



# Regional Marine Litter Action Plan for South Asian Seas Region



**Regional  
Seas**





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# Foreword



Marine litter has become one of the unavoidable Global, Regional and National challenges and has significantly impacted not only the marine and coastal environment but also human health and biodiversity. The problem is further aggravated due to lack of proper information on the marine litter production and consumption and is the major obstacle in developing useful mitigation measures at national and regional levels in the South Asian Seas (SAS) Region.

To address the Marine Litter issue, SACEP initiated the development of the Marine Litter Action Plan for South Asian Seas (SAS) region on the request of the SAS member countries and with the assistance of the UNEP-GPA, Nairobi.

This project included the development of five National Status Reports and the Regional Marine Litter Action Plan which are now ready. 'Towards Litter Free Indian Ocean', a summary of the regional marine litter action plan was launched at the World Environment Day-2018, in New Delhi.

The SAS region's constantly expanding coastal population and increased developmental activities have exacerbated pressure on coastal and marine resources, with growing evidence seen in further degradation of the coastal and marine environment and continued exploitation of living, as well as non-living resources. South Asian Seas Programme (SASP) is the appropriate regional platform working on need-based actions for protection and sustainable management of marine environment including preparation of regional action plans, regional policies, establishment of coral reef taskforce, capacity development, awareness raising and experience sharing among the member countries.

This report focuses on the regional marine litter management strategies, challenges and opportunities and the way forward and is primarily based on the information shared by the SAS member countries and the inputs of the consultative workshop held in Mumbai, India from 5 – 6 April 2018. The Action Plan contains programmes and measures for marine litter prevention and reduction, and timeframe for implementation based on the National Status Reports produced by the SAS Member States under the project. Therefore, this report will act as an implementational and reference tool for future policy, planning, research and development of marine litter mitigation tools in areas related to marine environment as well as pollution from the land and sea-based sources.

This report was adopted at the 6<sup>th</sup> Inter-governmental Meeting of Ministers of the South Asian Seas Programme (6IMM-SASP) held on 6<sup>th</sup> November 2019, to be implemented by the SAS member states. I am confident that the report will be owned by the SAS member countries and the institutions identified will assist SACEP in the implementation of the activities identified in the Regional Marine Litter Action Plan.



**Dr. Abas Basir**  
**Director General**  
**South Asia Co-operative Environment Programme**

# Acknowledgement

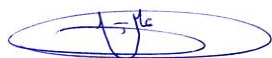
On behalf of South Asia Co-operative Environment Programme (SACEP), I would like to appreciate the support extended by the member countries of the South Asian Seas Programme (SASP) and information sharing for preparation of the Regional Marine Litter Action Plan for the SAS Region. Technical and financial support provided by the UNEP-GPA is highly appreciated.

SACEP also wishes to acknowledge the service rendered by Dr. Anil Premaratna, Regional Consultant.

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SACEP is also grateful to all the stakeholders who participated at the Parallel Event on Marine Litter Challenges and Opportunities organized by SACEP, back to back with the 8<sup>th</sup> 3R Forum held in Indore, India in April 2018.

I hope and wish that, this Regional Marine Litter Action Plan will go a long way in protecting the marine environment of the SAS region from ever increasing marine litter pollutions.



**Dr. Abas Basir**  
**Director General**  
**South Asia Co-operative Environment Programme**

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# Executive Summary

Marine Litter and micro plastic is increasing with every passing day due to the increased use of disposable substances specially. Plastic being light is easily carried by water from the inland through canals streams and finally to the seas in SAS region.

In the last few decades the adoption of different resolutions as well as multi-lateral Environmental conventions (MEAS) such as Convention on Biological Diversity (CBD), and the United Nations Environment Assembly- Three (UNEA-3) on Management of Marine litter and Micro Plastics indicate that the issue of marine plastic litter and micro plastics has continued to receive much international attention.

The origin and routes of marine litter are diverse and exact quantities and pathways are not fully known. The past studies showed that 83% of land-based plastic waste end up in the ocean and of those, majority countries are Asian and four of them (Bangladesh, India, Pakistan, and Sri Lanka are located in the South Asia Seas (SAS) region.

The amount of plastic waste eventually ending up in the ocean was mainly determined by the percentage of mismanaged waste. A study estimated that between 1.15 and 2.41 million tons of plastic waste flows from rivers into the ocean annually, and the top 20 of polluting rivers were located in Asia, and accounted for 67% of the global total.

Even though the main sources of marine litter and possible solutions offers a solid basis for effective management of the marine litter, it has become clear that so far the impacts of management strategies and policies and other initiatives are still not properly studied.

At present, there are several international efforts for reducing and preventing marine litter and for mitigating its impacts. More and more countries are implementing several management strategies and actions against marine litter. In the 2016 United Nations Environment Assembly countries unanimously adopted a stand-alone resolution on marine litter and micro plastics. In order to keep it also high on national agendas, pollution has been the focused of the UN Environment Assembly during June 2017.

The countries constituting the SAS Region have almost a fifth of the world's total population. High population density, low per capita income, low development indicators, and high dependence upon natural resources for livelihood characterize all these countries.

In the entire SAS region, data and information on the marine litter are very limited and current marine litter and micro-plastics management strategies of the SAS region are either non-available or very weak. In addition, no uniform and standard methods were adapted by the member countries to study and compare the micro-plastics for the better management including marine litter removal and disposal in the SAS region.

With reference to available literature it is observed that very little data is available in the open ocean on floating or submerged marine litter, as no systematic monitoring of such marine litter has so far been undertaken in the SAS region.

From different web references, it is clear that the Bangladesh marine litter is coming from land-based origin. It is also observed that the marine litter monitoring programme has not recently been conducted in Bangladesh. Quantification of marine litter in India including plastics in the water column, sediment and biota has been documented in the certain areas of the Indian beaches, coastal waters and open sea. However, systematic status and trend analyses are not available in India. Even though marine litter is one of the biggest environmental problems in the Maldives, it has not been done any quantification survey of marine litter. According to a study of environment ministry of Pakistan, the total solid waste generation is about 20 million tons a year. The marine litter data in Sri Lanka were analyzed based on the total number of pieces collected during the International Coastal Cleanup ICC program. As per the World Bank Waste Atlas, the per capita waste generation rate of Sri Lanka is 215.4 kg per year.

According to the country reports submitted by the SAS countries it was observed that all SAS countries are having unique problem to evaluate and quantify the total marine litter in the marine environment component of their respective countries.



Ecological, economic, and social impacts of marine litters must be understood to enable thoughtful prioritization and development of strategies to minimize the impacts of marine litters. However no area specific or site specific ecological, social and economic issues in relation to the marine litter have been studied or documented in the SAS region. Instead of the site specific or country specific information, these countries have indicated general issues in relation to marine litter.

Quantifiable targets for reducing marine litter for the SAS countries are needed and those targets must be based on scientific assessments of impacts. According to the present status, no quantifiable and scientific data and information is available in the SAS region. Therefore degradation of the coastal resource, habitats and biodiversity in the region may come to the critical condition in near future.

There are several management strategies implemented by the various agencies at the global, regional and country level to manage the marine litter and these strategies can be grouped under following categories: formation and declaration of management policies, international conventions, laws, regulations and treaties, implementation of direct development activities, conducting research and surveys, implementations of enforcement program, monitoring and evaluation, conducting education and awareness programs, and use market and economic instruments.

The existing international conventions, laws and regulations as well as SAS country level legislation, regulations and enforcement mechanisms need to be evaluated and strengthened. If existing systems are not effective a new set of legislation/regulation for marine litter and micro-plastics need to be enacted.

Except Sri Lanka, no other SAS country has been established a separate agency for marine litter management. This matter need to taking into consideration and need to assign marine litter management responsibilities to suitable existing agency or established a separate new agency.

The strategy of direct development basically targeted to prevent the solid waste enters into the coastal areas. According to the information, it was very clear that all the SAS countries are engaged in at least few of the direct development activities to control the marine litter. However, many countries

have not yet adequately designed and implemented activities for sea bed marine litter removing programs or water Column litter removing programs.

Regulations and enforcement strategies are aiming to mitigate the impacts of marine litter and reduce the waste generation. One of most important requirement for regulation and enforcement is that the availability of a separate legal entity to prepare the regulation and enforcement plan. Except Sri Lanka, no any SAS country has established a separate agency to manage the marine litter issues. Further no any SAS country has prepared and implemented a proper enforcement program for the marine litter reduction. Therefore it is necessary for these countries to prepare a proper regulation and enforcement program.

Monitoring and evaluation strategy needs to implement by individual country by preparation of proper monitoring and evaluation program. For this it is required accurate scientific information. According to the available information, most of the SAS countries have not given priority for preparation and implementation of the monitoring and evaluation plan.

Research and studies in SAS region have been limited to coastal sections of the marine environment components. Other areas such as socio-economics cost, marine ecosystem cost due to marine litter are not sufficient or available.

Education and awareness program is the most useful management strategy for any type of resources management since the strategy is mainly used for changing the behavior of people to achieve desirable targets. According to the available reports and information, many SAS countries have been implemented awareness programs targeting general public rather than the essential stakeholders. It is also observed that all of the SAS countries have implemented mainly beach cleaning program annually. These programs have not targeted real stakeholders who are directly responsible for marine litter generation.

Even though marketing and economic strategies are very useful and effective very few marketing and economic strategies have been introduced and implemented by the SAS countries to minimize the marine litter.





## 01. Marine Litter Challenge in SAS region

### 1.1 Introduction

Marine Litter and micro plastic concentration is increasing with the every passing day due to the increased use of disposable substances specially. Plastic use has greatly increased during the past couple of decades as it is easily and cheaply available in the market. Plastic being light is easily carried by water from the inland through canals, streams and river to the seas in SA region. The increased quantity of marine litter and micro plastic has greatly affected the marine environment and therefore both animal and human life in the SAS region is badly affected besides shipping, tourism industry, fishery, aquaculture and other blue economy activities. With a view to mitigate the increased impacts of marine litter and micro-plastic SACEP and SAS member countries jointly initiated the regional marine litter action plan with the support of UN environment.

The origin and routes of marine litter are diverse and exact quantities and pathways are not fully known in the SAS region. However, research that aims to estimate the exact quantities and types of plastic litter and pathways in the environment are being conducted to quantify these parameters. The past studies shows that approximately 83% of the 4.8–12.7 million tons of land-based plastic waste ends up in the ocean from the 192 coastal countries. Ansje Lo hr1 et al. (01) of those, majority of the countries are Asian and four of them Bangladesh, India, Pakistan, and Sri Lanka are located in the in the SAS region.

The amount of plastic waste eventually ending up in the ocean was mainly determined as a percentage of mismanaged waste. Studies estimated that between 1.15 and 2.41 million tons of plastic waste flows from rivers into the ocean annually, Lebreton et al. (02) likewise the main drivers were population density, mismanaged plastic waste and production quantity per country globally. The top 20 polluting rivers were mostly located in Asia, and they accounted for 67% of the total global plastic

waste. Available knowledge on main sources of marine litter and possible solutions offers a solid basis for effective management of the marine litter. Yet it is clear that so far the impacts of management strategies and policies and other initiatives are either missing or still not properly studied. Moreover, due to its multiple use, global plastic production increases each year and it has already exceeded 300 million tons in 2014.

At present, there are several international efforts aiming at reducing and preventing marine litter besides mitigating its impacts. These include worldwide initiatives such as the Global Partnership on Marine Litter (GPML), the Honolulu Strategy and the G7 countries. GPML is a voluntary multi-stakeholder co-ordination mechanism which brings together policymakers, civil society actors, the scientific community and the private sector to discuss solutions and catalyze actions.

In the last few decades the adoption of various marine litter resolutions as well as multi-lateral Environmental Agreement (MEAS) such as the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 and London Protocol prohibiting all dumping except for possibly acceptable wastes on the so-called "reverse list", 2006. The 3rd United Nations Environment Assembly (UNEA-3) adopted resolution on Management of Marine litter and Micro Plastics which indicate that the issue of marine plastic litter and micro plastics has continued to receive much international attention (03). The UNEA-3 resolution acknowledged marine plastic and micro plastic as a rapidly increasing, serious problem of global concern that needs urgent global response. The resolution signals countries continued willingness to put marine plastic pollution high on the environmental policy agenda. In order to keep it also high on national agendas, pollution has been the focused of the 3<sup>rd</sup> UN Environment Assembly held in December 2017.

In the last few decades the adoption of various marine litter resolutions as well as multi-lateral Environmental Agreement (MEAS) such as the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 and London Protocol prohibiting all dumping except for possibly acceptable wastes on the so-called "reverse list", 2006. The 3rd United Nations Environment Assembly (UNEA-3) adopted resolution on Management of Marine litter and Micro Plastics which indicate that the issue of marine plastic litter and micro plastics has continued to receive much international attention (03). The UNEA-3 resolution acknowledged marine plastic and micro plastic as a rapidly increasing, serious problem of global concern that needs urgent global response. The resolution signals countries continued willingness to put marine plastic pollution high on the environmental policy agenda. In order to keep it also high on national agendas, pollution has been the focused of the 3<sup>rd</sup> UN Environment Assembly held in December 2017.

United Nations Conference held in June 2017 to Support the Implementation of Sustainable Development Goals as part of the 2030 Agenda also affirmed a strong commitment, through various SDGs such as SDG-12, SDG-6 clean water and sanitation, SDG-14 life under water etc. to conserve and use our oceans, seas and marine resources for sustainable development(04).

The solution to marine litter is likely to be found in a transition towards more sustainable ways of production and consumption that are also promoted via the Sustainable Development Goals (SDGs). Available knowledge on the causes of marine litter and possible solutions offers for effective management of the marine litter. Yet, it has become clear that so far the effects of management strategies, policies, and other initiatives are still lacking.

## 1.2 Marine Litter status in South Asian Seas (SAS) Region

The SAS Region includes the seas bordering countries such as Bangladesh, India, Maldives, Pakistan, and Sri Lanka and comprises the Northern part of the Indian Ocean, along with parts of the Bay of Bengal and the Arabian Sea. Bangladesh, India, and Pakistan are parts of the Indian subcontinent, while the island of Sri Lanka shares a part of the continental shelf with India. Maldives is a group of coral atoll islands.

The SAS member countries have almost a fifth of the world's total population. High population density, low per capita income, low development indicators, and high dependence on natural resources for livelihood characterize all these countries are highly prone to and vulnerable to the impacts of marine litter and micro-plastic. The SAS region comprised of has some of the largest biologically rich in marine biodiversity like the Gulf of Mannar, coral atolls of the Maldives, coastal lagoons like Chilika in India and Puttalam in Sri Lanka, vast mudflats of the Gulf of Kutch and Sundarbans, large sea grass beds in the Gulf of Manner, the mangroves of the Sundarbans, and Pakistani coastal belts, marine mammal like dolphin, Dugong, and whales in the Indian Ocean.

The current marine litter and micro-plastics management strategies of the countries in the SAS region are either non available or very weak and disjointed. There is no uniform and standard method adapted to study and compares the micro-plastics for the better management including marine/beach litter removal and disposal in the SAS region. From the available data it could be concluded that the major sources of marine litter and micro-plastics are domestic and industrial wastes, solid waste dumping, urban and sewage runoff, shipping and fishing activities, tourism and recreational activities, etc. Very little data is available in the open ocean on floating or submerged marine litter as no systematic monitoring of such debris has so far been undertaken in the SAS region.

### 1.3 Marine litter status in SAS countries

The Bangladesh has low laying riverine area and many inland waterways with a 580 km coastline along the Bay of Bengal. The country is the home to the Ganges, the Brahmaputra and the Meghna rivers, and networks of smaller rivers and canals. The delta plain of the Ganges (Padma), Brahmaputra (Jamuna) and Meghna Rivers and their tributaries occupy 79 percent of the country (05).

An overview of the marine litter in the SAS member countries show that Bangladesh marine litter are coming from land-based sources. Most of the big cities and industries are located near major rivers.

These rivers are the repositories of most of the waste discharge from different industries and municipal waste of the city. Various industries are mainly responsible for originating litter that are directly disposed to the main rivers without proper recycling and management nor is there any marine litter monitoring programme in Bangladesh. The last data about marine litter monitoring in Bangladesh was found in the SACEP/UNEP report in 2007.

Quantification of marine litter in India including plastics in the water column, sediment and biota has been documented in certain areas of the Indian beaches, estuaries, coastal waters and open sea. However, comparisons between studies or even systematic status and trend analyses are not available due to differences in the collection and measurement methodologies used by the respective researchers. India, has undertaken research on the circulation patterns to determine marine litter circulation. Marine litter is one of the biggest environmental challenges in the Maldives as there has been a significant increase in the magnitude of the problem in Maldives due to the rapid growth of population, changing consumption patterns, tourism industry, and logistical difficulties of

waste disposal and lack of proper waste management facilities.

According to a study of Environment Ministry Government of Pakistan, the total solid waste generation in Pakistan is about 20.024 million tons a year, which is approximately 59,000 tons per day (06). The study also indicated that the growth rate of solid waste generation is about 2.4% per annum. At the rate of population increase in Pakistan, the amount of waste production will double in the next ten years. The marine litter data in Sri Lanka were analyzed based on the total number of pieces collected during the 2012-2015. The composition of debris is dominated by food and beverage packaging items. As per the World Bank Waste Atlas, the per person waste generation rate of Sri Lanka is 215.4 kg per year.

The marine litter data in Sri Lanka were analyzed based on the total number of pieces collected during the 2012-2015. The composition of debris is dominated by food and beverage packaging items. This clearly shows that the behavioral patterns of the public and the attitudes of disposing of their waste. As per the World Bank Waste Atlas, the per person waste generation rate of Sri Lanka is 215.4 kg per year (World Bank, 2013) (07). In Sri Lanka, collection capacity of the municipal waste is nearly 50 percent of the total waste (Waste Management Authority, 2016) (08). And balance 50 percent is damped or discarded into the nearest environment. As a result of this, large amount of land based waste enters into coastal and marine environment as marine litter.

Base on the available reports and the country reports prepared by the country representatives, the status of SAS countries marine litter were given in the **Table 1.1**.

**Table 1.1 Marine Litter statuses in South Asian Seas (SAS) countries**

Country	Marine litter status at country level	Marine litter quantity data availability at country level
Bangladesh	Litter classification information available.	Total Quantity Data not available.
India	Status of marine litter indicated 14 segments/regions. But not quantity not available	Quantity Data not available
Maldives	Waste management regulations and Island waste management plan has a mechanism in place to, but so far quantitative data is unavailable	Quantitative data specific to marine litter is not available. solid waste generation statistics for some regions are available
Pakistan	Regional level classification of marine litter is available.	Quantity Data not available
Sri Lanka	Urban level classification and quantity of solid waste is available and 50% of solid wastes are moving to sea as marine litter. .	Quantity Data not available

*As shown in the above table, none of the SAS country has quantity data of marine litter. Therefore, under this situation these countries are not in a position to preparation of proper management plan to reduce the marine litter. However, arbitrary estimation was done for each country of the SAS region using beach cleaning data and per capita waste generation data. These estimated data and solid waste reduction activity data are indicted in the Table 1.2*

**Table 1.2 The estimated solid waste quantity and solid waste reduction activity data**

Country	Total estimated solid waste Quantity per year	Availability of management system and quantity of reducing
Bangladesh	General data for solid waste is available; however no separate data for marine litter is quantified.	Local level solid waste management system is available in bigger coastal cities.
India	General data for solid waste is available; however no separate data for marine litter is quantified.	Local level solid waste management system is available in every state.
Maldives	Marine litter estimates are not available at national level. Solid waste quantity projections based on 2008 household waste audit are available. Per capita waste generation (1.1kg/day for Male' and 0.7 kg/day for atolls).	Quantity of recycling or re-use is not available
Pakistan	Total solid waste generation is about 20,024 million tons a year However, no specific .marine litter data	In Pakistan dumping and burning remain the most common methods of 60 per cent solid waste disposal.
Sri Lanka	General data for solid waste is available	Most of the organic waste is used to produce compost. Plastic is being recycled and recycle facilities are available but capacity in national level data is not available

*According to the table 1.2, date on solid waste reduction is not available from all SAS countries. Since the total waste generation data and waste reduction data unavailability in the SAS countries it is very difficult to estimate the total quantity of waste are ultimately going to the coastal areas as marine litter.*

## 02. Major marine litter management challenges in SAS Region

Marine litter is becoming a complex multi-sectorial issue with significant implications for the world's marine and coastal environments and human activities. Reduction of marine litter will entirely depend on a scientifically sound assessment of the litter. One of the issues for assessment is that an exact ecological, economic, and social cost due to marine litter around the globe is not properly estimated. The other issue is that the problems caused by marine litters are multifaceted. Still there are not available quantifiable targets for reducing marine debris. Much more complicated issue is that marine litter is constantly moving from place to place due to coastal process and current. However, it was observed that the management strategies are implementing by many countries without knowing the exact quantity of the marine litter.

All SAS countries are facing problems of marine litter quantification in their respective countries. As a result, they fail to identify the magnitude of the marine litter which is directly or indirectly impacting the ecological, social and economic systems in the SAS region. Therefore, this situation has severely affected preparation of the management strategies and policies to address the marine litter issues in the SAS region. Social, Economic and Ecological impacts of marine litter must be understood to enable thoughtful prioritization and development of effective management strategies. Entanglement of animals by marine debris presents issues of limited mobility and restricted movement that can lead to starvation, suffocation, laceration, subsequent infection, and possible mortality in marine animals.

No area specific or site specific ecological, social and economic parameters in relation to the marine litter have so far been studied or documented in the SAS region. Instead of the site specific or country specific information, these countries have indicated general issues experienced due to marine litter to their ecology. This is a very serious problem for preparation of management strategies and plans to mitigate the marine litter issues in the region as well as individual SAS countries and require urgent attention by national and regional organizations and authorities in the SAS region countries.

However, according to the present status, no quantifiable and scientific data and information is available in the SAS region to prepare a target oriented management plan for the region as well as country level to manage marine litter on sustainable basis. Therefore, degradation of the coastal resource, habitats and biodiversity in the region may come to the critical condition in near future thereby making coastal biodiversity in the region unproductive, creating social unrest, and the uncountable economic losses. Therefore, immediate proactive measures need to be implemented in the region for avoiding any disaster to happen.

### 2.1 Ecological Challengers due to Marine litter in the South Asian seas countries

In Bangladesh, more than 10 areas are listed as an Ecologically Critical Area (ECA). Of them, majority areas are situated adjacent to the Bay of Bengal (Khulna, Satkhira, Bagerhat, Sundarban, Cox's Bazar and Saint Martins Island. Most of the above biodiversity rich areas are near the coast or in the coastal area. Therefore, any type of marine litter will create threats to the biodiversity in ECA. Even though there are many ecological impacts to the Bangladesh ECAs in the coastal zone, no any specific study or information available to indicate the level of ecological issues in relation to the marine litter. (09)

Even though India is the biggest coastal country in the South Asian region, there is no area specific information on ecological impacts on to the coastal ecosystems due to marine litter. However there is some general information indicated that Marine litter may impacts on to the coastal ecosystems in India.

Maldives is very famous for beautiful coral reefs and coral reefs associate ecosystems. It is also very famous for Tuna fisheries industry and many of the tuna based productions are exporting to the European Union countries. Therefore ecological damages to the coral reefs and their associate ecosystems due to the marine litter may impact on to their tourism industry, fisheries industry and as a result to the economy very badly. Unfortunately, site or area specific information on ecological impacts due to marine litter is not available.



In Pakistan, there is still lack of precise knowledge about the quantity, sources, transport, accumulation and fate of plastics in the oceans ecological systems. The most visible and disturbing impacts of marine plastic pollution in the Pakistan are the ingestion, suffocation and entanglement of hundreds of marine species. Floating plastics in the Karachi Harbor area, which are presently the most abundant items of marine litter, also contribute considerably to the transport of non-indigenous (alien) marine species thereby threatening marine biodiversity and the food web. In Pakistan also not sufficient information is available to indicate the impacts to the ecological systems due to the marine litter at national or local level.

Marine litter pollution in Sri Lanka claims the lives of many marine turtles and dolphins. Leatherback turtles feed on jellyfish and they eat mistakenly plastic bags floating in the water assuming as jellyfish. They also eat plastic bags and those bags are blocking the turtle's gut and the animals finally starve to death (TCP, 2015). Beach trash in many beaches in the southern coastal area including Rakawa have been prevented sea turtle normal access to nesting sites as well as block access to the sea for hatchling making them prime targets for predators. Mangroves in Negombo lagoon areas in Sri Lanka are impacted by marine litter generated from fishing activities and a large number of plastic debris accumulated in the lagoon mangrove areas. The coral reefs scattered along the coastal areas in Sri Lanka are one of the most productive and sensitive ecosystems where many artisanal and coastal fishermen are depend directly on them. The high biological diversity of coral reefs also makes them popular commercial and recreational fishing grounds, which often results in the presence of derelict fishing gear, abandoned fishing gear is known to cause significant and persistent threats to the coral reef ecosystems in many areas.

## 2.2 Social Challengers due to marine litter in the South Asian Seas countries

Social impacts due to marine litter can have significant affect to the marine sectors in the SAS region including aquaculture, agriculture,

fisheries, shipping (including leisure boating), power generation and industrial use, and tourism.

Marine litter also is a serious issue to the visual and other aesthetic sensitivities of tourists and local visitors to beaches, especially sanitary, sewage related and medical waste which may also cause injuries and/or be a risk to human health.

Apart from beaches, high marine debris concentration on the seabed and on coral reefs may have serious impacts on the diving industry, as heavily marine litter polluted diving sites will be avoided by divers.

In the Bangladesh, country specific social issues due to marine litter have not been identified in the national report. However country report has indicated that some general social issues may be arises due to discarded fishing line, rope and plastic trash or food bags and medical wastes dumped onto beaches.

India has a long beach stretch and it is occupied by many fishermen, aquaculture farmers, tourist structures etc. Therefore marine litter may effect to their day to day life. Therefore site specific information is required to understand the magnitude of social impacts due to marine litter. Still, Indian country report also not indicted country specific social issues due to marine litter other than the general issues which are very common to other countries.

Even though some general information on social impacts due to marine litter in the Maldives is available no site specific information are available. Therefore it is very difficult to determine what type of social issues are emerging and which atoll/island communities are badly affecting the marine litter in the Maldives.

The marine fisheries are a direct source of livelihood for over one million people comprising more than 125,000 households in Pakistan. There are approximately 15,000 fishing vessels of various sizes ranging from small to medium-sized boats, large launches and trawlers engaged in fishing activities. The Pakistan report indicated that the fishermen health is impacting on marine litters. But the exact impacts are poorly studied in Pakistan even though it is an emerging problem.



Sri Lanka country report stated that the most incidents related to impact on human health due to marine litter. However these incidences are unrecorded or not studied. Beaches in Sri Lanka are very attractive and large number of local and foreign visitors is aware of the potential hazards due to marine litter. It was reported that the pollution due to marine litter is major issue of certain beaches in Sri Lanka (EFL, 2017) (09). The marine litter constantly blocking waterways in urban coastal areas of Sri Lanka and contribute to flood of that area during the rainy season. There were many incidences which have reported that marine litter accumulated in coastal beaches in Sri Lanka which were provided a breeding ground for mosquitoes and flies.

## 2.3 Economic Issues due to marine litter in the South Asian Seas countries

Measuring the full economic cost of marine litter is complex due to the wide range of economic, social and environmental impacts, and wide range of sectors impacted by marine litter. Some of the impacts are easier to evaluate in economic terms because they are more direct, such as increased marine litter cleaning costs but indirect impacts are more complex.

While marine litter has become an increasingly important issue in policy discussions, there is only a very little of knowledge on the costs of the impacts. Because of a lack of recording even the direct economic costs of marine litter tend not to be measured. Furthermore, even though there is a growing interest in ecosystem services little research has been done to date on the economic cost of marine litter on ecosystem service.

In Bangladesh, Cox's Bazar, Chittagong, Saints Martins, Sundarban, Nijhum Dwip (Island) etc are the main tourist spots. People of this area largely depend on tourism by doing many activities. However, a recent survey indicated that marine litter along beautiful beaches and waterways destroy the beauty and enjoyment of coastal beach areas, and hence, negatively affect tourism and the economic benefits they bring. However there are no any scientific studies or documents to calculate the total cost and economic loss due to marine

litter in the tourist development areas of the Bangladesh.

The Indian country report indicted very clearly that they are having the difficulties to measure the economic cost due to the marine litter in the Indian coastal areas. The main fact indicated in the report is that sound economic impact evaluation studies have not been done and therefore understanding the actual economic impacts due to marine litter is not available.

Economic cost due to marine litter in the Maldives also not available since any such studied are not available in the country. However country report indicated that the marine litter has contributed enormous impacts to the tourism sector of the Maldives. Most of the tourism-related activities in Maldives consist of snorkeling, diving, beach use, and mega fauna watching tours. Marine litter may result in lower revenues from tourism in the country with increasing incidence of debris on beaches, shallow coastal areas and other marine environments.

The issue of marine litter pollution along Pakistan's coast is a major concern and is worsening due to an inadequate solid waste disposal system along the coastline. As per the observations and events recorded by the WWF-Pakistan during 2017, the number of incidents of marine animals trapped in plastic products is on the increase. The economic impact of marine debris on coastal communities, especially for fisheries and municipalities are very high.

All ocean based industries such as fisheries, coastal tourism, aquaculture, sea transportation and seabed mineral industries highly depend on sustainable healthy marine and coastal ecosystem in Sri Lanka. These industries represent major contributions to country's Gross Domestic Product (GDP). For example, coastal tourism is the 5th foreign income generator in Sri Lanka. Marine litter which accumulates along the beaches and waterways disrupts the natural aesthetic beauty of the beaches which reduces the recreational value and tourism quality of these resources.

The summarized status of information availability and ecological, social and economic issues due to the marine litter in the South Asian Seas countries are given in table 2.1 below.

**Table 2.1: Information availability In SAS countries on Ecological, Social and Economic Issues**

Country	Ecological Issues	Social Issues	Economic Issues
Bangladesh	General information is available on ecology near the major coastal cities but no long term research is available	Negative impact on tourism. General information is available. Country wide and sites specific social data not available	General information available but country wide and site specific quantitative information is not available
India	General impact information is indicated, with marine litter on beaches near populated areas of major coastal cities	General statements but country and sites specific social data are not available	General statements but not any quantifiable information is available
Maldives	Local data available in different regions, but not enough to represent nationwide status	General statement indicates it is an emerging issue, but data isn't site specific	General statement indicates it is an emerging issue, but data isn't site specific. The impacts are not well understood.
Pakistan	Some isolated information on turtles and fishery damages reported. Large scale information on ecological issues not recorded.	No specific information or data available on social aspects.	Increased level of pollution mainly plastic related material posed a threats to different economic activities like tourism, shipping, fishing, etc.
Sri Lanka	Turtle entanglement information, Coral reefs, Mangroves, Lagoon and estuaries, physical damages due to marine litter are available but quantities are not available	Disturbances to fisheries and tourism activities	Impact on aesthetic and recreational activities Impact on tourism, damages to fishing gear boat engine- but no data is available

*According to the above table all SAS countries are having problem to identify the magnitude of the marine litter issues which are impacted on to the ecological, social and economic systems of the SAS region. This situation is very seriously affected to preparation of the management strategies and policies to address the marine litter issues in the region.*

## 03. Available Management Strategies for Marine Litter Management

Control or reduction of the marine litter at global, regional and country level is critically important since the coastal and marine areas are providing many livelihood and economic benefits to the all coastal countries and communities. In these aspects many management strategies have been formulated and being implemented by various international, regional, and national level agencies. This section will explain and evaluate the impacts of all type of strategies implemented by various agencies.

There are no readily available tools which are suitable to all countries or that would be effective to collect and clean-up marine litters from large areas once it is adrift. Prevention at source is therefore the key to reducing marine litters and its associated impacts. A combination of measures in a regionally coherent context is required, with a focus on reducing the rate at which waste is produced as well as ensuring the appropriate management measures are in place for the safe disposal of material that cannot be reused or recycled.

This chapter provides information on strategies that have been implemented in waste management and recycling and which could be applied to reduce land-based sources of litters as well as sea based marine litters.

There are several management strategies implemented by the various agencies at the world wide to mitigate the marine litter and all of the strategies can be grouped under following categories.

- a) Implementation of international conventions, laws, agreements and treaties
- b) Implementation of direct development activities
- c) Conducting research and surveys
- d) Implementations of enforcement program
- e) Monitoring and evaluation
- f) Conducting education and awareness programs
- g) Use market and economic instruments

### 3.1 Formation and declaration of International Conventions, laws, agreements and treaties

There are several International conventions, laws, regulations and treaties introduced by the various international agencies to control and minimize the generation of marine litter at the global level and regional level. Some of them are explained below.

#### 3.1.1 International Conventions laws, agreements and treaties

There are several international Conventions laws, agreements, treaties and declarations which are directly or indirectly relevant to the marine litter. Agenda 21 and the Johannesburg Plan of Implementation, Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), International Coastal Cleanup (ICC), United Nations Convention on the Law of the Sea (UNCLOS), Annex V of MARPOL 73/78, London Convention and London Protocol, Action Plan on Tackling the Inadequacy of PRFs, UNEP Regional Sea Program, UNEP/IOC Guidelines on Surveying and Monitoring of Marine Litter, UNEP/FAO Abandoned, Lost or Otherwise Discarded Fishing Gear, Honolulu Strategy, and UNEP Global Partnership of Marine Litter are some of them. Except very few, most of the above Conventions laws, agreements and treaties are not applicable or implemented fully in the SAS region.

#### 3.1.2 Regional level Conventions laws, agreements and treaties

There are several regional level Conventions, laws, agreements and treaties such as SAS Program, EU Port Reception Facility (PRF) Directive, EU Marine Strategy Framework Directive, EU Initiatives on Land-Based Waste Management, Helsinki Convention and Its Associated Initiatives, OSPAR Initiatives on Monitoring Marine Litter, OSPAR Fishing for Litter, and the Commission for the Conservation of Antarctic Marine Resources (CCAMLR) established. Of them OSPAR has developed guideline for monitoring marine litter on the beach and also providing practical advices for required countries.

SAS program is one of 18 such programs established by UNEP and the South Asian Seas Action Plan was adopted in March 1995. The SAS action plan is based on the region's environmental challenges as well as its socioeconomic and political situation. The plan is supported by a strong legal framework in the form of a regional convention and associated protocols on specific problems. The legally-binding convention expresses the commitment and political will of governments to tackle their common environmental problems through joint, coordinated activities.

### 3.1.3 National level Instruments

There are several national level management instruments and program developed by some countries to manage the solid waste and marine litter. Some of those are US Marine Plastic Pollution Research and Control Act (MPPRCA), US National Marine Debris Monitoring Program, UK Legislations on Garbage from Ships and PRFs, UK Beach Cleanup and Awareness Campaigns, Scotland Marine Litter Strategy and National Litter Strategy, South Korea Initiatives on Marine Litter, Taiwan Legislations Relevant to Marine Litter and Taiwan Initiatives on Land-Based Waste Management.

Of them, US National Marine Debris Monitoring Program (NMDMP) was developed to standardize marine debris data collection in the US by using a scientifically valid protocol to determine marine litter status and trends. The Taiwan initiatives were the plastic restriction policy and the compulsory garbage sorting policy which were two major initiatives on land-based waste management. The above country experiences can be replicated in the SAS countries through the institutional strengthen program of the region.

### 3.1.4 SAS regional countries Initiatives

The SAS region coastal countries also initiated beach cleaning program on 16th, of September each year to commemorate the International Coastal Cleanup Day arranged by the SACEP and several local level activities being implemented in every countries.

There is no specific marine litter management agency in Bangladesh. However, many agencies

are present for waste management, protection of environment, preservation of resources, water management, conservation of wildlife etc. that are indirectly have the act, rule, law or legislation which prevent marine pollution or litter. Bangladesh has initiated a process to develop National Program of Action (NPA) under the Global Program of Action (GPA) for the Protection of the Marine Environment from Land-based Activities in 1999. Even though Bangladesh has sign and rectified many international conventions, policies and laws it was observed that no any proper implementation mechanism to practically implement the litter management activities.

There are several management agencies, committees and policies which are directly or indirectly responsible to implement the international conventions, laws, regulations and treaties on marine litter management in India. The country has made effort to preparation of many acts and regulations to protect the environment, which came into force time to time. India also limited its marine litter management activities into the beach area.

Much like many other SAS countries, Maldives also addressed the issue of marine litter through variety of laws and regulations. However there is no specific legislation or legal frameworks governing marine litter in the Maldives.

Under Pakistan Environmental Protection Act (EPA) 1997, (revised in 2013) imposed ban on manufacturing, sale and use of non-degradable scheduled plastic products. Further as per order issued by the Pakistan EPA in February 2005, the powers related to monitoring and pollution control in the areas of Pakistan's Maritime Zones has been delegated to the Maritime Security Agency. Pakistan is lagging behind in implementing the strategy on International Conventions, laws, regulations and treaties due to non-availability of direct responsible agency to manage marine pollution and marine environment.

Sri Lanka also has gathered a number of agencies to manage the marine pollution. Even though there are many agencies to manage the marine litter only Marine Environment Protection Agency

(MEPA) has been engaged in to implement marine litter management activities in relation to the strategy on International Conventions, laws, regulations and treaties.

Institutional structure in relation to the implementation of the strategy on International Conventions, laws, regulations and treaties in the SAS region summarized in table 3.1

**Table 3.1: Status of the implementation of the Strategy on International Conventions, laws, regulations and treaties in the deferent marine environment component of the SAS region**

Country	In the beach/Coastline	Coastal Sea floor	In the water column	On the water surface	Deep sea	In the water column at deep Sea
Bangladesh	None	None	None	None	None	None
India	Very few but confined limited beach area	None	None	None	None	None
Maldives	Nationwide implementation quite well under waste management regulations (WMR 2013/R-58) as it falls under island management plans.	Marine protected areas. Green fins and some private parties (for localized regions)	Falls under WMR 2013/R-58, but weak implementation			
Pakistan	None	None	None	None	None	None
Sri Lanka	Certain polices island wide	Certain areas	None	None	None	None

*The above table very clearly indicated that implementation of the majority of international conventions, laws, agreements; treaties and local level Acts and regulation have been confined to the beach areas of the countries.*

Even though there are numerous international and regional conventions, agreements, laws, and treaties already exist and provide a good legal platform for management and minimization of marine litter issues, several cases indicate that cooperative action on marine litter has lagged behind, or the participation of states in these initiatives was insufficient. For example, there are no legal instruments in place dedicated to the management of marine litter as yet in the SAS region. Some countries in the region do not even initiated action in the UNEP Global Initiative. Therefore it is a very urgent requirement to prepare a regional level plan, to implement international conventions, agreements, laws, regulations and treaties.

### 3.2 Implementation of Direct development activities

The main objective of the direct development strategy is to prevent the litter and solid waste

enters into the beaches and sea areas. Following activities are carry out by various countries under the direct development strategies which include; source reduction, waste reuse and recycling, structures for waste conversion to energy, reception facilities, development of gear marking facilities, litter contained at points of entry into receiving waters, beach and reef cleaning activities and various waste management initiatives on land. Product modification and improvement (e.g. through eco design) is an important method for source reduction. A variety of source reduction schemes have been developed and are available, such as designing packaging that the product can be refilled, maintaining and repairing durable products, developing more concentrated products.



## 3.2.1 Status of Direct Development Strategy in SAS region

In the SAS region, variety of direct development activities (DDA) have been initiated and being implemented. Some of them are construction of litter disposal and dumping structures, construction of barriers at river mouths or lagoon mouths to trap waste which are eventually entering to the sea, removing and cleaning of beaches under the beach cleaning programs, waste reuse and recycling, structures for waste conversion to energy, development of reception facilities.

According to the available information Bangladesh has been conducting beach cleanup program annually and these activity has been limited to certain beach areas of the country.

India also indicated that they have conducting beach cleaning activities in the beach cleaning day in many states. Activities such as 3R and waste in to energy are being done by India but data and information on other activities are not available.

Maldives formed a long-term partnership with Parley to implement Parley's creative, multi-disciplinary approach to collection of plastic from the sea and recycling them to create yarn or fabric. Further Maldivian government has adopted a plan in collaboration with the fishing industry whereby fishers collect and bring back drifting plastics they encounter within the country's EEZ and the collected plastics are to be handed over to the closest designated collection point, which will then be delivered to Parley for the Oceans for recycling.

The severity of inflow of solid waste material into the navigational channel was so high in Pakistan that Karachi Port Trust (KPT) needs extra effort and resources to dredge the harbor. In this regard KPT is constantly being hired boats which scoop the inorganic waste and floating litters including polythene bags and plastic material from the port vicinity on daily basis. Approximately five to ten tons of litters is collected from the navigational channels daily.

The Sri Lankan government has taken several measures to overcome marine litter issues through several direct development strategies. At present majority of solid waste management activities are focuses onto land base areas and these activities have not focused on to the marine and coastal areas. The waste collection and waste disposal mechanism have been introduced by the MEPA but the municipal waste collection and disposal facilities are not sufficient to collect all waste generated in municipal areas in Sri Lanka. MEPA has also taken initiative to provide a waste reception facility to unload ship generated waste at the arrival to Sri Lankan ports.

It is obvious that SAS countries have taken several actions under the direct development strategy. However most of them are confined to the land base activities and to the shoreline areas. Very few countries have focused on to the marine and coastal areas but none of countries have developed activities to reduce marine litters in deep sea areas. The details of the activities implemented within the marine environment component areas under the direct development strategies by SAS countries are indicated in table 3.2.

**Table 3.2 Activities implemented within the marine environment component areas under the direct development strategies by SAS countries**

Country	In the beach/Coastline	Coastal Sea floor	In the water column	On the water surface	Deep sea	In the water column at deep Sea
Bangladesh	Beach cleaning activities at few coastal districts	Water quality monitoring some areas	Water quality monitoring some areas	Water quality monitoring some areas	no	no
India	Beach cleaning activities at regular intervals at each coastal state.	Regular water quality monitoring activities are carried out.				

Maldives	National Waste Management Policy (NWMP) 2015 includes activities to reduce and manage waste in general. Not specific to marine environment	NWMP 2015 includes activities to reduce and manage waste in general. Not specific to marine environment.				
Pakistan	Several Beach cleaning activities	Same activities by Fort Authority of Karachi	None	None	None	None
Sri Lanka	Beach cleaning, litter collection bins. Prevention litter entering into sea and beach	Underwater debris collection in sensitive ecosystem	No	No	No	No

**Remarks by India:** Reporting process also exists for identifying and responding to marine pollution incidents.

According to the above tables 3.2 and 3.3 it is very clear that all the SAS countries are confined their direct development activities to land areas or beach areas and not to the sea areas.

### 3.3 Development and enforcement of Regulations

Regulations and enforcement strategies are basically aiming to mitigate the impacts of marine litter and reduce the waste generation. Under this strategy concern agencies are need to prepare guidelines, regulations and enforcement plan to control the ways that litter is going to dispose. These measures are largely command and control methods to control marine liter. This strategy is involved to prevent certain types of plastics litter from entering into the sea.

One of most important factor needed for effective regulation is a separate legal institute/agency to prepare the regulation and implement. In this case relevant agency also needs to have a separate legal instrument such as Act to provide legal base to prepare regulations. It is also required well trained qualified enforce/detective

team who have knowledge to understand the thickness of the plastics or polythene etc.

#### 3.3.1 Status of Regulation and enforcement Strategy in SAS region

Bangladesh was the first nation to ban polythene bags in 2002. In Bangladesh, the Department of Environment (the nodal Department) is directly responsible for coastal and marine pollution control. However, Marine litter has not been identified as a separate entity for exclusive monitoring and management in the National Plan of Action for Environmental Protection by the Department of Environment. In Bangladesh Marine Pollution Ordinance is directly relevant to the marine litter management. According to the available information there is no enforcement program implemented under the above Ordinance to achieve the desired objectives of marine litter management. In India, there are several national level legal frameworks established and available to enforce the provisions to manage illegal activates in relation to marine litter. However, most reports emphasize that urban local bodies (ULBs) in India have failed to implement laws and regulations adequately. Even though many acts and rules have been implemented by India, no any enforcement details are available.



The National Solid Waste Management regulation prescribes the Environment Protection Agency to be the implementing body of the waste regulation (Ministry of Environment and Energy, 2013). However, since the Regulation on the Protection and Conservation of Environment in the Tourism Industry is pursuant to the Maldives Tourism Act, the implementation of this regulation falls under the mandate of Ministry of Tourism. The overlapping nature of these responsibilities causes lack of clarity on whom to report on misconduct. Moreover, monitoring and enforcement of this legislation is weak, hence the regulations have not shown to be very effective at national level.

The Government of Pakistan enacted the Pakistan Environmental Protection Act (PEPA) in 1997 which provides a framework for establishing federal and provincial Environmental Protection Agencies (EPAs). One of the functions of EPA is to ensure implementation of different provisions of the legal instrument including monitoring of marine pollution / marine litter. However, there is no monitoring mechanism in place to check trans-boundary shipments of waste and dumping of plastic at sea under the international convention for the Prevention of Pollution from Ships. By realizing the extent of the problem and translating this concern the Karachi Port Trust (KPT) established Marine Pollution Control Department.

However there is no any information to check whether the Government of Pakistan has

established a proper enforcement program to evaluate the Pakistan Environmental Protection Act (PEPA) provisions are met or not.

The management of solid waste is the primary responsibility of municipal councils, urban councils and other local authorities in Sri Lanka. Maintenance of clean beaches also falls within the purview of these local authorities. However, at present, removal of marine litter-floating or deposited on the sea bed has not dealt with any of these authorities. Marine Pollution Prevention Act also stipulates provisions for preventing dumping activities in the marine environment. The Marine Environment Protection (Sea dumping) regulations 2012 introduced by MEPA prohibits the sea dumping of waste and other matters without a valid permit.

The effectiveness of the Acts and regulations entirely depend on successful enforcement program. Therefore whenever any agency is planning to implement any regulation to manage illegal activities it is necessary to introduce a proper enforcement program. However in the case of marine litter management, no SAS countries have prepared and implemented a proper enforcement program to achieve the main objective of the marine litter reduction. Therefore it is necessary for these region countries to prepare proper regulations and enforcement program to manage the solid waste issues in the region. Present status regarding the enforcement programs implemented by the SAS region countries are indicated in Table 3.4

**Table 3.4 Status regarding the enforcement programs implementing by SAS countries**

Country	Availability of Separate Act for Marine Litter	Availability of Separate Agency for Marine Litter	Availability of Separate Regulations for Marine Litter	Availability of Separate team for Regulation Marine Litter
Bangladesh	No	No	No	No
India	No	No	No	No
Maldives	No	No	No	No
Pakistan	No	No	No	No
Sri Lanka	Yes	Yes	Yes	No

According to the above table only Sri Lanka has a separate Act, agency and regulations specifically made for marine litter management. Even Sri Lanka also not recruited a separate team for

enforcement. All other countries still not established a separate Act, agency or regulations and enforcement team to prevent/manage the marine litter.

## 3.4 Monitoring and Evaluation

Since this strategy needs to be implemented by individual country, preparation of proper monitoring and evaluation program for marine litter reduction need to be done by each country. Monitoring of any type of management strategies on marine litter required more accurate scientific base-line information and resources. However one of the issues in relation to the monitoring and evaluation of marine litter management program is it has not given priority. Most of the SAS countries have data and information upto some extent in respect to beach areas but do not have sufficient basic data on sea floor, water column, water surface, and deep sea marine litter. Therefore SAS countries are not in a position to develop an implementable monitoring and evaluation plan.

Taking into consideration the above issues and constraints, following section will explain the effectiveness of the monitoring and evaluation strategies implemented by various agencies in the SAS countries.

### 3.4.1 Status of the monitoring and evaluation strategies in SAS countries

As indicated before, baseline data is key to establish a proper monitoring plan to evaluate the effectiveness of the marine litter management program. However, according to available information, there is no proper data and information in the Bangladesh (except few places) for preparation of baseline information on marine litter to prepare a monitoring plan. In this situation it is very difficult to indicate that marine litter mitigation activities implemented in the Bangladesh are successful or not. Another unfortunate fact is that there is no responsible separate agency in the Bangladesh to collect the baseline data to commence monitoring program even in near future. Therefore it is necessary to establish separate agency or separate division under the Environment Department, Bangladesh to taking care of marine litter.

In respect to waste management in India, there are several ministries. Administration and regulation is governed by the Ministry of Environment and Forests and Climate Change (MoEF), the Ministry of Urban Development (MoUD), the National

Environmental Engineering Research Institute (NEERI), CPCB, and State Pollution Control Boards (SPCBs). The ground level implementation responsibility lies with urban local bodies.

Maldives has developed program to monitor certain aspect of the marine litter under foreign funded project and therefore same aspect of marine litter data and information are available. "Olive Ridley Project" is one of the organization who is actively implementing a monitoring programme in Maldives and they are monitoring geographic location of ghost net with attributes such as length between two knots, net construction type of twine, number of strands, type of material, diameter of twine, colour, floatation, and attachments. Using these baseline data Maldives can monitor marine litter abundance of ghost nets and their points of origin.

In Pakistan, presently no formulated baseline data exists about marine litter. However, some of the national as well as sub-national institutions have started taking interests in this issue particularly Karachi Port Trust. Further on the notice of Supreme Court Karachi City District Government and Sindh Solid Waste Management Board has started streamlining the issue of proper disposal of marine pollution including marine litter. The efforts therefore need to be started an integrated monitoring programme to monitor marine litter.

Different agencies carried out marine litter monitoring programs in selected areas of the coast line of Sri Lanka. However, there is no comprehensive national program to monitor marine litter in beaches, coastal areas and ocean. MEPA has conducted International Coastal Cleanup day program and the data collected during this program analyzed to get the idea reading the source and amount of marine litter. There is still need for the establishment of a comprehensive national marine litter monitoring program to continuous assessment of marine litter in Sri Lanka.

According to the above information almost all SAS countries have not developed and implemented a proper marine litter monitoring programmes in their respective countries. As a result, effectiveness of the marine litter mitigations programs in these countries is not known. This will give very clear evidence that

most of the policies developed by these countries to mitigate marine litter are basically arbitrary. The status of monitoring and evaluation strategy to

mitigate marine litter issues in the SAS countries are given in the Table 3.5.

**Table 3.5: Status of monitoring and evaluation strategy in the SAS countries**

Country	In the beach/Coastline	Coastal Sea floor	In the water column	On the water surface	Deep sea	In the water column at deep Sea
Bangladesh	No base line data	No base line data	No base line data	No base line data	No base line data	No base line data
India	Same monitoring data available	No base line data	No base line data	No base line data	No base line data	No base line data
Maldives	Weak enforcement					
Pakistan	No base line data	No base line data	No base line data	No base line data	No base line data	No base line data
Sri Lanka	National level monitoring programme is not available.	Same monitoring data available	Same monitoring data available	No base line data	No base line data	No base line data

## 3.5 Research and studies

One of the significant barriers to addressing marine litter is the absence of adequate scientific research, assessment, and monitoring. Reliable data and information on the amounts, distribution, and impacts of marine debris at global, regional, national, and local scales is essential to help prioritize, develop, and implement effective strategies to address the problem of marine debris. In relation to marine litter management, scientific research and studies needed to be done in all segments of the marine environment components (including land base solid waste, beaches/shoreline, sea surface, water column, sea floor, sea floor shallow, sea floor deep, ingestion by other marine organisms, entanglement rates of marine organisms, micro-plastic on shorelines, micro plastic at sea surface, ecological, and socio-economics.) In this situation, strategy of research and studies is cross cutting with all other strategies for marine litter management.

However, research studies in SAS region are limited mainly to the beaches/shorelines. Most of other research areas in relation to marine litter in the SAS countries such as marine litter impacts to the sea surface, water column, sea floor, sea floor shallow water areas, sea floor deep sea areas, micro-plastic

on shorelines, micro plastic at sea surface, socio-economics cost due to marine litter, cost to the ecosystem are very few and not sufficient when compare to certain other part of the world.

In this session it is not going to review research studies done by SAS region but going to evaluate what are the areas for SAS counters need to do more research and studies to make proper policies and actions to mitigate impacts of the marine litter. Therefore each SAS country situation will evaluated following sections.

Bangladesh has done a preliminary investigation on marine litter 2017 in Cox's Bazar and Chittagong districts. According to the study it was found that among the all categories, the plastic litter was the most dominant marine litter in all four beaches of Cox's Bazar and Chittagong Districts. However, in Bangladesh, no marine litter generation study has conducted yet for Land Based Sectors to calculate generation of land based solid waste both micro and macro level. The situation is same for the coastal and marine areas as well. According to the available information no scientific information are also available at national level to understand the ecological, social and economic impacts due to marine litter in Bangladesh.

In India, despite having more than 7500 km of coastline, studies on sources and composition of marine litter on its beaches are scarce and fragmentary. Quantification of marine litter including plastics in the water column, sediment and biota has been documented in the Indian beaches, estuaries, coastal waters and Open Ocean. However, comparisons between studies or even systematic status and trend analyses are challenging because of differences in the collection and measurement methodologies used. India has studied the currents and circulation patterns to collect information to determine marine litter circulation. However quantifiable data from land based solid waste through rivers and canals, dumping by ships and boats, surface drainage and other sources such as tourists, and wind are not available.

No formal studies or records have been published about the typology and pathways of marine litter in the Maldives, except for ghost nets. The Olive Ridley project, an international organization researching and identifying the impact of ghost nets in the Indian Ocean, has collected a considerable amount of data on the number of ghost nets found in the Maldives marine ecosystem. Plastics are estimated to be the predominant type found amongst the

marine litter in Maldives. This was also concluded based on observations and informal reports. Non availability of research on marine litter impacts on to the human health, and food safety, impacts to economic consequences is also common for Maldives.

Research on all aspect on marine litter in Pakistan is very limited and difficult to obtain. Therefore, calculation of different marine litters, policy formulation to minimize the marine litter, monitoring evaluation of marine litter management activities and preparation of the targeted environmental education plans are difficult in Pakistan.

Several research and studies have been conducted to estimate the quantity of marine litter in the beaches and sea bed areas in Sri Lanka. Marine litter classification and composition studies are also conducted by the authorities in Sri Lanka (World Bank, 2013) (10). However, there are no studies related to the circulation of marine debris in Sri Lankan waters.

According to the above information status of research in SAS region is summarize in the Table 3.6

**Table 3.6 Status of Research in SAS region**

Country	3Rs & Land base generation	Ecological Impacts	Social Impacts	Economic Impacts	Ocean circulation	Compartmentments of the marine environment
Bangladesh	No	No	No	Certain areas	No	No
India	Yes	Yes	Certain States	Very few	Yes	Certain component
Maldives	Household level in Male' (2008), Resort level-tourism sector (2010). Waste audits in few individual islands	No comprehensive studies conducted				
Pakistan	No	No	No	No		Certain component
Sri Lanka	Yes. But so far not introduced to fisheries sector	Yes. But quantitative data is not available.	Yes	No	No	Certain component

The table 3.6 very clearly proved that research on marine litter in the SAS countries are very few and need to improve. This may be a very alarming issue since lack of research impacted on to the policy preparation, litter mitigation, monitoring, and evaluation for sensitive coastal ecosystems, as well as sustainable development of the coastal resources in the region.

## 3.6 Education and Awareness

Education and awareness program is a most useful management strategy for resources management since the strategy is mainly use for changing the behavior of people to achieve desirable targets. This strategy is crosscutting and assist to develop and implementation of the other strategies also. Education and awareness strategies aim to encourage people to embrace the notion of waste as a resource and choose the products that generate lower quantities of litter, dispose of waste in a more environmentally sound way and participate in beach cleanups.

Marine litter management efforts are most likely to succeed if they are accepted as necessary and fair by large segments of the stakeholders. Acceptance comes with good communication particularly with those citizens directly affected by marine litter management measures. Hence, most marine litter managers are now consider environmental awareness and education as an essential aspect of a national, regional and international level marine litter management program.

If well-designed, education and awareness activities available, that creates the conditions necessary to implementing and adjusting policies for the sustainable management of coastal and marine litters.

Any good education and awareness program need to assign a main goal, priority topics/messages, target groups, educational objectives and messages to be delivered. Therefore, it is necessary to prepare well designed educational programs for short, medium and long time period.

### 3.6.1 Education and Awareness program in SAS countries on Marine Litter

According to the available reports and information, many SAS countries have been implementing marine litter management awareness program targeting general public rather than essential stakeholders. It is also observed that all of SAS countries have implemented beach cleaning program annually with participating general public but not with the real polluters of the beach who are directly responsible for marine litter. This very clearly indicated that it is necessary to prepare a well-designed awareness and education program for mitigation of the marine litter in the SAS region and countries.

Taking into consideration the above facts, it is necessary to evaluate awareness and education programs conducted by SAS region countries to reduce or manage the marine litters

It was observed that the Bangladesh has not prepared a separate education and awareness program targeting stakeholders of marine litter. The reason may be that in the Bangladesh marine litter management also comes under the Department of Environment in Bangladesh and they have mainly focused onto the country side environmental issues. According to the Environment Department, marine litter management may be low priority to them and therefore preparation and implementation of separate environment and awareness program for marine litter may be difficult to them.

India has not prepared a national level environmental education program for marine litter management. But according to the available information some states level awareness activities are being implemented. However none of programs has properly identified the target groups, messages to be delivered, delivering media, and awareness activities. Without such type of program India is also targeting the general public for their marine litter education program.

Maldives also has been implemented beach cleaning and some awareness program targeting general public. They are also not implementing a properly designed national environmental and



educational program. Like all other SAS countries the Pakistan also targeted general public as target group for their environmental education and awareness program and mainly implementing beach cleaning activities as awareness program.

There is no proper national environmental and awareness program prepared by the Sri Lanka for marine litter management and Sri Lanka also implementing awareness programs targeting the general public.

According to the above information, all SAS countries are not implementing national level education and awareness program to minimize the marine litter. Therefore it is immediately required to prepare country level environmental

education and awareness program for each SAS countries to marine litter management. In addition to the country level plans it is also need to prepare a regional environmental and education plan. The regional education plan needs to address the regional issues in relation to the marine litter. At the same time it is necessary to do the need assessments to identify the major educational objectives, target groups, educational messages, educational medias, educational activities and time frame.

It was reviewed the environment educational and awareness activities implemented by the SAS countries as a strategy to mitigate the marine litter in the region and the outcome of the review is indicated in table 3.7

**Table 3.7: Status of the Environment Education and Awareness programs implemented by the SAS countries**

Country	Availability of National program	Identification of goal and objectives	Identification of Target groups	Priorities of education messages	Identification of education media
Bangladesh	No	No	General Public	No	No
India	Yes	Yes	General Public, Fisheries, Port, School, Colleges and other stakeholders	Through media	TV, News Paper and Social Media
Maldives	Available. "Saafu Raajje" (clean Maldives) National campaign	Identified. Eliminate public littering by developing willingness of the individuals to act in reducing or eliminating public littering	Identified. Schools, Colleges General public Expatriates Food distributors and Service providers Retail Shops Metals, wood works and Automobile shops	Reduce and eliminate public littering	Identified
Pakistan	No	No	General Public	No	No
Sri Lanka	No national level programe	Goal and objectives established for fishermen and school children	General Public, School Children and Fishermen	No	No

## 3.7 Use Market and Economic Instruments

As a management strategy to manage the marine litter economic instruments has been designed to achieve a number of objectives. Among them, main objective is to reduction of marine litter. In addition to the main objective there are several secondary objectives such as to minimize the negative impacts caused by marine litter, and to avoid unexpected consequences from the application of the instruments. Practically it is very difficult to achieve all of above objectives. But many countries are using economic instruments even though those are facing big challenges.

Marine litter causes different types of impacts and the damages are arising from suffocation by plastic bags, introduction of toxic substances such impacts may be unique to some types of waste or focused around particular types of waste. In contrast, the impact of marine litter on tourism due to the presence of litter on beaches is largely a factor of its total quantity. In resolving marine litter problems, market and economic instruments can be used to reduce the impacts of such litter in a different of ways.

### 3.7.1: Market Instruments

In generally, marine litter arises, like other waste or pollution problems, through market failure. The marginal price of goods on the market, and that of disposable plastics in particular, does not reflect the full marginal cost to society of producing that good. This mean, there is an external cost to society not borne by the producer (or consumer). In generally, unpolluted and clean beaches and ocean are public goods, which are highly risk to free-riding, thereby those disposing of waste, inappropriately benefit from the good without paying the full cost, thereby causing contamination and degradation of the marine environment.

There are a range of market-based instruments that can be used to address marine litter. The measures are includes;

- a) Landfill taxes, if set at adequately high levels, can incentivize the final disposal of waste and help to incentivize recycling and recovery,

reducing the risk of waste reaching the marine environment.

- b) Product taxes, charges or ban can be used to discourage the consumption of certain products that frequently end up as marine litter, such as plastic bags, packaging and fishing tackle.
- c) Infrastructure charges, for example, for the use of port waste facilities, help to ensure that waste management infrastructures and facilities are developed and maintained.
- d) Deposit-refund schemes, which are most often applied to packaging items such as bottles, can encourage return and reuse by consumers, and therefore reduce the number of such items ending up as litter.
- e) Direct investment in infrastructure, such as rubbish bins and secure waste collections on beaches and in coastal areas, can help to keep coastal areas free of litter and reduce the risk of items reaching the seas. Such investment can be financed for example by tourist taxes or car parking fees.
- f) High fees and fines for littering, illegal waste disposal and fly-tipping help to dissuade behaviors that result in waste escaping from formal waste management processes, reducing the risk of waste reaching the marine environment as litter

### 3.7.2: Status of Market Instruments used by SAS countries

The following section focus on to what type of market base instruments/strategies used by the SAS region countries to mitigate the impacts of marine litter.

Bangladesh has imposed Product taxes and charges for use of polythene and subsequently bans use of polythene bags to discourage the consumption of certain products. This was a major and remarkable market instruments taken by Bangladesh. Most of the sewage lines of Dhaka city had been blocked by indiscriminate dumping of polyethylene bags over the years and the banning measure was taken by the Government of Bangladesh (GoB) in 2002. The government has banned the production, marketing, import, stock, distribution, carrying and use of polyethylene bags up to 20 microns thick or less from 01 March 2002.



India has not developed national level market instruments to mitigate marine litter but certain projects have been implemented at city level. One of such project is Ultra-Modern Waste Management Plant at Gurgaon. This project is comes under the market strategy of direct investment in infrastructure to reduce the marine litter. Under the similar strategy dustbin free and zero garbage town project was implemented at Suryapetin India. In Chennai, GPRS Equipped Waste Bin system introduced as market strategy which is also a success project. Andhra Pradesh of India has constructed a 3.66-MW Power Generation Project under the program of waste into energy program.

Some community islands in the Maldives (AA. Bodufolhudhoo, AA. Ukulhas, V. Keyodhoo) have taken the initiative to ban single-use plastic bags

in their islands. However, it was observed that these initiatives are voluntary gestures and are not legally supported by regulations or Act.

The Pakistan has not taken any marketing strategy to minimize the marine litter in their country.

In 2017, Sri Lanka ban use of up to 20 microns thick or less polythene to discourage the consumption of certain products and gave incentives to use non polythene biodegradable products. This is very positive marketing strategy used by the Sri Lankan government to control the polythene.

The summarized details of the marketing instruments used by the SAS countries as a strategy to mitigate the marine litter in the region are indicated in table 3.8.

**Table 3.8 Status of marketing instruments used by the SAS countries as a strategy to mitigate the marine litters in the region**

Country	landfill taxes	Product taxes or ban	Infrastructure charges	Deposit-refund schemes	Direct investment in infrastructure	High fees and fines
Bangladesh	None	Yes	None	None	None	None
India	None	Yes	None	Partially implemented	Yes	Partially implemented
Maldives	None	Yes	None	None	None	None
Pakistan	None	None	None	None	None	None
Sri Lanka	None	Yes	None	None	None	None

Even though marketing strategy is very useful and effective strategy, according to the table 3.11 very few marketing strategies have been introduced by the SAS countries to minimize the marine litter.

### 3.7.3 Status of Economic instruments used by SAS countries

In addressing marine litter, economic instruments also can be used to reduce the marine litter in many ways. Such instruments are:

- Incentivize industries to use less plastic (packaging) either through economic disincentives/subsidies
- Landfill tax;
- Tax plastic bags;
- Target sources of waste most problematic for marine litter—such as shipping;
- Collection fee for individual types of marine litter—reduce ghost fishing;
- Pay for the collection of litter;
- Target the toxicity of litter;
- Discourage polluting behavior.

The present status of the economic instruments used by the SAS countries is explained below.

Under the Dhaka Environment Management Plan (2005) solid waste recycling activities has been promoted and less land filling encouraged. This strategy was implemented through incentives to recycle the waste by internalizing the external costs such as land filling. Solid Waste Management Action Plan for Bangladesh has selected eight secondary towns in Bangladesh in 2005 under Integrated Flood Protection (Phase-2) Project of Local Government Engineering Department, GoB. This project has developed 4 R principle i.e. reduce, reuse, recycle and recover of the solid waste. Bangladesh also targeted specific types of waste—such as plastic bags in 2002 and banning measure was taken by the Government of Bangladesh (GoB) to produce or imported the plastics bags.

The Government of India has established a national waste management committee in 1990 and the main objective of the committee was to identify the recyclable contents in solid waste picked up by rag-pickers. The details of the activities implemented under the above initiative are not available. E-Waste Management and Handling Rules was introduced by India in 2011. This strategy applied to stakeholders associated with the manufacturing, handling, utilizing, processing, and recycling of electrical and electronic-related waste items.

Indian government has prepared separate parallel decentralized schemes by providing financial support for the community based decentralized schemes for the development of waste management method. For example, the municipality of Bangalore has a parallel scheme, “Swaccha Bangalore”, which levies mandatory fees from all households, businesses and educational institutions to increase its financial resources. These user fees imply that the residents will expect the municipality to provide proper waste collection services. It integrates them into the overall waste management strategy in all localities, thereby helping to reduce the amount of wastes going outside the locality.

By means of economic instrument an attempt was made to address the problem of lack of an

effective and coordinated waste collection and management system in the Maldives, the Government of Maldives established the Waste Management Corporation Limited (WAMCO) on 1st January 2016. WAMCO is a fully government owned entity that collects waste from households, businesses, resorts, and islands and transports them from transfer points to the nearest waste management facility.

The Maldives government also formed a long-term partnership with Parley to implement Parley’s creative, multi-disciplinary approach to collection of plastic from the sea and recycling them to create yarn or fabric. In addition to the above two economic instruments, the government of Maldives has begun an initiative in collaboration with the fishing industry whereby fishers collect and bring back drifting plastics they encounter within the country’s EEZ. The collected plastics are to be handed over to the closest designated collection point, which will then be delivered to Parley for the Oceans for recycling and fishermen will receive an incentive based on their collection of plastics.

According to the available information the Pakistan has not taken economic instruments to minimize the marine litter in their country.

The Central Environmental Authority (CEA) of Sri Lanka has initiated the “Pilisar” National Solid Waste Management Program in 2008 and donated a grant about 5.6 billion SL rupees to the local governments to implement solid waste management activities. The Sri Lanka Government also identified the importance of the promotion of the 3Rs and the establishment of an environmentally friendly final disposal site for sustainable SWM system. A national level program for solid waste management was implemented under the chairmanship CEA with initial budget of Rs. 5.675 billion to introduce small and medium level waste treatment system in all local government authorities in Sri Lanka from 2016 to 2018 and to cover 50% by the year 2016.

The summarized details of the economic instruments used by the SAS countries as a strategy to mitigate the marine litters in the region is indicated in table 3.9

**Table 3.9 Status of Economic instruments used by the SAS countries as a strategy to mitigate the marine litters in the region**

Country	Incentivize industries	Target waste arising	Target specific types of waste	Target sources of waste	Target individual types of marine litter	Pay for the collection	Discourage polluting behavior
Bangladesh	No	Yes	No	No	No	No	No
India	No	Yes	No	Yes	Partially	Yes	No
Maldives	No	Yes	Yes	Yes	Yes	Yes	Yes
Pakistan	No	No	No	No	No	No	No
Sri Lanka	No	Yes	Yes	Yes	Yes	Yes	Yes

According to the above table except Pakistan, all other countries have implemented at least one of the economic instruments to minimize the marine litter. The Maldives and Sri Lanka have implemented several instruments except instruments of incentivize industries.

## 04. Major Gaps and Challenges

Based on the national marine litter action plans of the SAS region coupled with the interactive dialogues during the consultative meetings at Mumbai and Indore, India, the following major gaps and challenges were identified:

### 4.1 Lack of Marine litter data in the SAS Region

SAS member countries do not possess any consolidated marine litter database nor does any indicators available for such database. Therefore, very little data exist on the quantities, trends, sources and sinks of marine litter in the SAS region and very little is known about the extent and nature of the problem in the region. As effectiveness of the management strategies can be ensured if accurate baseline data is available. Therefore, availability of accurate data for marine litter is critical to prepare proper policies, strategies and management plans to minimize the quantity of marine litter. Despite the existing management strategies for marine litter, the current knowledge of the quantities and the degradation of litter in the marine

environment and its potential physical and chemical impacts on marine life is still scarce.

SAS member countries possess a great deal of knowledge gaps in terms of the biological consequences of marine litter and micro-plastics. These gaps hinder the ability to prioritize mitigation efforts and to assess the effectiveness of implementation measures. Therefore, accurate and quantitative data is highly essential for large-scale and long-term monitoring across SAS region and countries. The small-scale dynamics that affect plastic movement and accumulation, and transfer of persistent organic pollutants via plastics through the marine food web in the region as large number of coastal population in these countries directly depend on coastal and marine resources.

### 4.2 Poor Institutional system for management of Marine litter

One of the major gaps in the Marine litter management in the SAS region is lack of proper institutional mechanism to implement marine litter mitigation activities. Except Sri Lanka all other SAS member countries do not have any

dedicated agency for management of the marine litter. Due to non-availability of separate institutions and marine litter management system there is no separate Act or legal instruments to regulate and manage marine litter. The absences of proper regulations became hard to establish the enforcement system. Consequently, marine litter has emerged as a serious threat to the marine resources in SAS region. Therefore, establishment of institutional mechanism especially for management of marine litter in the SAS region and countries is urgently required.

## **4.3 Non-availability of legal framework for marine litter management**

Legal framework which helps in regulating the production, use and recycling of the marine litter. SAS member countries do not possess any dedicated legal framework for regulating the marine litter. Despite the availability of many international and regional level legal instruments, SAS region is very poor in term of proper enforcement of regulatory and management regime of the marine litter. Therefore, marine litter continues to increase on the shorelines, in oceanic gyres, and on seafloors thereby, signaling that marine litter remains a significant problem, particularly with respect to micro plastics in the SAS region. There are complex reasons for this situation and, it is possible to identify a number of gaps in the current legal framework in the region since the existing legal framework does not specifically focus on the marine litter.

A few global examples indicate that such legal management measures have generated desirable results, such as fishing gear buyback programme in South Korea, Taiwan's plastic restriction and compulsory garbage sorting policy, US Fish for Energy, OSPAR Fishing for Litter, EU PRF Directive and HELCOM Baltic Strategy. Therefore, legal systems are highly helpful in ensuring effective control of marine litter. Under this situation enactment of new legal frame work for marine litter management in the SAS region countries is critically important.

## **4.4 Poor and insufficient enforcement of international Conventions, Agreements, laws, regulations and treaties**

Even though there are numerous international and regional conventions, agreements, laws, and treaties that provide a good legal platform for effective management of marine litter, several cases indicate that cooperative action on marine litter has lagged behind, or the participation of states in these initiatives was insufficient. There is neither any legal framework nor any rules and regulations that support enforcement of the relevant MEAs in the SAS member countries. Therefore, it is urgently required to either develop new laws and regulations or modify the existing regulations in line with the provisions of the MEAs. This will greatly help in effective enforcement of the marine litter MEAs in the SAS member countries.

## **4.5 Limited Implementation of Direct development activities for marine management**

SAS region possess very few direct development activities and those available are confined only to two main activities such as beach cleaning, and recycling of waste at limited level. The main objective of the direct development strategy is to prevent the litter and solid waste that enters into the beaches and seas. Therefore, there is an urgent need to undertake activities such as source reduction, waste reuse and recycling, structures for waste conversion to energy, reception facilities, development of bio-degradable fishing gear marking facilities. Marine litter contained at points of entry into receiving waters, beach and reef cleaning activities and various waste management initiatives on land are areas of special and immediate attention. Product modification and improvement (e.g. through eco design) is an important method for source reduction.

A variety of source reduction schemes have been developed and are available, such as designing packaging so that the product can be refilled, maintaining and repairing durable products, developing more concentrated products and electric messaging (Vaughn 2009) (11). Other methods include the development of

packaging material that is made from sustainable resources, the design of push-tap opening of metal beverage cans and the design of lids of beverage bottles or containers attached to bottles with a leash (Gold et al. 2013) (12).

## 4.6 Lack of Research and surveys on Marine Litter

The marine litter research and studies are very limited in the SAS member countries. Lack of research is a significant impediment in the way of innovation and developing futuristic mitigation strategies and action plans. Most of the research in the SAS region has been confined to the ecological and beach studies. There is therefore an urgent need to undertake marine litter and micro plastic research and survey of the marine environment components including land based solid waste, beaches/shoreline, sea surface, water column, sea floor, sea floor shallow, sea floor deep, ingestion by other marine organisms, entanglement rates of marine organisms, micro-plastic on shorelines, micro plastic at sea surface, ecological, and socio-economics.

India has done some research on marine litter circulation pattern in the Indian Ocean but other SAS member countries have so far not done such type of research on marine litter circulation to identify the marine litter circulation patterns.

No standard and uniform methodologies are followed in the SAS region for collecting, analyzing and interpreting the marine litter data. The available methods mismatch among countries and therefore this common problem of the SAS region could not effectively be tackled. Therefore, the SAS region failed to develop the required standard and uniform research methodologies for marine litter joint research studies. It is also strongly recommended to share data among the region and countries to avoid duplication and minimize cost for marine litter research.

## 4.7 Weak formulation and enforcement of regulatory framework.

Regulations formulation and enforcement strategies are basically aiming to streamline the development activities in relation to marine litter to mitigate the impacts of marine litter. The concerned agencies are required to prepare guidelines, regulations and enforcement plan to control the ways that marine litter is disposed. Methods of marine litter disposal that helps to minimize its adverse impact on the marine environment has to be adapted. These measures are largely command and control method to control marine litter.

One of the most important factors for regulation is a separate legal framework and institutions to prepare regulations and ensure its implementation. It is essential to employ qualified and trained enforcement team to understand different dimensions of marine litter. It is also essential to deploy adequate vessels and other equipment to facilitate the enforcement programs along with provision of adequate financial resources.

## 4.8 Lack of marine litter Production and Consumption Policy and Strategies

SAS region lacks proper marine litter production and consumption policies and strategies for regulating the marine litter in the member countries. Nor is there any formal forum to engage the producers and consumers of major marine litter products. This has created great deal of gaps between the regulators on the one hand of producers and consumers on the other hand.

## 4.9 Lack of Education and Awareness Program for Marine litter management

There is no dedicated education and awareness programme for marine litter in the SAS region. The education and awareness strategy is always crosscutting and same is true strategies for marine litter management. These strategies aim to encourage people to embrace the notion of waste as a resource and choose the products that generate low quantities of litter, dispose waste in a more environmentally sound and sustainable manner and regularly participate in



beach cleanups. Well-designed, education and awareness activities can create the conditions necessary to implementing and adjusting policies for the sustainable management of coastal and marine litter.

A sound and balanced education and awareness program need to assign a main goal, priority topics/messages, target groups, educational objectives and messages to be delivered. Therefore, it is essential to prepare well designed short, medium and long term education and awareness programme for SAS countries and region. Use of print and electronic media coupled with the use of smart communication technologies such as internet, social media and dedicated apps has to be developed as effective education and awareness tools.

According to the available reports and information many SAS countries have not prepared and developed any education and awareness program. Very few and scattered activities have been implemented that are targeting general public. It is also observed that all SAS countries are observing beach cleaning program annually but mostly such activities do not focus the real stakeholders/target group in public sector, civil society and private sector who are directly responsible for marine litter. There is no regular follow-up after the stand alone beach cleaning at institutional level.

Properly designed education and awareness program may lead to change of human behavior from the current throw-away culture into more accountable and responsible culture for marine litter disposal. The environmental education and awareness program need to focus on change of behavior of the stakeholders through changing their attitude toward the marine litter. Therefore, education and awareness program need to be designed very carefully identifying the correct target groups, correct messages to be delivered to the target groups, identifying effective communication tools such as print and electronic media, social media, internet seminars and workshop, discussion etc. It is therefore; strongly recommend to develop effective education and awareness need assessment in SAS member countries for preparing a

comprehensive education and awareness program.

### **4.10 Lack of Marketing and Economic Instruments for marine litter management**

SAS member countries lack marketing and economic tools and techniques for effective management of marine litter at production and consumption level. Private sector production, trade and consumption and businesses have never been involved for the marine litter management under market mechanism. Most of the developed countries are heavily using marketing and economic instruments to reduce plastics thereby reducing the marine litter. However, in the SAS region very few marketing and economic instruments are used to manage the plastics and marine litter. Reason may be the market failure in these countries or distorted market system that fails to properly reflect the marginal cost of the beach and marine pollution.

Under the market mechanism, direct tax can be introduced to the polluter as international environment law allows imposing laws for the polluter pay the price systems. Except few marketing instruments, most of SAS countries have not introduced any marketing instruments such as high tax for untreated landfilling which may incentivize recycling, recovery and reducing the risk of waste reaching the marine environment. Introduction of product tax for plastics bags, packaging, deposit refund schemes, direct investment in infrastructure such as rubbish bins and secure waste collections from beaches and high fees and fines for littering are the marketing and economic instruments that need to be introduced into the SAS member countries.

## 05. Way forward

In view of the information provided in the country action plans coupled with consultative workshops, the literature review and analysis of the gaps and challenges, the way forward of the marine litter action plan for the SAS region is given below:

### 5.1 Establishment and Revamping of the Institutional structure/system

**Objective 3.1.1 Ensure that all SAS member countries have dedicated institutions for sustainable management of marine litter**

**Action-i: SAS member countries shall;**

- 01) Review strengths and weaknesses of the existing institutional structure and improve their capacity for marine litter management.
- 02) Establish dedicated marine litter institution in countries lacking such institutions.

**Action-ii: SAS member countries shall;**

- 01) Review the existing marine litter policies, plans and strategies.
- 02) Develop marine litter policies, plans and strategies.
- 03) Enhance interagency cooperation among the relevant institutions for effective management of the marine litter.

**Action-iii: SAS member countries shall**

- 01) Review the annual or periodic marine litter management programme and plans
- 02) Develop periodic marine litter management programme and plans

**Action-iv: SAS member countries shall**

- 01) Review existing guidelines for governing the marine litter management
- 02) Formulate and implement guidelines for governing the marine litter management
- 03) Streamline coordination and information exchange among various agencies to identify interagency roles and responsibilities in relations to the marine litter management activities

### 5.2 Establishment of new Legal frame work

**Objective 3.2.1 Ensure that all SAS member countries have legal framework in place for sustainable management of marine litter**

**Action-i: SAS member countries shall;**

- 01) Review the existing legal framework including their strengths and weakness for effective governance of the marine litter
- 02) Develop dedicated laws or Act to minimize the legal dispute for sustainable management of marine litter

**Action-ii: SAS member countries shall;**

- 01) Review the existing rules and regulation relating to marine litter
- 02) Develop rules and regulations for effective governance of marine litter
- 03) Develop guidelines for governance of marine litter
- 04) Prepare enforcement program for the governance of marine litter.
- 05) Undertake regular monitoring and evaluation of the marine litter management systems.



### **5.3 Review and Establish Regional Institutional Mechanism for enforcement of the marine litter related MEAS**

#### **Objective 3.3.1 Review the existing institutional mechanism for enforcement of the marine litter related MEAs**

##### **Actions-i: SAS member countries shall:**

- 01) Review the existing MEAs enforcement mechanism and identify gaps for improvement.
- 02) Align national and sub-national laws and regulations to the existing marine litter related MEAs.
- 03) Identify and establish institutional mechanism for the enforcement of marine related MEAs

#### **Objective 3.3.2 Improve coordination within and among agencies for effective enforcement of marine litter related MEAs**

##### **Actions-i: SAS member countries shall:**

- 01) Review existing coordination mechanism for enforcement of marine litter related MEAs.
- 02) Improve the coordination mechanism to facilitate enforcement of marine litter related MEAs.
- 03) Develop a mechanism to Monitor and report the progress on marine litter MEAs to the secretariats of the respective MEAs.

### **5.4 Review and encourage direct development activities to control and minimize marine litter**

#### **Objective 3.4.1 Develop programs and plan for management of waste to reduce the marine litter at source.**

##### **Action i: SAS member countries shall;**

- 01) Review the existing source reduction activities such as recycling, reuse, reduce, structures availability waste to energy, reception facilities, sanitary waste disposal facilities etc.
- 02) Encourage direct development structure and tools at the river mouths at points of entry into the sea.
- 03) Prepare plans to implement identified source reduction activities for short term, medium and long term interventions.

#### **Objective 3.4.2 Develop a programs and plan for Product modification and improvement to reduce marine litter**

##### **Action ii: SAS member countries shall;**

- 01) Review all existing plastics and polythene Production modification and improvement possibilities (e.g. through eco design)
- 02) Prepare plans to implement plastics and polythene production modification and improvement program.
- 03) Encourage public private partnership for product modification activities
- 04) Encourage waste segregation at primary, secondary and tertiary levels.
- 05) Promote and develop recycling enterprise for increased marine litter recycling on decentralized scale.

## **5.5 Lack of Research, surveys and innovation of Marine Litter technologies**

**Objective 3.5.1 Research and innovation shall be undertaken to determine the total quantity of marine litter coming into the coastal areas through all sources and to prepare guidelines for best management of marine litter.**

**Actions-i: SAS member countries shall:**

- 01) Start research studies to review the amount of solid waste generation of all segments of the country and estimate by kind total quantity of marine litter that they have managed.
- 02) Develop and regularly update marine litter data base
- 03) Involve local bodies for preparation of solid waste management plan and programme by all local authorities and relevant other private and public agencies to effectively manage the marine litter on sustainable basis.
- 04) Identify various recycling and removal tools and techniques, and activities for sustainable management of marine litter
- 05) Assess the quantity of marine litter recycled and removed as percentage of the total production.

**Actions-ii: SAS member countries shall:**

- 01) Introduce training and techniques for marine litter data collection on scientific basis.
- 02) Identify marine litter hotspots and focus its management on priority basis.

## **5.6 Encourage and involve Private sector, Public sector and Civil Society through partnership arrangement for marine litter management and recycling.**

**Objective 3.6.1 Involve and encourage Private sector, Public sector and Civil Society involvement for marine litter management through partnership**

**Actions-i: SAS member countries shall:**

- 01) Review the existing public-private sectors and civil society partnership arrangements for marine litter management.
- 02) Identify private sector, public sector and civil society stakeholders involved in the marine litter management.
- 03) Encourage and identify private sector, public sector and civil society partnership arrangement.
- 04) Review and assess the existing marine litter recycling activities, and propose and develop measure to increase the recycling and management capacity under market mechanism.
- 05) Assist local authorities in identifying landfill/recycling sites in environmentally less vulnerable locations outside the coastal areas.
- 06) Assist local authorities to relocate dumping sites out of the coastal areas.

## **5.7 Development of Education and Awareness Program to manage the Marine litter**

**Objective 3.7.1 Prepare country specific education and awareness programme on marine litter management**

**Action-i: SAS member countries shall**

- 01) Review the existing education and awareness programme on Marine litter management
- 02) Prepare need assessment reports for education and awareness Program
- 03) Prepare the education and awareness programme on Marine litter management
- 04) Provide foundation and context for effective public participation in Marine litter management

- 05) Motivate people and organizations to find appropriate solutions to marine litter problems and propose actions
- 06) Encourage people to comply with marine litter management regulations
- 07) Implement programs to encourage local participation in marine litter management

**Objective 3.7.2 Prepare regional education and awareness programme for SAS region**

**Actions-ii: SAS region shall**

- 01) Review the existing marine litter education and awareness programs in the SAS region and assess its strengths and weakness
- 02) Prepare need assessment reports for SAS region education and awareness program
- 03) Develop regional marine litter education and awareness programme
- 04) Assign each country responsibilities to implement regional education and awareness program activities

**5.8 Introduction of market and economic instruments for marine litter management**

**Objective 3.8.1 Introduce new economic and market instruments for influencing consumers to reduce amount of marine litter**

**Action i: SAS member countries shall:**

- 01) Review effectiveness of existing economic and marketing base instruments for managing solid waste and marine litter in the SAS countries
- 02) Introduce some economic instruments such as financial disincentives (penalties, taxes and charges for plastics and polythene) to discourage market behavior that may contribute to reduce the marine litter.
- 03) Introduce financial incentive schemes for polythene and plastics (deposit-refund schemes, subsidies, and direct payments, price differentiation,) to stimulate behavior of customers on polythene and plastics.

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