South Asia Co-operative Environment Programme
(SACEP)
Plastic free Rivers and Seas for South Asia
(P171269)

ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESA)

26 February 2020

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PROJECT INTRODUCTION

i. The South Asia Region is the third largest contributor to plastic waste globally with an estimated doubling by 2050 unless action is taken. The Maldives aside, all of South Asia's coastal nations are among the top twenty most polluting nations ranked by the volume of mismanaged plastic waste, with Sri Lanka ranked among the top six according to published studies.

ii. There is growing global and regional recognition and call to reduce ocean plastic pollution. World leaders, including representatives from SAR within the G7, G20, APEC, IORA, SACEP and the UN, have agreed to reduce plastic waste, and signed agreements supporting greater cooperation across nations.

iii. **The Plastic free Rivers and Seas for South Asia (PRS)** project consists of four main components totaling US$40 million from IDA that will be implemented over a period of five years.

- Component 1: Regional Competitive Block Grants to Reduce Plastic Waste. The objective of this component is to identify, verify and scale up plastic pollution mitigation solutions that would be made available as a regional and global public good. To this end, the project will develop, administer and support a first of its kind SAR regional competitive grants program that would reduce plastic pollution and provide a demonstration effect for SAR nations on what is possible.

- Component 2: Leveraging Private Sector Engagement and Solutions. This component would be supported by design of the regional mechanism (including operations manual) and branded platform; support for annual convenings of public sector policy and decision makers with private sector representatives, including the sharing of PPP solutions from within the region and beyond; support for a research agenda that would identify sticking points in policy and its implementation (i.e., single use plastic bans) and identify workable and effective solutions; informational website, and operational support.

- Component 3: Promoting Educational Partnerships, Awareness, and Behavioral Change. The objective of this proposed component is to promote education, increase awareness and stimulate behavioral change of citizens across SAR. IDA support would forge educational partnerships targeting young people and public awareness campaigns. The rationale for this component is that the plastics waste problem cannot be solved without changing mindsets, particularly society's dependence on single use plastics.

- Component 4: Strengthening Regional Integration and Project Management. The proposed objective of this component would be to support regional coordination, cooperation, institutions and policy development that deliver both short and long-term solutions.

iv. The South Asia Cooperative Environment Programme (SACEP) is the responsible implementing agency for this project. SACEP is an inter-governmental organization established by Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka in 1982 to promote and support protection, management and enhancement of the environment in the region.

v. All SAR countries will benefit from the project by virtue that that IDA proceeds support the implementation of important features of two regional action plans, one specifically prepared to address marine litter, the other one on solid waste more broadly – both that feature plastic waste management and reduction. These plans (with proposed activities) were prepared by SACEP, consulted with all SAR nations and endorsed. The proposed project is designed to ensure that the activities are structured such that SACEP member-states are fully engaged during implementation.

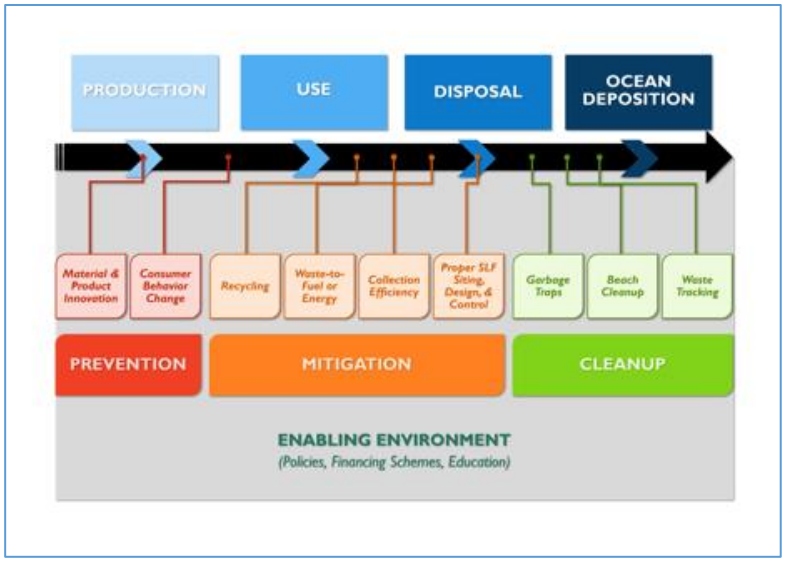
vi. This Environmental and Social Assessment (ESA) is undertaken to assess the environmental and social risks and impacts of the project (**technical assistance** - policy formulation, development of standards, guidelines, capacity building, etc. and **block grants** - innovative 3R technologies; plastics collection methods, etc.). It also provides guidelines to assess the downstream risks and impacts of enabling policies, standards, guidelines, etc. on 3Rs of plastics (reduce, reuse, and recycle). It establishes procedure to assess the environmental and social risks and impacts of different methods of collecting and hauling/transporting plastics to their final destinations of reuse and recycling.

vii. As part of data gathering and preparation of this ESA, an initial stakeholder consultation meeting on Plastic Free Rivers and Seas of South Asia Project was held on 19th January 2020 in Male, Maldives. Various stakeholders including government, private sector, civil society, hoteliers, and NGOs participated the one-day consultation meeting. During this consultation, participants were able to identify possible stakeholder groups, ongoing complementary activities, priority areas, etc. Several plastic recycling facilities and plastic litter collection points in Sri Lanka were also visited as part of the consultation process in the development of this ESA.

viii. Another round of consultations in planned in Sri Lanka and Bangladesh in March 2020 prior to project appraisal where the results of the ESA and the draft ESMF will be presented for comments and further enhancement.

CURRENT APPROACHES IN ADDRESSING PLASTIC POLLUTION

ix. The commonly known hierarchy of plastic waste management follows the order of points of intervention in the pathway of plastics from production to use to wastage until potential deposition in the oceans.



x. **Prevention strategies** include those that aim to reduce plastic waste generation. New or alternative products, new product design and behavior change among consumers would reduce plastic production to only the unavoidable plastic commodities. Further plastic waste reduction can be achieved through packaging reuse, plastic-free packaging or innovative product dispensing system.

xi. **Mitigation strategies** are actions for generated waste. Waste collected and eventually disposed in formal or informal dumpsites may be reduced through recycling recovered materials to new or waste-derived useful products (such as building materials, park benches, roads or pavements) and converting waste to fuel or energy. Meanwhile, uncollected garbage may be reduced through expanding or improving the collection services. The amount of garbage from dumpsites that are transported to oceans may be reduced through better design, control and location of formal or informal dumpsites. Flooding events bring garbage from poorly located dumpsites (e.g., near waterways or flood prone areas) to streams leading to oceans.

xii. **Cleanup** includes activities that target garbage that has escaped collection. Transport of garbage from shores to the sea can be reduced using garbage traps, beach cleanup and waste tracking system. Behavioral change is needed in many of the above strategies. Such behavioral change may be driven by education or re-training campaigns. Some strategies would entail innovations, which would require research and development. For some, like waste-to-energy processes, technology is available but would require large investment.

xiii. All these, i.e., education, technology, and innovation, would require an Enabling Environment, such as in the form of policy and financing scheme, to make them happen. In most of these strategies, government, private sectors, and individual consumers must take their respective roles.

ADDRESSING THE GAPS, NEEDS AND CHALLENGES IN THE SAR

xiv. This project, through TA and grants, can develop several action plans that will specifically address the gaps, needs and challenges initially identified by SACEP for plastic litter management.

Issues	Proposed Recommended Action Plan	TA	Grants
• Lack of marine litter data in the region	• Conduct an inventory/assessment of plastic & plastic waste generation in SAR to prepare proper policies, strategies and plastic waste management plan.	√	
• Poor institutional system in managing marine litter	• Help the SAR member countries to establish dedicated institutions for the sustainable management of marine litter.	√	
• Non-availability of legal framework for marine litter	• Establish the framework by reviewing and developing dedicated laws that will minimize the legal dispute for the sustainable management of marine litter; develop rules and regulation and prepare enforcement programs.	√	
• Poor enforcement of laws and regulations	• Improve coordination within and among agencies for effective enforcement of marine litter related multi-lateral environmental agreement (MEAS).	√	

Issues	Proposed Recommended Action Plan	TA	Grants
• Limited implementation of direct development activities	• Conduct inventory and assessment of existing source reduction activities such as 3R technologies, infrastructure availability of waste to energy, reception/and, collecting facilities and recycling facilities; and sanitary waste disposal facilities.	√	
	• Encourage/solicit proposals for direct development structure and tools at the river mouths at points of entry into the sea.		√
	• Scale-up identified source reduction activities including product modification for short- to medium- term interventions.		√
	• Prepare and implement plans for plastics and polythene production modification and improvement program		√
	• Encourage/develop recycling enterprise for increased marine litter recycling on de-centralized scale.	√	√
• Lack of research and surveys on marine litter	• Research studies to review the amount of solid waste generation of all segments for the country and estimate by kind the total quantity of marine litter that they have managed.	√	
	• Develop and regularly update marine litter database.	√	
	• Encourage/develop recycling enterprise for increased marine litter recycling on de-centralized scale.	√	√
	• Develop various recycling and removal tools and techniques, and activities for sustainable management of marine litter.		√
• Lack of marine litter production and consumption policy and strategies	• Assess the quantity of marine litter recycled and removed as percentage of the total production.	√	
• Lack of IEC and awareness programs	• Prepare country specific education and awareness program on marine litter management.	√	
• Lack of marketing and economic instruments	• Prepare country specific education and awareness program on marine litter management.	√	

POTENTIAL ENVIRONMENTAL & SOCIAL RISKS AND IMPACTS

xv. The proposed project is expected to have largely positive and beneficial impacts for SAR and its oceans. The project's objectives to support the enabling environment, cross-country coordination and capacity building, innovation; and support to the 3Rs is expected to have positive long-term effects in reducing and the dumping of plastic wastes in waterways that end up in coastal areas and oceans. The project will stimulate partnerships among civil society organizations, youth groups and other stakeholders to support national and community-based behavior change and awareness raising; provide

funding for innovative solutions; and support youth-led movements, among other things. It may also support, at the policy level, the strengthening of E&S standards and certification for sustainable plastics supply chains focused on socially and environmentally responsible waste sourcing and recycling through transparent, accountable, and legitimate supply chains addressing labor issues, working conditions, and livelihoods. In addition to, the project may also support strengthening industry standards for recycled plastic products (e.g. plastic roads and furniture products) to grow secondary-reuse markets and attract private sector investments.

xvi. At the concept stage, specific types of innovative technologies and solutions to reduce, reuse and recycle plastics which will be supported are not yet established. The project design, however, will ensure that only investments that focus on these 3Rs that are resource efficient, sustainable and environment-friendly will be supported. Those that are pollutive and resource intensive will be on a negative list and will be ineligible for project financing. That said, environmental risks still exist particularly to the potential subprojects through the block grant, which would relate to residual wastes or those plastics that cannot be reused, recycled and repurposed, which will have to be disposed and managed properly. However, given that the thrust of the project is 3Rs, residual plastic wastes should be minimal. In addition, innovative methods of collecting plastics from the oceans may still have risks and impacts, which will need to be properly screened and/or assessed during project implementation. The environmental risks from subprojects that will be supported through TA are very unlikely as the TA will mostly involve policy review and formulationm institutional building measures and IEC measures.

xvii. On the social side, there will be health risks and impacts to those working in plastics collection and recycling/repurposing due to potential exposure to harmful materials and chemicals during the recycling process, if proper health and safety measures in work places are not implemented and depending on the technology adopted to recycle and repurpose plastics. Resource use patterns will also need to be assessed in these facilities to ensure resources (energy, water and raw materials) are used in an efficient and sustainable manner. The project will include a range of stakeholders across the region: public sector organizations, social enterprises, community groups, and private sector entities. Specific criteria for the management of the challenge grants will need to be prepared and applied to ensure fair access to funding, especially by women's organizations and youth groups. In addition, institutional capacity of the implementing agency, inter-organizational and cross-regional coordination is also weak, and this will be strengthened under the project.

xviii. Based on the overall positive and beneficial impacts of the project, which outweigh whatever residual risks and impacts there may be on the adoption of environment-friendly, sustainable and resource-efficient technologies and practices on 3Rs, the overall Environmental and Social risk classification of the project is assessed to be Moderate. This will be revisited during preparation and during implementation and revised, if necessary, in accordance with an adaptive management approach.

xix. According to the Gender Based Violence (GBV) risk assessment, the project is classified as Low Risk. The GRM will include mechanisms to appropriately handle potential GBV/SEA complaints. Mapping of GBV service providers will be undertaken.

xx. The table below identifies potential environmental and social impacts, issues and risks for current approach on plastic litter management.

Current Approach	Anticipated Environmental and Social Impact, Risks
Prevention	
• Avoidance by new material, new product design (change in production or process) • Reuse	• Potential generation of other waste streams associated with new process or materials (i.e., more water and chemical usage in production of glass bottles than PET); • With the change of process and/or raw material, there may be a need to re-design existing wastewater treatment facilities to address new waste water characteristics or a totally new wastewater system will be needed; • Consequently, with the new process/products used, there might be a need to re-design existing air emission controls or additional treatment facilities may be required; • Workers safety.
Mitigation	
• Recycling technologies (same or new products) • Recovery of plastics • Waste to energy • Better storage, collection and transport • Better thrash trap design installed in waterways • Better design landfills	• Increase in water consumption for cleaning; • Generation of wastewater; • Potential release of micro-plastics and toxic chemicals (i.e., for plastic e-wastes) and fumes; • Generation of solid residues (non-recyclable components) which may need disposal or incineration; • Potential impact of constructing new facilities, and or installation of additional equipment; • Community safety; • Workers safety.
Cleanup	
• Beach and river bank cleanup • Garbage traps • Waste tracking	• Transportation/hauling issues for the recovered wastes; • Need of processing or recycling facilities; • Disposal for recovered plastic which are not recyclables; • Safety of workers/partners/volunteers; • Exposure to sewage-contaminated waste during cleanup.

ENVIRONMENTAL AND SOCIAL RISK MANAGEMENT

xxi. As part of the environmental and social procedures, World Bank classifies all projects into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. In determining the appropriate risk classification, it takes into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment

of the implementing unit to manage the environmental and social risks and impacts in a manner consistent with the ESSs.

xxii. Since the project will involve multiple subprojects that are identified, prepared and implemented during the course of the project, SACEP shall carry out appropriate environmental and social assessments of subprojects and prepare and implement such subprojects.

xxiii. The identified sub-projects will be screened and will be assessed based on the type and scale of the project, its location, and the nature and magnitude of the potential environmental and social impacts. Risk classification is determined by the significance of potential impacts. Both **TA and subprojects funded by the block grants** may be assessed using an environmental and social due diligence (ESDD) to proposed partners/grantees. Summary of potential measures is presented in the succeeding table.

ESS		Managing Risks
ESS1	Assessment & Management of Environmental and Social Impact	• Conduct of Environmental and Social Assessment (ESA) • Preparation of an Environmental and Social Management Framework (ESMF) • Environmental and social screening of subprojects • Application of positive and negative list of subprojects • Preparation of environmental and social diligence (ESDD) for subprojects • Preparation of sub-project specific Environmental and Social Management Plan (ESMP) • Submission of subproject specific Environmental Compliance Monitoring Plan • Corrective Action Plans
ESS2	Labor and Working Conditions	• Preparation of SACEP Labor Management Procedures • Requirement of Occupational and Health and Safety Plan from subprojects/grants • Preparation of GRM for labor related issues. • Codes of Conduct against GBV and SEA for SACEP and contractor (for HQ construction)
ESS3	Resource Efficiency, Pollution Prevention and Management	• Requirement of ESMP for subprojects/grants • Water & energy audits and GHG inventory report during project implementation for block grant recipients
ESS4	Community Health & Safety	• Preparation of Communication Plan, Stakeholders Engagement Plan and ESMP for subprojects

ESS		Managing Risks
		• Codes of Conduct against GBV and SEA for SACEP and block grant recipients
ESS5	Land Acquisition	• E&S screening • Preparation of environmental and social diligence (ESDD) for subprojects
ESS6	Biodiversity Conservation and Sustainable Management of Resources	• E&S Screening • Preparation of environmental and social diligence (ESDD) for subprojects • Preparation of ESMP
ESS10	Stakeholder Engagement and Information Disclosure	• Preparation of Communication Plan, and Stakeholders Engagement Plan for subprojects • Grievance Redress Mechanism

CAPACITY ASSESSMENT FOR PROJECT IMPLEMENTATION

xxiv. The current staff for SACEP will need to be complemented with additional regular staff to implement the project. An Environmental and Social Specialist and a Stakeholder Engagement Specialist will be hired by SACEP to beef up its PIU for the project. SACEP's national focal point in each member country, the Ministry of Environment, will also be mobilized to assist SACEP in the supervision and monitoring of block grants at the country level. In addition to the construction of the Secretariat Building that will be supported by the grant, necessary equipment will have to be procured to that will enhance SACEP as a training and coordinating center for the SAR. Support facilities such as video-conferencing equipment will be needed by SACEP.

xxv. In order to strengthen the capacity of SACEP to implement project including its monitoring several training modules will have to be provided on the following topics: (a) project management; (b) financial management; (c) environmental and social risk monitoring; and (d) monitoring and evaluation. SACEP will need to strengthen its capacity as the project implementing entity to extend sustainability training to its partners (TA and block grant recipients) as the project is implemented.

xxvi. SACEP will be providing trainings to PIU staff and other targeted groups including potential TA and block grant recipients on the following topics:

- stakeholder engagement for PIU staff
- environmental and social screening, ESMF and ESF for PMI, PIU staff and consultants
- standard gender and diversity framework training for all incoming staff and consultants
- sexual harassment policy and child protection policy training for all relevant staff

xxvii. Specific capacity building for stakeholders will be identified in the SEP process and during project implementation. PIU staff and social and environmental specialists may be required capacity building on specific environmental and social assessment, aligned with the project and WB's ESS.

xxviii. The Regional Marine Litter Action Plan for South Asian Seas calls for the involvement of the private sector and civil society through partnership arrangement for marine litter management and recycling. Among the identified activities include:

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

1 PROJECT INTRODUCTION

1.1 Regional, Sectoral and Institutional Contexts

1 While economic growth across the South Asia Region (SAR) accelerates, sustainable management of its environment and natural resource base is critical for sustainable growth. SAR is the fastest growing region in the world, with an average GDP growth rate of 7.2 percent over the past decade. At the same time, being home to over 1.92 billion people (one fourth of the world's population), SAR is not only the most populous, but also the most densely populated geographical region in the world at 299 people per square kilometer. The population growth rate in the region is also accelerating at 1.27 percent per annum in 2016.

2 Strong economic growth, coupled with rapid population growth and increasing population density, has been putting pressure on the region's environment and natural resources (marine and coastal habitats, freshwater sources, forests, fisheries, and wildlife). These ecological systems or natural assets, which are transboundary in nature, backstop economic systems: they provide valuable economic and other benefits and services. Their degradation and overuse, however, jeopardize hard-fought development gains, and affect livelihoods, especially of the poor.

3 Regional cooperation across SAR, particularly on environmental issues affecting all eight nations in the region could generate positive development outcomes. While it is generally recognized that cooperation across countries offer substantial benefits, the political economy of regional cooperation in SAR is complex with a variety of influencers at the national and sub-national levels in each country. Regional Organizations (RO) exist, but they face limitations in development effectiveness. However, while there are dozens of regional organizations established with varying mandates, The South Asia Cooperative Environment Programme (SACEP), a regional organization based in Colombo, Sri Lanka has proved since its inception in the 1980's by all eight SAR nations that it can convene member-states on environmental issues and over the past few years in particular make meaningful progress on waste management more generally, and marine debris and marine plastic pollution more specifically. SACEP, for example, led member-states in the preparation of a Regional Marine Litter Action Plan (2018). This was followed by each SAR nation, with support from SACEP, initiating the preparation of national action plans to reduce marine debris. While a small step to addressing a massive problem, it has been a timely and important one – this work has aided declarations by SAR nations at the G7, G20, APEC and UN to address marine plastic pollution.

4 The menace of plastic waste that pollutes land, flows into river systems and, ultimately into oceans, poses national, regional, and global threats to development**.** The qualities that make plastic useful—lightness, durability, strength, versatility and low production costs—have resulted in fast growing demand, but mismanaged plastic waste has also created a mounting pollution crisis, eroding ecological systems like rivers and oceans. The global production of plastic is currently estimated to be around 300 million tons per year, while plastic pollution in the marine environment alone (including beaches) estimated at 9.5 million tons with 1.5 million tons ending up in the ocean annually. The impact of marine plastic pollution has far-reaching economic, ecological and health impacts, including on planetary health. The annual global damage of plastics to marine ecosystems in particular is estimated at US$13 billion per year.

As a result, marine plastic waste has been acknowledged as one of the main global environmental challenges in recent years and the movement to combat marine plastic litter accelerated in 2019 and is poised to become a feature of many national development plans over this new decade.

5 Greenhouse gas (GHG) emissions and air pollution is linked to the generation of plastics, either through oil extraction and refineries or plastic manufacturing, improper solid waste management practices and measures – particularly from single use plastics and waste packaging materials. After a short first-use cycle, 95 percent of plastic packaging material value, or US$80–120 billion annually, is lost to the global economy; 32 percent of plastic packaging escapes collection systems, generating significant economic costs by reducing the productivity of vital natural systems such as the ocean and clogging urban infrastructure such as drainage and leading to flooding during period of high rainfall. The cost of such after-use externalities for plastic packaging, plus the cost associated with greenhouse gas emissions from its production, is conservatively estimated by independent experts in "The New Plastic Economy: Rethinking the Future of Plastics" at US$40 billion annually – exceeding the plastic packaging industry's profit pool. However, such data and analytics remain largely absent in national decision-making.

6 The South Asia Region is the third largest contributor to plastic waste globally with an estimated doubling by 2050 unless action is taken. The Maldives aside, all South Asia's coastal nations are among the top twenty most polluting nations ranked by the volume of mismanaged plastic waste with Sri Lanka ranked among the top six according to published studies. Modelled estimates of floating micro-plastic (<4.75 mm) and macro-plastic (>4.75 mm) abundance (items per square kilometer) suggest that the Bay of Bengal Large Marine Ecosystem, the ocean system that touches South Asian ocean-facing nations, is in a category of ocean regions with the highest plastic concentration. The Indian Ocean is also host to one of the world's largest plastic gyres due to the flow of plastic from land to sea. While twenty percent of the estimated plastic waste found in the marine environment originate from sea-based activities, plastic waste "leakage" from high mountain states in the upper river watersheds travel via transboundary river systems such as the Indus, Ganga and Brahmaputra and contribute to accumulation downstream and eventually in the region's seas. Following current trends, the amount of mismanaged waste (including plastic) across South Asia is projected to rise from 334 million tons per year in 2016 to 661 million tons by 2050. This will adversely impact the region's ocean ecosystems and sustainable development more broadly. In addition, Pakistan, along with Thailand, Vietnam and the Philippines have become the new destinations for plastic waste exports from developed countries as nations like China and Malaysia stopped the practice, in part due to the vast pollution caused and overall cost imposed, outweighing benefits. Accepting these waste streams from other nations while initially beneficial due to payouts received, have many longer-term negative implications not factored into these transactions and require further examination.

7 India dominates the region in plastic manufacturing and processing capacity, estimated at over 20 million tons per year by 2020. The industry includes 15 large polymer suppliers, about 200 equipment manufacturers, and over 30,000 more specialized micro- small, and medium sized plastic packaging processing units employing 3 million people. India is becoming a key market worldwide for plastics processing and polymer conversion with exports to the United States, UAE, Germany, China and Bangladesh. Other SAR countries have downstream plastics

production primarily by micro-, small, and medium sized plastics processing units. Enterprises producing plastic bottles for water distribution are even found in small non-industrial countries like the Maldives. In 2019, India banned the import of solid plastic waste by amending the Hazardous Waste Rules leaving waste plastic from China, South Korea, United States, Thailand and Japan seeking new nations willing to take their waste.

8 There is growing global and regional recognition and call to reduce ocean plastic pollution. World leaders, including representatives from SAR within the G7, G20, APEC, IORA, SACEP and the UN, have agreed to reduce plastic waste, and signed agreements supporting greater cooperation across nations. The 2018 G7 Summit in Canada concluded with a *G7 Ocean Plastic Charter*; the June 2019 G20 Osaka Summit in Japan concluded with an agreement to establish the *G20 Implementation Framework for Actions on Marine Plastic Litter* to facilitate, through voluntary national actions, the *G20 Action Plan on Marine Litter* launched at the 2017 G20 Hamburg Summit. G20 leaders also announced the *Osaka Blue Ocean Vision*, which aims to eliminate additional marine plastic pollution by 2050. The APEC Summit in June 2018 concluded with its 15 member-states endorsing the preparation of an APEC Marine Debris and Action Plan. The South Asia Cooperative Environment Program's (SACEP) ministerial level Governing Council has endorsed a Regional Marine Litter Action Plan for the South Asia Seas, and all SAR countries will deepen early stage draft country specific action plans.

9 Several South Asian nations are pioneers in single use plastics bans. However, these bans are largely ineffective. According to the UN, about 127 countries (of 192 reviewed) have adopted some form of legislation to regulate single use plastic bags, ranging from outright bans to progressive phase outs to laws that incentivize the use of reusable bags. Over 5 trillion plastic bags are produced per year and take an estimated 1,000 years to decompose. SAR has many such examples. Sikkim introduced a ban on plastic bags as early as 1998, and Bangladesh in 2002 was the first country in the world to introduce a ban or national restriction on single use plastic bags, followed by India (initiated in 2002, starting with New Delhi), Bhutan (2005, renewed with greater enforcement in 2019), Afghanistan and Nepal (2011), Sri Lanka (2011), and Pakistan (2013 municipal level ban). Maldives introduced a ban on single use plastic bags on *Bodufolhudoo* island in 2016, and established a national steering committee in 2019, mandated to advance the phase out of single use plastics by 2020. While such policy instruments have had initial positive response in many countries, due to a lack of enforcement, a failure to regulate plastic through its life cycle, too many exemptions, too few manufacturer limits, an absence of cost-effective alternatives, and growing but fragmented effort on public education and behavior change, these policy initiatives have not yet produced the desired results – a decrease in the use of single use plastics.

10 Despite the challenges, there are many promising initiatives that regional cooperation could help better recognize, share, and replicate to reduce the stock and flow of plastic waste. India leads the region on enactment of Extended Producer Responsibility (EPR) laws starting in 2016, a policy approach where producers must be responsible for the clean-up or recycling of their products. EPR encompasses management of the potential impacts of a product in all stages of production, use, collection, re-use, recycling, reprocessing, and disposal. In the small island state of Maldives, the public, private, and civil society such as youth have joined forces to collect plastics for corporations such as Adidas. Adidas in turn produces apparel branded "Parley for the Oceans" and formally kits out major professional sports teams such as FC Bayern Munich, Real Madrid and Manchester United FC, thereby creating a highly

visible public awareness campaign in addition to helping solve the marine plastic pollution problem. Revenue generated from sales are in part used to fund formal and informal youth environmental education programs via Parley Ocean Schools and further clean-up efforts in Maldives and around the world. There is further scope to extend such plastic clean-up programs linked to commercial value chains across SAR. EPR in India and the work of Parley in Maldives are two of many emerging examples of a circular economy approach, which looks to prevent depletion of finite natural resources from the global economy, and instead better use the natural resources we've already extracted to extend their useful lives. The proposed regional IDA project will support and promote a circular economy approach to plastics for South Asia.

11 Minimizing the use of plastics across company supply chains and better understanding the flow of plastic waste and the full extent of its externalities are key to reducing plastic waste. While supply chain challenges for recycled plastics to meet processing volume requirements and international ESG standards remains a challenge, over 30 companies have joined hands to form the Alliance to End Plastic Waste (AEPW), pledging $1 billion of investment over five years (with a focus on Asia) to help end plastic waste in the environment, particularly the world's oceans. International NGOs such as National Geographic have assembled an independent coalition of scientists who are mapping plastic flows along the Ganges River Basin throughout 2019-2020. At national levels, as lead up to the G20, India announced a National Mission on Plastics and in the Maldives, a historic youth-driven resolution to ban single use plastics was approved by parliament on July 4, 2019. At the grassroots level, entrepreneurs and new social enterprises are emerging with promising business models to help raise living standards of plastic waste "rag picker" workers; deploy low cost waste sorting equipment to process high organic co-mingled waste containing all forms of plastics; and, transform solid plastic waste back to usable and reusable liquid oils, among others.

1.2 Project Development Objective

12 The Project Development Objective is to catalyze actions that reduce the flow of plastic pollution into South Asian Seas. To achieve this, proposed PDO-level objectives include the following:

- Reduction of stock and flow of plastic pollution intercepted and/or recovered;
- Increased investment in 3R and/or AIR;
- Increased consumer demand for circular products;
- Increased access to regional data and analytics for plastic pollution abatement decision making;
- Regional plastic pollution mitigation guidelines incorporated into national standards; and
- Institutional capacities strengthened to undertake single use plastic informed policy bans, EPR and planning.

13 The project targets a long-term goal of eliminating leakage of plastics into the marine environment across the South Asia Region, which can only be achieved beyond the life of the project. The project seeks to catalyze transitions across the region toward a circular economy. This means identifying and reducing negative externalities of select plastic waste streams through adoption of a 3R approach (reuse, reduce, recycle) and the successful AIR approach

of avoid, intercept, redesign adopted by corporations such as Adidas, American Express, etc. Project implementation will focus on catalyzing actions to reduce the flow of plastic pollution into rivers that empty into the marine environment. This will require: (i) well-specified and enabling policies, incentives, education, behavioral change at the producer and consumer levels; (ii) bottom-up, community and citizen-led action in addition to more top-down regional level engagement; and (iii) public and private sector investments to support circular economy transitions.

1.3 Project Components

14 The **Plastic free Rivers and Seas for South Asia (PRS)** project consists of four main components totaling US$40 million from IDA that will be implemented over a period of five years.

1.3.1 Component 1: Regional Competitive Block Grants to Reduce Plastic Waste

15 The objective of this component is to identify, verify and scale plastic pollution mitigation solutions that would be made available as a regional and global public good. To this end, the project will develop, administer and support a first of its kind SAR regional competitive grants program that would reduce plastic pollution and provide a demonstration effect for SAR nations on what is possible. Most public investment across SAR (outside of the policy realm) has focused mainly on funding beach clean-up activities. This is despite a wide range of organized activities and enterprises doing much more to address plastic pollution. With IDA support, the project would establish a regional scheme that identifies and funds transferable, replicable and scalable solutions and innovations that measurably reduces the stock of plastic pollution and its flow into South Asia's rivers and seas. The project would also support an ICT platform that transparently showcases grantees, monitors progress and enables them to share knowledge and know-how across geographies. Grantees that meet specific performance benchmarks would be invited to meet in person and with project convened donor-partners, including the private sector to consider providing additional support to Grantees and/or the scheme itself to scale it up. Over the course of project implementation, donor-partners would be invited to pool their funds into a new vehicle designed with support from IDA to ensure sustainability of this activity and others that support the region transition toward plastic free rivers and seas. The component is supported by three subcomponents:

16 **Sub-component 1.1: Competition:** The objective of this subcomponent is to support the detailed design, management, and administration of the regional competition. The competitive grants platform will identify and scale-up projects, social enterprises and initiatives that reduce the stock and flow of plastic pollution and that without this support would not be possible.

17 The regional competition would seek proposals from social innovators, entrepreneurs, students, designers, businesses, materials makers and change makers or collaboratives – any group of individuals or institutions that have innovative and creative ideas and/or solutions for turning the tide on plastic pollution. The grants, ranging from [$250,000 to $1,000,000] would support both new approaches and the transfer or adaptation of existing and/or proven approaches to new contexts and or geographies. It would also support existing approaches that with grant capital could reduce constraints and thereby unlock and/or stimulate

demonstrable impact and scaled results. It is estimated that approximately 32 grantees from eligible countries would be selected over the duration of the project.

[18] An illustrative positive list and a strict negative list would be developed to ensure alignment with the use of IDA grant proceeds and project development objectives, including compliance with the World Bank's Environment and Social Standards. Grants would target change at local, national and/or regional levels, while being rooted in one of the following areas (non-exhaustive):

- Reducing the consumption of single use plastic products with viable and sustainable alternatives;
- Reducing, recycling, reusing, and/or upcycling existing accumulated plastic waste;
- Changing consumer behaviors, or retail and wider business practices;
- Implementing alternative business models and optimizing supply chains;
- Introducing new materials fit for a circular economy or that offer sustainable alternatives to fossil fuel-based and non-recyclable plastics (i.e. plastic sachets);
- Adopting, customizing and implementing Parley A.I.R. strategy: Avoid (reduce and replace), Intercept (retrieve and recycle) and Redesign (create new materials and new industry standards) successfully rolled out in Maldives with Adidas and other corporates.
- Clean-up, collection and removal of plastic waste from rivers and seas, including before it enters (or reenters) the sea (i.e. beach and river bank clean ups), among other things;
- Design, manufacturing, supply chain and other innovations that serve to reduce plastics utilization and/or enhance plastics recovery, recycling and re-use;
- Design and manufacturing of truly biodegradable substitutes for plastics, including single use plastic sachets;
- Material innovations, including design of recyclable plastic resins that can replace non-recyclable resins in similar products;
- Introduction of plastics waste collection, recycling and re-use programs in municipalities including mechanisms for full cost recovery (i.e. similar to container deposit laws);
- Financial, policy, regulatory or other incentives that minimize loss of fishing nets and optimize their recovery for re-use or recycling;
- Innovative economic, policy, regulatory and other measures/incentives to minimize or eliminate use of unnecessary single use plastic items and ensure better enforcement of such bans.

[19] Special areas of emphasis of particular interest to IDA (with dedicated support provided) include:

- Grant proposals that catalyze action along rivers (including transboundary hot spots) and hot spots at sea, including international waters;
- Grant proposals that explicitly support female-led social enterprises; NGOs and CSOs that working with bottom of the pyramid female waste pickers who would directly benefit from grant proceeds;
- Grant proposals by regional organizations that could accelerate and/or deepen regional cooperation and/or integration.

20 **Sub-component 1.2: Grantee Knowledge Exchange and ICT Platform.** The objective of this sub-component is to support information sharing, knowledge exchange and further scale activities of grant winners with support from partners. The project would do this in two ways, by creating an ICT platform (with website) to showcase grantees, exchange knowledge and to obtain acceleration funding from different sources. The foundation of the knowledge exchange activity would be to create an ICT platform that will showcase winners of the grants, provide a way for winner to interact with another (virtually and face to face) and allow for online monitoring and tracking, in addition to crowding-in additional sources of funding to grantees from external sources. The project would therefore support the design, build and administration of the ICT Platform.

21 **Sub-component 1.3: SACEP Sustainability Fund.** The objective of this sub-component is to create a donor-advised pooled fund to support the SAR region to accelerate toward the region's long-term goal of eliminating "leakage" on plastic into rivers and seas with sources of funding beyond IDA. This component would support SACEP in developing such a fund structure, including its governance, invite potential donor-partners and equip SACEP to manage such a fund, devoted to future regional projects tackling plastics in the rivers and oceans and building on this regional IDA operation.

1.3.2 Component 2: Leveraging Private Sector Engagement and Solutions

22 The proposed objective of this component is to establish a solutions-oriented ***South Asia Regional PPP Mechanism*** to: (i) forge action-oriented collaboration between public and private sector institutions; (ii) serve as a platform for consultation between public and private sector on existing and new national and/or subnational policies that address plastic pollution, waste and leakage across the value chain; (iii) identify and incentivize private sector led solutions; (iv) leverage capital (public and private) and incentivize the deployment of that capital to accelerate solutions; and, (v) facilitate knowledge transfer. IDA would support the design and operationalization of this mechanism, including the participation costs for public officials formulating and enforcing legislation.

23 The rationale for such a component is that the private sector plays a significant role in the production and use of plastics that "leak" into rivers and oceans and therefore must be a core stakeholder in the formulation and implementation of public-sector policy and associated actions. Moreover, consumers are beginning to hold companies accountable, opening them up to collaboration with private foundations and governments, while seeking market-based solutions. However, in order for public and private sectors to convene, dialogue, identify and deploy knowledge and solutions for South Asia, a collaborative and supportive convening mechanism is required that could also serve as a marketplace for exchange of ideas and that brokers solutions. Such platforms have been considered effective by organizations such as the International Finance Corporation (IFC).

24 This component would be supported by the following proposed activities: (2.1) design of the regional mechanism (including, operations manual) and branded platform, (2.2) support for annual convenings of public sector policy and decision makers with private sector representatives, including the sharing of PPP solutions from within the region and beyond; (2.3) support for a research agenda that would identify sticking points in policy and its implementation (i.e. single use plastic bans) and identify workable and effective solutions;

(2.4) informational website, and (2.5) operational support. The regional PPP mechanism would be branded to further accelerate awareness and exemplify regional cooperation in support of plastic free rivers and seas and could adopt a fee for private sector participation (a successful model used in trade shows, convening on other topics, etc.) to ensure the long-term sustainability of such a platform that SACEP would continue to oversee beyond the life of the project.

1.3.3 Component 3: Promoting Educational Partnerships, Awareness, and Behavioral Change

25 The objective of this proposed component is to promote education, increase awareness and stimulate behavioral change of citizens across SAR. IDA support would forge educational partnerships targeting young people and public awareness campaigns. The rationale for this component is that the plastics waste problem cannot be solved without changing mindsets, particularly society's dependence on single use plastics. Public awareness of the issue (and solutions) and large-scale, grass-roots action that gets to the core of consumers' daily life needs and affinity for low-cost plastic and the convenience it affords is a key change element. While localized public awareness campaigns are ad-hoc and temporary, there is also need for more long-term, systematic, and regionally reinforcing communication messaging within a wider regional and inter-connected context. Partnerships are key to accelerate change. This component would therefore support educational partnerships, public awareness campaigns, education, and communications support.

26 **Sub-Component 3.1: Support for Educational Partnerships.** The project would (a) map and forge educational partnerships that would tap region-wide educational content with partners who have presence across the region and distribution channels (TV, radio) with wide reach; (b) map and develop partnerships with partners that have a proven track record of success in particular nations and support their expansion to other suitable geographies. This could include, for example, support collaborative partnership with Discover Channel or National Geographic to reach millions across the region through their platforms and to expand Parley for the Ocean's Ocean School to Sri Lanka.

27 **Sub-Component 3.2: Public Awareness Campaigns, Regional and National**. The project would support (a) the design and roll out of a regional public awareness campaigns using innovative approaches including art, plays and other modalities considered effective to reach various audiences; (b) innovative and targeted grass-roots and national campaigns (radio, TV, youth-led, etc.) to promote awareness of the problem and local solutions.

28 **Sub-Component 3.3: Educational Curriculum Development and Deployment.** The project would support (a) design and deployment of new and/or existing educational materials targeting students; (b) the development of edu-tech games (via hackathons or other suitable youth-focused effort) to mobilize young people to create youth-inspiring content.

29 **Sub-Component 3.4: Communication Support.** The project would support development of communication strategies for SCAEP and all members of its governance and plans of action to enact change within public sector institutions on the use of single use plastics, microplastics, etc.

1.3.4 Component 4: Strengthening Regional Integration and Project Management

30 The proposed objective of this component would be to support regional coordination, cooperation, institutions and policy development that deliver both short and long-term solutions. The project would support the following four subcomponents:

31 **Sub-Component 4.1: Improved Policies**. Global assessments conclude that public policies often fail for reasons ranging from a failure to regulate plastic through its life cycle to an absence of cost-effective alternatives to promote. The project will therefore review existing policies and standards from across the region (and assess why they succeed and fail), identify good practice policies from both within and outside the region, develop a set of recommendations specific to each SAR nation that with revision could improve public policy and standards, identify incentive and fiscal mechanisms to help correct market inefficiencies, overcome poor incentives to recycle plastics or to explore alternatives, and facilitate investments which provide solutions. Harmonization of standards for recycled material in products would also be reviewed to promote greater market aggregation and uptake for more circular products.

32 **Sub-Component 4.2: Better Coordination of Regional Organizations**. There are a few Regional Organizations (with either all or a sub-set of SAR nations as member-states) with complementary mandates that with a mechanism to enable coordination among them and to undertake activities for which each has a comparative advantage, could help accelerate the project in meeting its objectives and assist the region toward plastic free rivers and seas. The project would support the establishment of an ***Inter-Regional Organization Dialogue Committee (IRODC)***. IRODC will be established to facilitate partnership amongst regional organizations (ROs) with existing mandates to assist SAR member-states in mitigating against plastic pollution. It will consist of leadership from ROs with such mandates. While initially the IRODC will consist of SACEP Secretariat and IORA Secretariat leadership (i.e. Director General of SACEP and Secretary General of IORA) as per an MOU between their respective organizations, it is envisaged to expand its membership over time to include other ROs (such as SAARC) and others as needed. The IRODC would enable coordination, data sharing and aggregation, sharing and dissemination of studies and solutions that reduce plastic pollution that flows into rivers and seas. The component would also support member ROs with activities that could accelerate the project in meeting its objectives. Given its mandate to convene at the highest levels of government (Head of State level), whereas SACEP's mandate enables convenings of the Ministers of Environment, the project would provide IORA with support to (a) convene Heads of State and Foreign Affairs Ministers on the topic of plastic pollution, causes, consequences and solutions, (b) undertake a research agenda that specifically reviews and aggregates good practice from outside SAR and brings those findings to SAR, and (c) build its capacity in this regard.

33 **Sub-Component 4.3: Regional Data Collection and Monitoring.** Uniform collection, analysis and interpretation of marine plastic pollution data is necessary at both the regional and national levels to inform policy. Currently no such standard methodology exists, nor is data being collected, analyzed, interpreted and shared to support better decision-making. The project will support the design, development and operationalization of a regional database. This database would enable SAR nations to collect basic data across the plastic supply chain using a standard template and have it analyzed with support from the project

using a standard methodology, also development by the project. It would offer uniformity of collection, interpretation and comparison for all SAR nations and be made available to all SACEP member-states. The rationale for this activity is that data on the quantities, trends, sources and sinks of marine litter across SAR is not collected and therefore not available; very little is known about the extent and nature of the plastic pollution problem in the region, outside some macro-level studies. Moreover, the potential physical and chemical impact of plastic pollution on marine life is scare, although global institutions are beginning to collect it from research institutions. Overall, SAR nations face 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. Accurate data is essential for large-scale and long-term monitoring across SAR.

34 **Sub-Component 4.4: Project Management Office at SACEP.** A first of its kind regional project with SACEP, a first-time recipient of IDA and previously unfamiliar with the rules and regulations governing IDA resources, requires a special approach to project management. The optimum arrangement balances a need for efficiency and skills to work with a wide network of partners with care to limit the project management capacity burden on the regional institution to functions like coordination, convening, and monitoring and evaluation that need to be stronger for the longer term and will require strengthening SACEP as an institution. To address capacity constraints within SACEP, the project will invest in building SACEP's capacity to strengthen SACEP as an institution for the medium term across all core functions, and, ensure it can effectively manage an IDA operation of this size. This includes dedicated support to upgrade systems to ensure transparent and effective fiduciary management, procurement, budgeting, accounting, and reporting. The project will also significantly invest in developing a best of class Project Implementing Unit (PIU). The PIU is envisaged to be led by a highly competent Director, a well-known (globally and regionally recognized) thought leader and manager, who would be supported by dedicated technical and support staff across all key functions in a separate floor of SACEP's new headquarters.

1.4 Project Beneficiaries

35 **Countries.** All SAR countries will benefit from the project by virtue that that IDA proceeds support the implementation of important features of two regional action plans, one specifically prepared to address marine litter, the other one on solid waste more broadly – both that feature plastic waste management and reduction. These plans (with proposed activities) were prepared by SACEP, consulted with all SAR nations and endorsed. The proposed project is designed to ensure that the activities are structured such that SACEP member-states are fully engaged during implementation.

36 **Organizations.** Organizations (social enterprises, NGOs/CSOs, MSMEs, Universities) across SAR will directly benefit from the project as recipients of competitive grants (Component 1).

37 **SAR People.** The project seeks to catalyze actions that will reduce the stock and flow of plastic pollution that finds its way into rivers and seas across South Asia. Plastics, including micro-plastics when left as waste in the environment, impact humans – polluting the food web and due to chemical toxins, human health – and the natural environment and ecosystems, killing off important species for the health of oceans and the wealth of nations, and harming

biodiversity. Thus, the project will reduce the level of threat to people, because of improvements in the environment from a reduction of plastic pollution over time.

38 **Disadvantaged and Vulnerable Groups.** Moreover, since the selection criteria calls for a proportion of benefits from IDA proceeds to be explicitly accrued to women and the poor, these two groups of critical importance to the Bank's mission will benefit. Other disadvantaged and vulnerable individuals/groups such as children, low income families including waste pickers and slum dwellers near dumpsites, landfills, and waste collection points who are currently involved in the plastic waste chain will be identified and included in the project development plans.

1.5 Objectives of the Environmental and Social Assessment

39 An Environmental and Social Assessment (ESA) will be undertaken to:

- Provide procedure to screen project activities (**technical assistance** - policy formulation, development of standards, guidelines, capacity building, etc.; **block grants** - innovative 3R technologies; plastics collection methods, etc.) for environmental and social risks;
- Provide guidelines to assess the downstream risks and impacts of enabling policies, standards, guidelines, etc. on 3Rs of plastics (reduce, reuse, and recycle);
- Establish procedure to screen available and proposed 3R technologies and assess their environmental and social risks and impacts with the intention of screening out and putting in the negative list non-environment-friendly and unsustainable technologies;
- Establish procedure to assess the environmental and social risks and impacts of different methods of collecting, and hauling/transporting plastics to their final destinations of reuse and recycling;
- Assess the risks and impacts (both positive and negative) of the aforementioned technologies and activities on identified disadvantaged or vulnerable individuals or groups in the sub-regions and/or countries considered likely for inclusion in the project;
- Assist SACEP to carry out Gender Based Violence (GBV) risk assessment focused on activities that will involve civil works and ensure implementation of measures to address GBV and sexual exploitation and abuse (SEA) risks and impacts that may arise during project implementation;
- Assess the E&S staffing and capacity of SACEP to screen activities and implement the ESMF and propose measures to address staffing and capacity gaps;
- Develop an ESMF for the project that includes the negative list of 3R technologies and plastics collection system; screening process of eligible 3R technologies, generic measures to manage E&S risks and impacts of eligible 3R technologies (including in relation to disadvantaged or vulnerable individuals or groups), and E&S staffing and capacity building for SACEP; and,
- Consult with and engage key stakeholders as identified in the stakeholder mapping exercise that will input into the separate Stakeholder Engagement Plan (SEP) for the project.

40 As part of data gathering and the preparation of this ESA, an initial stakeholder consultation meeting on Plastic Free Rivers and Seas of South Asia Project was held on 19th January 2020 in Male, Maldives. Various stakeholders including government, private sector, civil society, hoteliers, and NGOs participated the one-day consultation meeting. During this consultation, participants were able to identify possible stakeholder groups, ongoing complementary activities, priority areas, etc. Several plastic recycling facilities and plastic litter collection points in Sri Lanka were also visited as part of the consultation process in the development of this ESA.

41 Another round of consultations in planned in Sri Lanka and Bangladesh in March 2020 prior to project appraisal where the results of the ESA and the draft ESMF will be presented for comments and further enhancement.

1.6 Implementing Agency

42 The South Asia Cooperative Environment Programme (SACEP) is proposed as the responsible implementing agency for this project. SACEP is an inter-governmental organization established by Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka in 1982 to promote and support protection, management and enhancement of the environment in the region. SACEP's core program and project activities include waste management, incuding plastics and climate change adptation. In addition, SACEP serves as the secretariat of the South Asian Seas Programme (SASP), one of 18 such United Nations sponsored Environment Programs. SASP administers the Action Plan for the Protection and Management of the Marine and Coastal Environment of the South Asian Seas Region which includes, as one of its four key focus areas, the environmental effects of land-based activities. In 2007 SACEP adopted the Framework on Marine Litter Management in SAS Region and is the only regional organization, based in the region, that is actively engaged with issues relating to waste management and plastic debris. SASP specifically covers the seas relevant to South Asia and this proposed regional project.

43 The regional project would strengthen SACEP to administer relevant project activities via the following insutitonal structure, which includes a Minisiterial Level Governing Council, Consultative Committee, National Focal Points, Subject Area Focal Points, and a Colombo-based Secretatiat. **The Governing Council** is the principal review and deliberative body of SACEP and is responsible for determining its policies and programs. It consists of one representative from each member state who will be of Ministerial portfolio and as per Articles of Association, should meet annually. **The Consultative Committee** is responsible for facilitating the implementation of policies, strategies and programs approved by the GC and provides guidance to the Secretariat in its activities. It consists of representatives of diplomatic missions of the member states residing in Colombo. **The Secretariat,** based in Colombo, consists of a Director General that rotates between member-states and professional, administrative and support staff. SACEP Secretariat would host the Project Implementation Unit (PIU) for the project.

44 **Roles and Responsibilities.** At the regional level, SACEP as the PIU will play an important technical coordination role among member-states, provide technical input into terms of references and other activities that would then put out to bid (major regional studies, public awareness campaigns, competitive 3R grants, regional convenings on plastic policy,

knowledge transfer, etc) and provide technical oversight to these project activities. SACEP would undertake discrete activities for which it has a mandate. SACEP will also ensure that the ESF will be implemented and that all TAs and block grants will be consistent with the WB ESS and will meet appropriate WBG Environmental Health and Safety Guidelines (EHSGs).

45 **National Focal Points** have been designated by each member state from their environment ministries which function as the main communication link between the Secretariat and the respective member-state. For this project, the NFPs are expected to implement and monitor national-level programs which will be initiated by this project in cooperation with the Secretariat. These programs and activities, which will include several TAs and call for block grants that will be participated by several organizations within SAR member countries, will be promoted, monitored, assessed and reported by the NFPs. The NFPs shall also ensure that all TAs and block grant recipients will comply and adhere to national environmental and social policies and regulations. SACEP may seek assistance of the NFPs in approving and monitoring specific environmental and social management plans (ESMPs).

46 **Local Recipients.** Grantees of the block grants will implement specific activities and projects approved by SACEP and will be responsible in reporting the status of project implmentation including status of environmental and social management compliance to SACEP. Grantees and recipients of TAs will be oriented with the project's environmental and social requirements including WB's ESS, the ESF, and existing regional and national environmental and social commitments and regulations. It is the grantees' and TA implementers' responsibility to implement, monitor and report compliance with the agreed and approved ESMPs.

2 SAR COUNTRY ENVIRONMENTAL PROFILES

2.1 Regional Urban Development[1]

47 South Asia, which covers about 3.5% of world's land surface and 12% of the Asian continent includes eight countries: **Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka**. It provides home to about 1.9 billion people or more than 23% of the world's population and predicts to have 2.4 billion people in 2050. South Asia's urban population also grew by 130 million people in the period of 2001 - 2011 and is poised to rise by almost 250 million by 2030. The growth benefits associated with urbanization also increased and the countries made some progress in achieving greater prosperity, with the increase in productivity linked to the growing number of people living in the region's towns and cities. It has six of the world's megacities—Bangalore, Delhi, Dhaka, Karachi, Kolkata, and Mumbai—with more on the way as populations grow in Ahmedabad, Chennai, Hyderabad, and Lahore.

48 Average GDP per capita in the region also grew by almost 56% during 2010–2018, with average annual growth of more than 6%. At the same time, the human development indicators have also made substantial progress in the past two decades. South Asia was the fastest growing region of achieving the human development index (HDI) values over 1997-2017, at 45.3%, a headed of the East Asia and the Pacific at 41.8% and Sub Saharan Africa at 34.9%.

49 The Organization for Economic Co-operation and Development (OECD) countries, by contrast, grew 14% in the same period. The trends hold promise for reducing gaps in human development and absolute poverty declined from one in two people living on less than $1.25, a day in 1999 to less than one in three in 2010. In addition, universal access to safely managed drinking water services has also improved and this figure is almost 90% in South Asian countries, except Afghanistan (78%). The proportion of urban population living in informal settlements or slum areas has also declined. India, Bangladesh, and Nepal have done extremely well in reducing the share of their urban population living in slums by 17%, 22%, and 10% respectively during the period of 2000 and 2014. Urbanization thus presents South Asian countries with an opportunity to transform their economies and join the ranks of richer countries in both prosperity and livability.

50 Despite above benefits, economic growth and rapid urbanization have also triggered decline natural resources and led to unprecedented levels of air, water and land pollution threatening public health and placing future stress on natural capitals. Air quality is usually measured by the levels of particulate matter equal to 2.5 microns in diameter or less (PM2.5). The maximum level set by the World Health Organization (WHO) is 10 micrograms per cubic meter (μg/m^3) as a standard for the average annual PM2.5. The concentration level in all countries in South Asia exceed the WHO's thresholds and Bangladesh has the highest average annual mean concentration level of 88.8 μg/m^3.

51 In addition, consumption and production are fundamental to economic activities, but when unmanaged can contribute to depletion of natural capital. SDG 12 motivates achieving

[1] *Taken from "A Roadmap for Sustainable Waste Management and Resources Circulation in South Asia, 2019-2030" Annex 29: GC 15. SACEP.*

sustainable consumption and production through minimal extraction of natural resources, reduction in the use of toxic materials, and reliance on production processes that result in less waste and fewer pollutants. In South Asia, Maldives have the highest domestic material consumption per person at 11.6 tons of materials per capita. Other countries are also have witnessed the double of domestic material consumption per capita during the period of 2000 and 2015.

52 However, the most visible implication of rapidly urbanizing South Asia is the increasing generation of municipal solid waste. South Asia generates approximately 334 million tons of waste in 2016 at an average of 0.52 kg per person. About 174 million tons (57%) of waste in South Asia is organic with high moisture content. Due to a lack of effective policy and regulations, technical, financial, and human resources, many countries in South Asia are facing tremendous challenges to provide adequate waste management services. Average waste collection coverage in South Asian countries is about 51%, although the service coverage varies considerably by county to country and city-to-city. Rural areas and small cities have lower waste collection coverage and low-income or squatter settlements are often lack waste collection services as these communities fall outside of the official service areas. Uncollected waste burned openly either in the streets or end up in rivers, creeks, marshy areas, and empty lands thereby posing serious threat to public health. Open dumping is the most common method for the final disposal of municipal solid waste in South Asia without proper pollution control methods such as leachate collection and treatment, landfill gas collection and even liners to prevent public health and environmental risks. However, remediation of dumpsites and construction of sanitary landfills are taking place and well-functioning facilities are operating in some countries by either private sector or officials.

53 Most countries and cities in South Asia commonly practice composting and biogas to manage the organic waste, which is the largest portion in the waste composition. Small-scale composting and biogas plants have however shown some success than bigger-scale plants. A large-scale and centralized plants are faced some technical and operational challenges because of high investment and operating costs, poor quality of inputs as a result of lack of waste separation, and lack of effective marketing mechanisms. A potential of advanced treatment technologies such as waste to energy (WtE) incineration, mechanical biological treatment (MBT), Refuse Derived Fuel (RDF) has gained interest among countries, but substantial results have yet to be proven.

54 In South Asia, there are some initiatives to establish 3Rs (reduce, reuse, and recycle) and sustainable consumption and production (SCP) policies, rules, and regulations at national and local levels. However, the promotion of 3Rs in the domestic policies are given overemphasize on recycling and processing, less focus on waste prevention and reduction at the beginning. Most of these 3R policies are still needed to translate into practice and accountability structures are needed to set in place for proper monitoring and reporting. Strengthening legal enforcement, technical and institutional capacities to the regulators and operators are common priorities in all countries and cities. Lack of public awareness and participation is another challenge for effective implementation of the 3Rs policies. Thus, environmental education from schools to public become important.

55 Informal waste collection, material recovery and recycling activities are popular in South Asia. Collection of recyclable materials are happened at several stages such as households (during

a door-to-door collection), transfer stations and disposal sites. Many material recovery facilities are functioned simply as temporary storage centers and manual handling. Recovered recyclable materials are entering into the chain of dealers or manufacturing enterprises. The cooperation and coordination among different stakeholders including national and local governments, service users, non-governmental organizations (NGOs), community-based organizations (CBOs), private sector (formal and informal), academic and research institutes, regional agencies and donor agencies is required to increase sustainability of the waste management system and sharing of financial responsibilities. In South Asia, woman play an important role in waste management and many CBOs and NGOs provide support to informal sector to organize themselves.

56 In addition to the increase in municipal solid waste, managing complex and emerging waste streams, including plastic and marine litter, food waste, e-waste, medical waste and construction and demolition waste (C&D) are also growing issues in need of attention. Across many countries in South Asia, **about 80 to 90% of plastic waste is inadequately disposed of, and therefore pose the risk of polluting land, rivers, and oceans**.

2.2 Environmental Profiles[2]

2.2.1 Afghanistan

57 Afghanistan is a semi-arid and landlocked mountainous country buffered by the Hindu Kush mountain ranges. The country is the 41st largest in the world in size and lies at the intersection of three of the world's biogeographic realms: the Palearctic, Indomalayan, and Afrotropic bioregions. Natural resources and associated biological diversity provide the livelihood basis for up to 80% of the Afghan population. Biodiversity resources in Afghanistan comprise an estimated 3,500 to 4,000 native species of vascular plants, 428 to 515 bird species, 137 to 150 mammal species, 101 to 139 fish species, 92 to 112 reptile species, and 6 to 8 amphibian species (UNEP 2009).

58 Rangelands of Afghanistan occupy about 30 million hectares, representing roughly 45% of the country's territory. However large areas which are considered "barren land" or "waste land" are also used for grazing, particularly in winter. The total grazeable area is therefore much larger, estimated at 70 to 85% of the total land area, providing habitat and forage for nearly 35 million livestock as well as numerous wild animals.

[2] http://www.sacep.org/

59 Afghanistan is an agrarian country, with up to 80% of the population involved in farming or herding, or both, however agricultural production is limited by very high dependence on water from melting snow and ice and rainfall.

60 Almost all of the country's known oil and natural gas reserves are in the northern part of the country, located in parts of two geologic basins – gas in the Amu Darya Basin to the west, and oil in the Afghan-Tajik Basin to the east. Afghanistan has reasonably good quality coal reserves (estimated at 400 million tonnes), most of which are located in the northern part of the country in the region between Herat and Badakshan.

2.2.2 Bangladesh

61 Bangladesh is surrounded by India in the West, North and Northeast and by Myanmar on the Southeast with the Bay of Bengal in the South providing a gateway to the oceans of the world. It enjoys the sub-tropical monsoon climate regime characterized by high temperatures, heavy rainfall, and excessive humidity with marked seasonal variations.

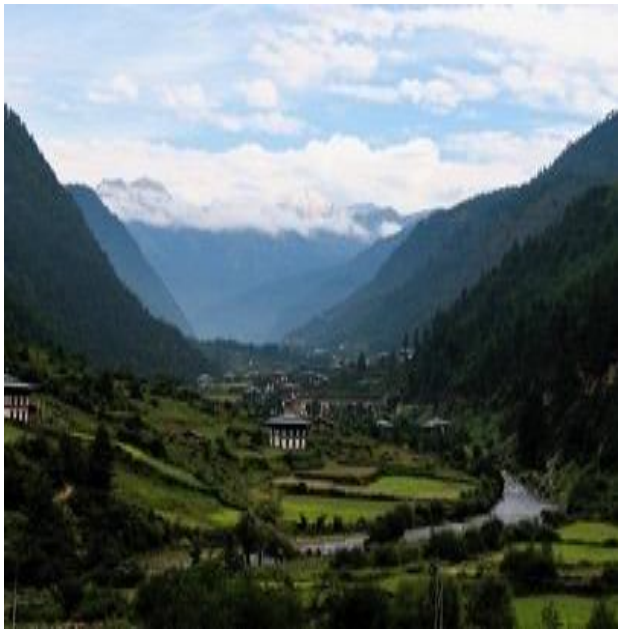
62 The Country is endowed with a unique natural resource base. About 80% of the country consists of floodplains and wetlands with over 300 rivers in the riverine network that sustains rare wildlife, flora, and fauna. There are diverse ecological systems in the country ranging from the unique mangrove forests of the Sundarbans in the Southwest to coastal and marine ecosystems in the deep South; dee p natural water basins called "haors" and "baors" in the Northeast which remain inundated for half of the year and has a unique but changing ecology; arid area in the upper mid-section to hill tracts in the Southeast and flat sandy or marshy riverine deltas in the middle down to South.

63 The country has more than 700 kms of coastline in the South along the Bay of Bengal with a population of over 35 million who are most vulnerable to cyclones, tidal surges, and salinity ingress. Coastal Estuaries and wetlands are rich in fisheries and other biodiversity resources.

64 Bangladesh has limited natural forest cover, at about 10% of land area, down from 20% in the 1960s, and almost all of that area is now seriously degraded, as a result of extreme population pressure for fuel wood and other forest products. Major Forest types found in the country are Tropical Green forests, Semi evergreen forest, Deciduous Forests, Mangroves forests and homestead forests.

65 The country supports good floral and faunal biodiversity which includes 4,061 species of vascular plants, 653 species of fishes, 34 species of amphibians, 154 species of reptiles,650 species of birds,121 species of mammals. Among them are some of the internationally significance species such as Asian Elephant, Royal Bengal Tiger, Gharial (Crocodile), Gigantic Dolphin, Black Bengal Goat, and different species of sea turtles.

2.2.3 Bhutan



66 The Kingdom of Bhutan is a small, land-locked mountainous nation in South Asia, located in the eastern Himalaya Mountains north of India and south of China with more than half the urban population concentrated in just two towns – Thimphu and Phuentsholing. Thimphu alone has more than 40% of the total urban population while Phuentsholing has more than 10%.

67 Bhutan is a predominantly agrarian society with 69% of the population living in rural areas and subsisting on an integrated livelihood system of crop agriculture, livestock rearing and use of a wide range of forest products. High precipitation, extensive forest cover and well-preserved watersheds have endowed the country with abundant hydropower resources. The country's economy is basically driven by renewable natural resources sector, hydropower production, tourism, and industrial development.

68 Forest is by far the most dominant land cover, with 72.5% of the country under forest cover, one of the highest in the world. The country's terrain is mostly mountainous with extreme variation in elevation (97m to 7,553m) with few fertile valleys and savannah. The fauna of Bhutan is also very diverse with more than 160 mammal species reported. Grey langurs, macaques, tigers, leopards, goral, serow, black bear, fox, deer, and many other species live in the temperate zone. The high-altitude fauna is mostly paleoarctic in origin and includes takin, blue sheep, red panda, snow leopard, brown bear, wolf, steppe cat, and Tibetan antelope.

69 Storms and frequent landslides during the rainy season are the two main natural hazards faced by Bhutan, hence the name meaning "the Land of the Thunder Dragon".

2.2.4 India

70 India is the seventh largest country in the world. Bounded by the Great Himalaya in the North, it stretches southwards and at the Tropic of Cancer, tapers off into the Indian Ocean between the Bay of Bengal in the East and the Arabian Sea in the West. The country accounts for 2.42% of the world's total land area and sustains 16% of the world population.

71 The climate of India is dominated by the Asiatic monsoon, most importantly by rains from the south-west between June and October, and drier winds from the north between December and February. From March to May the climate is dry and hot.

72 The northern most point of the Indian mainland lies in the state of Jammu and Kashmir and the southernmost point is Kanyakumari in Tamilnadu. From its northernmost point to the southern tip, India stretches 3,200 kilometers (2,000 miles) and has 26 states.

73 The mainland comprises of four regions:

- THE GREAT NORTHERN MOUNTAINS. They include the mountains and plateaus of northern Kashmir, the Himalayas proper and the hills of Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, and Meghalaya.
- THE GREAT NORTHERN PLAINS. This plain extends from west to east, between Himalayas in the north and Great Indian Plateau in the south. The plain extends from the arid and semi-arid areas of Rajasthan in the west to Brahmaputra valley in the east. This plain is very fertile, and a very sizeable part of the Indian population lives in innumerable villages and several big cities in this region.

- THE GREAT INDIAN PLATEAU. The Great Indian Plateau lies to the South of the Great Northern Plains. This is the largest physiographic division of our country. It covers an area of about 16 lakh square km, i.e., about half of the total area of the country. It is an old rocky plateau region. The topography consists of a series of plateaus and hill ranges interspersed with river valleys.
- COASTAL PLAINS. The Great Plateau of India is surrounded by plains on all sides. In the north lies the Great Northern Plain and in south, along the east and west lie the Coastal Plains. (a) East Coastal Plain extends along the coast of the Bay of Bengal from Ganga Delta in the north to Kanyakumari in the south. (b) West Coastal Plain extends along the Arabian Sea from the Rann of Kutchch in the north to Kanyakumari in the south. Except for the Gujarat plain, the western coastal plains are narrower than the eastern coastal plain. The total length of the coastline, including the mainland, Lakshadweep Islands, and the Andaman and Nicobar Islands is 7, 517 km.

74 There are two small groups of islands. One of these situated in the Bay of Bengal, off the coast of Myanmar is known as the Andaman and Nicobar Islands. The other is known as Lakshadweep and situated in Arabian Sea, off the coast of Kerala.

75 Biodiversity. India has about 91,000 species of animals and 45,500 species of plants, that have been documented in its ten bio-geographic regions. Of these 12.6% of mammals, 4.5% of birds, 45.8% of reptiles, 55.8% of amphibians and 33% of Indian plants are endemic, being found nowhere else in the world. The country also contained many threatened species. These include 53 species of mammal, 69 birds, 23 reptiles, and 3 amphibians. The country has three of 34 “global biodiversity hotspots” – unique, biologically rich areas which are facing severe conservation threats.

76 Wetlands. India has a rich variety of wetland habitats. The total area of wetlands (excluding rivers) in India is 58,286,000ha, or 18.4% of the country, 70% of which comprises areas under paddy cultivation. A total of 1,193 wetlands, covering an area of about 3,904,543 has. Two sites – Chilka Lake (Orissa) and Keoladeo National Park (Bharatpur) – have been designated under the Convention of Wetlands of International Importance (Ramsar Convention) as being especially significant waterfowl habitats.

77 Marine Environment. India's coast is 7,517 km (4,671 miles) long; of this distance, 5,423 km (3,370 miles) belongs to peninsular India, and 2,094 km (1,301 miles) to the Andaman, Nicobar, and Lakshadweep Islands. The mainland coast consists of the following: 43% sandy beaches, 11% rocky coast including cliffs, and 46% mud flats or marshy coast. Notable coastal features of India comprise the marshy Rann of Kutch in the West and the alluvial Sundarbans Delta in the East, which India shares with Bangladesh. India has two archipelagos – the Lakshadweep, coral atolls beyond India's South-Western coast, and the Andaman and Nicobar Islands, a volcanic island chain in the Andaman Sea. The nearshore coastal waters of India are extremely rich fishing grounds. There are five species of marine turtle occur in Indian waters: Green turtle (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Olive Ridley (*Lepidochelys olivacea*), Hawksbill (*Eretmochelys imbricate*), and Leatherback (*Dermochelys coriacea*).

78 The rivers. The rivers of India can be classified into four groups: the Himalayan rivers, the Deccan rivers, the coastal rivers, and rivers of the inland drainage basin.

2.2.5 Maldives

79 Maldives is one of the lowest lying countries in the world. The average height of the islands does not exceed 1.7m above mean sea level. It is a group of low-lying coral islands situated in the Indian Ocean. It consists of 1192 islands on 26 natural atolls spreading across an area of roughly 107,500 sq. km. For administrative purposes the atolls have been divided into 20 atolls, and recently the Government has clustered atolls into seven provinces.

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80 The temperature of Maldives ranges between 24°C (75°F) and 33°C (91°F) throughout the year. Although the humidity is relatively high, the constant cool sea breezes keep the air moving and the heat mitigated.

81 The coastal and marine ecosystems of the Maldives, particularly the coral reef ecosystems, are globally significant. They form the seventh largest reef system in the world and the coral reefs of Maldives represent as much as 3.14% of the world's reef area. In the 26 natural atolls of the Maldives there are 2,041 distinct coral reefs. The total number of coral species recorded from the Maldives to date is about 200, representing over 60 genera, 5 species of turtles, 51

species of echinoderms, 5 species of sea grasses and 285 species of alga & sponges, crustaceans, and tunicates.

82 The reef ecosystem of the Maldives has internationally threatened populations of hawksbill and green Turtles and is reported to be one of the most important feeding areas for hawksbill turtles in the Indian Ocean. The atolls of the Maldives are also home to globally significant populations of whale shark (*Rhincodon typus*), manta rays (*Manta birostris*), reef sharks, and more than 20 species of whales and dolphins. Other globally significant coral reef species include the Napoleon wrasse (*Cheilinus undulatus*), giant grouper (*Epinephelus lanceolatus*), giant clam (*Tridacna squamosa*), and black coral (*Antipatharia*).

83 Freshwater resources are scarce in the Maldives. There are no rivers or streams in the islands. Some of the larger islands have small freshwater lakes, some contain swampy depressions, and some have brackish water ponds with mangroves along the edges. The main source of freshwater in the islands is the groundwater aquifer.

84 Mangroves grow on about 150 of the islands of the Maldives. In these islands, mangroves are found in enclosed or semi-enclosed brackish water (kulhi) or in muddy areas without standing water (chas bin). The mangrove vegetation in both habitats is known locally as faa. The largest and richest mangrove stands occur on the northernmost atolls, and there is some cultivation and management, particularly of Bruguiera – Kandoo (*Bruguiera cylindrica*), bodavaki (*Bruguiera gymnorrhiza*), ran'doo (*Rhizophora mucronata*), kulhlhavah (*Sonneratia caseolaris*), burevi (*Lumnitzera racemosa*), karamana (*Ceriops tagal*), and thela (*Excoecaria agallocha*).

85 The islands of the Maldives are not known for their abundant wildlife. The only native mammals, endemic to the country are the two subspecies of fruit bats: *Pteropus giganteus ariel* and *Pteropus hypomelanus maris*.

86 Over 167 bird species have been recorded in the Maldives including seabirds, shorebirds, and terrestrial birds. Maldives was particularly rich in spider species. Some 130 insect species including scorpions, centipedes, rhinoceros beetle and paper wasps were identified in the country. In addition, four species of bumblebees are also reported from there.

2.2.6 Nepal

87 Nepal is a landlocked multiethnic, multilingual, multi-religious country. It is situated north of India in the Himalayas, in the region where, about 40 to 50 million years ago, the Indian subcontinent has crashed into Asia. Nepal is bordered by the Tibet, an Autonomous Region of China, to the north and India in the east, south and west. The country is rectangular in shape, approximately 885 km long boarded by Mechi River in east and Mahakali River in west and roughly 200 km tall north to south.

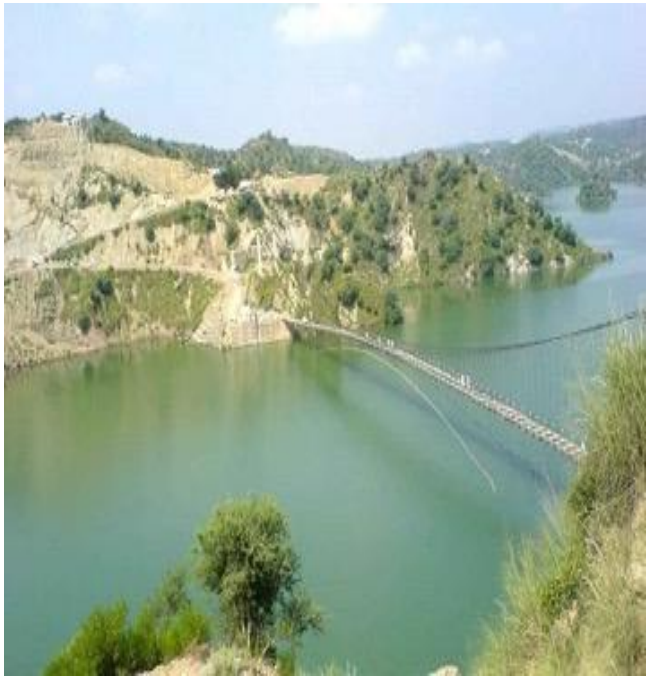
88 Nepal can be divided broadly into three ecological zones: the lowland, the midland, and the highland. The altitude of the Himalayan Region (the highland) ranges between 4,877 to 8,848 meters. It includes 8 of the 14 highest summits in the world, which exceed altitude of 8,000 meters including Mount Everest. The mountain region accounts for about 64% of total land area whereas the lowland Terai, the flat river plain of the Ganges with a belt of marshy grasslands, savannas, and forests, occupies about 17% of the total land area of the country.

89 The country has diverse climatic conditions. It is generally cold in the mountainous region, mild weather in the hills, and warm in the plains and has an average rainfall of 1,500 - 2,500mm. A total of 118 ecosystems have been identified in Nepal, including 112 forest ecosystems, four cultivation ecosystems, one water body ecosystem and one glacier/snow/rock ecosystem. These ecosystems range from the tall grasslands, marshlands, and tropical and sub-tropical broadleaf forests along the Tarai and Siwalik Hills to the sub-tropical and tropical broadleaf and conifer forests in the Middle Mountains.

90 Nepalese wetlands have very significant ecological significance, as they provide habitat for many threatened and endemic species of flora and fauna and serve as resting places for many migratory and globally threatened birds. They are known to support more than 20,000 waterfowls during peak migratory periods between Decembers to February.

91 The country occupies about 0.1% of global area, but harbors 3.2% and 1.1% of the world's known flora and fauna, respectively. Diversity of birds, bryophytes, mammals, and butterflies is especially high. A total of 284 species of flowering plants, 160 animal species, species of bird, and 14 species of herpeto-fauna are reportedly endemic to Nepal.

2.2.7 Pakistan



92 Pakistan is a land of some of the oldest civilization's in the world. It is the sixth largest nation of the world in terms of population size with an estimated 37% of its population living in cities. It is also the most urbanized country in South Asia.

93 The country is bordered by Iran on the west, Afghanistan on the northwest, China on the northeast, India on the east, and the Arabian Sea on the south. Pakistan lies in the temperate zone. The climate is generally arid, characterized by hot summers and cool or cold winters, and wide variations between extremes of temperature at given locations. There is little rainfall. The country experiences four seasons: a cool, dry winter from December through February; a hot, dry spring from March through May; the summer rainy

season, or southwest monsoon period, from June through September; and the retreating monsoon period of October and November. The onset and duration of these seasons vary somewhat according to location.

94 Pakistan can be divided into six major natural topographical areas.

- The northern Mountains and North Western Mountains
- The Western Mountains
- The Balochistan Plateau
- Potwar Plateau and Salt Range
- The Indus River plain,
- Desert Areas.

95 The northern highlands include parts of the Hindu Kush, the Karakoram Range, and the Himalayas. This area includes such famous peaks as Mount Godwin Austen at (8,611 meters) the second highest peak in the world, and Nanga Parbat (8,126 meters), the twelfth highest.

96 South of the northern highlands and west of the Indus River plain are the Safed Koh Range along the Afghanistan border and the Sulaiman Range and Kirthar Range, which define the western extent of the province of Sindh and reach almost to the southern coast. The lower reaches are far more arid than those in the north, and they branch into ranges that run generally to the southwest across the province Balochistan. North-south valleys in Balochistan and Sindh have restricted the migration of peoples along the Makran Coast on the Arabian Sea east toward the plains.

97 Pakistan's river system consists of more than 60 small and large rivers. Indus River, with an overall length of around 3200 KM and total estimated annual flow of 207 billion cubic meters, is Pakistan's longest and largest river. After originating in the highlands of Kailas Mountains of Tibetan Plateau, it runs from north to south through the entire length of the Pakistan and after collecting waters from all other Pakistani Rivers it finally unloads into the Arabian Sea near Karachi. Other famous rivers flowing through Pakistan includes Jhelum River, Chenab River, Ravi River, Sutlej River, and Kabul River etc. All of Pakistan's major rivers originate in northern highlands of Himalaya, Karakoram and Hindukush mountain ranges and pour one by one into each other and finally into Indus River creating the Indus River Basin, which covers an area of more than 0.6 sq. km.

98 Pakistan has over 5,700 species of flowering plants reported in the Flora of Pakistan (Nasir and Ali, 1970) with around 400 endemic species and 4 endemic genera (Douepia, Suleimania, Spiroseris, and Wendelboa). The country has around 6000 species of wild plants (Stewart 1972) out of which about 400-600 are considered medicinally important.

99 The mountainous areas embracing the Himalayan, Karakorum and Hindukush Ranges are rich in fauna and flora, as compared to other parts of the country. These areas provide an excellent habitat for wildlife in the form of alpine grazing land, sub-alpine scrub, and temperate forests. These habitats support a variety of wild animals. Some of the main wildlife species are the snow leopard, the black and the brown bears, otter, wolf, lynx, Himalayan ibex, Markhor, Bharal, Marco Polo's sheep, Shapu, musk deer, marmots, tragopan and monal pheasants. Birds of prey like the peregrine, cherrug or saker falcons, tawny eagle, imperial

and greater spotted eagles, osprey, shikra, and the black-winged kite occur throughout Pakistan, but their population statuses are unknown.

100 Along the shores, there are four species of marine turtles: the ridley, green, leatherback and hawksbill turtle, which are of high economic importance. Due to loss of habitat and human disturbances, their population is also decreasing. About eight species of freshwater turtles are found in Pakistan. Sand lizards, monitors, geckos, agamas, diamond snakes, sand snakes, vipers, cobras, kraits, and the famous Indian python constitute the other reptilian fauna.

101 Large water bodies in the country support a variety of waterfowl both resident and migratory. The wetlands are one of the most important wintering areas and "green routes" of Asia. The important waterfowl in Pakistan are the ducks (mallard, pintail, shoveler, pochard, gargeny, ruddy shellduck, teals, tufted and gadwall), geese (grey lag, bar-headed), coots, flamingoes, pelicans, spoon bills, storks, ibises, plovers, curlews, sand pipers, snipes, and herons.

102 About 179 species and sub-species of freshwater fish are reported to exist in Pakistan (15 exotics), including representatives from important groups such as loaches, carps, and catfish (including air-breathing catfish).

2.2.8 Sri Lanka

103 The Democratic Socialist Republic of Sri Lanka is an island in the Indian Ocean, which lies off the south-eastern tip of the Indian Subcontinent. The island's strategic location in the Indian Ocean, intersecting with the major air and sea routes between Europe and the Far East, gives it a strategic advantage as a global logistics hub.

104 The country has a maximum length of 432 km (Devundara to Point Peduru) and maximum breadth 224 km (Colombo – Sangamankanda). Sri Lanka with its tear-dropped shape is dominated by the astonishingly varied features of topography, making it one of the most scenic places in the world. The country has three zones which can be divided by its distinguished elevation: the central highland, the plains, and the coastal belt.

105 The coastal belt surrounding the island, consists of scenic sandy beaches and lagoons. Best beaches line along the southern coast, southwestern coast, and eastern coast. In the northeast and the southwest, the coasts cut across the stratification of crystalline rocks, cliffs, bays, and offshore islands, creating one of the world's best natural harbors.

106 Rivers in Sri Lanka originates in the central highlands, near Adam's Peak and flow through the gorges, broad valley, and plains and finally empty in the sea near Trincomalee, creating

the different landscapes of escarpments, waterfalls, and deep gorges. Most of the rivers are short and frequently interrupted by the discontinuities of terrain. The longest river of Sri Lanka is the Mahaweli Ganga with its length of 335 kilometers.

107 The average yearly temperature in Sri Lanka as a whole ranges from 28 to 32°C. The mean temperature varies from a chilly low of 16ºC in Nuwara – Eliya in the Central Highlands, where even frosting might occur for several days in the winter, to a high of 32oC in Trincomalee on the northeast coast. The coastal areas are cooled by sea breezes.

108 Rainfall in Sri Lanka has multiple origins. Monsoonal, convectional, and expressional rain accounts for a major share of the annual rainfall. The mean annual rainfall varies from under 900mm in the driest parts (southeastern and northwestern) to over 5,000mm in the wettest parts (western slopes of the central highlands).

109 The main forest types in the country are the lowland, sub-montane and montane tropical rainforests of the wet zone; moist monsoon forests of the intermediate zone; and the dry zone monsoon forests, tropical thorn forests and dry riverine forests in the dry zone.

110 Sri Lanka's biodiversity is considered the richest per unit area in the Asian region with regard to mammals, reptiles, amphibians, fish and flowering plants. The country has 677 extant species of indigenous vertebrate, and a further 262 species of migrant birds. Endemism among vertebrates is about 43%, with highest endemism among amphibians, freshwater fishes, and reptiles. Similarly, the island is home to over 3000 angiosperms, of which a quarter comprises endemic species.

111 Coral reefs are among Sri Lanka's most valuable shallow water marine ecosystems. Three types of distinctly different reefs comprising coral, sandstone, and rocky reefs have been identified around the island, occurring separately, or mixed together. Fringing coral reefs are found along 2% of the coastline. The most extensive coral reefs in Sri Lankan waters are the patchy coral reefs in the northwestern coastal and offshore waters, occurring within the Gulf of Mannar and west of the Kalpitiya Peninsula. Together these reefs support around 72 reef fishes, some of which are important in the ornamental as well as the food fishery.

112 Further, Sri Lanka's coastal waters have extensive sea grass beds that often occur in association with coral reef ecosystems or within estuaries and lagoons (CCD, 2004). Around 12 species of seagrasses have been recorded in Sri Lankan waters.

113 Sri Lanka's coastline has many picturesque and economically important estuaries and lagoons. These complex systems contain a diversity of species and a variety of coastal habitats including, mangroves, salt marshes, seagrass beds and mud flats. Overall, there are 45 estuaries, of which 28 are of the riverine type that discharge directly to the sea, and 17 are of the basin type.

3 PLASTIC POLLUTION IN THE SOUTH ASIA REGION

3.1 Plastics Overview

3.1.1 Types, sources, and uses of plastics

114 Large-scale production of plastics began in the 1950s. Production increased rapidly responding to an increasing demand for manufactured goods and packaging to contain or protect foods and goods. This was accompanied by an increasing diversification of types and applications of synthetic polymer.

115 The term 'plastic', as commonly applied, refers to a group of synthetic polymers. There are two main classes: thermoplastic and thermoset. Thermoplastic has been shortened to 'plastic and, in lay terms, has come to be the most common use of the term. In engineering, soil mechanics, materials science and geology, plasticity refers to the property of a material able to deform without fracturing. Thermoplastic is capable of being repeatedly molded, or deformed plastically, when heated. Common examples include polyethylene (PE, high and low density), polyethylene terephthalate (PET), polypropylene (PP), polyvinyl chloride (PVC) and polystyrene (PS, including expanded EPS). Thermoset plastic material, once formed, cannot be re-molded by melting. Common examples include polyurethane (PUR) and epoxy resins or coatings. Plastics are commonly manufactured from fossil fuels, but biomass (e.g. maize, plant oils) is increasingly being used. Once the polymer is synthesized, the material properties will be the same whatever the type of raw material used.

116 It's not mandatory to mark plastic in a way that indicates what polymer it is. However, to aid recycling, the British Plastic Federation (BPF) recommends that larger parts and packaging should be marked with an appropriate identification code. The BPF recommends the use of a coding system devised by the Plastics Industry Association as shown in **Table 1**. Molded plastics items should be marked in accordance with ISO 11469:2016 where possible.

Table 1: Types of plastic

Symbol	Acronym	Name	Typical usage and application
	PET	Polyethylene Terephthalate	Water bottles, soft and fizzy drink bottles, pots, tubs, oven ready trays, jam jars
	HDPE	High-Density Polyethylene	Chemical drums, jerricans, carboys, toys, picnic ware, household and kitchenware, cable insulation, carrier bags, food wrapping material.
	PVC	Polyvinyl Chloride	Window frames, drainage pipe, water service pipe, medical devices, blood storage bags, cable and wire insulation, resilient flooring, roofing membranes, stationery, automotive interiors and seat coverings, fashion and footwear, packaging, cling film, credit cards, synthetic leather and other coated fabrics.

Symbol	Acronym	Name	Typical usage and application
	LDPE	Low Density Polyethylene	Squeeze bottles, toys, carrier bags, high frequency insulation, chemical tank linings, heavy duty sacks, general packaging, gas and water pipes.
	PP	Polypropylene	Buckets, crates, toys, medical components, washing machine drums, bottle caps, and battery cases.
	PS	Polystyrene	Toys and novelties, rigid packaging, refrigerator trays and boxes, cosmetic packs and costume jewelry.
	Other	Other types of plastics	

117 About 311 million tons of plastic were produced globally in 2014 (Plastics-Europe 2015). Many different types of plastic are produced globally, but the market is dominated by four main classes of plastics: PE (73 million tons in 2010), PET (53 million tons), PP (50 million tons) and PVC (35 million tons). There are also appreciable quantities of PS (including expanded EPS) and PUR produced. In addition to the main polymer classes, there has been a proliferation of new polymers and co-polymers to meet new expectations and markets, mostly driven by new combinations of existing monomers. Four regions dominate production: China, Asia (excluding China), Europe and North America. If current production and use trends continue unabated then production is estimated to increase to nearly 2,000 million tons by 2050.

118 Plastics have gradually replaced more traditional materials due to their many advantages. One of the principal properties sought of many plastics is durability. This allows plastics to be used for many applications that formerly relied on stone, metal, concrete, or timber. There are significant advantages, for food preservation, medical product efficacy, electrical safety, improved thermal insulation and lower fuel consumption in aircraft and automobiles.

3.1.2 Micro-plastics

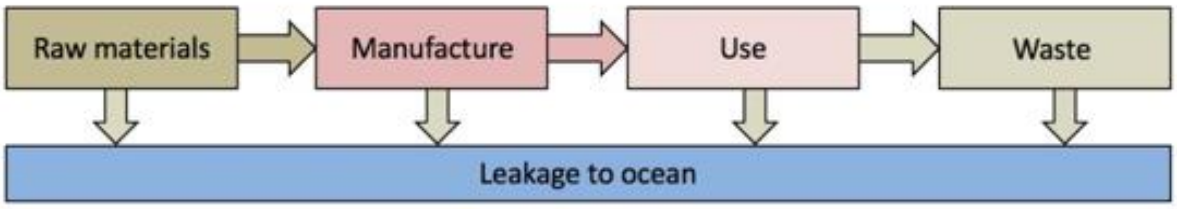
119 Micro-plastics have been defined as particles of plastic < 5 mm in diameter (GESAMP 2015). Primary micro-plastics are particles that have been manufactured to a particular size to carry out a range of specific functions. They are used extensively in industry and manufacturing, for example: as abrasives in air/water-blasting to clean the surfaces of buildings and ships' hulls; as powders for injection molding; and, more recently, for 3D printing. They are also used in so-called personal care and cosmetic products (PCCPs), often to improve the cleaning function or impart color, and are sometimes referred to as microbeads. PCCPs containing micro-plastics/microbeads include toothpaste, cosmetics, cleansing agents and skin exfoliators (Napper et al. 2015).

120 An additional important category of primary micro-plastics comprises plastic resin beads. These are spherical or cylindrical, a few mm in diameter, and are the form 'raw' plastics are produced in, for transport to production facilities for further processing.

3.1.3 Generating plastic waste

121 About 32% of plastic packaging escapes collection (Dame Ellen MacArthur Foundation 2017), clogs urban drainage, and ultimately reaches the oceans (refer to **Figure 1**). Ocean Conservancy (2015) estimates that at least 80% of ocean plastic debris comes from land-based sources. In 2010, 4.8 to 12.7 million tons of mismanaged plastic wastes end up in oceans (Jambeck et al., 2015). In 'business-as-usual scenario, i.e., no improvement in solid waste management in coastal countries, in 2025, plastics brought to the sea will be 99 to 250 million MT per year.

Figure 1: Linear approach to plastics production and use



Simplified representation of a linear approach to plastics production and use, indicating potential leakage points to the ocean (original by P. J. Kershaw).

122 Higher value recyclable plastics are better recovered for economic reasons. Large amounts of single-use low value plastics are not recovered through garbage scavengers and are brought to dumpsites or uncontrolled landfills, littered, illegally dumped by haulers, or directly disposed in water streams and shores (Ocean Conservancy 2015; Jambeck et al., 2015).

123 The main sources of plastic debris in oceans are:

- Municipal solid waste: packaging, single-use plastics
- Aquaculture and deep-sea fishing
- Marine transportation sector

124 Plastic debris in marine environment are found in various size range as shown in **Table 2**.

Table 2: Size categories of marine plastic litter

Diameter	Source	Examples
MICRO (≤5 mm)	Primary and secondary micro-plastics	Primary: industrial (e.g., air/water blasting to clean building surfaces) and domestic products (e.g., microbeads-containing personal care products; Secondary: textile, fibers, tyre dust
MESO (5–20 mm)	Fragmentation of larger plastic items	Bottle caps, fragments
MACRO (>20 mm)	Lost items from maritime activities or from rivers	Plastic bags, food and other packaging, fishing floats, buoys, balloons

Diameter	Source	Examples
MEGA (>100 mm)	Abandoned gear, catastrophic events	Abandoned fishing nets and traps, rope, boat hulls, plastic films from agriculture
Sources: Barnes et al., 2009; GESAMP, 2016 (as cited by Barboza et al., 2019)		

125 Smaller plastic debris, so-called micro-plastics, i.e., less than 5 mm diameter are of two types according to their origin:

- 'Primary' micro-plastics are those manufactured on purpose such as 'microbeads' in cosmetic and personal care products (such as toothpaste, exfoliating scrubs), cleaning agents (air or water blasting of surfaces), and resin pellets for plastic industry use.

- 'Secondary' micro-plastics are the result of weathering and fragmentation of larger plastic objects. These processes are enhanced by exposure to UV irradiation, which are almost absent in deep sea bottoms. Tire-wear dust from land-based transportation and microfibers of textiles are significant sources of secondary micro-plastics in marine environment.

126 As shown in **Figure 2**, land-based sources of macro-plastics (i.e., plastic debris greater than 5 mm in diameter) are construction, household goods, packaging, coastal tourism, and food and drink packaging. Higher abundances of plastics are found in coastal waters, particularly in regions with: high coastal populations, with inadequate waste collection and management; intensive fisheries; and, high levels of coastal tourism. Typhoons, tsunamis and storm surges also bring plastics, even the mega-plastics, from garbage dumpsites into oceans. Sea-based sources are shown in **Figure 3**.

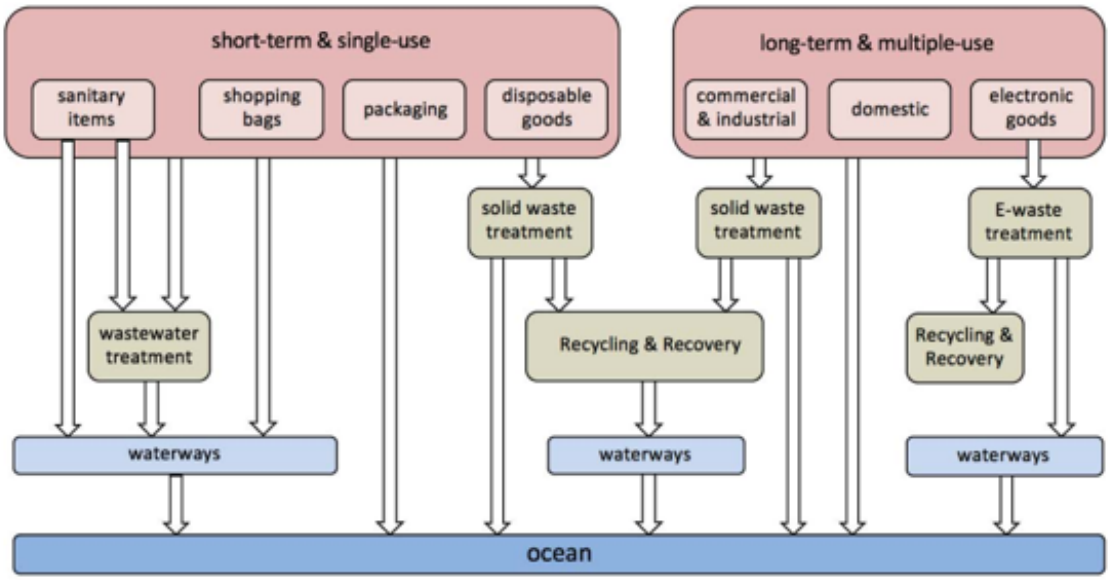
127 Abandoned, lost, or otherwise discarded fishing gear (ALDFG) are most common causes of entanglement of marine animals. They constitute about 10% (640,000 tons) of marine waste (Macfadyen et al. 2009, as cited by Barboza et al., 2019).

128 Jambeck et al. (Science, 2015) calculated the amount of plastic debris that end up in oceans from 192 coastal countries. Per country, the plastic debris brought into the seas are those that are mismanaged, i.e., escaped collection, and was calculated based on the population within 50 km from shore, per capita daily solid waste generation, the percentage of solid waste that is plastic and the percentage of the waste that is mismanaged. Among the top ten sources of plastic debris are eight Asian countries, including China, Indonesia, Philippines, Vietnam, Sri Lanka, Thailand, Malaysia, and Bangladesh.

129 The data used in the calculations showed that in lower-income countries, high population and inadequacy in waste management are major factors that must be addressed in order to significantly reduce marine plastics. A 50% increase in adequate disposal of waste in the top 5 countries will result in 26% reduction in marine plastics in 2025 while 41% if applied to top 20 countries that contribute to plastic waste inputs to ocean.[3]

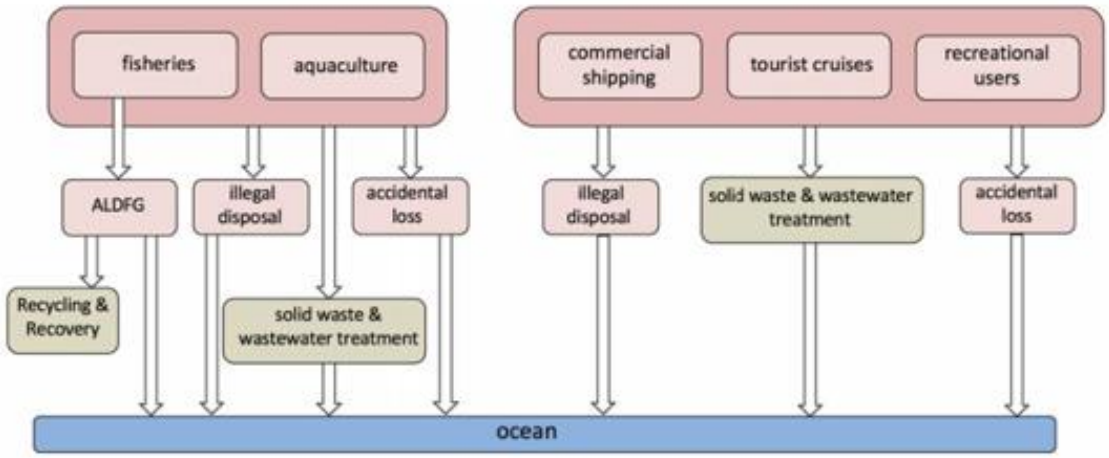
[3] *Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A. & Law, K. L. (2015). Plastic waste inputs from land into the ocean. Science, 347(6223), 768-771.*

Figure 2: Land-based sources of macro-plastics and pathways to the ocean



Land-based sources of macroplastics and pathways to the ocean (original by P. J. Kershaw)

Figure 3: Sea-based sources of macro-plastics and pathways to the ocean



Sea-based sources of macroplastics and pathways to the ocean (original by P. J. Kershaw)

130 The study by Schmidt et al., (2017) confirmed that plastic debris are transported by rivers into the sea. Plastic waste loads to the seas through rivers were calculated based on stream flow and plastic debris calculations. Micro-plastics were found in 98% of the rivers where the study measured the concentration of plastic debris.[4]

131 Plastic debris are scattered in all parts of the ocean. They are present in

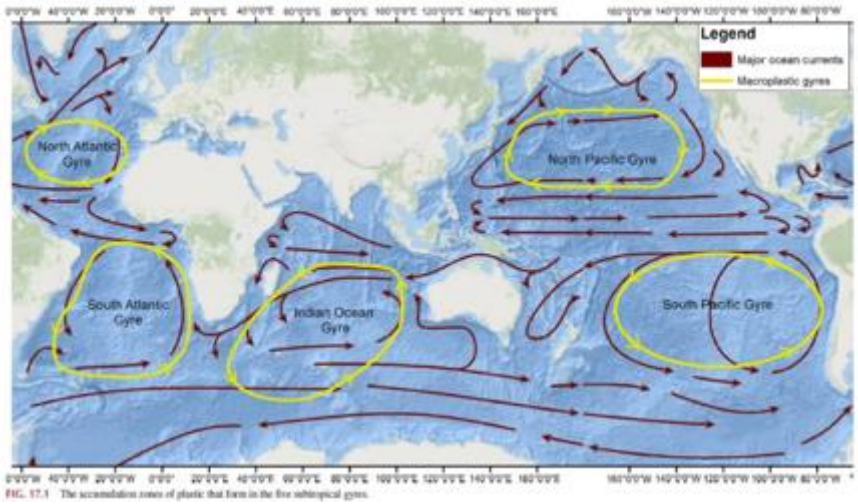
- Shores
- Water surface

[4] *Schmidt, C., Krauth, T., & Wagner, S. (2017). Export of plastic debris by rivers into the sea. Environmental science & technology, 51(21), 12246-12253.*

- Water column
- Bottom sediment or sea floor
- Living organisms in oceans (marine biota)
- Frozen ice in oceans

132 Uncollected or improperly disposed plastics find their way through water streams into the oceans. Trans-boundary movement, through ocean currents, spreads plastics from their source to other parts of the world's oceans, to some garbage patches and even in remote areas hardly having any human activities, such as Arctic and Antarctic. Global wind patterns and the consequent ocean surface currents bring the plastic debris in convergence zones of each of the five large subtropical gyres: North Pacific; South Pacific; North Atlantic; South Atlantic; and Indian Ocean (Cózar et al., 2014 and Eriksen et al., 2014 as cited by Barboza et al., 2019). Among the five gyres, the North Pacific accumulates the largest amount of floating plastics, see **Figure 4**.

Figure 4: The accumulation zones of plastic that form in the five subtropical gyres



133 Plastic debris of higher density compared to seawater sink at the bottom sediment while those of lower density float and spread easily across ocean surfaces. Upon losing their buoyancy, the originally low-density plastics would also sink at the bottom. Lower density plastics that tend to float are rafted to farther places and can bring potentially invasive or disruptive alien species to existing healthy or threatened ecosystems. Plastics at the bottom, where not much UV rays can degrade them, would persist and may have long term effects on the bottom ecosystem. Plastics in the water surface, bottom sediment or water column may fragmentize further forming finer plastic debris that are more easily taken up via ingestion by marine invertebrates and mammals (UNEP 2016, Barboza et al, 2019).

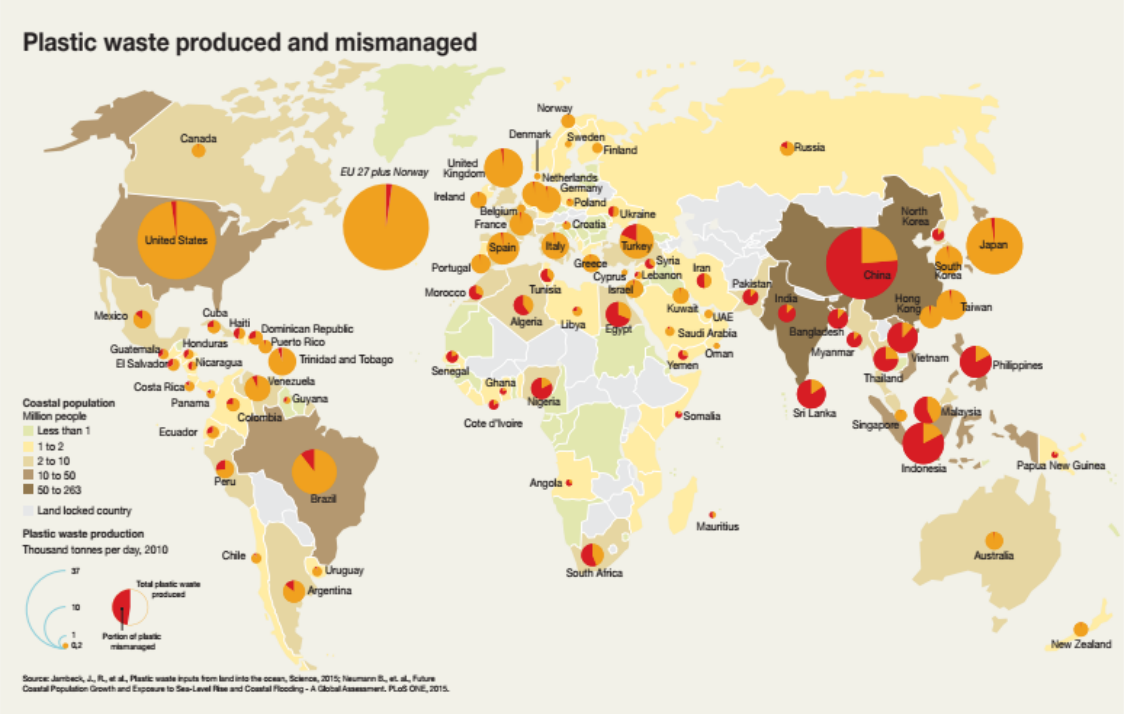
3.2 State of Surface, Coastal, and Marine Plastic Pollution

3.2.1 Brief global scenario

134 The menace of plastic waste that pollutes land, flows into river systems and, ultimately into oceans, poses national, regional, and global threats to development. The qualities that make plastic useful—lightness, durability, strength, versatility, and low production costs—have resulted in fast growing demand, but mismanaged plastic waste has also created a mounting global ocean pollution crisis. The global production of plastic is currently estimated to be

around 300 million tons per year, while plastic pollution in the marine environment alone (including beaches) estimated at 9.5 million tons with 1.5 million tons ending up in the ocean annually (Refer to **Figure 5**). The impact of marine plastic pollution has far-reaching economic, ecological and health impacts. The annual global damage of plastics to marine ecosystems is estimated at US$13 billion per year. As a result, marine plastic waste has been acknowledged as one of the main global environmental challenges in recent years and the movement to combat marine plastic litter has accelerated in 2019.

Figure 5: Plastic waste produced and mismanaged



Plastic waste produced and mismanaged. Taken from Marine Litter Vital Graphics (in preparation)

3.2.2 Regional scenario

135 The South Asia Seas Region includes the seas bordering 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.

136 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.

Plastic Pollution in the South Asia Seas Region[5]

137 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 show 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. Majority of the countries are Asian and four of them Bangladesh, India, Pakistan, and Sri Lanka are located in the SAS region.

138 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.

3.2.3 Country scenario in the South Asian Seas

139 In the South Asian Seas Region, numerous cities and industries with inadequate waste management are situated along major rivers such as the Ganges, Narmada, and Indus. Pollution from distant sources can also enter the marine environment through atmospheric deposition. The tsunami of 26 December 2004, which seriously affected Sri Lanka, India, and Maldives, demonstrated that in addition to land-based sources of pollution induced by human activity, natural events result in substantial but sporadic contributions mainly in the form of sediment and litter. (UNEP 2005b)

140 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% of the country (05). An overview of the marine litter in the South Asian Seas 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.

141 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 program in Bangladesh. The last data about marine litter monitoring in Bangladesh was found in the SACEP/UNEP report in 2007.

[5] *SACEP (2019). Regional Marine Litter Action Plan for South Asian Seas Region. South Asia Co-operative Environment Programme, Colombo.*

142 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.

143 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.

144 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% of the total waste (Waste Management Authority, 2016) (08). And balance 50% is damped or discarded into the nearest environment. As a result of this, large amount of land-based waste enters the coastal and marine environment as marine litter. Based on available data and reports prepared by the country representatives, the status of South Asian Seas countries marine litter is presented in the **Table 3**.

145 As shown, none of the South Asian Seas country has quantity data of marine litter. Therefore, under this situation these countries are not in a position to prepare of proper management plan to reduce the marine litter. However, arbitrary estimation was done for each country of the South Asian Seas region using beach cleaning data and per capita waste generation data.

Table 3: Marine litter status in South Asian Seas

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 quantity not available	Quantity data not available
Maldives	Waste management regulations and island waste management plan with mechanism in place; quantitative data not available so far	Quantitative data specific to marine litter not available; solid waste generation statistics available for some regions
Pakistan	Regional level classification of marine litter available	Quantity data not available

Country	Marine litter status at country level	Marine litter quantity data availability at country level
Sri Lanka	Urban level classification and quantity of solid wastes available; 50% of solid wastes moving to sea as marine litter	Quantity data not available

146 According to the **Table 4**, 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.

Table 4: Estimated Solid Waste Quantity and 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% 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

3.3 Risk and Impacts of Plastic Pollution

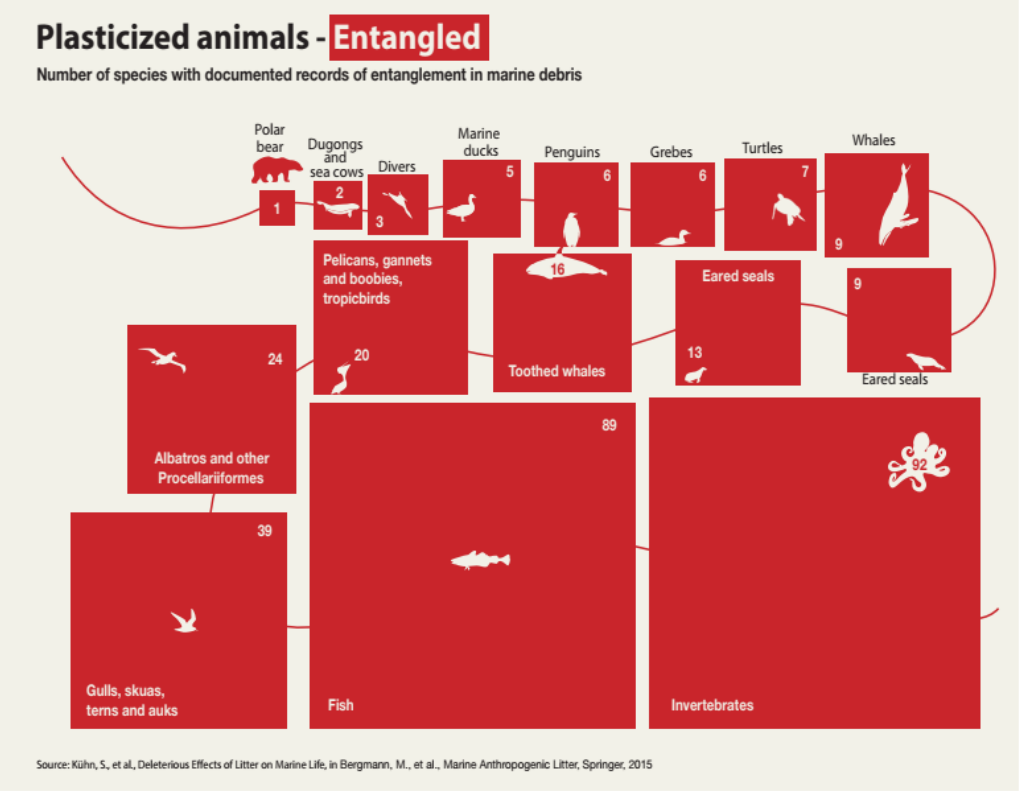
3.3.1 Ecological impacts

147 **Entanglement.** The impact of marine debris on individual animals is most obvious when dealing with entanglement in floating debris, very often but not exclusively related to fishing gear. This is a global problem that affects all higher taxa to differing extents. Incidents of entanglement have been widely reported for a variety of marine mammals, reptiles, birds, and fish (**Figure 6**). In many cases this leads to acute and chronic injury or death (Moore et al. 2006, Allen et al. 2012, Butterworth et al. 2012, Waluda and Staniland 2013, Thevenon et al. 2014). Up to 50% of humpback whales in US waters show scarring from entanglement (Robbins et al. 2007).

148 It is estimated that between 57,000 and 135,000 pinnipeds and baleen whales globally are entangled each year, in addition to the countless fish, seal, birds and turtles, affected by entanglement in ingestion of marine plastic (Annex VI; Butterworth at al 2012). Injury is both a welfare issue and a cause of increased mortality, for example in seals (Allen et al. 2012) and

turtles (Nelms et al. 2015) and may be critical for the success of several endangered species. A comprehensive review of marine litter impacts on migratory species has been published for the Secretariat of the Convention on Migratory Species (CMS 2014a).

Figure 6: Entanglement by species

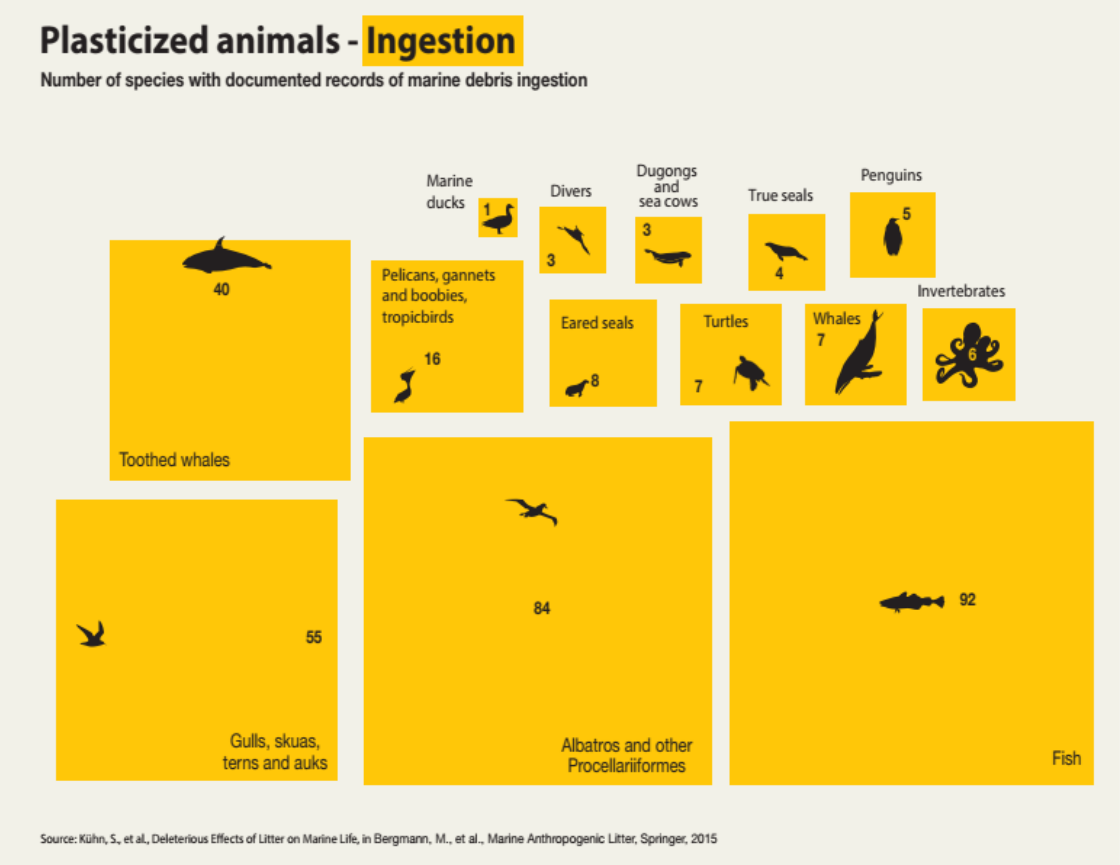


Entanglement by species. Taken from Marine Litter Vital Graphics (in preparation).

149 **Ingestion.** Examples of ingestion have been widely reported for a variety of marine mammals, reptiles, birds, and fish (**Figure 7**). Evidence of ingestion often comes from the dissection of beached carcasses, which represent an unknown proportion of the total number of individuals affected. Turtles and toothed whales frequently are found to have large quantities of plastic sheeting and plastic bags in their gut compartments (e.g. Campani et al. 2013, de Stephanis et al. 2013, Lazar & Gracan, 2011, CMS 2014a). Plastics have been found in the guts of Loggerhead turtles in the Adriatic Sea (Lazar and Gracan 2011) and western Mediterranean (Camedda et al. 2014), the eastern Atlantic around the Azores (Barreiros and Raykov 2014) and in the SW Indian Ocean around Reunion Island (Hoarau et al. 2014).

150 The physiology of some species of turtles and toothed whales makes it extremely difficult for the animal to eliminate the material once ingested. Ingestion of debris has been reported in 46 (56%) of cetacean species with rates as high as 31% in some species (Baulch & Perry, 2014). The differing feeding habits of closely related species can influence their susceptibility. For two species of dolphin off the coast of Brazil, far more specimens of the bottom-feeding *Pontoporia blainvelli* contained plastic than the surface feeding *Sotalia guianensis* in the same area (Di Beneditto and Ramos 2014).

Figure 7: Ingestion of plastics



Ingestion of plastics. Taken from Marine Litter Vital Graphics (in preparation)

151 **Population-level impacts.** While the impact of plastic debris on individuals of many species is beyond doubt, it may be more difficult to assess the impact at a population level. A review commissioned by the Scientific Technical and Advisory Panel (STAP) of the GEF, in collaboration with the Secretariat of the Convention on Biological Diversity (CBD 2012), concluded that 663 species had been reported as having been entangled in or ingested plastic debris, an increase of 40% in the number of species since the previous global estimate (Laist 1997). Plastic debris was responsible for 88% of recorded events; 15% of species affected were on the IUCN Red List. Of particular concern were the critically endangered Hawaiian monk seal (*Monachus schauinslandi*), endangered loggerhead turtle (*Caretta caretta*), vulnerable northern fur seal (*Callorhinus ursinus*), and vulnerable white chinned petrel (*Procellaria aequinoctialis*). Two studies have suggested population level effects for the northern fulmar (*Fulmarus glacialis*) and the commercially important crustacean (*Nephrops norwegicus*) (van Franeker et al. 2011; Murray and Cowie 2011).

152 **Coral reefs damage.** Coral reefs are very susceptible to damage from ALDFG. It is most obvious in shallow tropical reefs, but also occurs in cold water reefs located on many continental margins (Hall-Spencer et al. 2009). The movement of nets and ropes under the influence of winds or tidal currents can cause extensive damage.

153 **Loss of Mangroves.** Studies have shown that marine litter will tend to collect in mangrove forests, and that such habitats may act as a partial sink for plastics (Ivar do Sul et al. 2014).

3.3.2 Economic impacts

154 The degradation of ecosystems due to marine litter can have both direct and indirect socio-economic impacts. For example, marine litter can lead to economic costs in the commercial shipping sector due to damage caused by entanglement or collision with marine litter in general. Loss of cargo can introduce plastic debris into the environment and lead to compensation payments. Other economic costs may be more difficult to quantify, such as the impact litter may have on changing people's behavior.

155 **Fishery Sector.** The impact of marine litter on the fishery sector includes damage to fishing vessels and equipment and contamination of the catch with plastic debris. The direct impact is mostly due to floating plastic debris affecting engine cooling systems and becoming entangled in propellers (McIlgorm et al. 2011, Takehama 1990, Cho 2005). Information on the related costs is not systematically collected by marine authorities, and it can only be estimated. Takehama (1990) estimated the costs of marine litter to fishing vessels based on insurance statistics at US$40 million (Y4.4 billion) in 1985, i.e. about 0.3% of total annual fishery revenue in Japan. The total cost of marine litter to the EU fishing fleet has been estimated to be nearly US$ 65.7 million a-1 (€61.7 million a-1), representing 0.9% of the total revenues (Annex VII; Mouat et al. 2010, Arcadis 2014).

156 Indirect impacts include loss of target species due to ghost fishing from ALDFG, although the total losses are unknown. Gilardi et al. (2010) investigated the Dungeness Crab fishery in Puget Sound and estimated that targeted removal of derelict gill nets yielded a cost-benefit ratio (cost of removal versus increased landings) of 1:14.5. More recently, Scheld et al. (2016) estimated that the annual loss due to derelict pots and traps for nine species of crustaceans amounted to US$ 2.5 billion (US$ 2.5 x 109), using data from a derelict pot removal program in Chesapeake Bay. The authors argued that targeted removal campaigns, paying operators from the fishing community, during downtime, can be a cost-effective measure. A theoretical cost to the industry would be if the presence of microplastics in some way reduced the organisms' fitness or reduced reproductive capacity. However, there is no evidence that this is the case given current measured concentrations in fish and the environment.

157 **Tourism Sector.** The tourism sector is both significantly affected by marine litter and a major contributor to the problem. The visible presence of marine litter has an impact on the aesthetic value and attractiveness of beaches and shorelines for recreational purposes (Fanshawe and Everard 2002). For example, damage to marine ecosystems and the presence of marine litter affects recreational activities such as diving and snorkeling, fouling propellers and jet intakes of recreational boaters and affecting recreational fishers in terms of contamination of catch, restricted catch, and damaged gear.

158 Marine litter can thus discourage visitors from going to certain beaches. Reduced numbers of coastal visitors lead to lost revenues for the tourism sector, which in turn leads to a loss of revenue and jobs in the local and regional economy. This can have short-term (e.g. where a specific natural incident such as a flood or tsunami washes up marine litter) and/or long-term impacts. This may occur where consistent levels of marine litter damage the reputation and image of the area as a tourist destination thus discouraging private sector investment in new tourist developments (McIlgorm et al. 2011). These impacts can be quite significant in certain cases, particularly where local economies are heavily dependent on the tourism sector. For

example, Hawaii and the Maldives are facing declines in tourist numbers and associated revenues due to marine litter, particularly plastics, that threaten to affect the reputation of islands as sought-after tourist destinations (Thevenon et al. 2014).

3.3.3 Social impacts

159 **Health impacts associated with poorly regulated waste management.** There are several human health concerns associated with poorly managed waste collection and treatment. Higher levels of plastic-related compounds, including flame retardants, have been observed in people involved in, or living adjacent to, informal and poorly managed plastics recycling facilities, especially in the informal electronic and electrical waste recycling sector (Lee et al. 2015, Tang et al. 2014, Siniku et al. 2015). Littering can block wastewater drains, leading to sewage contamination of communities and areas of stagnant water. Plastic debris left lying outside can prove to be a very effective, if unwelcome, way of collecting rainwater, thereby becoming a breeding-site for many disease vectors.

160 **Micro-plastics and seafood safety.** For the present purposes, 'seafood' includes finfishes, crustaceans, mollusks, amphibians, freshwater turtles, and other aquatic animals (such as sea cucumbers, sea urchins, sea squirts and edible jellyfish) produced for the intended use as food for human consumption (FAO 2014). It is evident that humans are exposed to micro and nano-plastics through the consumption of marine food stuffs, such as shellfish, shrimp, small fish species such as sprat and potentially other species such as sea urchins, tunicates and sea cucumbers, that are consumed as whole animal foods including the gastrointestinal tract. Consumption of filter feeding invertebrates, such as mussels or oysters, appears the most likely route of human exposure to micro-plastics, but a wide variety of commercial species appear to be contaminated with micro-plastics. One study has attempted to estimate potential dietary exposure based on observed micro-plastic concentrations in seafood and assumed consumption rates. This study estimated dietary exposure for high mussel consumers in Belgium to range between about 11 000 (Van Cauwenberghe et al. 2014) and 100 000 MPs a-1 (GESAMP 2015).

161 Although it is evident that humans are exposed to micro-plastics through their diet, and the presence of micro-plastics in seafood could pose a threat to food safety (Van Cauwenberghe and Janssen 2014, Bouwmeester et al. 2015), our understanding of the fate and toxicity of micro-plastics in humans constitutes a major knowledge gap.

162 **Navigation hazard.** Floating plastic macro-debris represents a navigation hazard. It can lead to injury or death following loss of power, due to entangled propellers or blocked water intakes; and, collision with floating or semi-submerged objects, including (plastic) insulated shipping containers (Frey and De Vogelaere 2014). For example, in 2005, the USA coastguard reported that collisions with submerged objects caused 269 boating incidents, resulting in 15 deaths and 116 injuries (USCG 2005). In South Korea, 9% of all Korean shipping accidents involved marine debris from 1996-1998. In the worst case, a ferry capsized after both propeller shafts and the starboard propeller became entangled with derelict fishing rope, resulting in 292 deaths (Cho 2005).

3.4 Major Marine Litter Management Challenges in the Region

163 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 implemented by many countries without knowing the exact quantity of the marine litter.

164 All South Asian Seas 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 region. Therefore, this situation has severely affected preparation of the management strategies and policies to address the marine litter issues in the region. Social, economic, and ecological impacts of marine litter must be understood to enable thoughtful prioritization and development of effective management strategies.

165 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.

166 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 countries and require urgent attention by national and regional organizations and authorities in the region countries. However, according to the present status, no quantifiable and scientific data and information is available in the 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. Immediate proactive measures need to be implemented in the region for avoiding any disaster to happen.

167 According to the **Table 5**, all 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.

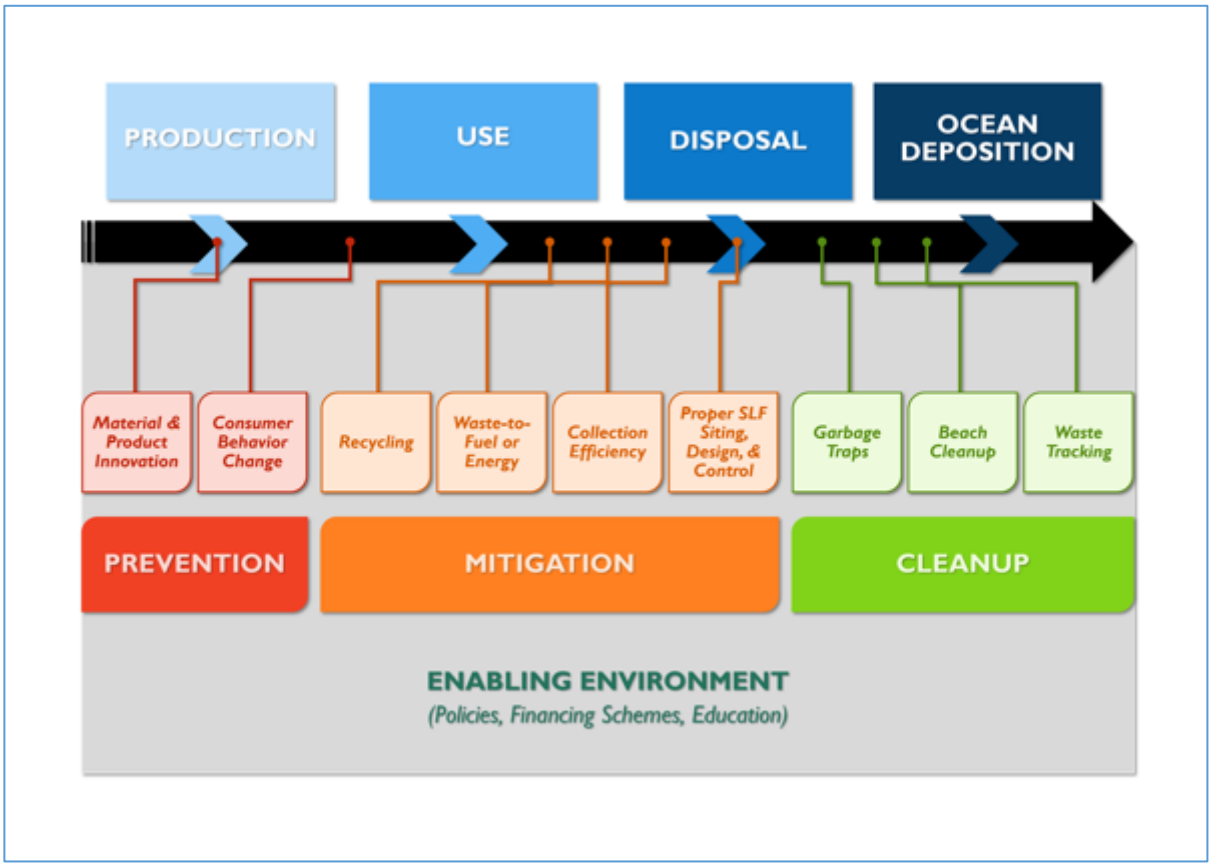
Table 5: Information Availability in the Region on Various Issues

Country	Ecological Issues	Social Issues	Economic Issues
Bangladesh	General information available on ecology near the major coastal cities, but no long-term research available	Negative impact on tourism; general information available; country wide and sites specific social data not available	General information available but country wide and site-specific quantitative information not available
India	General impact information indicated, with marine litter on beaches near populated areas of major coastal cities	General statements; but country and site-specific social data not available	General statements but quantifiable information not 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 not site-specific	General statement indicates it is an emerging issue, but data not site-specific; impacts 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 threat 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 available but quantities 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 available

4 CURRENT APPROACHES TO ADDRESSING PLASTIC POLLUTION IN THE REGION

168 The commonly known hierarchy of plastic waste management, shown in **Figure 8**, follows the order of points of intervention in the pathway of plastics from production to use to wastage until potential deposition in the oceans.

Figure 8: The pathway of plastic materials from production to deposition in the oceans



169 **Prevention strategies** include those that aim to reduce plastic waste generation. New or alternative products, new product design and behavior change among consumers would reduce plastic production to only the unavoidable plastic commodities. Further plastic waste reduction can be achieved through packaging reuse, plastic-free packaging or innovative product dispensing system.

170 **Mitigation strategies** are actions for generated waste. Waste collected and eventually disposed in formal or informal dumpsites may be reduced through recycling recovered materials to new or waste-derived useful products (such as building materials, park benches, roads or pavements) and converting waste to fuel or energy. Meanwhile, uncollected garbage may be reduced through expanding or improving the collection services. The amount of garbage from dumpsites that are transported to oceans may be reduced through better design, control and location of formal or informal dumpsites. Flooding events bring garbage from

poorly located dumpsites (e.g., near waterways or flood prone areas) to streams leading to oceans.

171 **Cleanup** includes activities that target garbage that has escaped collection. Transport of garbage from shores to the sea can be reduced using garbage traps, beach cleanup and waste tracking system. Behavioral change is needed in many of the above strategies. Such behavioral change may be driven by education or re-training campaigns. Some strategies would entail innovations, which would require research and development. For some, like waste-to-energy processes, technology is available but would require large investment.

172 All these, i.e., education, technology, and innovation, would require an Enabling Environment, such as in the form of policy and financing scheme, to make them happen. In most of these strategies, government, business entities, and individual consumers must take their respective roles.

4.1 Global and Regional Initiatives[6]

4.1.1 Prevention

173 Promoting better materials for packaging and single-use applications, as well as innovative products for multiple reuse and recycle can reduce about 30% of plastic packaging that would otherwise never be reused or recycled (World Economic Forum and Ellen MacArthur Foundation 2017). Policy mechanisms for packaging solutions include packaging directives, product bans and taxes, and extended producer responsibility, EPR (SAIC 2012). The latter aims to decrease a total environmental impact of a product by making the manufacturer responsible for the entire life cycle of the product and especially for the take-back, recycling, and final disposal.

174 Preventing waste can be also addressed via discouraging unnecessary consumption through the classification measures, public awareness, and economic incentives. Classifying the most harmful plastics as hazardous would empower regulatory agencies to prevent accumulation of marine debris (Rochman et al. 2013). The United States, Europe, Australia, and Japan classify plastics as solid waste, treating them like food scraps or grass clippings—despite their harmful effects, toxicity, and ability to absorb other pollutants. Heightened public awareness can change behavior through increased public access to rivers, streams, and beaches. Additionally, through public land and use management programs, governments can buy conservation easements along the river/coast that prohibit development and require new developments to control pollution stringently.

175 Economic incentives include: product take-back/buyback programs for items such as electronics, tires, plastics bags, and packaging waste, providing access to low-cost, recyclable inputs for future operations for the manufacturer; environmentally preferred purchasing programs - voluntary or mandatory for government agencies and corporations, effectively stimulating demand for recycled content products; and product bans and taxes. Funds generated can support environmental programs, including recycling or other waste activities.

[6] *UNEP (2016). Marine plastic debris and micro-plastics – Global lessons and research to inspire action and guide policy change. United Nations Environment Programme, Nairobi.*

Plastic bags (LDPE) and styrofoam (PS) are the most common plastic products subjected to bans and taxes.

Extended producer responsibility (EPR), packaging directives, and product redesign.

- More than 35 countries worldwide and several Canadian provinces have adopted EPR policies on packaging waste and printed paper (SAIC 2012).
- The State of California began implementing the Rigid Plastic Packaging Container Law in 1991. Manufacturers must meet one of five product requirements: (i) min of 25% post-consumer material generated in California; (ii) weight reduced by 10%; (iii) refillable five times; (iv) reusable five times; (v) 45% recycling rate.
- In 2018, the number of companies working toward 100% reusable, reusable, recyclable or compostable packaging by 2025 or earlier has grown to 11 – Amcor, Ecover, Evian, L'Oréal, Mars, M&S, PepsiCo, The CocaCola Company, Unilever, Walmart, and Werner & Mertz - together representing more than 6 million tonnes of plastic packaging per year.
- WalMart introduced a scorecard in 2006 for suppliers to self-evaluate against their peers based on packaging innovation, recycled content, product-to-package ratio, and recovery value. WalMart has reduced waste in its US operations by 80%+ and returned more than $231 million to its business in 2011.
- Aveda committed to use post-consumer recycled content in all packaging.
- LEGO committed in 2015 for the next 15 years to find more sustainable plastics both for packaging and to replace ABS as the single material used to make LEGO bricks.
- Several organizations won the 2018 Ellen MacArthur Foundation competition for new recyclable and compostable packaging solutions: (i) the University of Pittsburgh and Aronax Technologies Spain used nano-engineering to mimic the way nature uses molecular building blocks to create a large variety of materials; (ii) the VTT Technical Research Centre of Finland created a compostable multi-layer material from agricultural and forestry by-products, while the Fraunhofer Institute for Silicate Research developed a fully compostable silicate and biopolymer coating for a range of food packaging; (iii) Full Cycle Bioplastics, Elk Packaging and Associated Labels and Packaging created a compostable, high-performance material from agricultural by-products and food waste to pack products varying from granola bars to laundry detergent.

Bans on Plastic Bag

176 Governments all over the world have acted to ban the sale of lightweight bags, charge customers for lightweight bags and/or generate taxes from the stores who sell them. The Bangladesh government was the first to do so in 2002, imposing a total ban on the bag. The trend is growing and currently plastic bags are banned in Rwanda, China, Taiwan, Macedonia Mexico City, Rwanda, UK (Modbury), Yangon (Myanmar), China (restricted use), Bangladesh, Australia (12 towns, including Sydney) and most recently (August 2017) Kenya. Other places have discouraged use of plastic bags through financial means rather than a ban. Italy, Belgium, and Ireland have taxed plastic bags since before 2008. In Ireland, plastic bag use dropped by 94% within weeks of the 2002 ban. In Switzerland, Germany, and Holland, plastic bags come with a fee. In US, the bans were adopted in California, coastal North Carolina, and

the cities of Portland, Austin, Seattle, and Chicago; while Michigan, Arizona and Missouri states prohibit local governments from banning plastics bags, justifying it as protecting businesses from additional regulations.

Reusable coffee cups

- In 2014, Hamburg, Germany, introduced refillable cups from biodegradable material that can be returned to any shop in the network for a refund. Customers can also buy the cup with their own fitted lid. In New York, in 2014, students came up with a cup-sharing program that allows members to drop off their empty mug in a collection bin near the subway or at another cafe. The cup's lid acts as a membership card.
- The UK opened two specialist plants for recycling coffee cups in 2013, followed by the establishment of Simply Cups to help businesses segregate and transport their cups to these plants. As a trial, Simply Cups has been collecting cups from a few working Costa, Pret A Manger and McDonald's stores, with expansion planned into 2,000 stores. Having coffee cup recycling points in town centers is another possible solution, piloted in Manchester with large bins for the collection of cups. Waitrose, Greggs, KFC, and other coffee retailers have financially supported the campaign. Yet there still needs to be greater cooperation and investment from businesses to solve this problem, especially bigger businesses.

4.1.2 Mitigation

177 Mitigation includes remedial measures for end-of-life plastics, that is, when they are already considered wastes but have not yet entered the ocean and may consist of diverting wastes from landfilling or dumping to recycling, recovering materials from end-of life plastics, creating supply chain for materials recovered from plastic wastes. Increasing efficiency of waste collection, traps in waterways, better design, control, and location of landfills will help reduce plastics brought to beaches and oceans.

Eco-Spindle, PET Bottle Recycling in Sri Lanka

178 There are three main issues around collection. First, optimizing collection and street sweeping includes vehicle routing, frequency of collection and street sweeping (based on litter loading and climate patterns), use of appropriate technologies (vehicles, hand carts), and properly sized bins/bags. Second, supporting the informal waste sector involves offering training and micro-loans to help waste pickers, who are mostly women, to establish SMEs. Enhancing recycling, repurposing ("upcycling"), and composting to better capture waste at each stage of the value chain provides income for vulnerable populations in lower-income countries. Third, clean-up campaigns and litter collection education can combine with increased convenience, such as bin placement in strategic public places, single stream recycling and drop-off centers.

Clean-up campaigns, whose benefits are temporary, should occur in parallel to waste prevention strategies.

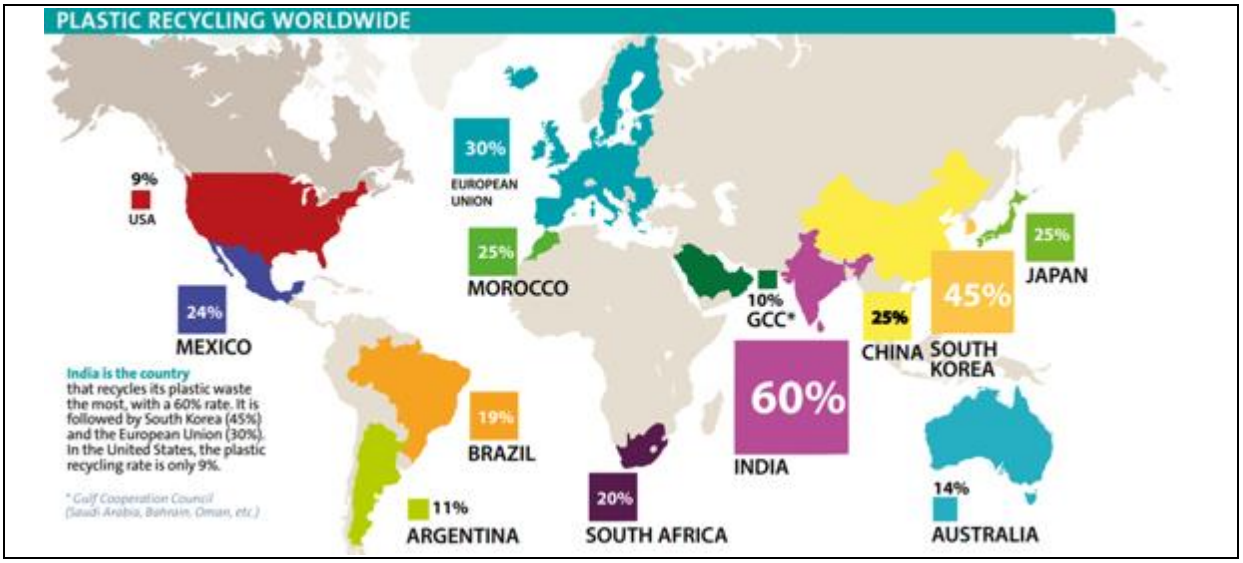
179 Waste collected and eventually disposed in formal or informal dumpsites may be reduced through recycling recovered materials to new or waste-derived useful products (such as building materials, park benches, roads, or pavements) and converting waste to fuel or energy. In contrast to reuse, recycling is the breaking down of the used item into raw materials which are used to make new items. It is a process to change waste materials into new products thereby preventing the wastage of potentially useful materials, and thus, reduce extraction of fresh raw materials from environment. Benefits of recycling include:

PET bottles to be processed into yarn , Eco-Spindle in Sri Lanka

- Provides a sustainable source of raw materials to the industry
- Greatly reduces the environmental (especially the CO_2) impact of plastic-rich products
- Avoids the consumption of the Earth's oil stocks
- Consumes less energy than producing new, virgin polymers

180 The total proportion of plastics being recycled varies by region around the world as shown in **Figure 9**.

Figure 9: Plastic recycling worldwide[7]



[7] *Veolia (2018). Plastic Recycling: A Key Link in the Circular Economy. Planet Magazine, October 2018. Veolia UK, London.*

Figure 10: Main global plastic waste flows before China's ban[8]

181 Incentives and methods for reduction, reuse, and recycle:

- Bottle bills, or container deposits, promote recycling or reuse by incentivizing the voluntary return of beverage containers to retail centers, redemption centers, or depositories.
- Advanced disposal fees put a surcharge on consumer goods to subsidize the otherwise cost-prohibitive action of recycling the product at its end of life.
- Variable pricing for waste generated, also known as pay-as-you-throw, and unit-based pricing – including resident's property taxes or a fixed monthly bill - drives customers to reduce the amount of waste they generate through billing structures that increase as the amount of solid waste thrown away increases.
- Variable rate pricing for waste reduced, also known as pay-for-success model - mean the borrower (municipality or NGO) repays a debt with (lower) rates based on the (higher) project's success. For example, a municipality could issue an impact bond to fund the growth of zero waste-based informal waste collection. With funds from an impact bond, the municipality could pay for training and infrastructure upgrades. It would repay the loan based on the program's ability to save money in the long run from reducing waste generated.
- Recycling penalties, rewards, rebates, and waste collection cessation can increase compliance with mandatory or voluntary source separation programs. Penalties, rewards, and rebates are applied to a generator's waste bill, depending on whether the generator meets minimum recycling requirements. Rewards often are in the form of coupons to local business. Waste collection cession programs discontinue service to generators that fail to comply until they change their behavior.

[8] *Veolia Institute (2019). Reinventing Plastics. The Veolia Institute Review – FACTS Reports, Special Issue 19. Veolia Institute, Aubervilliers.*

- Tax abatements for recycling and waste processing facilities that generate renewable energy can incentivize developers to construct new sites.
- Environmentally preferred purchasing programs - voluntary or mandatory - can be applied to the large purchasers of goods, such as government agencies and corporations, effectively stimulating demand for recycled content products.
- Disposal bans prohibit the landfill disposal of certain types of materials but require that recycling infrastructure and markets are in place. In the absence of markets for banned materials, and stringently enforced laws on dumping, waste can be hauled outside of the ban's boundaries or be illegally dumped, creating even larger problems for a community.
- Disposal limits incentivize recycling and can limit the number of bags per week collected or on the capacity of bins used. While this policy can drive generators to recycle more waste, it must be supported by effective recyclables collection. Otherwise, generators that produce excess waste may seek alternative disposal methods.

182 In collection, litter traps can collect litter not captured through street sweeping, waste collection, or storm drain grate systems. Grates on storm drain inlets in high litter-loading areas may require retrofits, installation, and regular cleaning, but are often less expensive than downstream interventions. Improving port reception, which lack proper facilities and treatment in many low- and middle-income countries, would also be beneficial. Developing organics management programs that separate dry and wet wastes at the source improves the quality of both organic waste (wet) sent to aerobic or anaerobic processing and recyclables (dry waste).

183 Integrated waste management solutions—combining various methods of collection, recycling, conversion, and disposal—are especially important for countries with low rates of waste capture and high leakage in areas of Southeast Asia, Africa, and Latin America. Integrated solutions comprise collection, recycling and repurposing, and conversion and disposal.

Training and microloans

- In Pune, India, Solid Waste Collection and Handling (SWaCH) is the first wholly owned cooperative of self-employed waste pickers. Pune's waste pickers are more than 90% women from the lowest caste (Dalit or "untouchables"), and most are the sole breadwinners for their families. In 2008, SWaCH partnered with the Pune Municipal Corporation for door-to-door garbage and recycling services for the city. This arrangement provides better working conditions (protective gear, rolling bins, and even some motorized carts or trucks) and workers can make the same or more money in fewer hours compared to other jobs.
- In the Philippines, the Payatas Environmental Development Programme and Vincentian Missionaries Foundation provided the women with micro-loans and waste-specific business consultancy and extension services, which resulted in several successful SMEs.

Re-purposing waste for social impact or new products

- In Ghana, the Recycle Not A Waste Initiative, "Recnowa," trains street youth, people with disabilities, and women from urban slums to use waste plastic to create handcrafted eco-friendly products, sold in international markets. Similar programs exist in other African, Asian, and Latin American countries.
- Adidas and Parley for the Oceans created a running shoe made from plastic reclaimed from the ocean around the Maldives.
- Method combined reclaimed ocean plastic and postconsumer recycled plastic to create bottles for its two-in-one dish and hand soap.
- Italian firm Aquafil is using reclaimed discarded nylon fishing nets as feedstock for carpeting and to make clothing, including swimsuits.
- Bureo makes skateboards and sunglasses from fishing nets dropped off at its collection sites in coastal Chile.

Recycling of fishing gear

184 Recycling and repurposing is part of the complex fishing gear solution, which has three parts: (i) Losing less gear through marking to identify ownership and using new technology to avoid unwanted gear contact with seabed and to track gear position; (ii) using gear products that biodegrade; and (iii) marinas or others providing incentives for fishermen to collect gear they find. For example, the Global Ghost Gear Initiative addresses lost and abandoned fishing gear worldwide, and the Net Works program in the Philippines aggregates fishing nets collected by local people for an income to make carpet at Interface. Likewise, the Steveston Harbor Net Recycling Initiative collects nets and ships them to an ECONYL plant in Slovenia to be made into carpeting and clothing. In the US, NOAA MDP sponsors Fishing for Energy where nets are collected from marinas and then combusted for energy recovery in Hawaii and on mainland United States.

Microfiber capture in washing machines

185 Synthetic fabrics such as polyester may shed microfibers at any time, however, the wash cycle has been identified as both a moment when fibers are more readily shed and more readily collected. This is especially important as wastewater treatment does not clean all microplastics out of the water before discharge back into the environment. The Rozalia Project is bringing a microfiber catcher device to market to address this issue. The device can capture microfibers in the washing machine prior to the rinse cycle and prevent them from washing into the sea.

Zero Waste Initiatives

186 In 2012, Bogota launched the Basura Cero (Pollution Zero) program to achieve zero waste within 15 years. It has already achieved visible results, including new treatment facilities and incorporation of informal recycles, but it faces challenges. See Annex 5 for details and next steps. The following plastic reduction recommendations from the GPO Colombia Magdalena-Basin Plastic Waste Management Pilot Program in Colombia would be useful for other geographies:

- Enhance coordination with relevant policy making and regulatory departments;
- Measure and classify solid waste streams, including by conducting formal litter studies18 that measure the composition of waste streams and determine their points-of-inflow to river basins;
- Stimulate demand for recyclable post-consumer plastics by helping recycling cooperatives capture and deliver more consistent and larger volumes of clean, plastic feedstock;
- Enhance regulations and their effectiveness;
- Increase public awareness;
- Improve collection and street sweeping services;
- Increase nationwide processing capacity for postconsumer plastics;
- Expand collection of post-consumer plastics in rural communities;
- Evaluate EPR policies and financial incentives that divert plastics from landfills and increase recycling (packaging directives, advanced disposal fees, bottle bills, recycling rebates, etc.); and
- Install secondary control measures along main rivers and their tributaries.

187 Several municipalities in the Philippines are investing in comprehensive zero waste systems:

- The City of Fort Bonifacio in Taguig established effective systems, built necessary infrastructure, created supportive policies, and inspired constituents to cooperate. All households are now covered by door-to-door collection.
- The City of San Fernando in Pampanga has a citywide separate collection, recycling, and composting system, and has achieved high participation and a 73% diversion rate. San Fernando has saved almost 80% of the costs of its “collect and dump” model.
- In the City of Malabon, Mother Earth Foundation (MEF) has worked in the low-income, industrial Barangay Potrero, which was rife with illegal waste dumping, to establish Material Recovery Facilities (MRFs). It has reached 89% compliance with 65% waste diversion in less than a year. Building on this success, MEF is pursuing scale-up work in other cities in Metro Manila.
- A WB-supported integrated SWM project in Teresa, Rizal has increased the solid waste diversion to almost 80% with waste materials being recycled as compost, coco-nets and bricks. Some waste materials are also diverted as refuse derived fuels used in a nearby cement manufacturing plant.

4.1.3 Cleanup

188 According to the World Economic Forum, it is expected that by 2050, oceans will contain more plastics than fish. To address the problem, a straightforward solution is to clean up what up what has already accumulated in the oceans.

189 To date many strategies and technologies have been developed to clean up the ocean and foremost among them is System 001 which was developed by Boyan Slat, Founder and CEO of The Ocean Cleanup, the Dutch foundation developing advanced technologies to rid the oceans of plastics.

190 System 001 has a monitoring system that process, stores and transfers large amount of data collected by many sensors. The data pertains to navigation, environmental conditions, the system's integrity, and operational status. Located at the center of the system are 2 high-definition cameras, one of which can be remotely oriented for 360-degree coverage and provide feedback from any direction. Placed at each end of the system, navigation pods carry a complete weather station and automatic Identifier system (AIS) that shares the system's location with other vessels. Beside each navigation pods are satellite pods that enable the Ocean Cleanup Team to communicate to the system remotely and retrieve data, including images and GPS locations, from their headquarters in the Netherlands. Ensuring visibility of the whole system, lanterns are placed every 100 meters and they feature radar reflections for detectability. These electronic pods are solar powered and communicate to each other via a WiFi mesh network and satellite connection.

191 The system is safe for marine wildlife as (1) it moves slowly allowing sea animals to swim away, (2) the skirt is impenetrable so that current flows underneath it, guiding with it the marine animals, (3) the skirt is not a screen so that it does not entangle sea animals, and (4) the whole thing is monitored.

192 Thru satellite imagery, the Ocean Cleanup team can detect marine debris, and thus, determine the optimal deployment location of the passive concentrators. Through satellite imagery, the team can determine the quality of garbage in the ocean and possible methods to process them into recycled materials or new products.

193 The modular fleet of systems can be scaled up gradually, allowing the team to learn from the systems field performance and, thus, improve the technology. The more systems deployed, the faster the cleanup will be. With about 60 of this system by 2021, the Great Pacific Garbage Patch would be reduced by half in five years.

Cleanup and recycle banks

194 Plastic Bank, the Vancouver-based for-profit social enterprise pays poor people to pick up plastic from waterways, canals, beaches, and other access points to oceans. They redeem the items at collection centers for money, and goods and services like cooking fuel and phone charging. After testing a small project in Lima, Peru, Plastic Bank is rolling out a larger project in Haiti with plans for Brazil and Indonesia as well.

195 Other organizations with similar initiatives and results include:

- Oceana is the largest organization in the world solely devoted to marine conservation. As part of its campaigns, Oceana is involved in efforts to end major sources of ocean pollution such as oil, mercury, aquaculture and shipping emissions. In addition to that, the organization also campaigns for the protection of vulnerable places in the oceans, including the Arctic, the Aleutian Islands, the Mediterranean and Chile's Juan Fernandez Islands, among others.
- The Ocean Conservancy focuses on educating the public and advocating for policy changes for maintaining vibrant ocean wildlife. One of Ocean Conservancy's best-known efforts is the International Coastal Cleanup program. The annual cleanups bring

millions of volunteers all over the world together to collect and document the trash littering their coastline.

- Project AWARE Foundation is the organization working specifically with scuba divers across the globe to protect underwater environments. Focused on the critical issues of Shark Conservation and Marine Debris, Project AWARE empowers thousands to work together for a clean, healthy, and abundant ocean planet.
- The nonprofit Monterey Bay Aquarium is a showcase for the habitats and sea life of one of the world's richest marine regions. The organization also coordinates marine conservation and research programs.
- The Marine Megafauna Foundation or MMF focuses specifically on research and conservation for threatened marine-megafauna species, such as sharks, rays, marine mammals and turtles. In recent years, however, MMF researchers have expanded their efforts worldwide. The MMF's current research focuses on species-level population ecology and conservation biology. The organization also works to improve the management of existing marine protected areas (MPAs) and develop effective, long-term conservation strategies to protect and restore key habitats.
- Sea Shepherd Conservation Society is now best known for obstructing Japanese whaling activities in the Southern Ocean. Sea Shepherd aims to end the destruction of habitat and slaughter of wildlife in the world's oceans in order to conserve and protect ecosystems and species.
- The Coral Reef Alliance works with communities around the world, helping to solve coral reef conservation challenges. Through collaboration with fishermen, government leaders, divers and scientists the organization leads holistic conservation programs that improve coral reef health and resilience and are replicated across the globe. The majority of the work is done in four critically important reef regions of the world - Fiji, Hawaii, Indonesia and Mesoamerican Region.
- The Nature Conservancy operates projects that include work to create sustainable fisheries, while protecting and restoring fish habitat; mapping ocean wealth and incorporating the gathered information into decision-making; improving the health of coral reefs; protecting the coastlines, etc.
- Among the World Wildlife Fund or WWF's top priorities in the area of marine conservation are working with fishers, fishing companies and scientists around the globe to understand and meet sustainability standards; working with organizations around the world toward the goal of expanding the extent of mangrove cover around the world 20% by the year 2030; and safeguarding the Arctic through advancing climate-smart, sustainable development, and securing permanent protection for ecologically critical areas.
- Greenpeace works towards several issues pertaining to the marine environment in particular. With its vast networks across the world, Greenpeace argues big corporations to reduce their plastic footprint to end the flow of plastic into our oceans. In addition, the organization is also engaged in addressing unsustainable industrial fishing practices, climate change and ocean acidification.

196 As a summary, **Table 6** presents the list of reported global initiatives including 3R technologies, innovations and policy interventions in the SAR.

Table 6: Summary of Global and Regional Initiatives on Plastic Pollution

Prevention	Mitigation	Cleanup
• Alternatives for packaging and single use applications • Specific product bans and taxes • Extended producer responsibility (EPR) • Use of 100% reusable, recyclable and compostable packaging • Economic incentives such as product take back and buy-back programs • Sustainable plastics • Ban on use of plastic bags • Reusable coffee cups • Full cycle bioplastics	• Recycling and upcycling • Recycle banks (i.e., Plastic Banks) • Fishing gear recycling • Micro-fiber capture • Waste derived products (building materials, park benches) • Plastic roads and pavements • Zero waste initiatives • Waste to energy (i.e., refused derived fuels) • Other incentives such as bottle bills or container deposits • Tax abatements for recycling and waste processing facilities • Disposal bans for certain plastic types • Litter traps • Improved solid waste management (i.e., collection) including training and microloans for SWM enterprises • Parleys and Adidas recycling of plastic for shoes	• System 101 • Ocean Cleanup • Ocean Conservancy • WWF • Coral Reef Alliance • Oceana • Project AWARE Foundation for scuba divers • Monterey Bay Aquarium • Marine Megafauna Foundation • Sea Shepherd Conservation Society • Nature Conservancy • WWF • Greenpeace

4.2 National/Local Initiatives/Technologies in the SAR[9]

4.2.1 Enabling environment (government policies, campaigns, and movements)

197 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

[9] *SACEP (2019). Regional Marine Litter Action Plan for South Asian Seas Region. South Asia Co-operative Environment Programme, Colombo.*

Initiative. Therefore, it is a very urgent requirement to prepare a regional level plan, to implement international conventions, agreements, laws, regulations, and treaties.

Bangladesh

198 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.

199 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 proper implementation mechanism to practically implement the litter management activities.

India

200 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.

Maldives

201 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.

Pakistan

202 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

203 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.

4.2.2 Prevention

Bangladesh

204 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.

India

205 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 enforcement details are available.

Maldives

206 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.

Pakistan

207 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 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.

Sri Lanka

208 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 seabed 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.

4.2.3 Mitigation

Bangladesh

209 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.

India

210 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 Gurgoan. 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.

Sri Lanka

211 The Central Environmental Authority (CEA) of Sri Lanka has initiated the “Pilisaru” 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 billon 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.

4.2.4 Cleanups

Bangladesh

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

India

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

Maldives

214 Maldives formed a long-term partnership with Parley to implement Parley's creative, multidisciplinary 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.

Pakistan

215 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.

Sri Lanka

216 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.

Beach litter collection point in Dehiwala Beach in Sri Lanka

4.3 Gaps, Needs, and Challenges in the SAR[10]

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

4.3.1 Lack of marine litter data in the SAS Region

218 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 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.

219 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 coastal population in these countries directly depend on coastal and marine resources.

4.3.2 Poor institutional system for management of marine litter

220 One of the major gaps in the marine litter management in the region is lack of proper institutional mechanism to implement marine litter mitigation activities. Except Sri Lanka all other 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 region. Therefore, establishment of institutional mechanism especially for management of marine litter in the region and countries is urgently required.

4.3.3 Non-availability of legal framework for marine litter management

221 Legal framework which helps in regulating the production, use and recycling of the marine litter. 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, the 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

[10] *SACEP (2019). Regional Marine Litter Action Plan for South Asian Seas Region. South Asia Co-operative Environment Programme, Colombo.*

gyres, and on seafloors thereby, signaling that marine litter remains a significant problem, particularly with respect to micro plastics in the 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 program 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 framework for marine litter management in the region countries is critically important.

4.3.4 Poor and insufficient enforcement of international conventions, agreements, laws, regulations, and treaties

222 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 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 member countries.

4.3.5 Limited implementation of direct development activities for marine management

223 The region possesses 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 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 biodegradable 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).

4.3.6 Lack of research and surveys on marine litter

224 The marine litter research and studies are very limited in the 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 region has been confined to the ecological and beach studies. There is 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 socioeconomics.

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

225 No standard and uniform methodologies are followed in the region for collecting, analyzing, and interpreting the marine litter data. The available methods mismatch among countries and therefore this common problem of the 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.

4.3.7 Weak formulation and enforcement of regulatory framework

226 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 must be adapted. These measures are largely command and control method to control marine liter. 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.

4.3.8 Lack of marine litter production and consumption policy and strategies

227 The 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.

4.3.9 Lack of education and awareness program for marine litter management

228 There is no dedicated education and awareness program for marine litter in the region. The education and awareness strategies are always crosscutting and same is true for marine litter management strategies. 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 program for 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, must be developed as effective education and awareness tools.

229 According to the available reports and information many 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 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.

4.3.10 Lack of marketing and economic instruments for marine litter management

230 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 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.

231 Except few marketing instruments, most of 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 member countries.

4.4 Potential Project Activities to Address the Challenges in SAR

232 The project can develop several action plans that will specifically address the gaps, needs and challenges initially identified by SACEP. Recommendations on potential project activities are presented in **Table 7**.

Table 7: Summary of Potential Project Activities to Address the Challenges[11]

Issues	Proposed Recommended Action Plan	TA	Grants
• Lack of marine litter data in the region	• Conduct an inventory/assessment of plastic & plastic waste generation in SAR to prepare proper policies, strategies and plastic waste management plan.	√	
• Poor institutional system in managing marine litter	• Help the SAR member countries to establish dedicated institutions for the sustainable management of marine litter.	√	
• Non-availability of legal framework for marine litter	• Establish the framework by reviewing and developing dedicated laws that will minimize the legal dispute for the sustainable management of	√	

[11] *Regional Marine Litter Action Plan for South Asian Seas, SACEP.*

Issues	Proposed Recommended Action Plan	TA	Grants
	marine litter; develop rules and regulation and prepare enforcement programs.		
• Poor enforcement of laws and regulations	• Improve coordination within and among agencies for effective enforcement of marine litter related multi-lateral environmental agreement (MEAS).	√	
• Limited implementation of direct development activities	• Conduct inventory and assessment of existing source reduction activities such as 3R technologies, infrastructure availability of waste to energy, reception/and, collecting facilities and recycling facilities; and sanitary waste disposal facilities.	√	
	• Encourage/solicit proposals for direct development structure and tools at the river mouths at points of entry into the sea.		√
	• Scale-up identified source reduction activities including product modification for short- to medium- term interventions.		√
	• Prepare and implement plans for plastics and polythene production modification and improvement program		√
	• Encourage/develop recycling enterprise for increased marine litter recycling on de-centralized scale.	√	√
• Lack of research and surveys on marine litter	• Research studies to review the amount of solid waste generation of all segments for the country and estimate by kind the total quantity of marine litter that they have managed.	√	
	• Develop and regularly update marine litter database.	√	
	• Encourage/develop recycling enterprise for increased marine litter recycling on de-centralized scale.	√	√
	• Develop various recycling and removal tools and techniques, and activities for sustainable management of marine litter.		√
• Lack of marine litter production and consumption policy and strategies	• Assess the quantity of marine litter recycled and removed as percentage of the total production.	√	
• Lack of IEC and awareness programs	• Prepare country specific education and awareness program on marine litter management.	√	
• Lack of marketing and economic instruments	• Prepare country specific education and awareness program on marine litter management.	√	

5 POTENTIAL ENVIRONMENTAL & SOCIAL RISKS AND IMPACTS

5.1 Environmental Risks

233 The proposed project, both through TA and the block grants, is expected to have largely positive and beneficial impacts for SAR and its oceans. The project's objectives to support the enabling environment, cross-country coordination and capacity building, innovation; and support to the 3Rs is expected to have positive long-term effects in reducing and the dumping of plastic wastes in waterways that end up in coastal areas and oceans. The project will stimulate partnerships among civil society organizations, youth groups and other stakeholders to support national and community-based behavior change and awareness raising; provide funding for innovative solutions; and support youth-led movements, among other things.

234 It may also support, at the policy level, the strengthening of E&S standards and certification for sustainable plastics supply chains focused on socially and environmentally responsible waste sourcing and recycling through transparent, accountable, and legitimate supply chains addressing labor issues, working conditions, and livelihoods. In addition to, the project may also support strengthening industry standards for recycled plastic products (e.g. plastic roads and furniture products) to grow secondary-reuse markets and attract private sector investments.

235 At the concept stage there is lack of clarity on what specific types of innovative technologies and solutions to reduce, reuse and recycle plastics will be supported. The project design, however, will ensure that only investments that focus on these 3Rs that are resource efficient, sustainable and environment-friendly will be supported. Those that are pollutive and resource intensive will be on a negative list and will be ineligible for project financing. That said, environmental risks still exist particularly to the potential subprojects through the block grant, which would relate to residual wastes or those plastics that cannot be reused, recycled and repurposed, which will have to be disposed and managed properly. However, given that the thrust of the project is 3Rs, residual plastic wastes should be minimal. In addition, innovative methods of collecting plastics from the oceans may still have risks and impacts, which will need to be properly screened and/or assessed during project implementation.

236 Re-processing and recycling of wastes are also potential sources of residues. For instance, PET bottle recycling facilities produce wastewater from washing, and fumes/smoke from heating. Such impacts must be mitigated by installing proper pollution control equipment such as wastewater treatment facilties for washwater, and fume hoods with scrubber for air pollution control.

237 The transport of collected plastic litters and e-wastes from cleanup and several collection points to the recycling facilities and final disposal must be included in the risk analysis. The project must ensure that wastes are properly handled, stored and transported to avoid leakages and, when necessary, residuals and non-recyclable residues are treated and disposed off properly in approved disposal facilities or in licensed incinerators.

238 The environmental risks from subprojects that will be supported through TA are very unlikely as the TA will mostly involve policy review and formulation of institutional building measures and IEC measures.

5.2 Social Risks

239 On the social side, there will be health risks and impacts to those working in plastics collection and recycling/repurposing due to potential exposure to harmful materials and chemicals during the recycling process, if proper health and safety measures in work places are not implemented and depending on the technology adopted to recycle and repurpose plastics. Resource use patterns will also need to be assessed in these facilities to ensure resources (energy, water and raw materials) are used in an efficient and sustainable manner. The project will include a range of stakeholders across the region: public sector organizations, social enterprises, community groups, and private sector entities.

240 Specific criteria for the management of the challenge grants will need to be prepared and applied to ensure fair access to funding, especially by women's organizations and youth groups. In addition, institutional capacity of the implementing agency, inter-organizational and cross-regional coordination is also weak, and this will be strengthened under the project.

241 Based on the overall positive and beneficial impacts of the project, which outweigh whatever residual risks and impacts there may be on the adoption of environment-friendly, sustainable and resource-efficient technologies and practices on 3Rs, the overall Environmental and Social risk classification of the project is assessed to be Moderate. This will be revisited during preparation and during implementation and revised, if necessary, in accordance with an adaptive management approach.

242 According to the Gender Based Violence (GBV) risk assessment, the project is classified as Low Risk. The GRM will include appropriate measures to handle potential GBV/SEA complaints. Mapping of GBV service providers will be undertaken.

5.3 Anticipated Impacts, Issues and Risks

243 Prevention strategies that will be supported by the block grants include those that aim to reduce plastic waste generation. New or alternative products, new product design and behavior change among consumers would reduce plastic production to only the unavoidable plastic commodities. Further plastic waste reduction can be achieved through packaging reuse, plastic-free packaging or innovative product dispensing system.

244 Mitigation strategies are actions for generated waste. Waste collected and eventually disposed in formal or informal dumpsites may be reduced through recycling recovered materials to new or waste-derived useful products (such as building materials, park benches, roads or pavements) and converting waste to fuel or energy.

245 Meanwhile, uncollected garbage may be reduced through expanding or improving the collection services. The amount of garbage from dumpsites that are transported to oceans may be reduced through better design, control and location of formal or informal dumpsites. Flooding events bring garbage from poorly located dumpsites (e.g., near waterways or flood prone areas) to streams leading to oceans.

246 Cleanup includes activities that target garbage that has escaped collection. Transport of plastic wastes from shores to the sea can be reduced using garbage traps, beach cleanup and waste tracking system. Behavioral change is needed in many of the above strategies. Such behavioral change may be driven by education or re-training campaigns. Some strategies would entail innovations, which would require research and development. For some, like waste-to-energy processes, technology is available but would require large investment.

247 All these, i.e., education, technology, and innovation, would require an Enabling Environment, such as in the form of policy and financing scheme, to make them happen. In most of these strategies, government, business entities, and individual consumers must take their respective roles.

248 **Table 8** below identifies potential environmental and social impacts, issues and risks for current approach on plastic litter management.

Table 8: Analysis of Potential Environmental and Social Impacts/Risks

Current Approach	Anticipated Environmental and Social Impact, Risks
Prevention	
• Avoidance by new material, new product design (change in production or process) • Reuse	• Potential generation of other waste streams associated with new process or materials (i.e., more water and chemical usage in production of glass bottles than PET); • With the change of process and/or raw material, there may be a need to re-design existing wastewater treatment facilities to address new waste water characteristics or a totally new wastewater system will be needed; • Consequently, with the new process/products used, there might be a need to re-design existing air emission controls or additional treatment facilities may be required; • Workers safety.
Mitigation	
• Recycling technologies (same or new products) • Recovery of plastics • Waste to energy • Better storage, collection and transport • Better thrash trap design installed in waterways • Better design landfills	• Increase in water consumption for cleaning; • Generation of wastewater; • Potential release of micro-plastics and toxic chemicals (i.e., for plastic e-wastes) and fumes; • Generation of solid residues (non-recyclable components) which may need disposal or incineration; • Potential impact of constructing new facilities, and or installation of additional equipment; • Community safety; • Workers safety.
Cleanup	
• Beach and river bank cleanup • Garbage traps • Waste tracking	• Transportation/hauling issues for the recovered wastes; • Need of processing or recycling facilities; • Disposal for recovered plastic which are not recyclables; • Safety of workers/partners/volunteers; • Exposure to sewage-contaminated waste during cleanup.

5.4 Risk from Micro-plastics

249 **Primary** micro-plastics are those manufactured on purpose such as 'microbeads' in cosmetic and personal care products (such as toothpaste, exfoliating scrubs), cleaning agents (air or water blasting of surfaces), and resin pellets for plastic industry use. **Secondar**y micro-plastics are the result of weathering and fragmentation of larger plastic objects. These processes are enhanced by exposure to UV irradiation, which are almost absent in deep sea bottoms. Tire-wear dust from land-based transportation and microfibers of textiles are significant sources of secondary micro-plastics in marine environment. Recycling facilities are also potential sources of secondary micro-plastics. **3R technologies must be therefore evaluated to ensure that secondary micro-plastics are not produced during recycling processes.**

5.5 Risks from Recovery and Processing of Plastics from E-Wastes

250 Around 2% of the total solid waste generation in developed countries consists of waste electrical and electronics equipment (WEEE) (UNEP, 2007). The presence of hazardous substances in WEEE makes it imperative to effectively manage them, as well as, to strictly implement regulations concerning their proper disposal. WEEE have components that are covered under the amended Stockholm Convention (2009) on POPs. These include certain brominated flame retardants (BFRs) that are listed in Annex A of the Convention. These are: (a) hexabromobiphenyl (HBB) and (b) polybrominated diphenyl ethers (PBDE) – commercial Octa BDEs and commercial penta BDE. There is no specific exemption for the production or uses of HBB, while production and use of POP-PBDEs have to be eliminated by Parties subject to the exemptions allowed by the Convention.

251 Each year some 3 million Metric Tons plastics are used in new Electric and Electronic Equipment (EEE) in Europe. In the separately collected Waste of Electric and Electronic Equipment (WEEE) there are many plastics. There are many types of plastics used in EEE products. The most common are HIPS, ABS, PP and PC-ABS. These plastics may contain Brominated Flame Retardants (BFR's) and some of the BFR's are restricted, because they contain substances of concern. The vast majority of WEEE plastics do not have BFR's in them.

252 Plastics with BFR's are typically used in appliances that generate heat such as CRT televisions and monitors, printed circuit boards in IT equipment, printers and cables and connectors. In the average mix of WEEE plastics only 5 – 10 % consist of plastics with Brominated Flame Retardants. The majority (> 92 %) of the applied Brominated Flame Retardants in EEE are not restricted. The restricted BFR's, according to POP regulation are: Octa BDE, Penta BDE, and HBCD. Deca BDE has been added to these POP's, but no thresholds have been defined yet. Since the introduction of the RoHS directive in 2003 these restricted BFR's are not allowed into new electronic equipment.

253 At this point, there are no available data on the percentage of WEEE are intercepted as marine litters. As it is difficult to analyze the amount of the restricted BFRs in the plastic WEEE, potential WEEE that will be collected must be handled, stored and processed according to prescribed procedure. The disposal of WEEE via landfill could pose serious environmental threats, like groundwater and surface water pollution. Open burning emits toxic substances into the air, while direct human exposure to the hazardous components of WEEE poses serious health concerns.

5.6 Negative List

254 From the ESA conducted for this project, and the environmental and social risk analysis of anticipated subprojects from the TA and block grants, the ESMF proposed that the initial screening for the eligibility be based on the list of excluded activities (Refer to **Table 9**) that will **NOT** be supported by the project.

Table 9: List of Non-Eligible Activities/Technologies for TA and Block Grants

• Activities that will produce wastewater that will not be possible and viable for on-site treatment.
• Processes/technologies that will discharge highly polluted processed water, emit toxic fumes and noxious odor exceeding the national emission standards or the World Bank Group Environment, Health and Safety Guidelines (EHSG).
• Use of innovative and cutting-edge technologies in marine clean-up that would harm marine life.
• Technologies whose by-product will promote production of secondary micro-plastics.
• Will cause high negative impact on income/livelihood resources.
• Activities which will employ forced labor.
• Activities which will involve any kind of forceful evictions of people.
• Production of residues with no available safe disposal facilities duly approved by the government.
• Activities which will involve recovery of plastics from waste electronic and electrical equipment (WEEE) which will potentially release toxic restricted BFR.
• Activities/processes which will involve use of highly toxic and/or banned chemicals.
• Involve activities that cause or lead to child abuse, child labor exploitation or human trafficking; No child under the age of 14 should work on the construction, rehabilitation or maintenance of a subproject. Children between ages 14-18 will not be employed or engaged in connection with the project in a manner that is likely to be hazardous[12] or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral and social development.
• Involve development of new settlements or expansion of existing settlements in critical habitats, protected areas or areas proposed for certain levels of national protection (e.g., reserved forests).
• Entail the purchase or use of illegal/illicit drugs, military equipment or other potentially dangerous materials and equipment, including chain saws, pesticides; insecticides; herbicides; asbestos (including asbestos-containing materials); or other investments detrimental livelihoods including cultural resources.
• Subprojects screened with High and Substantial risks.

[12] *Work considered hazardous for children is work that, by its nature or the circumstances in which it is carried out, is likely to jeopardize the health, safety, or morals of children. Examples of hazardous work activities prohibited for children include work: (a) with exposure to physical, psychological or sexual abuse; (b) underground, underwater, working at heights or in confined spaces; (c) with dangerous machinery, equipment or tools, or involving handling or transport of heavy loads; (d) in unhealthy environments exposing children to hazardous substances, agents, or processes, or to temperatures, noise or vibration damaging to health; or (e) under difficult conditions such as work for long hours, during the night or in confinement on the premises of the employer.*

- Subprojects that adversely affect and pollute international waters such as the Bay of Bengal and international rivers.

6 ENVIRONMENTAL AND SOCIAL RISK MANAGEMENT

6.1 Environmental and Social Risk Classification

255 As part of the environmental and social procedures, the World Bank classifies all projects into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. In determining the appropriate risk classification, it takes into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the Client to manage the environmental and social risks and impacts in a manner consistent with the ESSs.

256 Since the project will involve multiple subprojects that are identified, prepared and implemented during the course of the project, SACEP shall carry out appropriate environmental and social assessments of subprojects and prepare and implement such subprojects as follows:

- High Risk subprojects, in accordnace with the ESSs;
- Substantial Risk, Moderate Risk and Low Risk subprojects in accordance to national law and any requirements of the ESSs that the World Bank deems relevant to such subprojects which were initially identified in the ESRS.

257 The identified sub-projects will be screened and will be assessed based on the type and scale of the project, its location, and the nature and magnitude of the potential environmental and social impacts. Risk classification is determined by the significance of potential impacts. Both **TA and subprojects funded by the block grants** may be assessed using an environmental and social due diligence (ESDD) to proposed partners/grantees. Subprojects screened as H or S risks will NOT be funded by the project.

6.2 Managing Risks

258 The identified sub-projects (TA and block grants) will be screened and will be assessed based on the type and scale of the project, its location, and the nature and magnitude of the potential environmental and social impacts. Risk classification is determined by the significance of potential impacts. Summary of potential measures is presented in **Table 10**.

Table 10: Managing Risks According to Applicable ESS

ESS		Managing Risks
ESS1	Assessment & Management of Environmental and Social Impact	• Conduct of Environmental and Social Assessment (ESA) • Preparation of an Environmental and Social Management Framework (ESMF) • Environmental and social screening of subprojects • Application of positive and negative list of subprojects • Preparation of environmental and social diligence (ESDD) for subprojects • Preparation of sub-project specific Environmental and Social Management Plan (ESMP)

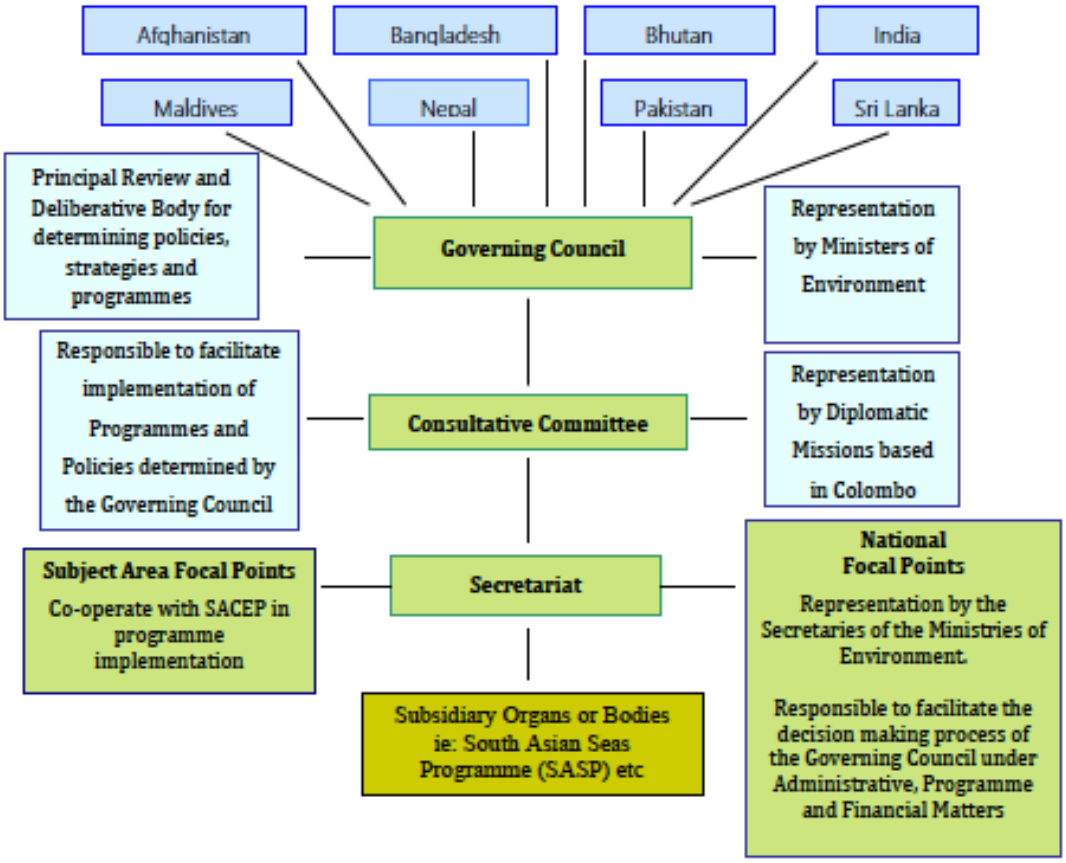
ESS		Managing Risks
		• Submission of subproject specific Environmental Compliance Monitoring Plan • Corrective Action Plans • Final Residues Disposal Plan • E-Waste Management Plan
ESS2	Labor and Working Conditions	• Preparation of SACEP Labor Management Procedures • Requirement of Occupational and Health and Safety Plan from subprojects/grants • Preparation of GRM for labor related issues. • Codes of Conduct against GBV and SEA for SACEP and contractor (for HQ construction)
ESS3	Resource Efficiency, Pollution Prevention and Management	• Requirement of ESMP for subprojects/grants • Water & energy audits and GHG inventory report during project implementation for block grant recipients
ESS4	Community Health & Safety	• Preparation of Communication Plan, Stakeholders Engagement Plan and ESMP for subprojects • Codes of Conduct against GBV and SEA for SACEP and block grant recipients
ESS5	Land Acquisition	• E&S screening • Preparation of environmental and social diligence (ESDD) for subprojects
ESS6	Biodiversity Conservation and Sustainable Management of Resources	• E&S Screening • Preparation of environmental and social diligence (ESDD) for subprojects • Preparation of ESMP
ESS10	Stakeholder Engagement and Information Disclosure	• Preparation of Communication Plan, and Stakeholders Engagement Plan for subprojects • Grievance Redress Mechanism

7 CAPACITY ASSESSMENT

7.1 Set-up and Implementation Arrangements

259 The Organization structure of SACEP is made up of five main sub-units; The Governing Council, Consultative Committee, National Focal Points, Subject Area Focal Points, and the Secretariat as indicated in **Figure 11**.

Figure 11: Organization structure of SACEP



7.1.1 The Governing Council

260 The GC is the principle review and deliberative body of SACEP and is responsible for determining its policy and programs. It consists of one representative from each member state who will be of Ministerial portfolio and as per Articles of Association, should meet annually.

7.1.2 The Consultative Committee

261 The CC is responsible for facilitating the implementation of policies, strategies, and programs approved by the GC and provides guidance to the Secretariat in its activities. It consists of representatives of diplomatic missions of the Member States residing in Colombo.

7.1.3 National Focal Point

262 Each Member State has designated a National Focal Point to facilitate the work of the Secretariat and to function as the main communication link between the Secretariat and the respective country. NFPs are expected to implement and monitor national programs in co-operation with the Secretariat.

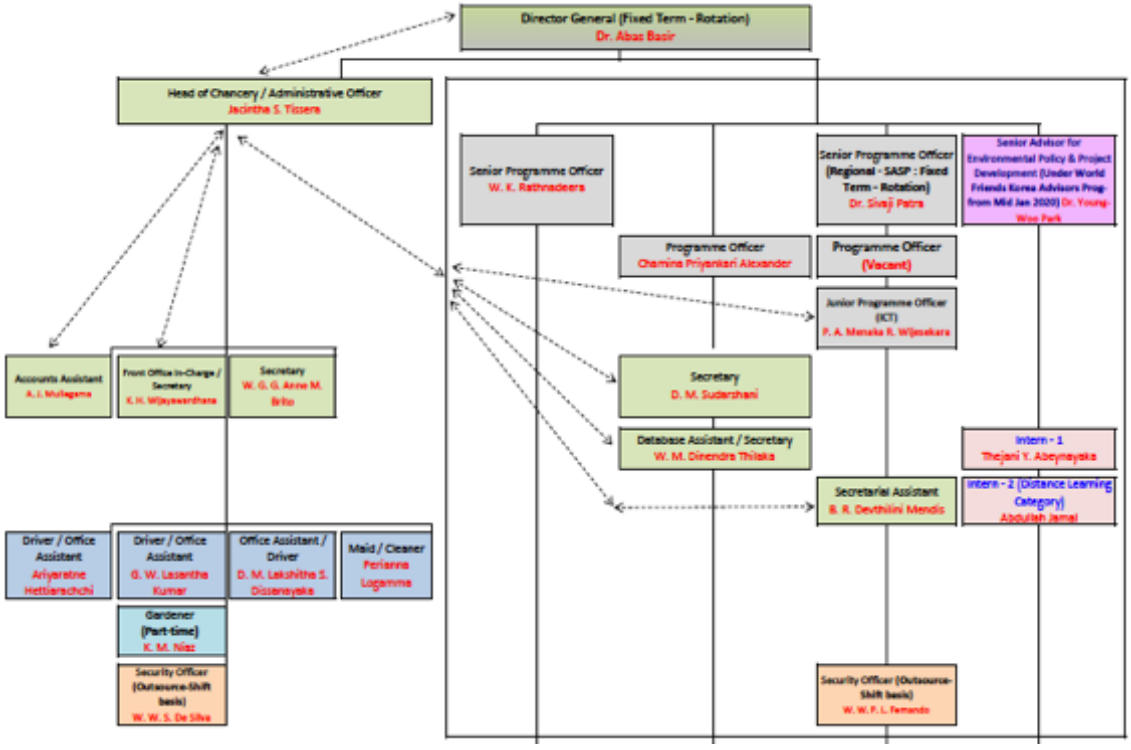
7.1.4 Subject Area Focal Point

263 The Subject Area Focal Points are expected to co-operate with the secretariat in project identification, formulation, implementation, and monitoring. The country, which is responsible for a particular subject area, designates a center of excellence for the subject and appoints a liaison officer.

7.1.5 Secretariat

264 The Secretariat (illustrated in **Figure 12**) consists of the Director General, administrative, professional, and supporting staff. The Director General is appointed on rotation, from the member states in alphabetical order and the appointment is for a fixed period of three years. The secretariat is based in Colombo, Sri Lanka and is under the patronage of the Sri Lankan Government for its existence.

Figure 12: The Secretariat



7.1.6 Subsidiary Organ or Bodies

265 SACEP is the Secretariat for the South Asian Seas Programme (SASP) which is one of the 18 Regional Seas Programmes of the United Nations Environment Programme (UNEP)

7.2 Action Plan to Strengthen Capacity and Systems

266 The current staff for SACEP will need to be complemented with additional regular staff to implement the project. **Table 11** presents the proposed incremental staff necessary for the project preparation stage of the project.

267 In addition to the construction of the Secretariat Building that will be supported by the grant, necessary equipment will have to be procured to that will enhance SACEP as a training and coordinating center for the SAR. Support facilities such as video-conferencing equipment will be needed by SACEP.

268 In order to strengthen the capacity of SACEP to implement project including its monitoring several training modules will have to be provided on the following topics: (a) project management; (b) financial management; (c) environmental and social risk monitoring; and (d) monitoring and evaluation. SACEP will need to strengthen its capacity as the project implementing entity to extend sustainability training to its environmental partners (TA and block grant recipients) as the project is implemented.

Table 11: Information Availability in the Region on Various Issues

		SACEP Project Preparation Facility			
					Number
Incremental Project Preparation Staff					
Preparation Team Leader					1
Monitoring and Evaluation Specialist				Indiv	2
Public Awareness and Communications				Indiv	2
Data Scientist/ Data Analytics				Indiv	2
Procurement				Indiv	1
Environmental Due Diligence Spec.					1
Project Implementation Agent				Firm	1
Project Implementation Facilities					
Video-Conference meeting room equiment					2
Operating Costs					
Consultation Meeting Costs					8
Preparation Studies					
ESA Process Studies				Firm	1
Public Awareness Baseline Study				Indiv	1
Private Sector Baseline Study				Firm	1
Legal Services				Indiv	1
Operations Manual Preparation				Indiv	1
Monitoring and Evaluation Specialist				Indiv	1
Block Grant Program Design				Indiv	1
SACEP Institutional Capacity Development Plan				Indiv	1

269 SACEP will be providing trainings to PIU staff and other targeted groups including potential TA and block grant recipients on the following topics:

- stakeholder engagement for PIU staff
- environmental and social screening, ESMF and ESF for PMI, PIU staff and consultants
- standard gender and diversity framework training for all incoming staff and consultants
- sexual harassment policy and child protection policy training for all relevant staff

270 Specific capacity building for stakeholders will be identified in the SEP process and during project implementation. PIU staff and social and environmental specialist may be required capacity building on specific environmental and social assessment, aligned with the project and WB's policies.

7.3 Enhancing Capacity through Private Sector Initiatives

271 The Regional Marine Litter Action Plan for South Asian Seas call for the involvement of the private sector and civil society through partnership arrangement for marine litter management and recycling. Among the identified activities include:

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

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9 ANNEXES: INITIATIVES IN THE SAR

9.1 Annex 1: Plasticcycle

The Plasticcycle Social Entrepreneurship project is aimed at reducing plastic pollution, through encouraging reduction in the use of single-use plastics, supporting responsible disposal and promoting recycling initiatives.

The Government and related agencies have, over the years, come up with various programs to address the challenge of plastic pollution. However much more needs to be done and we believe that we, the John Keells Group, have an opportunity to do more, both internally and externally, especially recognizing that some of our businesses are in industries that contribute directly or indirectly to the problem.

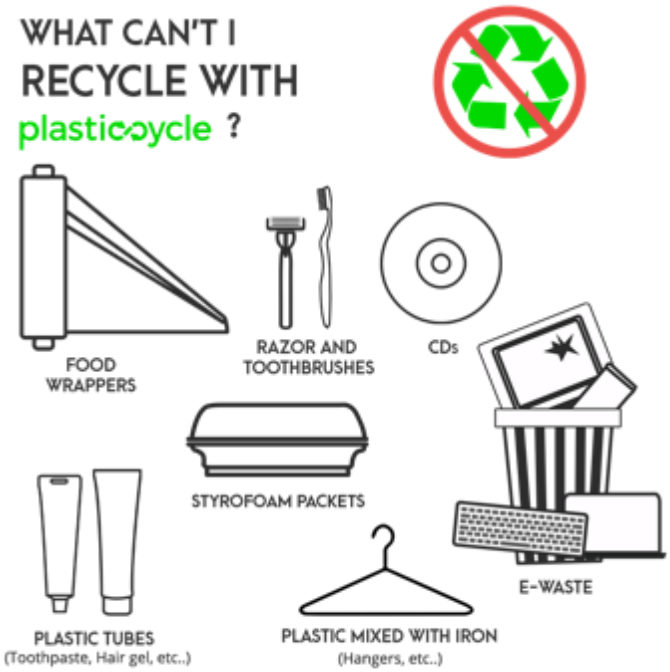
Plasticcycle has placed specially designed bins to support responsible disposal of recyclable plastic. Just wash, crush, and drop off your recyclable plastic at a bin convenient to you.

While John Keells Group companies, Keells and Elephant House are partners in this initiative, our efforts are backed by a commitment from Sri Lanka Recyclers Association to recycle all recyclable plastic collected in these bins.

Plasticcycle was launched as a pilot in July 2017 in two wards belonging to the Colombo Municipal Council located in Colombo 2 (Wekanda and Hunupitiya) with the intention of adopting the learnings from the pilot in expanding the project.

Under the initiative we have introduced bins to collect plastic waste for recycling. Based on the positive response to the three bins that were placed initially, we are now expanding bin locations across many of the Keells outlets in and around Colombo. Our bin locator will help you find the bin nearest to you.

Change needs to start with each and every one of us. Let us all take the pledge to Refuse, Reduce, Reuse and Recycle plastics and become catalysts for that change.



9.2 Annex 2: IUCN Sri Lanka

In Sri Lanka, the government imposed a deposit refund policy and a tax on plastics, which proved to be untenable and detrimental to economic development. The private sector cited difficulties with the deposit refund scheme, particularly due to the logistical challenges of engaging over 200,000 retailers across the country to take up collections of plastic and packaging, use hygienic and safe storage practices, and properly refund deposits.

A more pragmatic approach was required, so **IUCN Sri Lanka** proposed the 'polluter pays, by way of **Extended Producer Responsibility (EPR)' principle**. For this approach, the plastic producer is fully responsible for the product it creates and bears the burden of properly recovering and recycling the product after disposal.

With financial support from USAID, and in collaboration with the Ceylon Chamber of Commerce, the ERP approach will be implemented through a Public-Private-Partnership (PPP) model involving plastic producers and importers, the government (including local governments), recyclers, and consumers.

The proposed PPP model will manage, support, and enable the EPR approach through policy development, education and awareness-raising, training, and capacity building, monitoring and evaluation of progress, and promoting innovation. The intended target of the PPP is to raise the collection and recycling rate for polyethylene terephthalate (PET) plastics – the most common type of recyclable plastic – from 20% to 85% in three years.

The EPR approach will link closely with the National Waste Management Policy that is currently being updated.

To support the implementation of the EPR system, IUCN, with support from Mangroves for the Future and funding from the private sector, will carry out a detailed study to define an operational system for the western province, which reports the highest use of plastics in Sri Lanka. The trust established between IUCN and the government of Sri Lanka during the initial development of the EPR proposal has allowed for considerable operational flexibility, which bodes well for the effectiveness of the study.

Next steps include a pilot program to establish 10 central collection and processing centers in the Western Province. The data collected will be used to develop detailed operational guidelines to enable the EPR approach to be expanded and executed throughout Sri Lanka. Both public and private sectors will jointly provide resources to establish this pilot initiative.

Set to be fully implemented in early 2018, the ERP approach is predicted to be a win-win for all parties. It will lead to the reduction of health hazards by enhancing air, water, and soil quality; conserve biodiversity; improve the local and global image of the Sri Lankan environment; enhance tourism; and bring economic advantages through material and energy recovery.

Mangroves for the Future (MFF) is a partnership-based regional initiative which promotes investment in coastal ecosystem conservation for sustainable development. MFF focuses on the role that healthy, well-managed coastal ecosystems play in building the resilience of ecosystem-dependent coastal communities in Bangladesh, Cambodia, India, Indonesia, Maldives, Myanmar, Pakistan, Seychelles, Sri Lanka, Thailand, and Viet Nam. The initiative uses mangroves as a flagship ecosystem, but MFF is inclusive of all types of coastal ecosystem, such as coral reefs, estuaries, lagoons, sandy beaches, sea grasses and wetlands. MFF is co-chaired by IUCN and UNDP, and is funded by Danida, Norad, and Sida and the Royal Norwegian Embassy in Thailand.

The International Union for Conservation of Nature (IUCN) is a membership Union composed of both government and civil society organizations. It harnesses the experience, resources and reach of its more than 1,300 Member organizations and the input of more than 15,000 experts. This diversity and vast expertise make IUCN the global authority on the status of the natural world and the measures needed to safeguard it.

9.3 Annex 3: IPS Sri Lanka

The **Institute of Policy Studies of Sri Lanka (IPS)** is an autonomous economic research organization, established by an Act of Parliament. Our mission is to conduct high-quality, independent, policy-relevant research to provide robust evidence for policymaking and improve the lives of all Sri Lankans.

Study on Post-Consumer Plastics in Sri Lanka

This study investigated the current status of the plastic industry in Sri Lanka with special emphasis on PET based bottle industry. The specific objective of this study is to estimate the approximate amount of post-consumed PET based bottles available in the most urbanized (Western Province) areas of Sri Lanka to be recycled by RECNET International Lanka Private Ltd. in their newly proposed plant.

Data was collected from a number of sources that included the Department of Customs for imported plastic raw materials, the Plastics and Rubber Institute for domestic plastic manufacturing and finished plastic products, Colombo Municipal Council (CMC) waste collection center for waste data, selected hotels for waste generation data and a recycling plant in Moratuwa for technical data. The total domestic PET based bottle production and the amount exported as finished products were estimated based on available information.

Findings of the study revealed that Sri Lanka imported 1337 mt of PET based raw materials in year 2003. The amount imported as PET bottles is insignificant. Raw material imports of PET are rising at 28% per year since 2000, while all plastic products manufacturing is increasing at 7.5% per year. Based on data from a separation center in one district of Colombo, it was estimated that each household generates about 3 kg of collected PET waste per year that could be extrapolated to about 736 mt for the entire Western Province. Waste from hotels above the 3-star level generates about 58 mt per year. Although there are no PET bottle recycling plants in Sri Lanka, about 80 mt of collected bottles are exported to India, which is about 10% of the PET waste stream in the Western Province.

Comparatively only 225-300 mt of PVC enters the waste stream annually island wide while about 1270 mt of plastic bags enter the waste stream in the Western Province alone. Much of the plastic bags and PVC consumer products are presently being recycled, but there are no PET recyclers, currently.

Sri Lanka Recyclers Association (SLRA), a registered non-profit oriented industrial association, was established with the aim of enabling the systematic development of the country's recycling industry. It is an independent industrial platform for all types of industry stakeholders such as Waste Recyclers, Waste Collectors, Suppliers, Waste Generators, Waste Disposal Solution Providers and Researchers.

Sri Lanka Recyclers Association (SLRA), a non-profit oriented industrial association, was founded to promote waste material recycling and uplift recycling standards in the country. It is the common industrial voice of Waste Recyclers, Solution Providers and Waste Generators in Sri Lanka. SLRA services are designed for the benefit of its members. The key objective of membership is the reduction of virgin raw material importation through improved waste material recycling. SLRA further aims to expand exporting of value-added recycled products/raw materials

9.4 Annex 4: Kabadiwalla Connect (India)

"Smart waste collection and processing solutions for cities in the developing world – powered by the informal sector"

Company Info

- Established in 2014
- Headquarters: Chennai, Tamil Nadu, India
- Website: https://www.kabadiwallaconnect.in/

Kabadiwalla Connect (KC) has received grants from the World Economic Forum, the Global Partnership for Sustainable Development Data and Expo Live. To improve the impact and efficiency of informal waste recover, KC focused on developing a data-centric approach to leverage the existing informal waste ecosystem. It mobilized volunteers to map the network of over a thousand local kabadiwallas (scrap dealers) in Chennai at a neighborhood level. Based on KC's research of Chennai's informal waste ecosystem and kabadiwallas, the Global Partnership for Sustainable Development Data and ExpoLive. To improve the, over 70 percent of kabadiwallas earn less than Rs. 30,000 a month (approximately USD 435); 90 percent own a smartphone; and 14 years is their average number of years of experience.

KC's app makes it easy for households and businesses to contact the local kabadiwalla to sell their sorted wasted for upcycling or recycling. KC then helps the kabadiwallas get better prices for the waste by helping them report when they have recyclables to sell in order to aggregate inventory, and acting as a buying club, sell higher up the value chain. KC's various initiatives improve the efficiency of collecting recyclable waste and help the kabadiwallas earn more.

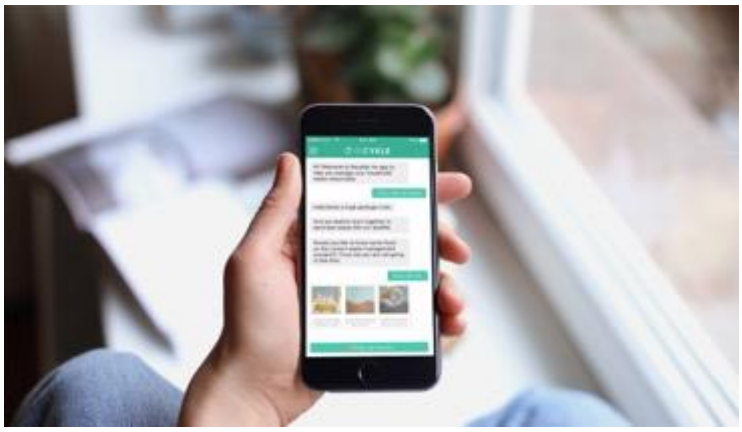
The current situation

At a macro level, while the waste management sector makes a relatively minor contribution to greenhouse gas (GHG) emissions, the waste sector is in a unique position to becoming a major save of emissions–proper waste management has positive GHG emissions from energy, forestry, agriculture, mining, transport, and manufacturing sectors (Kabadiwala Connect, 2016).

At a micro level, "In Indian cities, the generation of Municipal Solid Waste (MSW) is over-riding the population growth rate. In Chennai for example, the population growth between 1991 and 2001 was 21 percent, while its waste generation grew 61 percent between 1996 and 2002. Improper Solid Waste Management is a systemic problem for all of India's cities, and a study found that 91 percent of all solid waste is collected and dumped unscientifically in open landfills (Kabadiwala Connect, 2016)."

Human technology as intervention

KC operates two separate but linked waste management initiatives. KC Recover works hand in hand with communities to send less waste to the landfill. KC's mobile-based app called "Recykle" makes it easy for city residents, commercial establishments, and industries to sell better sorted recyclable waste materials to local kabadiwallas. The app ensures traceability through its real-time tracking system.



Consumer Engagement

To engage city residents, commercial establishments and industries, KC has brought the kabadiwallas online: you can find the ones near you, see what scrap they deal in, and then call them to collect your sorted waste. KC's map-based listing service at a neighborhood level helps consumers find the right waste recyclers for their sorted recyclables.

Smart Recycling Bins

KC also operates smart recycling bins that store many types of recyclable plastics. The bins have a QR code which app users can scan when they drop off waste to earn points, which will entitle them to discounts at restaurants. A built-in sensor sends a text message to the local kabadiwalla once the bin is full and the plastics are ready for collection.

KC Transform is another initiative which aims to create more value from upcycled or recycled plastics through plastic recovery facilities optimized to benefit the kabadiwallas. KC has built a material recovery facility in Chennai, which can currently handle PET bottles.13 KWC is also looking into the practicality of building a customized and commercially viable MRF that can procure all grades of plastics amassed by kabadiwallas. To date, KC has helped recover more than 2,000 tons of scrap metal, 1,000 tons of waste paper, 400 tons of plastic waste, and nearly one million PET bottles. As of writing, the MRF has processed over 100 tons of PET plastic.

[13] A materials recovery facility is a destination where the kabadiwallas can deliver the waste they gathered and sorted. This is then cleaned and processed, to prepare it for use by a recycling plant.

9.5 Annex 5: Plastic Roads in India

In India, plastic roads were developed as a solution to address two urgent issues - poor roads and burgeoning plastic waste. In 2016, the Government of India notified the Plastic Waste Management Rules 'to give thrust on plastic waste minimization, source segregation, recycling' among other things (Gazette of India, 2016). One of the objectives of the rules is 'to promote use of plastic waste for road construction as per Indian Road Congress guidelines. This legal validation of plastic roads has come a decade late, for, in 2006, the process invented by one Dr. R. Vasudevan, dean of a renowned engineering school in Tamil Nadu, and his team at the Centre for Studies on Solid Waste Management (CSSWM) was patented. The process essentially involved mixing shredded plastic with hot gravel and adding it to molten asphalt (Sirish, Annamalai, & Koshy, 2018).

Typically, two methods are used in the laying of plastic roads- Dry process and Wet process. In the dry process, plastic wastes like bags, bottles (less than 60 microns) are shredded uniformly. The aggregated mix is heated to 170 degree centigrade and transferred to a mixing chamber. Similarly, bitumen is heated up to a maximum of 160 degree centigrade. In the mixing chamber, the heated bitumen is added and coated with the shredded plastic. The aggregate is then mixed with hot bitumen. In the wet process, waste plastics are directly mixed with hot bitumen at 160 degree centigrade. A mechanical stirrer is needed for this process. Owing to higher investment and need for bigger plants, dry process is most commonly used. Plastic films, hard foams, soft foams and laminated plastics with thickness up to 60 microns are used for plastic roads. Polyvinyl Chloride, which releases harmful toxins when heated are not used (Centre for Innovations in Public System, 2014).

This groundbreaking yet frugal technology was discovered and pioneered by Dr. Rajagopalan Vasudevan, a Chemistry professor at Thiyagaraja School of Engineering, Madurai in 2001 based on a laboratory research. Popularly known as the 'Plastic Man of India' for his indigenous invention of converting plastic waste into usable form of tar, Dr. Vasudevan's technology incorporates the use of 'Plastone', a mixture of stone chips and waste plastic bags which is heated at 150-170 Degree Celsius, in laying roads, pavements and flooring purposes as an alternative to interlocking paver blocks (Centre for Innovations in Public System, 2014). He demonstrated that at this processing temperature, the plastic waste is heated enough to act as an adhesive in binding stone chips and not generating any toxic gases. The aggregate becomes waterproof after getting coated with molten plastic. This step is followed by the addition of hot plastic-aggregate mix to hot bitumen while maintaining the process temperature. This approach is known as 'Dry Process'. The 'Wet Process' involves mixing of plastic to hot bitumen followed by mixing with hot aggregate. Both the processes lead to the formation of plastic modified bituminous aggregate mix with enhanced properties imparting strength, stability, and durability to the roads (Centre for Innovations in Public System, 2014).

In order to determine physical characteristics of the plastic road, Dr Vasudevan has prescribed a few tests such as Benkelman Beam test, Sand Texture Depth test, Skid resistance, Merlin test and Field Density Test. The plastic roads are cost friendly in that, this technology needs no interference from strong machineries as they are created in warehouses and installed onto pathways directly, thus reducing the cost of onsite production (Govindarajan, 2018).

Vasudevan's innovation was patented in 2006 and it generated interest among civic bodies in the country and in Japan and China as well. It has since been used to build over 100,000 km of roads in at least 11 states in India. In recognition of his contributions, the Indian government awarded him with 'Padma Shri' in 2018, the fourth highest civilian award in India (Govindarajan, 2018).

Though approved specifications were not available in the nascent stages of pioneering this technology, several trial roads were constructed using waste plastic as early as in 2001, in few states in the country. Though detailed performance studies were not systematically planned and done on all such roads, generally it has been found that the roads constructed using waste plastic, popularly performed better compared to those constructed with conventional bitumen. Further it has been found that such roads were not subjected to stripping when come in contact with water. With the experience gained over the years of construction of roads using waste plastic, regulatory authorities in the state as well as at the centre have firmed up the specifications for the utilization of plastic waste for the construction of roads such as the Indian Road Congress guidelines for the use of waste plastic and the more recent, Plastic waste management rules 2016 (Ministry of Rural Development, Government of India).

In 2015, the government the Ministry of Road Transport and Highways via a circular, acknowledged the lukewarm response to the concept of 'plastic roads' amongst the stakeholders and decided to encourage the use of plastic waste in the hot mix bituminous wearing coat in the construction of national highways (Ministry of Road Transport & Highways, 2015). In fact, it went a step further to encourage the use of plastic waste by mandating that in case of non-availability of plastic waste, the road developer would have to seek approval from the ministry for bitumen-only roads. Yet, the uptake of this technology remains poor due to two main reasons despite it being successful and scalable. In fact, estimates show that if the country had used 6%-8% plastic every year in the construction of roads as stipulated by the Indian Road Congress Guidelines 2013, India could have saved more than 300 tonnes of plastic waste from going to the landfill (Sirish et al., 2018).

Worldwide, currently, we produce approximately 400 million tonnes of plastic per year, breaking down to more than a billion kilograms per day. This is likely to experience a four-fold increase by 2050 (Graph below) (Guglielmi, 2017). Studies have shown that only 9% of the plastics produced thus far have been recycled (GAIA, 2018). Plastic roads thus present a great potential for the alternative use of the plastics that otherwise end up in our oceans and choke our marine life. While reducing plastic production may be a logical ask, the reality we are faced with the booming production capacity of plastic production units. Therefore, to recalibrate our solutions commensurate with the estimated problems may just serve us better. It is here that the plastic roads come as a wonderful solution to address the burgeoning problem of littering and waste.

Fortunately, this technology uses plastic waste that finds no application even in recycling and typically ends up in landfills or leaks into marine environments. Plastic roads also enjoy proven success, making roadways stringer and safer for drivers and road users. The polymer mixture is also known to increase the lifespan of roadways, minimizing the required maintenance, thereby bringing down the financial burden on the municipal bodies. While cities become more congested and the negative impact on our environment increases, utilizing plastic waste for our roadway construction could be a surer way to address many problems plaguing developed countries by reducing pollution, bringing down financial stress on annual budgets while also improving public safety for all motorists.

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9.6 Annex 6: Parley AIR Initiative

Parley AIR is the strategy to end the fast-growing threat of marine plastic pollution. We believe plastic is a design failure, one that can only be solved by reinventing the material itself. To create change, we can stop producing more plastic right away and use up-cycled marine plastic waste instead. Everyone has a role to play.

AVOID **PLASTIC WHEREVER POSSIBLE**
INTERCEPT **PLASTIC WASTE**
REDESIGN **THE MATERIAL ITSELF**

Parley for the Oceans addresses major threats towards our oceans, the most important ecosystem of our planet. We believe the power for change lies in the hands of the consumer – given we all have a choice – and the power to shape this new consumer mindset lies in the hands of the creative industries.

Artists, musicians, actors, filmmakers, fashion designers, journalists, architects, product inventors, and scientists have the tools to mold the reality we live in and to develop alternative business models and ecologically sensible products to give us earthlings an alternative choice, an everyday option to change something.

To succeed, we need to find ways to synchronize the economic system of humankind with the ecosystem of nature. And make environmental protection fiscally lucrative for pacesetting major companies.

Parley has been created to accelerate a process of change that is already in progress. No other big movement in the history of humankind has developed faster than the environmental cause. We want to make sure we are fast enough to meet the ultimate deadline and turn the ship around before we lose a treasure we have only just started to explore and still don't fully understand: the fantastic blue universe beneath us — The Oceans.

Parley Initiatives

- GLOBAL CLEANUP NETWORK
- GHOSTNET RETRIEVAL
- OCEAN PLASTIC® MATERIALS
- RE-INVENT PLASTIC
- OCEAN SENTINELS
- MICROPLASTIC RESEARCH
- CLEAN WAVES
- PARLEY OCEAN SCHOOL
- AIR IMPLEMENTATION

9.7 Annex 7: Plastic Recyclers in Sri Lanka

A. Eco-Spindles

- Composed of 3 facilities: (a) PET bottle recycling; (b) yarn plant and (c) mono-filament plant
- Collecting PET bottles from 16 collection centers all over Sri Lanka with the company providing bailing machine for each center
- 10% of the recycled materials comes from industrial clients (rejects and scrap plastics)
- Each collection center collects about 300 to 400 kg of PET bottles per day
- The facility is currently recycling, about 250 to 300 MT per month or equivalent to around 10 million PET bottles.
- Company has partnered to several companies like Coca-Cola, Parley AIR Initiative, various municipalities, ports and the SL Navy for collection of PET bottles.
- Recycled Products: PET flakes, yarn and mono-filaments used for cleaning and paint brush
- Partnering with NGO to monitor ocean plastics collected from various points in SL through GPS tracking for product branding.
- Facility has its own wastewater treatment plant; solid wastes are transported to 3rd party treater; while non-recyclables (1.5% of accepted materials) are sent to Holcim for incineration.

PET Bottle to Mono-filaments and flakes

Baled PET bottles

Recycled product - PET flakes

Product shirt from yarn

B. Green Lanka
(Location: about 20 minutes from Colombo)

- Waste polyethylene (or polythene) plastic recycling facility
- Raw materials – waste plastics and packaging
- Producer of polybags (sando plastic bags)
- One of about 20 polythene plastic recyclers in SL
- Operating as recycler since 1990
- Located inside an industrial complex

Dirty waste plastics

Ground Polythene

Extrusion Process

Recycled (non bio-degradable) polybags

C. Darshana Bio-Packaging
(Location: Maligawa Road, about 20 minutes from Colombo)

- Scrap (clean) polythene plastic recycling facility
- Raw materials – rejects, scraps from industrial packaging facility
- Product – recycled polythene beads which will be used again in the company's plastic bag production
- The company produces polybags from virgin polythene, recycled polythene and bio-degradable raw material.
- Located inside an industrial complex

Plastic scraps and reject

Recycling to polythene beads