly focused on waste management rather than minimising the overall production and use of SUPs.

Overall, there are significant issues with design and approach of SUP ban which has led to poor enforcement.

Box 2: COVID-19 and SUPs

The COVID-19 pandemic re-introduced SUPs in the form of disposable masks, gloves and other healthcare tools. There was a simultaneous increase in dependence on online shopping and food delivery, thereby increasing plastic packaging waste. While on one hand this increase was attributed to the general sense of hygiene associated with disposables, a lot of this was in open contradiction to existing SUP bans. On the other hand, states like Kerala, Sikkim and Odisha reported a decrease in tourism and festivities, there was a noticeable decrease in plastic waste.

A critical learning from the pandemic was the need for a seamless and robust waste management system. While biomedical waste from hospitals and quarantine facilities were handled as per guidelines issued by the CPCB, waste emerging from potentially infected households were poorly handled. Below are some key lessons to be considered for future SUP legislations:

- Going forward, waste management regulations, especially SUP bans must account for extraordinary circumstances (e.g., pandemic, natural disaster etc.) and introduce exemptions in the legislations. This can prevent indiscriminate use of SUPs.
- Coordination between government departments is fundamental to a successful ban. Measures that openly contradict the ban, such as promotion of disposable masks, gloves and cutlery need to be carefully deliberated before endorsement.
- Segregation of waste is fundamental to a sound waste management system, especially in a crisis like the COVID-19 pandemic. Continued enforcement of segregation through appropriate steps needs to be priority.

V. Policy Recommendations and Strategies to Limit SUPs in Marine Litter

A. Strategies to enhance knowledge

- i. There is scope to increase the body of knowledge (research projects, publications, and databases) on marine plastics, including plastics/microplastics on beaches and shorelines, sea surface, water column, seafloor (deep and shallow), and ingestion by marine organisms. Linkages between inland sources and marine litter need to be further researched to find appropriate solutions. There is also a need for studies to examine the ecological and socio-economic impacts of marine plastic litter. Large-scale studies to capture the temporal and spatial variation of marine plastic litter are a requirement and need to be carried out across all coastal regions of the country.
The top priorities for future research have been identified as:
 - (1) Litter source evaluation, chemical composition, transportation, and distribution modelling.
 - (2) Impact of litter on marine food web.
 - (3) Improvement of instrumentation capacity and advanced techniques for marine litter assessment.
- ii. Adopting United Nations Environment Programme-Intergovernmental Ocean Commission (UNEP-IOC) (2009) proposed operational guidelines for beach, benthic and floating litter in quantification surveys can help standardise methods and units. These protocols prescribe site selection & characterisation, sampling units, sampling frequency as well as equipment needs. Periodic all-India studies using the UNEP-IOC protocols can help generate comparable datasets. Comparability of data is of utmost importance to be able to evaluate future efforts in managing marine litter.
- iii. It is important to augment the capacities of existing institutions so that they can lend their unique specialisation for studying the issue of plastic litter. Capacity-building among institutions can be achieved through providing financial assistance to improve/acquire specific instrumentation, training in advanced techniques and creating a greater workforce to carry out large-scale surveys.
- iv. There is a need for an All India Coordinated Project on Marine Litter (AICPML), coordinated by the Marine Litter Cell. The primary goal of the AICPML should be to strengthen the capacity of marine-related institutions, to understand the linkages between the various sources of waste and marine litter and to publish an annual report on the state of marine litter on India's coast and exclusive economic zone with special focus on plastic pollution, including microplastics.
- v. Finally, a knowledge platform to compile and manage existing information on marine litter needs to be setup. The platform will further perform the essential function of a knowledge-sharing conduit. A key consideration for the long-term success of this effort is ensure dedicated staff (database managers, subject-knowledge experts, software engineers, data scientists) and consistent funding.

B. Strategies to improve land-based management of SUPs

- i. India should develop a National Plastic Strategy horizon to support an environmentally responsible plastic industry, reduce SUPs, improve waste management, and reduce plastic pollution, including marine pollution.
- ii. A ban on SUPs must be complemented by economic and market instruments such as taxes, subsidies, other fiscal mechanisms; standards, certifications, labelling; EPR provisions; and waste management strategies.
- iii. State and city governments have a critical role to play in the success of the nationwide SUP ban. A key focus of these state and city action plans should be on evidence-based policy making through the collection of information on the successes and gaps during the implementation of the bans.
- iv. Information, education, and communication should form the core of India's plastic strategy. These campaigns should aim to orient consumers on the list of banned SUP as well as the need and importance of such a ban.
- v. The EPR in India can be augmented by adopting upstream and downstream strategies. The upstream strategies will address components of circularity like material design, sustainable alternatives, design for reuse, and recycling by creating mandatory requirements or targets to replace SUPs. Downstream EPR (as already being done by the latest guidelines under the PWM (Amendment) Rules 2022) will create and enforce a financial structure for companies for compliance with EPR.
- vi. A sound waste management ecosystem, including segregation, collection, and recycling, is crucial for managing SUPs and in turn limit the accumulation of marine litter. Solid Waste Management and PWM Rules need to be revisited, setting practical goals and targets for improving segregation, recycling, and municipal waste disposal.
- vii. Promotion of SUP alternatives should be an integral part of the SUP ban implementation strategy. Existing plastic manufacturers should be compensated and encouraged to move to alternative industries. Simultaneously, local and small-scale manufacturers need to be supported through procurement measures or financial incentives.
- viii. Building capacity among stakeholders in the plastics value chain is the need of the hour. These capacity building exercises must include policy instruments, EPR and its implementation, and strengthening infrastructure on PWM for better channelization of resources.
- ix. SUP management during emergencies such as the COVID-19 pandemic is a challenge. During such events, coordination between government agencies such that any measure to safeguard the public does not contradict an existing plastic legislation is a necessity. To this end, there is scope for the plastic legislation to incorporate exceptions valid under extraordinary circumstances (e.g., pandemic, natural disaster etc.) to prevent indiscriminate use of SUPs.

REFERENCES

- 1 Plastic debris comprises of fishing related items, such as rope, nets, float etc. (48%), food packaging (13%), sandals (3%), plastic bottles (7%), bottle caps (2%), food containers (1%), and foamed plastics (8%). The major source of microplastics include those which are either manufactured as pellets and microbeads, or from fragmented parts of larger objects.
- 2 IUCN. (2018). Marine Plastic. <https://www.iucn.org/resources/issues-briefs/marine-plastics>
- 3 Mangotra, K., & Chandrasekhar, K. (2020, 11 November). Are we at sea with marine plastic pollution? Financial Express. <https://www.financialexpress.com/opinion/are-we-at-sea-on-marine-plastic-pollution/2125852/>
- 4 Mohanty, S. (2018). Recycling of plastics in Indian perspective. <https://www.unido.org/sites/default/files/files/2018-11/Plenary%20-%20Plastics%20-%20Mohanty.pdf>
- 5 Single-use plastic (SUP) refers to a variety of single-use plastic products such as plastic carry bags, plastic cutlery, packaging, among other such products. The MoEF&CC, Government of India defined SUP in Plastic Waste Management (Amendment) Rules 2021 as follows - "Single-use plastic commodity" mean a plastic item intended to be used once for the same purpose before being disposed of or recycled;
- 6 IUCN. (2018). Marine Plastic. <https://www.iucn.org/resources/issues-briefs/marine-plastics>
- 7 Barkha Mathur. (2019, September 12). 'The World Must Bid Goodbye To Single Use Plastic': PM Modi Takes Forward The Campaign Against Plastic At UN Meet. [swachh india.ndtv.com. https://swachhindia.ndtv.com/world-must-bid-goodbye-to-single-use-plastic-pm-modi-takes-forward-the-campaign-against-plastic-at-un-meet-37906/](https://swachhindia.ndtv.com/world-must-bid-goodbye-to-single-use-plastic-pm-modi-takes-forward-the-campaign-against-plastic-at-un-meet-37906/)
- 8 UN-Environment. (2018). Global Manual on Ocean Statistics- Towards a definition of indicator methodologies. https://uneplive.unep.org/media/docs/statistics/egm/global_manual_on_ocean_statistics_towards_a_definition_of_indicator_methodologies.pdf
- 9 Kaladharan, P., Vijayakumaran, K., Singh, V. V., Prema, D., Asha, P. S., Sulochanan, B., Hemasankari, P., Loveson Edward, L., Padua, S., Veena, S., Anasukoya, A., & Bhint, H. M. (2017). Prevalence of marine litter along the Indian beaches: A preliminary account on its status and composition. *Journal of the Marine Biological Association of India*, 59(1), 19–24. <https://doi.org/10.6024/jmbai.2017.59.1.1953-03>. <http://eprints.cmfri.org.in/12330/>
- 10 Raha, K.U., Kumar, R.B., Sarkar, K.S. (2021). Policy framework for mitigating land-based marine plastic pollution in the Gangetic Delta region of Bay of Bengal – A review. *Journal of Cleaner Production*, 278, 123409. <https://www.sciencedirect.com/science/article/abs/pii/S0959652620334545>
- 11 Kapinga, C.P., and Chung, S.H. (2020). MARINE PLASTIC POLLUTION IN SOUTH ASIA. Escap South and South-west Asia Office. https://www.unescap.org/sites/default/files/SSWA%20Development_Paper20-02_Marine%20Plastic%20Pollution%20in%20South%20Asia.pdf
- 12 Bhushan, C., & Gorthi, A. (2021). Status of research capacities and information systems on marine plastic litter in India. UNEP (to be published).
- 13 Patterson, J., Jeyasanta, I., Sathish, N., Booth, N.A. & Edward, P.K.J. (2019). Profiling microplastics in the Indian edible oyster, *Magallana bilineata* collected from the Tuticorin coast, Gulf of Mannar, Southeastern India. *Science of The Total Environment*, 691, 727-735. <https://www.sciencedirect.com/science/article/abs/pii/S0048969719331766#:~:text=Samples%20of%20water%2C%20sediment%20and,0.45%20items%2Fg%20of%20tissue.>
- 14 Sathish, N.M., Jeyasanta, I.K. & Patterson, J. (2020). Monitoring of microplastics in the clam *Donax cuneatus* and its habitat in Tuticorin coast of Gulf of Mannar, India. *Environmental Pollution*, 266, 115219 <https://www.sciencedirect.com/science/article/abs/pii/S0269749120311398>
- 15 Sathish, N.M., Jeyasanta, I. & Patterson, J. (2020). Occurrence of microplastics in epipelagic and mesopelagic fishes from Tuticorin, Southeast coast of India. *Science of The Total Environment*, 720, 137614. <https://www.sciencedirect.com/science/article/abs/pii/S0048969720311256#:~:text=The%20abundance%20of%20MPs%20varied,contamination%20than%20the%20mesopelagic%20ones.>
- 16 Sathish, N.M., Jeyasanta, I. & Patterson, J. (2020). Microplastics in salt of Tuticorin, Southeast Coast of India. *Archives of Environmental Contamination & Toxicology*, 79, 111-121. <https://link.springer.com/article/10.1007/s00244-020-00731-0#:~:text=The%20mean%20abundance%20of%20microplastics,%25%20were%20found%20in%20salt.>
- 17 Arun. Kumar, A., Sivakumar, R., Reddy, Y. S. R., Bhagya. Raja, M.V., Nishant, T., & Revanth, V., (2016). Preliminary study on marine debris pollution along Marina beach, Chennai, India. *Regional Studies in Marine Science*, 5, 35–40. <https://doi.org/10.1016/j.rsma.2016.01.002>. <https://www.sciencedirect.com/science/article/abs/pii/S2352485516300020>
- 18 Sundar, S., Chokkalingam, L., Roy, P. D. & Usha, T. (2020). Estimation of microplastics in sediments at the southernmost coast of India (Kanyakumari). *Environmental Science and Pollution Research*. <https://link.springer.com/article/10.1007/s11356-020-10333-x>

-
- 19 Behera, D. P., Kolandhasamy, P., Sigamani, S., Devi, L. P., & Ibrahim, Y. S. (2021). A preliminary investigation of marine litter pollution along Mandvi beach, Kachchh, Gujarat. *Marine Pollution Bulletin*, 165, 112100. <https://doi.org/10.1016/j.marpolbul.2021.112100>
 - 20 G. Dharani, A. K. Abdul Nazar, R. Venkatesan and M. Ravindran.(2003). Marine debris in Great Nicobar. https://www.researchgate.net/publication/259985648_Marine_debris_in_Great_Nicobar
 - 21 Karthik, R., Robin, R.S., Purvaja, R., Ganguly, D., Anandvelu, I., Raghuraman, R., Hariharan, G.Ramakrishan, A. & Ramesh,R. (2018). Microplastics along the beaches of southeast coast of India. *Science of The Total Environment*, 645, 1388-1399. <https://www.sciencedirect.com/science/article/abs/pii/S0048969718326986>
 - 22 Kaladharan, P., Singh, V.V., Asha, S.P., Edward, L. & Sukhadane, S.K. (2020). Marine plastic litter in certain trawl grounds along the peninsular coasts of India. *Marine Pollution Bulletin*, 157, 111299. <https://www.sciencedirect.com/science/article/pii/S0025326X20304173>
 - 23 Ibid
 - 24 Veerasingan, S., Saha, M., Suneel, V., Vethamony, P. Rodrigues, C.A., Bhattacharya, S. & Naik, B.G. (2016). Characteristics, seasonal distribution and surface degradation features of microplastic pellets along the Goa coast, India. *Chemosphere*, 159, 496-505. <https://www.sciencedirect.com/science/article/abs/pii/S0045653516308141>
 - 25 Patterson, K.E., Mathews, G., Diraviya Raj, K., Laju, R.L., Selva Bharath, M., Dinesh Kumar, P., Arasamuthu, A., Grimsditch, G. (2020). Marine debris — An emerging threat to the reef areas of Gulf of Mannar, India. *Marine Pollution Bulletin*, 151, 110793, <https://www.sciencedirect.com/science/article/pii/S0025326X1930949X>
 - 26 Sulochanan, B., Bhat G.S, Lavanya S., Dineshbabu A.P., & Kaladharan P. (2014). A preliminary assessment of ecosystem process and marine litter in the beaches of Mangalore. *Indian Journal of Geo – Marine Science*, 43(9), 1764–1769. https://www.researchgate.net/publication/305250962_A_preliminary_assessment_of_ecosystem_process_and_marine_litter_in_the_beaches_of_Mangalore.
 - 27 Sulochanan, B., Veena, S., Ratheesh, L., Padua, S., Rohit, P., Kaladharan, P., & Kripa, V. (2019). Temporal and spatial variability of beach litter in Mangaluru, India. *Marine Pollution Bulletin*, 149, 110541. <https://doi.org/10.1016/j.marpolbul.2019.110541>. <https://www.sciencedirect.com/science/article/abs/pii/S0025326X1930685X>
 - 28 Manickavasagam, S., Kumar, S., Kumar, K., Bhuvanewari, R.G., Paul, T. & Shukla, P.S. (2020). Quantitative assessment of influx and efflux of marine debris in a water channel of South Juhu creek, Mumbai, India. *Regional Studies in Marine Science*, 34, 101095. <https://www.sciencedirect.com/science/article/abs/pii/S2352485519302014>
 - 29 Veerasingam, S., Mugilasaran, M., Venkatachalapathy, R. & Vethamony, P. (2016). Influence of 2015 flood on the distribution and occurrence of microplastic pellets along the Chennai coast, India. *Marine Pollution Bulletin*, 109, 196-204. <https://www.sciencedirect.com/science/article/abs/pii/S0025326X16304027?via%3Dihub>
 - 30 Mugilasaran, M., Venkatachalapathy, R., Sharmila, N. & Gurumoorthi, G. (2015). Occurrence of microplastic resin pellets from Chennai and Tinnakkara Island: Towards the establishment of background level for plastic pollution. *Indian Journal of Geo Marine Sciences*, 46, 1210-1212. <http://nopr.niscair.res.in/bitstream/123456789/41992/1/IJMS%2046%286%29%201210-1212.pdf>
 - 31 Ibid
 - 32 IUCN. (2018), Marine Plastic. <https://www.iucn.org/resources/issues-briefs/marine-plastics>
 - 33 <https://plasticoceans.org/the-facts/>
 - 34 Barkha Mathur. (2019, September 12). 'The World Must Bid Goodbye To Single Use Plastic': PM Modi Takes Forward The Campaign Against Plastic At UN Meet. *swachh india.ndtv.com*. <https://swachhindia.ndtv.com/world-must-bid-goodbye-to-single-use-plastic-pm-modi-takes-forward-the-campaign-against-plastic-at-un-meet-37906/>
 - 35 PlastIndia Foundation. 2019. Indian Plastic Industry Report, 2019. <https://www.plastindia.org/plastic-industry-status-report.html>
 - 36 Central Pollution Control Board (CPCB). 2019. Annual Report 2018-19, Implementation of Plastic Waste Management Rules, 2016. https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2018-19_PWM.pdf
 - 37 Mohanty, S. (2018). Recycling of plastics in Indian perspective. <https://www.unido.org/sites/default/files/files/2018-11/Plenary%20%20-%20Plastics%20-%20Mohanty.pdf>
 - 38 MoEFCC.(2016). Plastic Waste Management Rules, 2016. <http://www.mppcb.nic.in/proc/Plastic%20Waste%20Management%20Rules,%202016%20English.pdf>



<https://www.norway.no/en/india/>



<https://www.facebook.com/norwayinindia>



<https://twitter.com/norwayinindia>



<https://www.instagram.com/norwayinindia/>



Norwegian Embassy

New Delhi