SOUTH ASIA COOPERATIVE ENVIRONMENT PROGRAMME (SACEP)
DEVELOPMENT OF A REGIONAL MARINE LITTER ACTIVITY IN THE SOUTH ASIAN SEAS (SAS) REGION

INDIA – COUNTRY REPORT

EVALUATION AND ASSESSMENT OF MARINE DEBRIS/LITTER

Dr. R. Venkatesan
National Consultant

National Institute of Ocean technology
Ministry of Earth Sciences
Chennai, India

April 2007

SOUTH ASIA COOPERATIVE ENVIRONMENT PROGRAMME
SACEP - DEVELOPMENT OF A REGIONAL MARINE LITTER ACTIVITY IN TH`E SOUTH ASIAN SEAS (SAS) REGION

INDIA – COUNTRY REPORT

EVALUATION AND ASSESSMENT OF MARINE DEBRIS/LITTER

Name of the Country		:	India
Name of the Consultant		:	Dr. R. Venkatesan
Occupation		:	Scientist F - Group Head - Ocean Science & Technology for Islands
Organisation & address		:	National Institute of Ocean Technology (Ministry of Earth Sciences) Pallikaranai, Chennai, 601302, India
City/Town		:	Chennai
Country		:	India
Telephone	**Business**	:	91-44-66783422& 91-44-22461102
	Residence	:	91-44-24425234
	Mobile	:	91 9444399829
Fax		:	91-44-22460275/66783430
e-mail address		:	venkat@niot.res.in, rvenkatin@yahoo.com

1. Preamble

1.1 State of Marine and Coastal Environment in your country, including the issue of marine debris/litter with a comparison on the global status.

The Indian peninsula, hemmed in by the Indian Ocean, Arabian Sea and the Bay of Bengal, boasts of a magnificent marine ecosystem. A combination of geo-morphological and climatic factors and the nutrients supplied by the rivers along the coast makes it exceptionally productive and biologically rich. The marine environment, which includes the adjacent coastal areas, supports productive and protective habitats such as mangroves, coral reefs and sand dunes. The marine environment is facing a number of pressures, arising out of the needs of people, and the multiple uses that coastal and marine areas can be put into. These pressures contribute to the depletion of marine resources and degradation of the marine environment. In the absence of good management, these pressures might result in severe stress.

India has a long coastline of more than 7500 km. Its marine resources are spread over in the Indian Ocean, Arabian Sea and Bay of Bengal. The Exclusive Economic Zone (EEZ) of the country has an area of 2.02 million sq km comprising 0.86 million sq km on the west coast, 0.56 million sq km on the east coast and 0.6 million sq km around the Andaman and Nicobar islands. The east coast supports activities such as agriculture and aquaculture while a number of industries are supported on the west coast. Tourism has emerged as a major economic activity in coastal states such as Goa, Kerala and Orissa.

Chapter 17 of Agenda 21a spells out certain programmes for the sustainable development of the marine environment. This chapter presents a brief overview of the institutional set-up of the marine sector in India. This is followed by a summary of the major programmes of Agenda 21 relevant to this sector and highlights of the policies and programmes undertaken by the Government of India to meet the objectives of Agenda 21 with regard to marine resources. The government policies and programmes are analyzed in the context of Agenda 21 in the following section. The chapter concludes with recommendations for a cleaner and healthier marine environment.

Island ecosystem

In India, there are two major human inhabited island groups – Andaman & Nicobar and Lakshadweep islands. The Andaman and Nicobar islands comprise about 550 islands occupying an area of about 8249 sq km in the Bay of Bengal. The coastline alone is about 1926 km long and the EEZ comprises 30% of Indian EEZ. Most coastal areas support a rich growth of mangrove vegetation and fringing coral reefs.

The Lakshadweep is an archipelago of 37 coralline islands covering 32 sq km in Arabian Sea with an EEZ of about 0.4 million sq km. It has an abundance of living resources including microbes, sea grasses, seaweeds, sea grapes, mangroves, and varied marine fauna.

The other important group of islands includes the 20 odd islands that extend from Pamban to Tuticorin in the Gulf of Mannar. To protect its biological wealth, the Gulf of Mannar with vast diversity of marine flora and fauna, has been declared as a Marine Biosphere Reserve by the Ministry of Environment and Forests, Government of India.

Marine biodiversity

Dense mangrove forests in the Sunderbans, the world's largest congregation of nesting sea turtles in Orissa, delicate seagrass beds in Palk Bay, enigmatic dugong in the Gulf of Mannar, majestic

whale sharks in the Gulf of Kutchchh and some of the world's most beautiful coral reefs in the Lakshadweep and Andaman and Nicobar islands; are just a few of the rare treasures to be found along India's coast line.

Marine Pollution

The coastal marine environment around India's coastline supports a variety of marine ecosystems including the fragile mangroves and coral reefs. Major industrial cities and towns of the country such as Surat, Mumbai, Kochi, Chennai, Visakhapatnam and Kolkata are situated on or near the coastline. Demographic pressure in the urban cities and towns as well as an increase in the rural population and rapid industrialization have resulted in the production of enormous amounts of waste materials. These wastes reach the marine environment either directly or indirectly through rivers, creeks and bays, posing treat to ecosystems and India's coastal resources. The domestic sewage contributes to the largest amount of waste. Even though the quantity of these wastes varies from place to place, their chemical characteristics remain almost similar. Domestic wastes are discharged mostly in untreated condition due to the lack of treatment facilities in most of the cities and towns. It has been reported that only primary treatment facilities are available in cities and towns where the population is more than 100,000 and the capacity of the plants is inadequate for the treatment of the total waste generated in the city. Due to such partial treatment, the chemical characteristics of the waste waters remain unchanged causing severe damage to the water quality.

Indian coastal waters are subjected to considerable pressure from sewage and industrial wastes, which are responsible for the contamination of the waters with consequent loss in biodiversity. Waste management strategies adopted in India have failed to keep pace with the industrial growth and urbanization. This has resulted in the accumulation of contaminants with a consequent loss in coastal marine biodiversity, over the past few decades. Estimates indicate that Mumbai city itself discharges around 2200 MLD of waste to the coastal waters[1] Similar is the case with some of the major cities such as Chennai, Kolkata and Visakhapatnam and the industrial areas of Gujarat, Pondicherry and Orissa, where the coastal and estuarine waters remain in degraded condition. Many pollution impacts on marine communities can be traced directly to the industrialized centres, which release an array of chemical contaminants into the open coastal waters. Others are more difficult to delineate because they are largely derived from contaminants supplied by diffused source such as run-off from land and atmospheric fallout. Of even greater concern has been the adverse environmental effects associated with waste-disposal activities, particularly sewage sludge and dredged spoil dumping, oil spills and

leakages, besides the municipal and industrial waste-water discharges. These wastes often contain a wide range of contaminants such as petroleum hydrocarbons, chlorinated hydrocarbons and heavy metals. Some of the studies in the Arabian Sea have shown that the petroleum hydrocarbons ranged from 1.8 to 11.1 mg/l in water, 1.84 to 5.81 mg/g dry wt in sediments and 0.33 to 3.67 mg/g wet wt in fish, while the total DDT in zooplankton samples in the Arabian Sea varied from 0.083 to 0.563 mg/l. In the coastal waters off Mumbai, which receive large amounts of domestic and industrial waste, the Hg content fluctuated between 0.12 and 1.4 mg/l, in sediments from 0.08 to 0.36 mg/g dry wt and in fish muscle at Thane Creek from 0.217 to 0.512 mg/g wet wt. Also, off Karwar (Karnataka) Hg value recorded was as high as 2.68 mg/l in water and 1.32 mg/g dry wt in sediment. Eutrophication of estuarine waters often culminates into anaerobiosis, toxic algal blooms, mass kills of benthic and epibenthic organisms and change in the abundance and diversity patterns of fish. But the extent to which contaminants enter the biotic components and interact with communities in terms of its physiological and biochemical concerns is a problem to be investigated thoroughly[2].

Modern life-style with its emphasis on consumption and waste disposal has brought in its wake the acute problem of liquid and solid waste management across the globe. The problem is aggravated by the pressure on land space on our planet. The urban solid waste consists of different materials - wet and dry. In a typical composition of Municipal Solid Waste (MSW), it is estimated that plastic waste constitutes 5-6 per cent. The liquid waste in the form of municipal sewage, land runoff, industrial effluents, agricultural wastes, etc., contributes to over 20,000 MLD.

Marine Debris

The trash in and on the water, on the seabed, and along the shoreline — has been of growing concern as the widespread use of plastics and other non-biodegradable wastes has led to an increase in persistent debris on the planet earth. Marine debris is defined as any man-made, solid material that enters ocean directly (e.g. by dumping) or indirectly (e.g., washed out to sea via rivers, streams, storm drains, etc).

***Liquid waste management*:** About 131 large and medium industries exist in the coastal areas and all of them have treatment plants. As per the guidelines of Coastal Aquaculture Authority, Govt. of India, aquafarms having a water spread area of 5.00 hectares and above should have Effluent Treatment System. Most of the aquafarms are in the process of establishing ETS.

***Solid waste management*:** The Aquaculture Authority of India has evolved guidelines and regulations for shrimp waste management. (http://aquaculture.tn.nic.in/publication.htm). The

disposal of solid waste generated by 121 coastal cities and towns is partly disposed in landfill sites, partly dumped openly and partly composted. These 121 Cities generate about 8914 tons of garbage every day, of which nearly 70 % is not collected.

The status of marine debris in India varies from place to place. The information collected from different sources explains the diversity of the problem. There appears to be no focus to address this problem in the country as a whole, except for a small but significant effort taken by a NGO – EXNORA in Elliots (Besant Nagar) beach in Chennai. During the International Coastal Cleanup day, it was observed that public was very much concerned about this menace. Considering the long coastline and sizeable coastal population, massive campaign needs to be launched to clean the coastal areas of marine debris so as to protect the marine environment and its resources at the national and international levels.

2. Current status of marine debris in your country

2.1 What are the sources (both land based and ocean-based – shore-line & recreational activities, smoking related activities, medical/personal hygiene wastes, ocean/water way activities, dumping activities) of marine litter (input on debris from vessels, coastal litter, floating litter, seabed litter) in your country? Give in detail the various sources and the types/composition, quantity and distribution of litter, factors controlling litter distribution in space and time, litter dynamics, etc., in your coastal and marine waters, along with the methods adopted for collecting information on marine litter.

The identified sources of garbage to the coastal waters of India are:

- Industrial Effluents
- Ports and Harbours including fishery harbours and fish landing centres
- Ship Building Yard
- Ship Breaking Yard
- Fish/food Processing Industries
- Coconut Husk Retting in Kerala coast
- Salt Pans
- Tourist Resorts / Beaches
- Solid Waste Dumping
- Urban runoff including municipal waste

- Shipping including garbage from ships
- Oil rigs
- Agricultural runoff
- Fishing industry including gear from fishing vessels
- Aquaculture
- Recreational & leisure usage
- Marine mining

An inventory of the types of marine litter includes:

- Plastics (fragments, sheets, bags, containers)
- Polystyrene (cups, packaging, buoys)
- Rubber (gloves, boots, tyre)
- Wood (construction timber, pellets, plywood, fragments of both)
- Metals (drink cans, oil drums, aerosol containers, scrap)
- Sanitary or sewage related debris (tampons, diapers, condoms, faeces)
- Paper and cardboard
- Cloth (clothing, furnishings, shoes)
- Glass (bottles, light bulbs)
- Pottery/Ceramic
- Monofilament fishing line
- Waxed milk carton
- Fruit peel
- Cigarettes, cigarette fibre, lighters, cigar tips, and other tobacco related packaging/wrappers
- Used batteries,
- Building materials,
- Fishing lines, floats, marking buoys and abandoned cut pieces of used nets,

- Plastic beach chairs (in many places in the Nicobar Islands after the tsunami) and computer monitors and refrigerators (in Nicobar).
- Grenade, Urea and wicks used by Thai fishermen poaching in Andaman waters to dynamite fish in the Nicobar islands, etc.

Efforts were made to communicate with many Government and Private agencies, educational institutions, Non-Government Organizations, etc., for seeking information required on marine debris. The information collected in different places from some of these organisations across the country on the quantum and type of marine litter during the course of this present study, are furnished below.

Fisheries: Fisheries plays an important socio-economic role – it supplies cheap and nutritious food, generates employment and income, earns foreign exchange through export, and stimulates subsidiary industries. More than ten million fishermen and fish farmers in the country depend on fisheries and aquaculture for their livelihood. India has a significant marine fisheries sector that has long been an important source of employment and livelihood for coastal communities. The sector is dominated by small-scale and artisanal fish workers, making a livelihood from fishing and small-scale trading activities.

Smoking among fishers is widely found and hence cigarette buds are strewn in many coastal areas. But there is no data available[3].

Aquaculture: Aquaculture is confined to a few coastal states in India. The total area under aquaculture in the country is 0.157 million hectare numbering 92591 aquaculture farms and the quantity of wastewater discharged is 10 to 12 million m^3 from one harvest over a one hectare farm area – in most cases two harvests in a year (seasonal).

Indian Ports and Harbours: Indian coastline has 13 major ports and 181 minor/ intermediate ports out of which 139 are operational. The major ports are located at Kolkata, Haldia, Chennai, Kochi, Ennore, Jawaharlal Nehru Port at Nhava Sheva, Kandla, Mormugao, Mumbai, New Mangalore, Paradip, Tuticorin and Vishakhapatnam. The 139 minor ports are under the jurisdiction of the respective State Governments. During 2001- 2002, the total cargo handled at major ports was 288 million tonnes as against 281 million tonnes during 2000- 2001. Even though IMO regulations are strictly followed, the quantity of solid waste handled due to these activities is enormous. They are also sources for marine debris.

Ship Yards: Major ship yards are Garden Reach Shipyard, Kolkata; Vizag Shipyard, Visakhapatnam; Cochin Shipyard, Kochi; Goa Shipyard, Goa; Mazagaon Shipyard, Mumbai and

minor private shipyards located at different places. In West Coast of India, the world's largest ship breaking yard is located at Alang in Gujarat. These activities generate peeled off paint and iron scrap and other types of non-degradable solid waste, which enter the marine environment as marine debris.

Coastal population: A dense coastal population, still on the rise, is exerting increasing pressure -- both direct and indirect – on marine and coastal ecosystems. A study by Central Pollution Control Board, New Delhi, under the programme on Coastal Ocean Monitoring and Prediction System (COMAPS) showed that the human population in the metros, class I cities, and class II towns in the coastal area has registered a phenomenal increase during the 3 decades ending 2001. From 3 metro cities to 7, from 25 class I cities to 65 and from 31 class II towns to 56 and overall the total number of cities has grown up from 59 to 128. Consequently, the population in these cities has also grown from 23 million to 45 million people.

Tourism: Negative impacts from tourism occur when the level of visitor-use is greater than the environment's ability to cope with its use within the acceptable limits of change. During the coastal cleanup campaign in Chennai, it was noticed that the beaches where tourist activity was more, the marine debris was found in large quantities.

Natural disasters - Tsunami & Floods: The December 26, 2004 tsunami devastated the Indian coastline from Andaman & Nicobar Islands to Tamil Nadu and Andhra coast in the east and Kerala coast in the west. This has left behind huge quantum of solid wastes of different kinds along the coast. The Indian Government and some Non-Governmental Organisations have jointly helped the affected people and cleared the debris accumulated due to the damages caused to coastal installations. Not only is the amount of debris left behind on land is of concern, but also of concern is the vast amount of debris that was carried back to sea. There is no report available on the impact of these debris on the marine ecosystem.

Andaman & Nicobar Islands

A survey was conducted in March 2003 by A & N Centre for Ocean Science and Technology, National Institute of Ocean Technology, Port Blair, Andaman in the Great Nicabar. The unexpected quantities of marine plastic debris observed in this region might have been due to improper handling of the solid waste from fishing/mariculture activity in the neighbouring countries and ship traffic. Assorted types of marine debris in large quantity consisting largely of plastics were recorded. Various objects such as detergent bottles, hazardous medical waste, robe, rubber gloves, plastic scoops, plastic gallons, large carboys, variety of fishing buoys, net fragments, trawl

webbings, fishing lines, fishing ropes and fishing traps, fish basket, plastic crates, water bottle, liquor bottles, milk containers, egg cartons, brush and broom, incandescent light bulbs, florescent light bulbs, gallon, oil and fuel filters, cargo strapping bands, cooking utensils, refrigeration gas cylinders, cigar lites, insulation pipings, HDPE and plastic pipes, plastic toys, footwear and umpteen number of man-made domestic items (more than 20 different types of materials), were recorded from a stretch of more than 1 km the total quantity of which was more than 200 kg.

The surface current prevailing in that region might have resulted in the debris being circulated continuously in the open sea & coastal areas and subsequently washed ashore in our coastal areas. From the above observation, it could be inferred that in all probability the garbage generated along the coastal areas of Sumatra, Singapore, Malaysia, Indonesia and other south East Asian countries and/or by the international shipping services may not have been disposed off properly but dumped into the sea, (disregarding international treaty regulating disposal of wastes generated by vessels, MARPOL 73/78 International Convention for the Prevention of Pollution from Ships) which is carried by the currents and washed ashore on the pristine beaches of Great Nicobar and Nancowry group of Islands.

The **Second survey** in the east coast of Great Nicobar was conducted in 2004 to assess the magnitude of the debris accumulation, rate of accumulation, quantitative and qualitative assessment of the marine debris, assessment of current and drift pattern and occurrence of floating debris. A fifty meter parallel transect to shore line was studied for the quantitative and qualitative assessment of marine debris. For the accumulation studies, a transect of (50 x 12 m) was laid parallel to shoreline and the latitude and longitude coordinate was recorded. The entire 600 sq. m was cleared manually and the various kinds of debris were assorted.

The magnitude of the foreign bound marine debris appears to be steadily increasing when compared to that of the previous year. Floating debris including long line marker buoys with beacon lamp, fishing buoys, water bottles, oil canes and thermocol were recorded in the offshore region.

2.2 Identify the Government bodies and other agencies including local governments, who have a mandate for addressing marine litter; NGOs, conservancy and other civic groups working with projects or programmes that address marine litter issues.

The following Indian Government Ministries/Departments bodies and agencies, have the mandate for addressing the marine pollution and protection of coastal environment related issues, but not specifically for marine debris:

Central Government:

- Ministry of Environment and Forests
- Ministry of Agriculture
- Ministry of Earth Sciences (erstwhile DOD)
- Ministry of Science and Technology
- Ministry of Surface Transport including Directorate of Shipping, Ports and Harbours
- Customs Department – some minor ports are manned by the Indian Customs
- Ministry of Urban development
- Ministry of Tourism
- The Indian Coast Guard
- The Indian Navy
- Central Pollution Control Board

Coastal State Governments (Tamilnadu, Pondicherry, Andhra Pradesh, Orissa, West Bengal, Kerala, Karnataka, Goa, Maharashtra, Daman & Diu, and Gujarat; UTs of Andaman & Nicobar Islands and Lakshadweep):

- Department of Town Planning,
- Department of Fisheries,
- Department of Environment & Forests,
- State Maritime Board,
- State Pollution Control Board,
- Coastal District Administration,
- Municipalities/Panchayats of coastal cities/towns,
- NGOs such as EXNORA Chennai
- Indian Maritime Foundation, Pune,
- Green Peace- India,
- Toxilink,
- Kadal Ammai Padukappu Sangam, Chennai,

- Indian Council for Plastic Environment (ICP), WWF, India

2.3 What are the social, physical, biological and economic ramifications of marine debris?

Social: Human health is affected in many ways. Broken glasses, ropes and lines dangling in ocean pose threat to beach goers, boaters & divers. There is lack of awareness on biomedical waste disposal. Outbreaks of cholera and infectious hepatitis are occurring with increasing frequency among coastal populations.

Physical: Impact is mostly on the quality of coastal marine waters and sediment quality, besides of course stray animals swallowing these debris. Land runoff carries a heavy silt load along with agricultural pesticides and fertilizers, into the marine environment. Dredging of ports and harbours for increased access and maintenance represents a threat to adjacent or down-stream biodiversity. Sand-mining represents another source of threat from particulate matter. This exposes the coastline to greater wave action, as well as creating high levels of coastal turbidity, as fine material is washed across the inter-tidal and the sub-tidal zone and out onto the critical coastal habitats supporting mangroves, coral reef, sea grass beds, etc., which are already damaged substantially due to natural and human perturbations, including the December 2004 tsunami in parts of Tamilnadu coast and Andaman and Nicobar Islands.

Biological: Marine debris causes tremendous threat to wildlife such as endangered species-fish, turtles, sea birds through entanglement and ingestion. Entanglement can trap animals, whereas smaller items adhering to body surfaces can increase drag, snag on the sea floor, or inhibit growth or development. Many entanglements involve fishing nets and line causing "Ghost fishing". Ingestion of litter by animals usually occurs when litter items are mistaken for food, or by secondary ingestion with prey items. This leads to growth impairment, diseases, inability to eat, breathe and swim and impaired immune competence in them. It also affects the coral reefs, sea grass beds and other fragile coastal habitats. Storms and hurricanes have impact on terrestrial biodiversity, physically damaging and up-rooting plant species and de-stabilizing soils, thereby causing erosion. Man-made influences such as removal of mangrove (and its coastal protective function), and removal of inland vegetation for forestry or agricultural purposes, will exacerbate the effects and reduce chances of recovery of healthy reefs.

Economic: Some impacts on coastal activities affecting tourism by contamination of coastal amenity areas, thereby affecting recreational activities such as bathing and boating in the beaches,

have been evident along the Indian coast. The cost of beach cleanup exercises is a very pertinent issue. Every time a beach was cleaned by NGOs in Thoothukudi in Tamilnadu, the same quantity of waste was dumped on the shore in a week. This is because the people have no sense of proper waste disposal, unorganized manner of collection of waste and monitoring its disposal and the indifferent attitude of Municipalities and other departments, as the dumping yards are not available.

3. Current initiatives to manage marine litter/debris in your country.

3.1 Are there any national, sub-regional or regional projects and programmes for the management of marine litter? If yes, please list and make a brief assessment/review.

There are no specific government programmes / projects exclusively for the management of marine litter management in India. However, under the Ministry of Earth Sciences (erstwhile Department of Ocean Development), through a multi-institutional programme called Coastal Ocean Monitoring and Prediction System (COMAPS), the "health of the seas" along the Indian coast is being monitored for over 2 decades. Among them, a project was completed by the Central Pollution Control Board (CPCB) on the Assessment of land based sources of marine pollution along the Indian Coast.

As a part of beach clean up activity a NGO called EXNORO at Chennai is involved in this activity for the past eight years.

There is no national, sub-regional or regional projects and programmes for the management of marine litter in India

2 Are there marine litter management activities/practices in your country including beach cleanups, participation in International Coastal Cleanup Day, solid waste handling, collection, transport, disposal; waste avoidance, reduction, reuse/recycling, treatment, etc? If so, give a brief account of such activities. (Give information on activities and groups/stakeholders involved in waste management, clean-up activity, description and location of monitoring activities, frequency of sampling, constraints, if any, in sound waste handling, strengths and weaknesses in current marine litter management programme, etc., along with the lessons learnt).

Marine litter management activity: In India, from time to time, the Municipalities and local town/village Panchayats are involved in cleanup of the beaches as it affects their income. In particular beaches in Goa are comparatively cleaner and Government is very keen on upkeep of the beaches, as their major income is from Indian and foreign tourists. Further NGOs/citizens raise such issues of pollution in beaches in the public for attracting the attention of the local Government. In Chennai, a NGO called Friends of Beach Exnora (A unit of Exnora International and coordinated by the Forum of Adayar Civic Exnora – FACE) carries out regular beach clean up campaigns of

their own. Exnora International has been running services at the Elliots Beach, Besant Nagar, Chennai from 1998 onwards under the banner Friends of Beach Exnora. Basically there are two activities viz. Beach Cleaning and Life Guards. However, in other parts of the country there are no systematic efforts in this regard.

Beach Cleaning: The stretch of the sandy area of the Elliots Beach is about 1200 m x 560 m. Every day the beach used to be full of throwaways of all sorts indulged in by the floating casual beach visitors, who remained an undisciplined lot despite the efforts of the local Exnora. A group of 10 women from the adjoining fishing hamlets manually pick up the garbage daily from the sandy stretch and the water front between 5 and 8 am. This has been going on for the past 8 years. They are being paid Rs. 900/- pm sponsored by a corporate body. With the help of the local police they keep the vendors and hawkers on the Beach properly lined up. It is found to be difficult to evict them due to other social and political reasons. With the help of the Health staff of the Chennai Corporation they try to ensure that the junk foods they sell are hygienic. They observe "Beach Day" on the Chitra Pournami Day every year (in the month of April-May) and stage a variety folk entertainment programme and organise clean foods and beverages.

The total volume of the litter in this area is reported to be about 30 m^3 with an approximate weight of about 1.5 MT during week days. It is about twice the volume and weight during week ends and holidays and 2.5 times more during the summer vacation. The composition of the litter is mostly paper, plastic bags, cups and plates, liquor and beverage bottles of all kinds of glass or plastic and to some extent the leftover of the eatables thrown by the visitors to the Beach. It also consists of discarded disposables like clothing and beddings of the dead, dismantled pandals put up for domestic and public functions by dwellers along the coast which are thrown into the sea and washed ashore. Thus, it is a mixed form of litter varying in kind and quantity on a day-to-day basis. No attempts for such quantification were made before, for want of necessary facilities. It is opined by EXNORA that the upkeep and safety of the beaches should be a Government function under a composite authority of a multi-task outfit. There is no waste management scheme and waste is being taken by local municipality and dumped in the city garbage dumping yard in the outskirts of the city.

Indian Centre for Plastics in the Environment (ICPE) that has been set up as a non-profit body in India to work with governments, nongovernmental organizations and industry to advance solid waste disposal solutions that optimize use of all 3 R's- Recover, Reuse & Recycle. In working towards this mission or goal, ICPE has been joining hands with local bodies & municipalities that are willing to accept that the industry can play a proactive role in the community to help protect our

environment. There is wealth in the waste that our communities are generating and the answer to disposal of this waste is no longer the landfills & garbage dumps, but intelligent segregated waste collection & recycling. ICPE has demonstrated that the present day problems of solid waste disposal can be effectively tackled by a multipartite arrangement of the community if all in the area want it to improve.

The International Coastal Cleanup day

The International Coastal Cleanup day is being organized by the Indian Navy, Indian Coast Guard, National Institute of Ocean Technology at Andaman, and NGOs like Indian Maritime Foundation with the participation of school children, Industries and citizens, from the year 2002.

The Indian Coast Guard, in coordination with International Maritime Foundation, Pune (a NGO) conducted the coastal clean up during 17 September to 2 October 2005, in the west coast. Nearly 14850 people participated to clean a small coast line of 238.5 km and removed 253.6 tonnes of marine debris which was carried in 14428 bags.

In 2006, International Coastal Clean-up (ICC) day was successfully organized by the Indian Coast Guard, National institute of Ocean Technology, Chennai, and Indian Navy under the auspices of SACEP in different parts of Indian coast. The efforts taken in India on the ICC day by various agencies location-wise, are given below.

Chennai Elliot's beach - January 1999: Elliot's Beach, a 2 km long part of the Marina coastline in suburban Chennai, witnessed a truly remarkable movement, in January 1998, when a group of people led by Mr. A. Shankar, an Adyar-based businessman, formed an organization named Friends of the Beach, under the aegis of Exnora International. Their objective was to make a contribution to the environmental wellbeing of their neighbourhood beach. Shankar, a beach addict, was dismayed by the deteriorating conditions at the beach, and resolved to do something about it.

Elliot's Beach is not very different from many of the beaches that dot the long stretch of the Marina, among the longest urban coastlines in the world. Growing crowds generate tons of garbage every day; this is often left unattended to by a grossly inefficient garbage disposal system. Further aggravating the situation is that the nearby slum and hutment dwellers often use the shoreline as an open-air toilet. Despite their embarrassment, they have little choice; they are simply too poor to afford an alternative, and there are hardly a few, public toilets in the area[4].

Another problem that caught the attention of the campaigners is related to safety. The sea washes ashore floating debris from time to time, some of this is a flotsam of rugged and abrasive

pollutants. These have the potential to cause harm, especially to children playing on the shore. More workers and equipment were needed to remove them from the beach regularly.

The first thing the Friends of the Beach campaigners did was to establish the infrastructure for the beach to be cleaned periodically. Some of the hutment-dwellers were employed on a daily basis from 6 AM to 11 AM to clean the beach. They were provided uniforms, footwear and relevant accessories. Second, mass cleaning campaigns were held on the first Sunday of every month. Students, members of Exnora, Rotractors, and neighborhood youth zestfully came forward to participate in the beach cleanup campaign. The physical involvement and feeling of shared responsibilities quickly led to an exchange of thoughts and ideas, as well as increased awareness.

Since Chennai Corporation has limited resources to maintain the beaches, the Friends of the Beach volunteers made arrangements with the civic body to place 15 garbage collection bins in the beach area. It has been very encouraging to them to see that the bins are being used. According to the campaigner's assessment, the beach requires at least fifty bins, and working on filling the shortfall is a priority.

An important aspect of this campaign is the underlying activities. The volunteers make a continuing effort to get the local schools, clubs and colonies involved and those who are aware of the problems. The campaigners plan to stage socio-cultural get-togethers and similar events on the beach..

Importantly, the campaigners have recognised that merely posting signs that read ""Do not throw litter on the beach", does not achieve results. In the absence of usable infrastructure, such efforts fail. Notices and signs become weak in their recommendation, if they are not supplemented by the requisite facilities.

An excellent outcome of this campaign is that it has inspired another community further south along the coast to get together for a similar effort. If this takes off, indeed, much of the populated coast will see the promise of becoming like the Oregon coast in the United States. Every mile of the Oregon coast was adopted by the local residents to keep it clean and safe, under funding from the local city and county governments.

Plastic waste management

Over the years a countrywide network for collection of plastic waste through rag-pickers, waste collectors, waste dealers and recycling enterprises, consisting of over 20,000 units, has sprung up. In 1998 around 800,000 tonnes representing 60 per cent of plastic wastes generated in the country was recycled involving 2,000 units. This level of recycling is the highest in the world. Europe is 7

per cent, Japan 12 per cent, China 10 per cent, and South Africa 16 per cent. It should be remembered that collection of plastic waste is a source of livelihood for innumerable "rag-pickers", or "waste collectors". Plastic waste collection is a lucrative business when compared to that of other items. A typical rates are: Newspapers in English: Rs. 4-5/kg; Newspapers in Hindi/Tamil: Rs. 3-4/kg, Magazines: Rs. 3-3.50/kg; Iron scrap: Rs. 5.50/kg; Plastic waste: Rs.12-15/kg; Beer bottle (per bottle): Rs. 2. The plastic waste commands the highest rate in the recycled market.

These are some efforts taken for solid waste management in India. There is no specific programme of marine litter in India.

3.3 Has any assessment of the economic loss due to marine litter problem, been done in your country?

No. This assessment is not available in the public domain on the economic loss due to marine litter problem as no systematic data collection on marine debris is in place in India.

3.4 Outline briefly any evidence of the negative impact of marine debris including lost and abandoned fishing gear on marine and coastal ecosystems e.g. costs of beach cleanup exercises, damage to ecosystems, entanglement of marine animals - marine mammals, birds, turtles, fish , etc., tourism, human/public health and safety. Is "Ghost Fishing" an important problem for your country?

Stray instances of entanglement of fish and endangered marine fauna is reported from the Indian waters. In Gujarat (west coast of India) there was a report on abandoned fishing gear to marine fauna. It was reported that off Jakhau, Gujarat where a dolphin was stranded due to entanglement in an abandoned fishing gear. In addition, many incidences where the abandoned fishing net was entangled to the boat propeller, were reported in Tamilnadu and Gujarat coast, but no detailed account on the ghost fishing is available from any part of the Indian coastline.

Marine plastic debris can harm fish species and other aquatic organisms that use the coral reef and kill coral reefs by continually rubbing against it or smothering it. Further, plastic pieces can attract and hold hydrophobic compounds like PCB and DDT up to one million times the background levels. As a result, floating plastics is just like a poison pill, which is regarded as potential endocrine disrupters. Most of the plastic floating in the surface are being mistakenly ingested by marine turtles, which may be a potential hazard to the leather back turtles and their hatchlings. However, there are no reports of marine turtles being entangled in the lost or abandoned fishing gear.

Another major ecological problem contributed by the marine debris is the movement of invading species. Debris floating in the sea can carry many organisms such as small crustaceans, plankton, algae, bacteria, and fungi. Rafts of debris can even colonize some land-based species. When

organisms from one environment are carried to another part of the world, significant problems can arise. The invading organism in its new environment may not have any predators or another species to compete against for food. When this happens, the number of invading organisms grows so fast and gets so big, that other organisms become out-numbered and cannot compete for food leading to the ecological imbalance.

There are few published reports are available on marine debris in India waters

3.5 Are there any legal mechanisms, legal and institutional frameworks, and policies in your country for monitoring, controlling/reducing/preventing dumping of litter in the marine and coastal regime? If so give details of such Acts, Rules, compliance with International and National Conventions/Instruments, Acts, Codes, Rules, etc; description and functions of the institutions involved in marine litter management; and policies.

Remedies under the Indian legal system: Indian shipping policy is not isolated or any different from the global maritime environment and policies. The main source of maritime law, besides domestic law, has been international conventions to which India is a signatory. Under the Constitution of India, merchant shipping is dealt with by the Ministry of Surface Transport. The principal legislation dealing with the combating of oil pollution is:

- The Merchant Shipping Act of 1958 (MS Act)
- The Marine Insurance Act of 1963
- The Merchant Shipping (Prevention of Pollution of the Sea by Oil) Rules, 1974.

Role of the Port authorities

Section 331 of the MS Act regulates the carriage of dangerous goods, while sending an unseaworthy ship to sea is an offence under Section 334 of the Act. MS Act also enables the State to detain unsafe and unseaworthy ships.

The MS Act does not apply to pollution on the high seas. However, for a peninsular country like India, it is extremely important to have provisions to prevent pollution of the high seas adjoining its EEZ. The International Convention relating to Intervention on the High Seas in case of Pollution Casualties, 1969, extends the jurisdiction of a coastal state to the high seas, but only when it poses a grave and imminent danger to fishing, tourism and wildlife. India has not yet ratified this convention.

Furthermore, the MS Act empowers the court to hold formal investigations, arrest witnesses, board vessels, commit trial, and censure or remove masters, mates or engineer. A marine board can be appointed if the casualty occurs in foreign waters.

These provisions play an important role in combating pollution. However, the statute needs certain amendments. For instance, it would be desirable to constitute a formal board of investigation, headed by a judge or some other suitably qualified person, instead of giving control to the court.

Clean-up costs: The persons and entities responsible for oil pollution must compensate not only for the actual damage caused by the pollution but also for the clean-up costs. The international liability scheme is governed by many conventions:

Criminal liability: The ship owner can also be criminally liable in certain cases. However, the International Convention for the Prevention of Pollution from Ships, 1973 (ICPPS), in an attempt to deter ship-owners, introduced criminal liability. India ratified ICPPS in 1986. ICPPS covers pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage, etc. It deals with operational pollution and some aspects of accidental pollution too. It provides that any violation within the jurisdiction of any state, which is a party to the convention, shall be punishable under the law of that state. Under ICPPS, very limited discharge is permitted, but when the discharge is due to *force majeure*, the polluter is exempted.

Indian government Organization associated with Marine litter management: The organizations listed below have the responsibilities linked to marine litter management. This Information is collected from the Central Pollution Control Board, Government of India web site.

- Ministry of Environment and Forest:
- Ministry of Earth Sciences (Department of Ocean Development)
- Ministry of Agriculture
- Ministry of Defence (Indian Coast Guard)
- Ministry of Surface Transport
- Ministry of Petroleum and Natural Gas
- Ministry of Tourism
- Ministry of Mines

Functions of the some of Indian Government Institutions associated with coastal management are listed below:

Ministry of Earth Sciences (erstwhile Department of Ocean Development) (MoES)

Among the projects introduced by the Ministry of Earth Sciences (MoES), which are relevant to marine debris are discussed hereunder.

Integrated Coastal and Marine Area Management (ICMAM) This project aims at integrated management of coastal and marine areas. The concept of ICMAM has been adopted to facilitate the management of marine environment and biodiversity as well as for their monitoring. Decision Support Systems are being established for the management of critical coastal/marine habitats such as mangroves, coral reefs, areas rich in biodiversity, etc. under this programme.

Coastal Ocean Monitoring and Prediction System (COMAPS) This project being implemented from 1991 onwards assesses the health of coastal waters and facilitates management of pollution-related issues. This Programme was restructured and modified in 2000-01 to include pollution monitoring; liaison, regulation and legislation; and consultancy services.

Ministry of Environment & Forests (MoEF), Govt of India

As per the Central Pollution Control Board, Ministry of Environment & Forests (Govt. of India) guidelines, the prescribed authority for plastic waste management are as follows;

- The prescribed authority for enforcement of the provisions of these rules related to manufacture and recycling is State Pollution control Boards in respect of States and the Pollution control Committees in Union Territories;
- The prescribed authority for enforcement of the provisions of these rules relating to use, collection, segregation, transportation and disposal shall be the District Collector /Deputy Commissioner of the concerned district where no such Authority has been constituted by the State Government/Union Territory Administration under any law regarding non-biodegradable garbage.

A number of laws, Acts and rules regulate activities on the Indian coast. India has regulatory agencies such as the Central Pollution Control Board (CPCB) at the central level and State Pollution Control Boards (SPCB) at the state levels, constituted under Water (Prevention and Control of Pollution) Act, 1974.

A Coastal Aquaculture Authority of India has been constituted and guidelines for sustainable coastal aquaculture development and for regulating coastal aquaculture have also been evolved and put in place. A National Contingency Plan has been formulated to combat oil spills in the EEZ of India with the Coastal Guard as the nodal agency.

The disposal of ship-based wastes is regulated by the Merchant Shipping Act, 1958 and by the adoption of MARPOL 73/78. Standards for discharging effluents are listed in the Environment (Protection) Act (EPA) 1986. This serves as an umbrella Act, providing for the protection and improvement of the environment including coastal and marine areas. The effluents/discharges from various sources have to meet these standards before being discharged into the coastal/marine waters.

The Coastal Regulation Zone (CRZ) Notification was issued in 1991 by the Government of India, under the EPA, 1986. The Notification aims at protecting and improving the quality of the coastal environment. The notification declares the limits of the Coastal Zone and classifies it into four categories for the purposes of regulation. CRZ I includes areas which are ecologically sensitive, areas of outstanding natural beauty, historical heritage or rich genetic diversity. CRZ II includes the areas that have already been developed up to or close to the shoreline. Areas that are relatively undisturbed are classified under CRZ III. CRZ IV includes the coastal stretches in the Andaman and Nicobar, Lakshadweep and other small islands except those designated as CRZ I, II and III.

The Notification lays down certain prohibitions and also exceptions to prohibitions. Prohibited activities include setting up of new industries (except those which are directly related to the Water front or which directly need foreshore facilities) and expansion of existing industries including fish processing units, manufacture, handling, storage or disposal of hazardous wastes and substances, discharge of untreated wastes and effluents and dumping of municipal wastes as landfills or otherwise. Withdrawal of groundwater within 200 metres of the High Tide Line (HTL) is prohibited with some exceptions. In most of these areas, an area of 200 metres from the high tide line (HTL) has been declared a no development zone. Several restrictions have been imposed for carrying out development in the area between 200 to 500 metres from the HTL. These measures have been adopted to protect fragile ecosystems which exist in the area and are vital for sustaining the ecological balance.

Mangroves and coral reefs have been declared ecologically sensitive areas (CRZ I) under this Notification and regular monitoring using satellite imagery is in progress. A state-wise Mangrove Committee has been formed for effective management of the mangrove ecosystem. Mining of corals and coral sands has been banned. The CRZ notification also offers protection to coastal communities such as traditional fishermen.

The Recycled Plastics Manufacture and Usage Rules, 1999; Municipal Soild Wastes (Management and Handling) Rules, 2000; Ozone Depleting Substances (Regulation) Rules, 2000; The

Prevention and Control of Pollution (Uniform Consent Procedure) Rules, 1999, etc., are some of the rules framed under EPA, 1986, with an aim to providing environmental protection and are relevant to the coastal environment.

Since 1982, the CPCB has been carrying out a rapid inventory annually to assess the pollution status of coastal waters of India. This programme known as the Coastal Pollution Control Series (COPOCS), comprises among other things:

a) Identification of the uses of coastal water at different stretches and the best use among them; class designation of the sector or a portion thereof, and

b) Identification of land-based pollutants and polluting activities and those that require immediate control.

The Coastal Ocean Monitoring and Prediction System (COMAPS) programme was launched in 1991, by the Ministry of Earth Sciences (erstwhile Department of Ocean Development) for monitoring the health of India's coastal waters. The programme monitors the effect of anthropogenic activities on the marine environment periodically and assesses the impact on the marine flora and fauna in the coastal waters of India. Studies related to the waste assimilation capacity of coastal waters have been undertaken from 1997-98 onwards.

Efforts have been made to set up sewage treatment plants in all coastal states. Treated effluents are being discharged into deeper waters through pipelines. The Government is also preparing an action plan for treatment of domestic wastes.

Legislation has helped in the treatment of industrial wastes. In India, the Water (Prevention and Control of Pollution) Act includes tidal waters, unlike some other countries. The Act is applicable up to 5 km into the sea. Though the discharge of effluents from small-scale industries is still a problem, efforts are being made to set up common treatment plants. This will help in minimising the waste load in the sea, sustainable use and conservation of marine living resources under national jurisdiction and the high seas.

A total of 32 critical habitats which include the Sundrabans, Coringa, Pichavaram mangroves, Gulf of Mannar, Cochin backwaters, islands off Karwar, islands off Kochi and Lakshadweep islands, Gulf of Kutch, Gulf of Khambat, Malvan, etc., have been identified in India. To address the concern on conservation of marine living resources, in some marine areas which support high biodiversity, such as the Gulf of Mannar and Wandoor (Andaman) have been declared as marine national parks, while some other coastal critical habitats such as the Malvan coast (Maharashtra) and the Gulf of Kutchchh (Gujarat). Sunderbans (West Bengal) and Bhitrakanika (Orissa) have been

declared marine sanctuaries. The Gahirmatha beach (Orissa) where mass nesting of the endangered Olive Ridley turtle takes place was accorded marine sanctuary status in 1997. Such measures offer protection to the flora and fauna of the region and help prevent any damage to the marine ecosystem.

The Indian Coast Guard is empowered to prevent capture of endangered marine species under the Wild Life (Protection) Act, 1972. A number of threatened marine species have been placed in Schedules I and III of this Act. Some of these are the whale shark, sea horse, sea cucumber, sea shells and different types of corals.

To protect and conserve biodiversity, the Biodiversity Bill, 2000, was passed in the Indian Parliament through which the National Biodiversity Authority was established.

Medical waste management: State/Union Territory pollution control committee, is taking necessary steps for safe environmental management of hospital wastes under the Bio-medical Wastes (management & Handling) Rules, 1998

Highlights of major Acts/Rules, policies and programmes

- 1897 Indian Fisheries Act offers protection to fisheries against explosives or dynamites.
- 1908 Indian Ports Act an enactment relating to ports and port charges provides for rules for the safety of shipping and conservation of ports.
- 1950 Coast Guard Act which provides levying of heavy penalties for the pollution of port waters.
- 1993, Coast Guard under Ministry of Defence made directly responsible for combating marine pollution.
- 1996 National Oil Spill Disaster Contingency Plan formulated under Coast Guard Act lays down action to be taken in the event of oil spills.
- 1958 Merchant Shipping Act controls pollution from ships and off-shore platforms
- 1972 Wild Life Protection Act and the subsequent amendments offers protection to marine biota. It creates conditions favourable for *in situ* conservation of flora and fauna.
- 1974 Water (Prevention and Control of Pollution) Act controls pollution from land-based sources, includes tidal waters, unlike many other countries and has jurisdiction up to 5 km into the sea.

- 1976 Maritime Zones Act describes various zones such as territorial waters, EEZ, Continental shelf, etc.
- 1978 the model Marine fishing Regulation Act, which provided guidelines to the maritime states to enact Act and Rules for protection and conservation of marine fisheries by regulating fishing in the territorial waters.
- Forest Conservation Act Protection to marine biodiversity
- 1982 Coastal Pollution Control Series (COPOCS programme) started in 1982 by CPCB aims at assessing the pollution status of coastal waters.
- 1986 Environment Protection Act (EPA) under which, the Coastal Regulation Zone 1991 was notified. Standards for discharging effluents are listed in this Act.
- 1991 (under EPA, 1986) Coastal Regulation Zone Notification prescribes regulations on various activities in coastal zone, classifies coastal zone into four categories specifying activities permitted and prohibited in each category and preparation of Coastal Zone Management Plans (CZMPs) by all the Coastal states.
- 1995 National Environmental Tribunal Act has been created to award compensation for damages to persons, property and the environment arising from any activity involving hazardous substances.
- 1995 Land Ocean Interaction in the Coastal Zone (LOICZ Project) aims to develop, on a scientific basis, the integrated management of coastal environments.
- National Environment Appellate Authority Act: Addresses appeals with respect to restrictions of areas in which classes of industries etc. are carried out or prescribed subject to certain safeguards under the EPA The objective is to bring in transparency and accountability and to ensure the smooth and expeditious implementation of developmental schemes

In order to strengthen international, including regional cooperation and coordination, India is a member of various international programmes and some of them relevant to marine debris are given below:

- Global Ocean Observing System (GOOS)
- Global Coral Reef Monitoring network (GCMRN)

- International commissions and organizations such as the United Nations Convention On Law of Sea UNCLOS, Antarctic Treaty Consultative Committee etc.,
- Regional Sea Programme
- South Asia Cooperative Environment Programme
- Intergovernmental Oceanographic Commission (IOC) Executive Council and other groups/committees of IOC,
- International Sea Bed Authority (ISBA),
- UN Commission on Sustainable Development (UNCSD),

International Geosphere-Biosphere Programme (IGBP),

- Land-Ocean Interactions in the Coastal Zone (LOICZ).
- Some of the other international conventions on environment ratified by India which are closely associated with marine debris are
- International Convention for the Prevention of Pollution from Ships (MARPOL Convention 73/78)
- International Convention on Civil Liability for Oil Pollution Damage, 1969.
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, (London Protocol of 1996).
- Special Trade Passenger Ships Agreement, 1971
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973
- International Convention for the Safety of Life at Sea, 1974,
- Convention on Biodiversity, 1992.
- Convention of Wetlands of International Importance, protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, Vienna
- Convention for the Protection of the Ozone Layer, Convention on Migratory Species,
- Basel Convention on Trans-boundary Movement of Hazardous Substances 1992,
- Montreal Protocol on Substances that Deplete the Ozone Layer.
- Sustainable development of small islands

3.6 What are the gaps and needs in coverage of marine litter management?

Curbing the marine debris problem in the Indian coast is not an easy task. This requires:

- Reducing marine debris will require preventing litter from entering the marine environment in the first place by pursuing a long-term public education and awareness campaign. While existing education and cleanup initiatives can make a substantial contribution to improving the ocean environment, the volumes of trash that continue to appear on beaches and in the oceans indicate that many people and communities living in coastal areas have not yet changed their behaviour.
- In addition to educating the public, marine debris education campaigns can target the tourism industry, packaging companies, local government officials, recreational boaters, and fishermen (both traditional and commercial). For example, it is important to educate both commercial fishermen and recreational boaters who take items out to sea with them to ensure that they are returning to shore with their plastic and other trash.
- Proper solid - waste disposal practice.
- Setting up of small scale plastic recycling plant in the affected coastal areas.
- Importance has to be given to bio-waste management.
- Implementation and enforcement of local anti-litter regulations. At the same time issues such as beach cleaning activities should be considered as pressure from recreational and leisure interests necessitate routine beach cleaning with machines, the biota living in or on the beach is threatened. This could be avoided by hand picking of litter items rather than gross removal of everything including driftwood and seaweed.
- Active management of debris entering and exiting the sewer systems. Floatable controls can help reduce or eliminate solid waste emitted from sewer systems. Placing sufficient trash receptacles at regular intervals in a coastal colony/village, can also make it easier for people to dispose of the materials that might otherwise end up in the marine environment.

4. Suggested approaches/strategic framework for marine litter management.

The suggested approach is to make marine litter and solid waste management activity a mandatory requirement.

Role of Govt. agencies: The local administration/Municipality or the local body will need to see that there are bins at regular intervals preferably separate ones for dry & wet waste to minimize opportunities for littering and prevent good waste getting poor by mixing it all up at collection points. The Central Government should formulate and put in place stringent and enforceable rules for anti-litter & waste segregation at source and enforce them effectively at the state level to change age-old practices of disposal.

Role of NGOs: The NGOs will need to work on community awareness programmes involving commercial establishments, hotels, resident associations, schools, etc., to effectively convey the need and merits of an improved waste management system and recycling programme and support the change. There is a need for short-term and long-term communication strategies based on local conditions.

Housing societies for citizens, hoteliers and commercial establishment heads for reaching out to tourists will also need to get involved to pass on the message of "Segregated Waste Collection at Source" and BIN Culture is adopted by all in this area. This will ensure that solid waste is not mixed with wet garbage and the reasonable value from the waste keeps the interest of recyclers alive as the project advances and can become self sustainable.

Recyclers can be asked to belong to the project in the area and commit to take away the solid waste at regular intervals, compensating if possible those that help in accumulating & storing it for them.

The other approaches should include:

- Awareness creation to fishermen and other coastal stakeholders.
- Port management.
- Mandatory requirements for the coastal industries/ports/jetties to maintain the beaches in the vicinity.
- Capacity Building which is a basic pre-requisite for monitoring, assessment and exploitation of the marine resources should include human resources development through knowledge/skill upgradation, education, training and awareness.
- Assessment and monitoring of the floatable debris and beach and underwater clean up campaign in the coastal water and submerged debris in the underwater areas, need to be taken up periodically to check the marine debris in the coastal waters and beaches.

- Above all, setting a pilot scale plastic recycling plant in the affected islands will be advantageous in curbing this problem effectively.

4.1 What in your opinion are the priority thematic areas, activities and possible approaches, which could be included in a regional project on marine litter management in the South Asian Seas Region in general and your country in particular?

Globalization:

Trade is becoming borderless. The globalization of markets and industry means that production and consumption is no longer confined within the borders of nation-states. The manufacturing, consumption and disposal of goods are geographically separated like never before. Production takes place in one country, products are consumed in another, and disposed in a third.

It is becoming increasingly clear that products in the globalised economy generate an international trail of waste. Any solution must be based on fundamental approaches such as the precautionary principle that is recognised in international and national laws. When a process, practice or product raises potentially significant threats to human health and environment, precautionary action should be taken to restrict or ban it.

Profits and environmental concerns must coexist. Companies make profits by minimizing production costs and maximizing markets globally, but they leave a trail of waste behind. "Polluter Pays" principle should be employed in such cases and the cost of the waste treatment and damage to the coastal marine ecosystem and its resources should be recovered from such law breakers.

Suggested approach for Waste management along the coast

Community participation

Partnerships between communities, community groups, businesses and governments, should be encouraged in an effort to manage wastes responsibly and sustainable. The message is simple: waste minimization and recycling are essential for managing waste, and this requires responsible partnerships.

Case study:

Singapore: The Singapore model can be adopted in any one of the important tourist places in India. With four million people squeezed onto an island of just 647 km^2, Singapore's urban planners have been able to control sprawl, and even expand parks and protected areas and enacting zoning laws that help people live and work in the same areas. The concept plan adopted

has a strategic development framework that is updated every decade. The city is just as meticulous about disposing of its solid wastes as the liquid wastes. Four large incinerators reduce 85% of the city's solid wastes into fly ash that is then deposited in a monitored landfill located on an offshore island. A recently introduced recycling and re-use programme expects to capture up to three-quarters of the paper, metals, and organic wastes generated by Singaporeans, transforming these wastes into useful products.

Some of the other International initiatives on marine litter management are in the Mediterranean sea involving a number of countries and individual country's initiatives particularly by Korea, China and Japan. Taking inputs from these international exercises the under mentioned work plan is envisaged for the SAS Region in general and Indian seas in particular.

Proposed Work Plan for marine litter management in India

The marine debris management is a multidisciplinary process that unites levels of government and the community, science and management, sectoral and public interests in preparing and implementing a programme for the protection and the sustainable development of coastal resources and environment. The overall goal of this work plan should be

- to improve the quality of life of the communities that depend on coastal resources,
- to provide for needed development (particularly coastal dependent development)
- to maintain the biological diversity and productivity of coastal ecosystems in order to achieve and maintain desired functional and/or quality levels of coastal systems,
- to reduce the costs associated with coastal hazards to acceptable levels.

Indian model should have national and regional programme involving other neighboring countries. The national programme should involve all the relevant agencies in Central and State Government levels, Industry, NGOs and private partners.

Identification of specific projects and approaches to potential funding sources (including Government) for various components and activities of the Marine Litter Activity in the South Asian Seas; and International projects

Integrated Marine Debris Management (IMDM) - India

Integrated Marine Debris Management is proposed with following components. In preparing this proposal inputs from similar initiatives from Korea, Japan, China and Russia were taken into consideration. Also the globally known Integrated Marine Area Management model is also studied.

In the Indian perspective, the large population along the coastal region, complexity involved in the management aspects of different agencies such as the central, state and the local administration, NGOs, etc; lack of data on marine litter; diversity of marine litter due to site specific reasons such as tourism, fishing, vicinity of ports; should be taken into account for evolving a marine litter management programme.

According to a report published in The Hindu dated 18 March 2007, global waste management practices such as source segregation, composting use of biodegradable products and the need for governments to provide monetary incentives for ecologically sustainable practices at the individual and community levels, are the need of the hour.

The Project – IMDM

The project envisaged is a national project on Integrated Marine Debris Management (IMDM) with following objectives

- to initiate a National level awareness campaign
- to conduct Marine debris survey in near shore and deep sea
- to formulate Integrated management strategy
- to support Technology development
- to develop Management tools
- to build capacity/skill and knowledge development
- to consider administrative issues
- to monitor marine debris on a long-term basis

Project components

IMDM should concentrate on practical solution to marine debris by formulating the marine conservation policy with respect to marine debris.

Survey is: the main components of IMDM. In order to assess the quantity of marine debris in beach, near shore and deep sea a marine debris survey should be conducted at selected sites.

R & D component for marine debris management is required to be initiated with a major thrust on technology development for disposal of debris collected. In particular latest technology should be made available for safe and environmentally friendly disposal method of marine debris. Further, when dealing with medical waste disposal special care should be taken.

The Conservation Policy should focus on minimizing and mitigation of marine debris, with a mechanism for timely response for recovery, maximization of recycling with environmentally friendly treatment. The administration has to support the mitigation measures, education, and monitoring,

Field Survey : The survey can be carried out in a phased manner with initial emphasis on tourism related sites where majority of marine debris is generated and finding way into the sea. There is a great demand for practical strategy to control the input from marine vessels and land-based activities in order to assess their potential impact on marine environments and fishery resources, and to remove the accumulated litters on the seabed.

Ports: The marine debris survey should include collection of data from Ports and Harbors. This is important information that would provide the basic statistical data for making a budget and policy formation.

The Survey method should be simple and cost-Effective. The land based near shore survey can be conducted along the shore by visual documentation of surface and buried debris as weight/volume and type of debris distribution. Divers are to be engaged for sea bed survey.

Equipment The equipment required are GPS, Camera, hand tools for debris collection and segregation. The survey equipment like Side Scan Sonar, echo sounder with Auxiliary tools like Bottom trawl net, Dredge, Corer and underwater camera are required. The large collection bins and rooms for storage are also required.

Locations: From the International coastal clean up campaign conducted in September 2006, the suggested locations where this project can be initiated are

1. Gulf of Kuchchh - Ship traffic, fisheries
2. Alang - Ship breaking yard
3. Daman - Tourism, fisheries
4. Veraval - Fisheries

5. Mumbai - Anthropogenic effect, Industry, tourism, ship traffic
6. Mangalore - Fisheries, ship traffic
7. Kochi - Anthropogenic effect, tourism, fisheries, industry
8. Kanyakumari - Tourism, fisheries, international ship traffic
9. Minicoy - International ship traffic, fisheries
10. Tuticorin - Ship traffic, Industry, fisheries
11. Chennai - Ship traffic, Industry, anthropogenic effect
12. Kakinada - Fisheries, Industry
13. Viskhapattinam - Ship traffic, fisheries, Industry
14. Paradip - Ship traffic, fisheries
15. Haldia - Ship traffic
16. Kolkatta - Ship traffic, fisheries, anthropogenic effect,
17. Port Blair - Ship traffic, human settlement
18. Great Nicobar - International ship traffic

The Project cost estimation:

Indian coast is about 7500 km long with 9 states and 3 union territories and 3 major three island groups. Hence survey can be taken up in few selected places including major cities like Chennai, Mumbai and Kolkatta.

Project should be conducted in phases to identify different sources of marine debris and amount of debris along the coast and on the sea bed.

1. Formation of working groups involving various agencies
2. Field survey
3. Technology for treatment and recycling
4. Prevention of marine debris

1. Formation of working group

The Indian Government should constitute a Working Group involving Central and State Governments with the support of Industry and NGOs. These working groups should formulate

detailed work plan for this programme in 6 months period. A Project Directorate with supporting staff should be recruited to coordinate these activities. They can also be involved with other international programmes like GEF etc.

The cost for manpower is projected as part of field survey

Here the cost component is for arrangement of meetings with Government officials and expenditure towards formation of working group, travel expenses and Project Directorate, Preparation of visual and written document showing detrimental effect of marine debris and importance of marine debris management

Cost for formation of working group/ Project Directorate **50000 USD**

2. Field Survey

The field survey will include seasonal sampling spread over a period of 3 years to get systematic data on marine debris, covering the

2.1 Survey along the beach

2.2 Survey of floating debris and debris settled on the sea bed, and

2.3 Identifying the source of marine debris

2.1 Survey along the beach

- Beach walk for survey and collection
- Positioning device
- Collection devices
- Photographic documentation
- Collection of data on source

2.2 Survey of floating debris and on the sea bed

- Study floating debris
- Collection of floating debris
- Deep-sea Bottom trawl equipment
- Underwater camera system (1,000m water depth)
- Position-tracking device

Cost estimation for field survey:

Sl no	Description	Cost USD
1	Vessel hiring charges boats/research ships **1. Beach** Travel expenses to different beaches along the coast Collection and transpiration of debris Collection of supporting data from local people, source of debris, social impact of debris, seasonal variation etc., Appoint local NGOs to get systematic data per location 3 visits per year totaling to 9 visits @ 20000 USD per location per year for 3 years per location amounts to 60000 USD For 18 locations **1080000 USD** **2. Near shore** Sampling per site : Boat # 500 USD per day for 45 days per year and for 3 years estimated to be 67500 USD and for 18 sites amounts to 18 x 67500 = 1215000 USD Transportation,port charges etc., 50000 USD **Total** **12650000 USD** **3. Deep sea** 45 days cruises one each for east and west coast per year for 3 years totally 6 cruises are required Vessel hiring charges @ 10000 USD per day for 45 days and for 2 voyages (east and west coast) – 90 days (45x2x10000) Cost of vessel hiring charges 900000 USD per year and for 3 years 2700000 USD Transportation, Port charges, fuel and water charges 300000 USD **Total** **3000000 USD**	16730000

2	**Ports and Horbours** *Data to be collected on daily basis with support of Port authorities* Cost for per year per site Installation of disposable bins, arrangement for collection of debris from ships, transportation to recycling / dump yard 30000USD Periodic collection of fish waste, broken nets and unusable fishing gears from Fishing horbours 50000USD Underwater survey to assess debris in Port waters 10000USD Provide training on marine litter management to fishers 10000USD Subtotal 100000 USD For 18 locations for 3 years (100000 x18x3) = 5400000 USD	5400000
2	Equipment and accessories side scan sonar, Remotely operable vehicle, cameras, GPS units, etc.,	100000
3	Arrangement of local tours, meetings workshops seminars local transport and related expenses	200000
4	Incidental expenses	250000
5	Salaries (Please work out details and incorporate the budget – present projection for 3 years appears to be very much on the lower side) Manpower @ Project head 1; Senior scientific officer 3, consultant 1, field staff – 20, Research students – 15, Administrative staff 8	300000
6	Expense towards Documentation and photography, workshops, awareness campaign etc	100000
7	Diving charges 20000 USD per location for 18 locations 360000 USD	360000
8	Consumables trash bags, gloves, safety and protective gears etc.,	160000
	Grand total	23600000
	Grand Total	**23.6mUSD**

Total cost for this survey for 3 years amounts to 23.6 million USD

3. R&D - Technology for treatment and recycling

As part of this programme appropriate technology for recycling and eco-friendly disposal of marine debris should be taken up and management of these debris has to be initiated.

This technology can be divided into three stages

Phase I

Development of Base Technologies – this should be viable to Indian conditions. R&D Projects to be initiated through Govt and Private agencies.

Phase II

Practical Technologies - should be easily adoptable and cost effective. The technology developed in Phase I can be taken to Industry for pilot scale trials before dissemination in the field.

Phase III

Popularization of Developed Technologies – efforts should be made to disseminate these Technologies and to conduct training programmes through Local bodies and NGOs. The Self Help Group movement which is very popular in southern coastal states can be used. At selected sites these Recycling and eco-friendly technology demonstration and management Units can be set up under this project.

The scope of work for R & D, therefore, can be in the following areas:

- Pre-treatment system
- Waste fishing net and Polystyrene Buoys Recycling System
- Marine Debris Incinerator
- On-board Combined Treatment System
- Waste FRP vessel Treatment System

Considering the technology involved and scope of work and diversity of marine debris along the Indian coast the estimation is arrived at

	mUSD
Special incinerator for medical waste	0.50
Site specific technology to suit Indian conditions and Low cost and maintenance free technology preferred	0.50
Plastic recycling units @ 20000 USD x 18 units	0.36
Development of proto type models	1.25
Indigenous models	
Procurement of safe disposal systems	0.39
Total	3mUSD

Total cost for Technology for treatment and recycling- 3 million USD

4. Prevention of marine debris

The final phase is to control marine debris after detailed survey and technology development. Here the Indian Government should enforce strict regulations and simultaneously educate the people on the importance of marine debris management.

Also this includes accumulation of marine debris from other countries and passing ships. South Asian Seas programme can formulate joint projects with neighbouring countries with International / Regional funding.

The scope of work includes

- Management tools & administrative issues
- Legislation
- Carry out several site experiments in rivers, and channels leading to sea
- Mitigation Strategy
- Education & Campaign
- International Coastal Clean-up Activities

	Cost Millions
Expenditure on formation of legislation, arrangement of meetings, travel, related expenses	1.00
Awareness campaign at sites involving local Self Help Groups, NGOs and local elected bodies like panchayats	1.00
Advertisement thorugh media and newspaper	0.50
Preparation of teaching materials, student competition	0.75
National seminar	0.50
Printing of books and reading materials, video on marine debris	0.25
To organdie International coastal clean Up day	3.00
Total	7.00

The cost for prevention of marine debris could be approximately 7 million USD

To sum up

The programme on Integrated Marine Debris Management (IMDM) – India is estimated as given below to conduct this study at 18 locations for 3 years

1.	Formation of working group/ Project Directorate	0.05 million USD
2.	Survey for 3 years	23.60 million USD
3.	Technology for treatment and recycling-	3.00 million USD
4	Prevention of marine debris could be approximately	7.00 million USD

Hence total cost of the project is estimated to be approximately 33.65 million USD

5. Summary assessment/Conclusion

The basic statistical data for distribution of marine litters seems to be the first exercise to be initiated. The approach of the integrated management system is very important in dealing with the problem of marine debris. Technology development should place emphasis on the practical needs and must keep pace with management tools and administrative issues.

The suggested directions for managing the marine litter in the Indian seas in particular are the following:

- Specification of mass pollution sources by carrying out monitoring research in marine regime in seawater areas and coastal zones;
- Creation of databases on the sunk sea objects for creation of databases on the sunk sea objects for this region;
- Estimation of pollution at the demersal and the bottom of the sea in the areas of intensive fishing:
- Ecological education
- Strict enforcement of Regulations

- Periodic assessment of debris
- Sustained interest by Government agencies
- Study flow of funds for the project
- International efforts

The programme on marine debris management on a long term basis has to be evolved with Government - People participation in a more cohesive and systematic manner after studying the results collected from the sample study conducted at selected sites.

6. References/literature cited

1. Metha. R , Demands on the Indian Coasts: opportunities and conflicts, Development Commissioner, Goa, Government of India – from web site.
2. Verlecar, X. N, N. Pereira, S. R. Desai, K. B. Jena and Snigdha, 2006. Marine pollution detection through biomarkers in marine bivalves. Current Science, Vol. 91, NO. 9, 10 November 2006. 1154)
3. *http://www.bobpigo.org/bobp_india.htm*
4. (HYPERLINK: *http://www.indiatogether.org/stories/bigelliot.htm).*
5. Acharya P and Thakur N K. 1999, Aquatic resources management policy to cater to the needs of 21st century, In Vision on Indian fisheries of 21st century, Abidi S A H, Thakur N K, Biradar R S, Shenoy L (eds.) Mumbai: Proceedings of the national seminar CIFE, pp. 35-46

5 Biradar R S and N K Thakur. 1999 Fish production prospects in India by 2020, In Vision on Indian fisheries of 21st century , Abidi S A H, Thakur N K, Biradar R S, Shenoy L (eds.) Mumbai: Proceedings of the national seminar CIFE, pp. 26-34

6. Devaraj M. 1996, Deep-sea fishing in Indian waters, In Proceedings of the seminar on fisheries - A multibillion dollar industry, Chennai: pp. 35-41.
7. Devaraj M and Vivekanandan E. 1999, Marine capture fisheries of India: challenges and opportunities, Curr Sci 76 (3): 314-332,
8. Krishnan M., Birthal P S, Ponnusamy K., Kumaran M., Singh H. 2000, Aquaculture in India: retrospect and prospects, In Krishnan M and Birthal P S (eds.) Aquaculture development in India: problems and Prospects, Workshop Proceedings organised by

National Centre for Agricultural Economics and Policy Research (NCAP) with Central Institute of Brackishwater aquaculture (CIBA), New Delhi pp:11- 31

9. Mehta R. 1999, Demands on the Indian coasts – opportunities and conflicts, Coast in Newsletter 1: 3-4.

10. MoA. 1996, A hand book on Fisheries Statistics 1996, Ministry of Agriculture. 217 pp.

11. Ninth Five Year Plan: 1997-2002, Vol. 2: Thematic Issues and Sectoral Programmes, New Delhi: Government of India, Planning Commission. 1059 pp.

12. Pandian T J. 1999, Curr Sci 76 (3): 313

13. Planning Commission. 2001, Draft Approach Paper to the Tenth Five-Year Plan (2002-07) Marine and coastal environment 227; New Delhi: Planning Commission. 49 pp.

14. Rao T A, Molur S and Walker S. 1999, Mangroves of India: Report summary 1998 Publ. Zoo Outreach Organization ISSN 0971-6378, XIV (2). pp. 1-49

15. Somvanshi V S. 1997, Deep sea fishing and its impact on coastal fishing, In Rajan H.P. (ed), Proceedings of National Seminar on Coastal Ocean Regime and Developing Countries, New Delhi: Department of Ocean Development. pp. 38-46

16. Somvanshi V S. 1999 Indian fisheries in 21st Century: Some thoughts on marine fisheries resources management. In Vision on Indian fisheries of 21st century, Abidi S A H, Thakur N K, Biradar R S, Shenoy L (eds.) Mumbai: Proceedings of the National Seminar. CIFE. pp. 54-64

17. TERI. 1999 First year progress report: Ongoing study on 'Measuring, monitoring and managing sustainability: the coastal dimension' Submitted to European Union, DG XII.

18. Zingde M D. 1999, Health of the coastal marine environment and fisheries development in India, In Vision on Indian fisheries of 21st century, Abidi S A H, Thakur N K, Biradar R S, Shenoy L (eds.)Mumbai: Proceedings of the national seminar CIFE. pp. 276-287

19. Occurance of Foreign Marine Debris in Great Nicobar: A Potential Threat to the Coastal Ecosystem, - Current Science 2004

19. Web site for kids : http://marine-litter.gpa.unep.org/kids/kids.htm

20. Aquaculture Authority of India http://aquaculture.tn.nic.in/notification.htm

Annexure – I

List of organizations, which provided inputs by filling up the questionnaire circulated to them

Sl no	ORGANISATION	LOCATION	E-MAIL
1.	Central Pollution Control Board	Delhi	cpcb@alpha.nic.in
2.	Gujarat Pollution Control Board	Gandhinagar	kvbhanujanchairmangpcb@rediffmail.com
3.	Maharashtra Pollution Control Board	Mumbai	mpcb@vsnl.net, mpcbeic@rediffmail.com eic.hq@mpcb.mah.nic.in
4.	Goa State Pollution Control Board	Panaji	goapoll@goa.nic.in
5.	Karnataka State Pollution Control Board	Banglore	kspcb@kar.nic.in
6.	Kerala State Pollution Control Board	Trivandrum	ms@keralapcb.org jp@keralapcb.org
7.	Tamil Nadu Pollution Control Board	Madras	tnpcb@md3.vsnl.net.in
8.	Pollution Control Committee Department of Science, Technology & Env	Pondicherry	dste@pondy.pon.nic.in
9.	A.P. Pollution Control Board	Hyderabad	info@appcb.org
10.	Orissa State Prevention and Control of Pollution Board	Bhubaneswar	paribesh@dte.vsnl.net.in paribesh@sancharnet.in
11.	West Bengal Pollution Control Board	Calcutta	wbpcbnet@wbpcb.gov.in
12.	Secretary (Fisheries), Andaman & Nicobar Administration	Port Blair	
13.	A & N Islands Pollution Control Committee	Port Blair	
14.	Central Pollution Control Board	Delhi	adrct.cpcb@nic.in
15.	Gujarat Ecological Society Vadodara	Gujarat	info@gesindia.org
16.	National Institute of Oceanography Andheri (W)	Mumbai	
17.	Marine Chemist (Retd.)	Vishakhapatnam	
18.	The Joint Secretary - Control of Pollution Ministry of Environment & Forests Government of India	New Delhi	secy@menf.delhi.nic.in
19.	Pollution Control Division, Ministry of Environment & Forests	New Delhi	
20.	DOD-COMAPS Centre for Earth Science Studies	Thiruvananthapuram	
21.	National Institute of Oceanography	Goa	
22.	Mineralogy & Metallography Department and PL - COMAPS Project Regional Research Laboratory	Bhubaneswar	bcacharya@rrlbhu.res.in

23.	CAS in Marine Biology, Annamalai University	Parangipettai	stbcas@nic.in casmb@envis.nic.in
24.	Dr. D. Chandramohan Dy. Director, NIO (Retd.)	Chennai	
25.	Director (Shipping) Ministry of Surface Transport	New Delhi	
26.	Transport Bhawan	New Delhi	
27.	Indian Coast Guard	New Delhi	vprotect@vsnl.com vprotect@vsnl.net
28.	National Environmental Engineering Research Institute	Nagpur	director@neeri.res.in
29.	NEERI	Chennai	
30.	Centre for Marine and Coastal studies School of Energy, Environment and Natural Resources Madurai Kamaraj University	Madurai	
31.	Indian National Centre for Ocean Information Services Department of Ocean Development	Hyderabad	
32.	Regional Research Laboratory	Trivandrum	
33.	Director, Institute of Ocean Management Anna University	Chennai	rramesh_au@hotmail.com, ramesh@annauniv.edu
34.	Ministry of Ocean Development	New Delhi	mades-dod@nic.in
35.	Mercantile Marine Department	Chennai	mmdchennai@vsnl.net
36.	Directorate General of Shipping	Mumbai	kiran@dgshipping.com
37.	Ministry of Environment & Forests	New Delhi	ddverma@nic.in
38.	National Centre for Antarctic & Ocean Research	Goa	rasik@ncaor.org
39.	Mumbai Port Trust	Mumbai	mbpt@vsnl.com
40.	Kolkata Port Trust	Kolkata	chairman@portofcalcutta.com
41.	JN Port Trust	Mumbai	
42.	Cochin Port Trust	Cochin	copt@ker.nic.in
43.	Kandla Port Trust	Gujarat	bdc@kandlaport.com
44.	Visakhapatnam Port Trust	Visakhapatnam	info@vizagport.com
45.	Tuticorin Port Trust	Tuticorin	cpt@sancharnet.in
46.	Chennai Port Trust	Chennai	cpt@chennaiport.gov.in
47.	Paradip Port Trust	Paradip	chmppt@paradipport.gov.in
48.	New Mangalore Port Trust, Mangalore	Karnataka	nmptchairman@sify.com
49.	Ennore Port Limited	Chennai	mraman@ennoreportltd.com
50.	Mormugao Port Trust, Mormugao	Goa	chairmpt@sancharnet.in
51.	Central Institute of Plastics Engineering & Technology (CIPET)	Chennai	cipethq@vsnl.com
52.	Department of Science & Technology	New Delhi	dstsec@nic.in
53.	Ministry of Earth Sciences	New Delhi	dodsec-dod@nic.in dodsec@dod.delhi.nic.in
54.	Department of Biotechnology Ministry of Science and Technology	New Delhi	mkbhan@dbt.nic.in

55.	Ministry of Environment & Forests	New Delhi	envisect@nic.in
56.	Department of Scientific & Industrial Research Ministry of Science and Technology	New Delhi	dg@csir.res.in
57.	Ministry Of Petroleum and Natural Gas	New Delhi	srinivasan2k@nic.in
58.	INDIAN INSTITUTE OF PACKAGING (IIP) Government of India	Mumbai	iip@bom4.vsnl.net.in
59.	Rubber Board Kottayam	Kerala	chairman@rubberboard.org.in
60.	Fishery Survey of India Ministry of Agriculture	Mumbai	fsi@bom.nic.in
61.	Hindustan Shipyard Ltd	Visakhapatnam	hs102@itfvis-ap.nic.in hsl@hslvizag.com
62.	Cochin Shipyard Ltd.	Cochin	info@cochinshipyard.com
63.	Hooghly Dock & Port Engineers Limited (HDPEL)	Kolkata	hdpeltd@cal2.vsnl.net.in
64.	Directorate General of Lighthouses and Lightship Ministry of Shipping, Govt. of India	Uttar Pradesh	dgll@ndb.vsnl.net.in
65.	Shipping Corporation of India Limited	Mumbai	s.hajara@sci.co.in
66.	Andaman Lakshadweep Harbour Works	Port Blair	pblceaalhw@sancharnet.in alhw@and.nic.in pblsrscalhw@sancharnet.in
67.	Dredging Corporation of India Ltd	Visakhapatnam	nkgupta@dci.co.in
68.	Indian Ports Association	New Delhi	ipa@nic.in ipadel@nda.vsnl.net.in
69.	S. D. S. Shipping P Ltd	Mumbai	
70.	Sanmar Shipping Ltd.	Chennai	ship@sanmargroup.com
71.	Reef Watch Marine Conservation	Mumbai	coral110@rediffmail.com sarang@reefwatchindia.org
72.	Ellon Hinengo Ltd	Calcutta	
73.	Hauers Lines Ltd	Calcutta	
74.	Indian Steamship Company Ltd	Calcutta	
75.	Jayshree Shipping Industry House	Calcutta	
76.	Ratnakar Shipping Company Ltd	Calcutta	
77.	Shanthi Shipping Company Pvt. Ltd	Calcutta	
78.	Surendra Overseas Ltd.	Calcutta	
79.	Texmaco Ltd. Shipping Division	Calcutta	
80.	Balaji Distilleries Ltd.	Chennai	
81.	Chettinad Cement Corpn. Ltd.	Chennai	
82.	Essar Shipping Limited	Mumbai	contactshipping@essar.com http://www.essar.com
83.	Hauers Line Ltd	Chennai	
84.	India Cements Ltd. Shipping Division	Chennai	
85.	Pearl Ships Ltd.	Chennai	
86.	Poompuhar Shipping Corporation Ltd	Chennai	psclt@giasmd01.vsnl.net.in
87.	South India Shipping Corporation Ltd	Chennai	

88.	Southern Petrochemical Inds. Corporation Ltd	Chennai	
89.	Jaisu Shipping Company Pvt. Ltd.	New Kandla	mail@jaisu.in
90.	Kerala Lines Ltd.	Kochi	
91.	Chowgule Steamships Ltd.	Mormugao	
92.	Damodar Bulk Carriers Ltd.	Mormugao	
93.	Sea Shipping Pvt. Ltd.	Mormugao	
94.	V.M. Salgaonkar & Bro. Ltd.	Mormugao	
95.	Arcadia Shipping Ltd.	Mumbai	arcadia@mtnl.net.in
96.	Atlas Shipping Company Pvt. Ltd.	Mumbai	
97.	Binny Ship Management Pvt. Ltd.	Mumbai	
98.	Century Shipping	Mumbai	
99.	Dolphin Offshore Enterprises (I) Ltd.	Mumbai	
100.	Chowgule Steamship Ltd.	Mumbai	csl@chowgule.co.in
101.	Frank Shipping (India) Ltd.	Mumbai	
102.	Gajambuja Cement	Mumbai	
103.	Gal Offshore Services Ltd.,	Mumbai	
104.	Garware Offshore Services Ltd.	Mumbai	secretarial@garwareoffshore.com
105.	Hauers Lines Ltd.	Mumbai	
106.	Hede Ferrominas Pvt.Ltd.	Mumbai	
107.	India Steamship Company Ltd.	Mumbai	
108.	Infrastructure Leasing & Financial Services Ltd.	Mumbai	
109.	James Mackintosh & Company Pvt. Ltd.	Mumbai	
110.	Larsen & Toubro Ltd.	Mumbai	
111.	Mazagaon Dock Ltd.	Mumbai	
112.	Mercator Lines Ltd.	Mumbai	mercator@mllindia.com
113.	Mysore Petro Chemicals Ltd.	Mumbai	
114.	Natvar Parikh Industries Ltd.	Mumbai	
115.	Peerless Drive Ltd	Mumbai	
116.	Polaris Shipping Pvt. Ltd.	Mumbai	
117.	Pratibha Shipping Company Ltd.	Mumbai	pscl@vsnl.com
118.	Raj Shipping Agencies (Bombay) Pvt. Ltd.	Mumbai	
119.	Reliance Industries Ltd.	Mumbai	mv_ramamurthy@ril.com
120.	Sadhana Technical Works Pvt. Ltd.	Mumbai	
121.	Salgaocar Engineers Pvt. Ltd.	Mumbai	
122.	Samarat Asia Maritime Pvt. Ltd.	Mumbai	
123.	Samon Maritime Ltd.Malet Bunder	Mumbai	
124.	SCICI Ltd.	Mumbai	
125.	Seaspan Shipping Ltd.	Mumbai	
126.	Seatrans Shipping Ltd.	Mumbai	
127.	Coastal Shipping Ltd.	Calcutta	
128.	Garuda Carriers & Shipping	Mumbai	
129.	VNS Offshore Services Company	Mumbai	
130.	Vikram Ispat	Mumbai	
131.	SKS (Ship) Limited	Mumbai	shahi@bom3.vsnl.net.in

			shahi@bol.net.in shahi_bcd@vsnl.net enquiry@shahiship.com
132.	Shreyas Shipping & Logistics Limited	Mumbai	devli@shreyas.com
133.	ABG Shipping Ltd.	Mumbai	shipping@abgshipping.com
134.	Apeejay Shipping Limited	Calcutta	solcal@apeejaygroup.com http://www.apeejayshipping.com
135.	GATI Coast To Coast	Chennai	gatiship@eth.net gatiship@vsnl.com
136.	Good Earth Maritime Ltd.	Chennai	info@goodearth.co.in http://www.archeangroup.com
137.	Gujarat Ambuja Cements Limited	Mumbai	skgupta@ambujamail.com www.gujaratambuja.com
138.	Ocean Sparkle Limited	Hyderabad	oslhyd@oceansparkle.com http://www.oceansparkle.com
139.	South East Asia Marine Engineering & Construction Limited	Mumbai	crodricks@technip.com
140.	South India Corporation Limited	Chennai	chettinadshipping@vsnl.net
141.	Tamilnadu Maritime Academy Nandanam	Chennai	
142.	TAG Sealogistics Limited	Mumbai	sapparao@tagsea.net tsl@tagsea.net
143.	TCI Seaways Ltd.	Chennai	ru.singh@tciseaways.com
144.	The Great Eastern Shipping Company Limited - Shipping Division	Mumbai	k_sheth@greatship.com
145.	Tidewater (India) Pvt. Ltd.	Mumbai	cmckenny@tdw.com
146.	Tolani Shipping Company Limited	Mumbai	ops@tolanigroup.com
147.	Trans Asian Shipping Services (P) Ltd.	Cochin	jmktas@vsnl.net
148.	United Shippers Limited	Mumbai	operations@unitedshippers.com
149.	Varun Shipping Company Limited	Mumbai	ydk@varunship.com http://www.varunship.com
150.	West Asia Maritime Limited	Chennai	abdul.qadir@wam.co.in
151.	India Steamship Co. Ltd.	Kolkata	md@indiasteamship.org
152.	Indian National Shipowners' Association	Mumbai	secygen@insa.org.in kulkarni@insa.org.in
153.	Balaji Mariline Pvt. Ltd.	New Delhi	rama@balajimariline.com info@balajimariline.com
154.	Clarion Logistic India Pvt. Ltd.	Mumbai	joy@clarionlogistics-india.com
155.	Transworld Management Consultancy Pvt. Ltd.	Mumbai	corporate@twgrp.net
156.	Haytrans (India) Pvt. Ltd.	Mumbai	dixit.sp@haytrans.com
157.	Orient Express Ship Management Ltd.	Mumbai	oesm@oesm.co.in
158.	Relay Shipping Agency Ltd.	Kochi	
159.	Admec Logistics Ltd - Mumbai (Port Office)	Mumbai	admec@admec.twgrp.com
160.	Sea Meridian Shipping Agency Pvt. Ltd.	Calcutta	
161.	Transworld Shipping Services (I) Pvt. Ltd.	Mumbai	ray@twss.co.in

162.	Gujarat Maritime Board	Gujarat	
163.	Char Godown	Gujarat	
164.	Gujarat Maritime Board	Gujarat	
165.	New Port, Port Office, Bhavnagar	Gujarat	
166.	Gujarat Maritime Board	Surat	
167.	Dhej Port Gujarat Maritime Board	Bharuch	
168.	Maharashtra Maritime Board	Mumbai	
169.	Director of State Ports Kakinada	Andhra Pradesh	dirofports@ap.gov.in
170.	Tamil Nadu Maritime Board	Chennai	tnmb@md5.vsnl.net.in
171.	Azhikkal Port Office Govt.of Kerala	Trivandrum	
172.	Belikeri Port Office	Karwar	
173.	Jakhau Port Office Gujarat Maritime Board	Gandhinagar	
174.	Mundra Port	Mundra (Kutch)	mktg@portofmundra.com
175.	Mundra Port Office Gujarat Maritime Board	Gandhinagar	
176.	Pipavav Port Office Gujarat Maritime Board	Gandhinagar	
177.	Coondapur Port Office	Karwar	
178.	Cannanore Port Office	Trivandrum	
179.	Ponnani Port Office Govt.of Kerala	Trivandrum	
180.	Beypore Port Office	Trivandrum	
181.	Neendakara Port Office	Trivandrum	
182.	Thalassery Port Office	Trivandrum	
183.	Adani Port Ltd. Navinal Island, Kutch	Gujarat	
184.	Port Pipavav	Gujarat	feedback@portofpipavav.com
185.	Tuticorin Container Terminal	Chennai	
186.	Cocanada Port	Kakinada	
187.	Calicut Port	Calicut	
188.	Cuddalore Port	Tamilnadu	
189.	Gopalpur Port	Chatrapur	
190.	Karwar Port	Karwar	
191.	Nagapattinam Port	Tamilnadu	
192.	Redi Port Maharashtra Maritime Board, Indian Mercantile Chambers	Mumbai	
193.	Trivandrum Port The Director - Ports Department	Trivandrum	
194.	Port Department	Pondicherry	port@pondy.pon.nic.in
195.	Government of Goa Captain of Ports Department	Goa	
196.	Panaji Port Authority (Port Office)	Goa	
197.	Garden Reach Shipbuilders & Engineers Limited	Kolkata	

198.	Mazagon Dock Limited	Mumbai	corplg@mdlindia.com
199.	Goa Shipyard Limited	Goa	contactus@goashipyard.com
200.	Department of Fisheries	Kolkata	secfisheries@wb.gov.in
201.	Department of Environment	Kolkata	sec-env@wb.nic.in
202.	Haldia Development Authority	West Bengal	kgp_chief1@sancharnet.in
203.	Marine Engineering & Research Institute Kolkata	West Bengal	director@merical.ac.in
204.	Fisheries and ARD Department Bhubaneshwar	Orissa	cjvenu1@yahoo.co.uk
205.	School of Naval Oceanology & Meteorology Naval Base (Kochi)	Kerala	pandacs@rediffmail.com
206.	Meteorology Office	Mumbai	mangalnavy@yahoo.com
207.	Naval Base	Kochi	uroojathar@yahoo.com
208.	Daman & Diu Administration Daman UT of Dadra & Nagar Haveli	Daman and Diu	
209.	ENVIS Coordinator Industrial Toxicological Research Centre (ITRC)	Uttar Pradesh	f_jaffery@yahoo.com
210.	ENVIS Coordinator The Energy Resources Institute (TERI)	New Delhi	pkbhatta@teri.res.in
211.	ENVIS Coordinator National Institute of Occupational Health (NIOH)	Gujarat	adewan@envisnioh.org
212.	ENVIS Coordinator Centre for Ecological Sciences Indian Institute of Science (IIS)	Karnataka	iisc@envis.nic.in
213.	ENVIS Coordinator Zoological Survey of India(ZSI)	Kolkata	Email Id: zsi@envis.nic.in
214.	ENVIS Coordinator Indian School of Mines	Jharkhand	s_gurdeep2001@yahoo.com Email Id: ism@envis.nic.in
215.	ENVIS Coordinator Jawaharlal Nehru University (JNU)	New Delhi	subra@jnuniv.ernet.in Email Id: subra@jnnuiv.ernet.in
216.	ENVIS Coordinator University of Kalyani	West Bengal	scsantra@yahoo.com Email Id: scsantra@yahoo.com
217.	ENVIS Co-ordinator University of Madras	Chennai	nmunuswamy@yahoo.com Email Id: dzum@envis.nic.in
218.	Shri. T.K. Bandopadhyay ENVIS Coordinator Indian Centre for Plastic in the Environment (ICPE)	Mumbai	icpe@envis.nic.in
219.	Environment Management Division - Confederation of Indian Industries (CII)	New Delhi	cii@envis.nic.in
220.	Gujarat Cleaner Production Centre (GCPC)	Gujarat	gcpc@envis.nic.in
221.	ENVIS Coordinator Indian Institute of Chemical	Andhra Pradesh	murthyusn@yahoo.com

	Technology (IICT		Email Id: usnmurthy@iict.ap.nic.in
222.	Head – ENVIS Centre World Wide Fund for Nature – India (WWF)	New Delhi	gareendran@wwfindia.net Email Id: wwf@envis.nic.in
223.	ENVIS Coordinator Nehru Foundation for Development	Gujarat	Email Id: cee@envis.nic.in
224.	ENVIS Coordinator Environment Protection Training and Research Institute (EPTRI)	Hyderabad	baquer@eptri.com Email Id: ap@envis.nic.in
225.	Indian Environmental Society (IES)	Delhi	iesenro@del2.vsnl.net.in
226.	ENVIS Coordinator Centre for Symbiosis of Technology, Environment and Management (STEM)	New Delhi	stemdel@gmail.com Email Id: stem@envis.nic.in
227.	Consumer Education and Research Centre (CERC)	Gujarat	Email Id: cerc@envis.nic.in
228.	CPR Environmental Education Centre (CPR)	Chennai	Email Id: cpreec@envis.nic.in
229.	ENVIS Coordinator National Solid Waste Association of India (NSWAI)	Mumbai	Email Id: nswai@envis.nic.in
230.	Assam Science, Technology and Environmental Council	Assam	Email Id: asm@envis.nic.in
231.	Department of Environment - Govt. of NCT of Delhi	New Delhi	Email Id: del@envis.nic.in
232.	ENVIS Coordinator Department of Science, Technology and Environment	Goa	envisgoa@rediffmail.com Email Id: goa@envis.nic.in
233.	Gujarat Ecology Commission (GEC) Vadodra	Gujarat	Email Id: guj@envis.nic.in
234.	ENVIS Coordinator Science, Technology and Environment Department Thiruvananthapuram	Kerala	Email Id: ker@envis.nic.in
235.	ENVIS Coordinator Environment Department Mumbai	Maharashtra	Email Id: mah@envis.nic.in
236.	Centre for Environmental Studies (CES) Bhubaneshwar	Orissa	Email Id: ori@envis.nic.in
237.	Department of Environment - Tamil Nadu	Chennai	Email Id: tn@envis.nic.in
238.	Department of Environment - West Bengal	West Bengal	chinmoy@cal3.vsnl.net.in Email Id: wb@envis.nic.in

239.	Department of Environment and Forest - Andaman and Nicobar Port Blair	Andaman and Nicobar	Email Id: an@envis.nic.in
240.	Daman Pollution Control Committee Moti Daman	Daman and Diu	Email Id: dd@envis.nic.in
241.	National Institute of Oceanography (NIO) Dona Paula	Goa	Email: shetye@nio.org
242.	Centre for Science and Environment (CSE)	New Delhi	sunita@cseindia.org E-mail: cse@cseindia.org Website: www.cseindia.org
243.	Dept. of Marine Sciences Berhampur University	Orissa	kalicsahu@rediffmail.com khshmrsc@yahoo.com
244.	Dept.of Marine Biology, Microbiology and Biochemistry Cochin University of Science and Technology	Cochin	saramma@cusat.ac.in rd@cusat.ac.in
245.	Ocean Science and Technology Cell (OSTC) Mangalore University	Karnataka	E-mail: ostcmgg@yahoo.com
246.	Department of Marine Living Resources Andhra University, Visakhapatnam	Andhra Pradesh	E-mail : kandulasujatha@mailcity.com
247.	Ocean Science and Technology Cell Bhavnagar University	Bhavnagar	ajjoshi@yahoo.co.in
248.	Ocean Science and Technology Cell – Marine Microbiology Goa University	Goa	ostcgu@unigoa.ac.in
249.	Central Institute of Fisheries Education	Mumbai	root@cife.bom.nic.in fishinst@bom3.vsnl.net.in
250.	Director Central Marine Fisheries Research Institute	Kochi	E-mail : mdcmfri@md2.vsnl.net.in
251.	Central Institute of Brackishwater Aquaculture Raja Annamalai Puram	Chennai	ciba@tn.nic.in
252.	Central Institute of Fisheries Technology (CIFT)	Cochin	
253.	National Biodiversity Authority	Chennai	nba_india@vsnl.net
254.	Energy & Petrochemicals Department	Gujarat	
255.	Gujarat Ecological Education and Research (GEER) Foundation	Gujarat	dir-geer@gujarat.gov.in www.geerfoundation.gujarat.gov.in
256.	Chief Commissioner of Customs Navrangpura, Ahmedabad	Gujarat	ccoahm@rediffmail.com cusahmed@guj.nic.in
257.	Office of the Commissioner of	Gujarat	

	Fisheries, Gandhinagar		
258.	Centre for Materials for Electronics Technology (C-MET)	Pune	tlprakash@cmet.gov.in
259.	Indian Rubber Manufacturers Research Association (IRMRA	Maharashtra	rubberin@bom7.vsnl.net.in
260.	The Plastics Export Promotion Council (PLEXCONCIL	Mumbai	E-mail : plexconcil@vsnl.com
261.	Plastindia Foundation	Mumbai	plastindia@vsnl.com mkshah@samsons.com www.plastindia.org
262.	All India Plastics Manufacturers' Association (AIPMA)	Mumbai	aipma@vsnl.com plastocraft@vsnl.com
263.	Organization of Plastics Processors of India (OPPI)	Mumbai	Email: oppi@vsnl.com
264.	Committee on Environment Federation of Indian Chambers of Commerce & Industry (FICCI)	New Delhi	E-mail: ficci@ficci.com
265.	polymerupdate.com	Mumbai	sajjidmitha@polymerupdate.com info@polymerupdate.com
266.	Managing Director Plastemart.com	Mumbai	contact@plastemart.com
267.	123plastics.com	Mumbai	business@123plastics.com 123plastics@123plastics.com
268.	Office of the Chief Commissioner of Customs – Mumbai	Mumbai	contact@mumbaicustoms.gov.in
269.	Office of the Commissioner of Customs	Bangalore	
270.	National Institute of Technology	Karnataka	
271.	Environment Management and Policy Research Institute (EMPRI)	Bangalore	etikspcb@giasbg01.vsnl.net.in
272.	College of Fisheries	Mangalore	
273.	Department of Fisheries	Hyderabad	
274.	United Nations Development Programme (UNDP)	New Delhi	webadmin.in@undp.org
275.	Stockholm Environment Institute (SEI)	Sweden	E-mail: postmaster@sei.se
276.	Visakhapatnam Custom House	Vishakhapatnam	vizagcus@itpvis.ap.nic.in
277.	Indian National Centre for Ocean Information Services (INCOIS)	Hyderabad	
278.	College of Science & Technology Andhra University	Visakhapatnam	principal_science@andhrauniversity.info aucst@yahoo.com
279.	M.S.N.P.G. Center Kakinada	Andhra Pradesh	aupgck@rediffmail.com
280.	Directorate of Fisheries	Chennai	
281.	Tamil Nadu Fisheries Development Corporation Ltd. (TNFDC)	Chennai	

282.	Department of Environment	Chennai	tndoe@md3.vsnl.net.in
283.	Winrock International India	New Delhi	winrockindia@winrockindia.org
284.	Toxics Link	Chennai	E: tlchennai@toxicslink.org sudhakar@toxicslink.org
285.	Delnet	New Delhi	hkkaul@delnet.ren.nic.in
286.	Shri A M M Murugappa Chettiar Research Center (MCRC)	Chennai	energy@mcrc.murugappa.org
287.	Tamil Nadu State Council for Science and Technology	Chennai	Email : enquiry@tnscst.org
288.	Alagappa Chettiar College of Engineering & Technology	Karaikudi	contact@accet.net
289.	Alagappa University	Karaikudi	
290.	Divisional Forest Officer Mangroves – cum – Wildlife Warden Bhitarkanika National Park	Orissa	info@bhitarkanika.org
291.	Institute of Life Sciences Chandrasekharpur	Bhubaneswar	bbmishra3@yahoo.com
292.	National Institute of Technology Rourkela	Orissa	info@nitrkl.c.in director@nitrkl.ac.in
293.	Kerala State Council for Science, Technology & Environment (KSCSTE) Thiruvananthapuram	Kerala	
294.	Central Institute of Fisheries Nautical & Engineering Training (CIFNET) Kochi	Kerala	cifnet@ker.nic.in
295.	Integrated Fisheries Project Ministry of Agriculture Cochin	Kerala	ifpchn@nic.in
296.	C U Shah College of Engineering & Technology	Gujarat	
297.	Faculty of Technology and Engineering M S University of Baroda Kalabhawan	, Vadodara	
298.	Government Engineering College Distt. Sabarkantha	Gujarat	
299.	Government Engineering College (Affiliated to Gujarat University and approved by AICTE, New Delhi) Distt. Kutch	Gujarat	
300.	Government Engineering College Gandhinagar	Gujarat	
301.	L.D. College of Engineering Ahmedabad	Gujarat	
302.	Lukhdhirji Engineering College Morbi	Gujarat	

303.	Nirma Institute of Technology Ahmedabad	Gujarat	
304.	Sardar Vallabh Bhai Regional College of Engineering and Technology Surat	Gujarat	
305.	Sarvjanik College of Engineering and Surat	Gujarat	
306.	Shantilal Shah Engineering College Bhavnagar	Gujarat	
307.	Government Science College Surat District	Gujarat	
308.	Bawanga University Bhavnagar	Gujarat	
309.	Bhavnagar University Bhavnagar	Gujarat	
310.	Gujarat University Navrangpura Ahmedabad	Gujarat	
311.	University of Baroda Vadodara	Gujarat	
312.	Centre for Environmental Planning and Technology (CEPT) Ahmedabad	Gujarat	
313.	Birla Vishvakarma Mahavidyalaya Vallabh Vidyanagar	Gujarat	
314.	North Gujarat University	Gujarat	
315.	South Gujarat University Surat	Gujarat	
316.	Saurashtra University Rajkot	Gujarat	
317.	Sardar Patel University Vallabh Vidyanagar	Gujarat	

ANNEXURE – II
COMPILED REPORT ON COASTAL CLEANUP DAY OBSERVED IN INDIA

S.No.	Date	Place	No. of people participat-ed	No. of Students participat-ed	Approx weight of marine litter collected (kg)	Probable Source*
		GUJARAT				
1.	18-10-06	Nararabet	47		350	4 / 12 / 10 / 13
2.	18-10-06	Okha (Khadir Temple Beach)	150		150	4 / 12 / 13
3.	27-09-06	Chowpathy Beach, Porbander	1200		1500	4 / 12 / 13
4.	18-09-06	Hover port / Jakhau village, Jakhau	26		200	4 / 5 / 10 / 12 / 13 / 15
5.		Alang, Gulf of Cambay			59940	**Data taken from research article****
6.		Sosiya, Gulf of Cambay			36780	
		GOA				
7.	2-10-06	Vasco-da-Gama (Bina beach)	250		1590	4 / 12 / 13
		MUMBAI				
8.	16-09-06	Sassoon Dock	20		13	15
9.	16-09-06	Katalwadi Anjenvel, Dabhol, Maharashtra	60		300	3 / 4 / 5 / 14 / 15
10.	14-10-06	Mumbai (Girgaon, Juhu, Dadar beach)	2000	600	2062	4 / 12 / 13
11.		Juhu Beach			20000	**Data obtained from Mumbai Municipal Corporation, Mumbai**
12.		Versova Beach			7500	
13.		Dadar-Mahim Beach			20000	

ANNEXURE – III
COMPILED REPORT ON COASTAL CLEANUP DAY OBSERVED IN INDIA

14.		Girgaum Beach			10000	
15.		Coastal Areas adjoining Versova Jetty			5000	
16.		Marve, Aksa, Madh, Danapani, Erangal and Silver Beach			8000	
17.		Gorai			1500	

ANNEXURE – II
COMPILED REPORT ON COASTAL CLEANUP DAY OBSERVED IN INDIA

S.No.	Date	Place	No. of people participat-ed	No. of Students participat-ed	Approx weight of marine litter collected (kg)	Probable Source*
		GUJARAT				
1.	18-10-06	Nararabet	47		350	4 / 12 / 10 / 13
2.	18-10-06	Okha (Khadir Temple Beach)	150		150	4 / 12 / 13
3.	27-09-06	Chowpathy Beach, Porbander	1200		1500	4 / 12 / 13
4.	18-09-06	Hover port / Jakhau village, Jakhau	26		200	4 / 5 / 10 / 12 / 13 / 15
5.		Alang, Gulf of Cambay			59940	**Data taken from research article****
6.		Sosiya, Gulf of Cambay			36780	
		GOA				
7.	2-10-06	Vasco-da-Gama (Bina beach)	250		1590	4 / 12 / 13
		MUMBAI				
8.	16-09-06	Sassoon Dock	20		13	15
9.	16-09-06	Katalwadi Anjenvel, Dabhol, Maharashtra	60		300	3 / 4 / 5 / 14 / 15
10.	14-10-06	Mumbai (Girgaon, Juhu, Dadar beach)	2000	600	2062	4 / 12 / 13
11.		Juhu Beach			20000	**Data obtained from Mumbai Municipal Corporation, Mumbai**
12.		Versova Beach			7500	
13.		Dadar-Mahim Beach			20000	

ANNEXURE – III
COMPILED REPORT ON COASTAL CLEANUP DAY OBSERVED IN INDIA

14.		Girgaum Beach			10000	
15.		Coastal Areas adjoining Versova Jetty			5000	
16.		Marve, Aksa, Madh, Danapani, Erangal and Silver Beach			8000	
17.		Gorai			1500	

DAMAN						
18.	22-09-2006	Daman	700		1900	4 / 10 / 12 / 13
KARNATAKA						
19.	15-10-2006	Dakshina Kannada, New Mangalore	2000		5400	4 / 10 / 12 / 13
KERALA						
20.	16-09-2006	Cochin	3000		5500	2 / 4 / 5 / 10 / 11 / 12
21.	16-09-2006	Thiruvananthapuram	30		200	4 / 10 / 12 / 13
22.	16-09-2006	Fort Kochi Beach	185		2350	4 / 10 / 12 /13
23.	16-09-2006	Hama beach, Kovalam	13		13	13
24.	16-09-2006	Samudya beach, Kovalam	35		150	10 / 13
25.	16-09-2006	Light House beach, Kovalam	7		30	13
26.	16-09-2006	Calicut	60		600	12 / 13
TAMIL NADU						
27.	16-09-2006	Manavalakuridi (village beach), Kanyakumari	155		200	4 /10 / 12
28.	16-09-2006	Ganapathipuram (village beach), Kanyakumari	222		1050	4 / 10 / 12
29.	16-09-2006	Kallukootam, Kanyakumari	85		200	4 / 10 / 12
30.	16-09-2006	Mandaikadu (village beach), Kanyakumari	90		150	4 / 10 / 12
31.	16-09-2006	Puthalam, Kanyakumari	85		300	4 / 10 / 12

32.	16-09-2006	Tuticorin (Harbour beach)	247		2023	4 / 10 / 12 / 13
33.	16-09-2006	Tirunelveli District	43	5	60	3 / 5 / 9 / 10 / 13
34.	16-09-2006	Thoothukudi District	93	4	985	4 / 10 / 12 / 15
35.	16-09-2006	Ramanathapuram District	35		1121	10 / 13 / 15
36.	16-09-2006	Mandapam beach	110		3000	4 / 10 / 12 / 15
37.	16-09-2006	Manadad, Thiruchendur	17		90	5 / 10 / 13
38.	16-09-2006	Alanthali, Thiruchendur	26	4	28	4 / 5 / 10 / 13
39.	16-09-2006	Kayalpatinam, Thiruchendur	12		72	4 / 5 / 9 / 10 / 13
40.	16-09-2006	Chinna Erwadi	35		1121	10 / 13 / 15
41.	16-09-2006	Ekkiarkuppam, Marakanam, Villupuram	452		3060	4 / 10 / 12
42.	16-09-2006	Kaipanikuppam, Marakanam Villupuram	155		1600	4 / 10 / 12
43.	16-09-2006	Chinamudaliarchavadi kuppam, Villupuram	458		4670	4 / 10 / 12
44.	16-09-2006	Nadukuppam, Villupuram	440		2900	4 / 10 / 12
45.	16-09-2006	Periamudaliar chavadi Beach, Villupuram	10		460	4 / 10 / 12
46.	16-09-2006	Sodhanaikuppam, Villupuram	75		250	4 / 10 / 12
47.	16-09-2006	Thanthirayan kuppam, Villupuram	8		145	4 / 10 / 12
48.	16-09-2006	Panaiyurkuppam, Villupuram	145		1900	4 / 10 / 12
49.	16-09-2006	Cuddalore Silver Beach	800		5675	4 / 10 / 12 / 13
50.	16-06-2006	Nagapattinam	650	600	4850	4 / 10 / 12 / 13
51.	18-09-2006	Parangipettai	18	12	114.5	4 / 10 / 12

52.	18-09-2006	Mudasal odai landings	18	18	44	10 / 12 / 15
53.	18-09-2006	Samiyarpettai and Madavapallam	50	50	500	2 / 4 / 9 / 10 / 12 / 15
54.	18-09-2006	Vellar estuary	9	9	143	15
55.	18-09-2006	Reddiyarpettai	10	10	46.5	4 / 10 / 12
56.	18-09-2006	Ammankoil	15	12	4	4 / 10 / 12
57.	18-09-2006	Madavappallam	6	6	55.6	4 / 10 / 12
58.	18-09-2006	Pudupettai	21	19	65	4 / 10 / 12
59.	18-09-2006	Chinnoor	14	12	45	4 / 10 / 12
60.	23-09-2006	Nainarkuppam Beach	55	25	328.00	4 / 9 / 10 / 13 / 15
61.	23-09-2006	Panaiyur Beach	72	42	189.00	4 / 5 / 9 / 10 / 13
62.	23-09-2006	Injambakkam Beach	150	150	63.50	5 / 10 / 12 / 15
63.	16-09-2006	Thiruvanmiyur Beach	150	150	430.00	4 / 5 / 10 / 12 / 13
64.	16-09-2006	Besant Nagar Beach	250	200	247.10	4 / 5 / 10 / 12 / 13
65.	16-09-2006	Marina Beach	3000		19504.00	4 / 5 / 12 / 13
66.	16-09-2006	Chennai Port Trust (CPT)	300		1650	4 / 5 / 10 / 12 / 15
67.	16-09-2006	Royapuram Fishing Harbour (CPT)	200		2320	4 / 5 / 10 / 12 / 13 / 15
68.	16-09-2006	Royapuram Fishing Harbour, Chennai	50	10	1218.00	4 / 5 / 8 / 10 / 12 / 13 / 15
69.	16-09-2006	Ennore Port, Chennai	23		23.7	4 / 5 / 10 / 12 / 15
70.	16-09-2006	Kasimedu	30	10	226	3 / 9 / 12
71.	16-09-2006	Sozhanganallur	145	50	1928.50	4 / 9 / 10 / 12 / 13

PONDICHERRY						
72.	16-09-2006	Beach Road	300	151	5525.00	4 / 12 / 13
73.	16-09-2006	Kalapet Beach	255	57	2600.00	4 / 12 / 13
74.	16-09-2006	Periya Kalapet	77	57	267	3 / 9 / 10 / 12 / 13
75.	16-09-2006	Kurusukuppam Beach	260	68	1800.00	4 / 10 / 12 / 13
76.	16-09-2006	Nallanadu Beach	110	59	1125.00	4 / 10 / 12 / 13
77.	16-09-2006	Narambai Beach	120	60	1325.00	4 / 10 / 12 / 13
78.	16-09-2006	Solai Nagar Beach	224	4	2350.00	4 / 10 / 12 / 13
79.	16-09-2006	Vambakeerapalayam Beach	121	5	3280.00	4 / 10 / 12 / 13
80.	16-09-2006	Veerampattinam Beach	160	4	1250.00	4 / 10 / 12 / 13
ANDHRA PRADESH						
81.	18-09-2006	Guntur District	200	150	297.00	7 / 9 / 10 / 11 / 13 / 14 / 15
82.	16-09-2006	Kakinada Beach	150		1205.00	13
83.	16-10-2006	Visakhapatnam (R K beach submarine area) – 1	199		745	4 / 5 / 7 / 12 / 13 / 15
84.	16-10-2006	Visakhapatnam (R K beach submarine area) – 2	230		814	4 / 5 / 7 / 12 / 13 / 15
85.	16-10-2006	Visakhapatnam (R K beach Gokul park area) – 1	189		700	4 / 5 / 12 / 13 / 15
86.	16-10-2006	Visakhapatnam (R K beach Gokul park area) – 2	195		814	4 / 5 / 12 / 13 / 15

ORISSA						
87.	16-10-2006	Paradip (Light house area)	50		210	4 / 12 / 13 / 15
88.	16-10-2006	Paradip (Mahanadi mouth area)	100		430	4 / 5 / 12 / 13
89.	16-10-2006	Chandipur, Paradip	150		200	4 / 12 / 13
90.	16-10-2006	Paradip Beach	200		1000	4 / 12 / 13
91.	16-09-2006	Gopalpur & Baliground Beach	700		2600	4 / 12 / 13
WEST BENGAL						
92.	16-09-2006	Kolkata	500		3500	4 / 9 / 10 / 12 / 13
93.	16-10-2006	Haldia (Marine drive)	500		4550	4 / 12 / 13
94.	16-10-2006	Haldia (Diamond Harbour)	80		76	4 / 5 / 10 / 12 / 15
ANDAMAN & NICOBAR ISLANDS						
95.	16-09-2006	Andaman & Nicobar Islands	3000		8750	2 / 4 / 5 / 8 / 10 / 12 / 13 / 15
96.	16-09-2006	Corbyns cove, Port Blair	349		890	4 / 12 / 13
97.	16-09-2006	Campbell Bay (From jetty to Break water)	155		1160	4 / 8 / 12 / 13 / 15
98.	16-09-2006	Lakshman beach, Campbell Bay	50		1800	4 / 8 / 12 / 13
99.	16-09-2006	Butter beach, Hut Bay	65		250	4 / 12 / 13
100.	16-09-2006	Durgapur resort, Hut Bay	56		102	4 / 12 / 13
101.	16-09-2006	Durgapur aerial Bay, Hut Bay	20		33	4 / 8 / 12 / 13
102.	16-09-2006	Aerial Beach, Hut Bay	20		75	4 / 12 / 13
103.	18-09-2006	Kavaratti beach, Lakshadweep	30	8	1757	4 / 12 / 13
		TOTAL	**27632**	**2621**	**307563.4**	

* - Numbering done as follows:

S. NO	SOURCE OF SEWAGE
1.	Sewage Treatment Works (STWs)
2.	Combined Sewer Overflows (CSOs)
3.	Other industrial discharges
4.	Urban runoff
5.	Shipping including garbage from ships
6.	Oil rigs
7.	Ministry of Defence munitions
8.	Dereliction (piers, wrecks, etc)
9.	Agricultural waste
10.	Fishing industry including gear from fishing vessels
11.	Aquaculture
12.	Municipal waste
13.	Recreational & leisure usage
14.	Marine mining
15.	Harbours/Ports, fish landing centres

** Srinivasa Reddy, M., V.G. Sravan Kumar, H. V. Joshi, P.K. Ghosh (2003) Quantification and classification of ship scraping waste at Alang-Sosiya, India. Marine Pollution Bulletin 46, 1609 – 1614.

Annexure III
The marine debris data collected from International Coastal Cleanup day in 2006
INDIA - PERCENTAGE OF MARINE LITTER