



Regional Action Plan for the Sustainable Management of Marine Litter in the Red Sea and Gulf of Aden



September 2018



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PERSGA – “The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden” is an intergovernmental organization dedicated to the conservation of the coastal and marine environments in the region. The Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (Jeddah Convention) 1982 provides the legal foundation for PERSGA. The Secretariat of PERSGA was formally established in Jeddah following the Cairo Declaration of September 1995. The PERSGA member countries are Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan, and Yemen.

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List of Acronyms

Acronyms	Description
GPA	Global Programme of Action
LBA	Land-Based Activities
MARPOL	The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78; MARPOL is short for marine pollution)
MC	Member Countries
NAP	National Action Plans
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PERSGA	The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
RAP	Regional Action Plan
SDG	Sustainable Development Goal
UN	United Nations
UNE	United Nations Environment
UNEP	United Nations Environment Programme

Executive Summary

This Regional Action Plan pertains to marine litter in the Red Sea and Gulf of Aden (the PERSGA region). Its purpose is to provide a road-map to sustainably manage marine litter in the PERSGA region. More specifically, it lists practical actions that if enacted will greatly reduce the amount of litter entering the marine environment and to remove litter when it has.

There are 60 actions listed in this Regional Action Plan and each is ranked in terms of its urgency. There are four ranks: Very High, High, Medium and Low. Each action is linked to one of seven complementary components (or strategies) designed to comprehensively address the threat of marine litter. The components are:

Integrated Management Framework: The objective of this component is: *To promote integration and coordination of PERSGA initiatives to sustainably manage marine litter in the PERSGA region.* There are seven actions proposed to achieve this objective. Actions include the establishment of an Interagency Task Force made up of members from PERSGA and member countries. Other actions are the selection of national agencies from each member country to coordinate actions at the national level and who will prepare National Action Plans. National Action Plans will complement the Regional Action Plan by listing country specific actions.

Awareness and Education: The objective of this component is: *Raise government and public awareness of the impact of marine litter to the marine environment, economy and human health through the implementation of education and awareness programs and literature.* There are nine actions proposed to achieve this objective. Actions include raising awareness of stakeholders to the environmental, social and economic consequences of marine litter. Other actions include targeted educational programs such as litter clean-up campaigns, newspaper articles, the publication of school curriculum material and workshops for more specialised training.

Legal and Institutional Framework: The objective of this component is: *To review and, if necessary, improve the legal basis for preventing litter entering the marine environment.* There are 12 actions proposed to achieve this objective. This component identifies actions to evaluate laws relating to litter in each member country, and actions to improve compliance and enforcement. Actions also relate to the ratification and enforcement of international protocols relating to marine litter.

Encouraging Public-Private Partnerships: The objective to achieve this component is: *Encourage public-private partnerships to address marine litter by removing, preventing and/or recycling marine litter in the PERSGA region.* There are eight actions proposed to achieve this objective. This component proposes actions to encourage private companies to take voluntary initiatives to address the issue of marine litter independent of government laws and regulations. Such actions should include phasing-out single-use plastic bags and other plastic items. The advantage of such actions is that they may not require public funding and thus are likely to be more sustainable.

Removing Marine Litter: The objective to achieve this component is: *To clean-up litter from the marine environment.* There are six actions proposed to achieve this objective. This component focuses on actions to remove litter already in the environment. One of the most straightforward and cost-effective approaches to remove plastics and other forms of marine litter from the environment is beach clean-ups. A beach clean-up is where marine litter is collected from a beach and taken to a legally designated litter disposal site, such a landfill or recycling plant. Other actions relate to activities that remove litter from the seafloor and water column.

Research and Monitoring: The objective for this component is: *Undertake research to determine the source, density and composition of marine litter in each PERSGA member country.* There are 15 actions proposed to achieve this objective. Research and monitoring programs are essential to address the threat of marine litter in the PERSGA region. The term 'research' refers to short-term hypothesis driven experiments designed to evaluate the effectiveness of specific management interventions to prevent or remove marine litter. The term 'monitoring' relates to long-term studies focusing on quantifying trends in litter accumulation or to evaluate compliance with a management threshold. Research and monitoring are essential because without a precise understanding of the source of litter it will be challenging to implement effective management. Further, monitoring is essential to evaluate if outcomes, such as the reduction in marine litter, are being achieved and thus confirming the effectiveness of management actions.

Capacity Building and Training: The objective for this component is: *Identify capacity limitations and training needed to implement actions.* There are three actions proposed to achieve this objective. Stakeholders responsible for implementing actions in this Regional Action Plan may require new skills and knowledge. PERSGA could facilitate this through developing training material and programs, workshops convened by subject matter experts, on-line courses and developing guidelines. Training courses could cover subjects ranging from raising awareness about microplastic to explaining advanced litter monitoring techniques.

Introduction

Litter (also called debris, solid waste, garbage or trash) is ubiquitous throughout the world's oceans and is a significant threat to marine and coastal biodiversity (Weis, 2015). Marine litter can be defined as “.....*any manufactured or processed solid waste material (typically inert) that enters the marine environment from any source*” (PERSGA, 2008)¹. Marine litter is also seen as a public health issue (Seltenrich, 2015) and can be detrimental to economic activity such as coastal tourism (Ballance et al., 2000). Marine litter doesn't discriminate among national marine boundaries because currents will move litter across borders. For this reason, management action to address marine litter will need to be coordinated at a regional rather than at a national level.

In 2010 alone, 4.8 to 12.7 million metric tons of plastic litter were estimated to have entered the ocean from 192 coastal countries (Jambeck et al., 2015). According to the same authors, countries contributing the greatest amount of plastic to the oceans were China, Vietnam and Indonesia. Worldwide, about 80% of litter entering the marine environment is land based (Weis, 2015), either being blown in by wind or discharged from rivers. The remaining 20% is ocean-based having entered the ocean from vessels, oil platforms or jetties (also known as piers).

Outline of this RAP

This Regional Action Plan (RAP) is structured in the following way:

1. **Marine Litter in the PERSGA Region:** Provides an overview of the types and quantities of marine litter observed in the Red Sea and Gulf of Aden.
2. **Environmental, Health and Economic Impacts of Marine Litter:** Summarises the types of impacts associated with marine litter.
3. **The Role of PERSGA in Managing Marine Litter:** Identifies PERSGA role to mitigate the impact of marine litter.
4. **Background to this RAP:** Provides context to the RAP and how it relates to proposed National Action Plans (NAPs).
5. **Framework for Action:** Describes a logical framework to implement and evaluate actions to address marine litter.
6. **The Actions:** Lists the actions for seven components.

¹UNEP has a similar definition “.... any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment” (PERSGA, 2014).

Marine Litter in the PERSGA Region

The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) recognises litter as a major threat to the marine environment² (PERSGA, 2008). PERSGA (2008) provided a detailed summary of the extent of marine litter in the Red Sea and Gulf of Aden (hereafter ‘the PERSGA region’). Rather than repeating that information, a summary of more recently published data is given here. Table 1 provides a list of the principle types of marine litter (both material and form) found in the PERSGA region (PERSGA, 2014; Dr. Agwan, unpublished data). Compared with some Asian countries, the potential contribution of plastic to the ocean from PERSGA member countries is much less (Jambeck et al., 2015). For instance, the maximum amount of plastic waste available to enter the ocean in 2010 from China was >5 million metric tons compared with between 0.01 to 1 million metric tons for PERSGA member countries (Jambeck et al., 2015). Other studies have shown that the amount of plastic material in the Red Sea is less than some other regional seas. Marti et al. (2017) concluded that plastic fragments (excluding fibres) in the upper water column of the eastern Red Sea (mean 3,546 fragments/km²) is about 40 times less than the Mediterranean Sea (147,500 fragments/km²; source Ruiz-Oregon et al., 2016). Al-Najjar and Al-Shyab (2011) reported moderate to high levels of marine litter on the seafloor in shallow waters off Jordan. They found marine litter densities on the seafloor ranged from 1 to 6 items/m², and the most common items were cans and plastics.

Table 1: Common types of marine litter in the PERSGA region

Material	Form
Plastics	Fragment, sheets, bags, containers, pellets, ropes, bottles
Polystyrene*	Cups, packaging, buoys
Nylon*	Fishing nets, fishing line
Rubber	Gloves, boots
Wood	Construction timber, pallets, fragments of both
Metals	Drink cans, oil drums, aerosol containers, scrap
Sanitary	Sewage related litter
Paper/cardboard	Books, newspaper, wrapping material
Cloth	Clothing, furnishing, shoes
Glass	Bottles, light bulbs
Ceramics	Pottery

*These are types of plastics.

²In this report, the phrase ‘marine environment’ generally, unless stated otherwise, collectively refers to marine and coastal environments, and associated biodiversity.

Environmental, Health and Economic Impacts of Marine Litter

PERSGA (2008) provided a detailed summary of the impact of litter in the marine environment. Since publication of that report, there has been a considerable amount of new information on the impact of marine litter and, more specifically, in relation to plastics. The focus of this section is to complement the information in PERSGA (2008) by providing a summary of more recent literature. The environmental impact of marine litter is mainly physical but can be chemical. Large pieces of litter can crush or smother sessile marine organisms such as hard corals and seagrasses, while smaller pieces, especially plastics, can be consumed by whales, sharks, turtles and seabirds (Li et al., 2016). Plastics in the stomachs of some marine organisms may cause starvation by becoming lodged in digestive tracts. Seabirds are particularly vulnerable to this type of pollution and it is predicted that 186 species of seabird are at risk of plastic ingestion (Wilcox et al., 2015).

Marine mammals, fishes and birds can become entangled in marine litter, such as discarded nets or fishing line, leading to drowning (Laist, 1997). More recently, Lamb et al. (2018) presented evidence that plastic litter may increase the susceptibility of reef-building corals to disease. They found that where plastic had come into contact with coral, the likelihood of the presence of disease rose from 4 percent to 89 percent - a 20-fold increase.

Marine litter has significant human health implications (Williams et al., 2013). Previously, health concerns largely focused on broken glass or used syringes on beaches. More recently, there is the growing concern about the accumulation of pollutants in the tissues of seafood species that have ingested marine litter (Rochman et al., 2015). Ingestion of tiny plastics can harm humans and other organisms in multiple ways: a) once in the ocean, plastics can sorb high concentrations of toxic and bioaccumulating chemicals³, which can leach out into the gut; b) plastics contain their own chemicals, such as additives, that can affect the endocrine system; and 3) nano-sized plastic particles may have the potential to pass through the placenta and the blood-brain barrier in humans (Seltenrich, 2015).

Marine litter can have economic impacts by compromising the aesthetic values of important tourist sites. For instance, Ballance et al. (2000) reported that litter densities > 10 large items/m² of beach would deter 40% of foreign tourists from returning to Cape Town, South Africa. Litter can also get entangled in nets and propellers, and or entrained in water intake pipes on vessels leading to costly engine repairs and reduced fishing effort. There is also the cost associated with removing litter from the environment, which can amount to millions of dollars per year in some countries (UNEP, 2011).

³Such as Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs) and DDT.

The threat of marine litter to the natural environment and human health has increased with the advent of plastics. Plastic is a synthetic or semi-synthetic organic chemical. While plastics may be made from just about any organic chemical, most industrial plastics are made from oil or gas-based products. The name "plastic" refers to the property of plasticity, which is the ability to deform without breaking. The major environmental concern with plastic is that it generally cannot be broken down by biological processes⁴ and thus persist in the environment for a very long time. The approximate degradation time for plastics and other common forms of litter are given in Table 2.

Table 2: Decomposition rates for common litter

Material	Degradation Time*
Paper Towel	2-4 weeks
Banana and Orange Peel	2-5 weeks
Newspaper	6 weeks
Apple Core	2 months
Waxed Milk Carton	3 months
Plywood	1-3 years
Wool Sock	1-5 years
Plastic Bag	10-20 years
Nylon Fabric	30-40 years
Leather	50 years
Tin Can	50 years
Rubber-Boot Sole	50-80 years
Foamed Plastic Cup	50 years
Foamed Plastic Buoy	80 years
Aluminium Can	80-200 years
Disposable Diaper/Nappy	450 years
Plastic Beverage Bottle	450 years
Monofilament Fishing Line	600 years
Glass Bottle	1 million years

(from US National Park Services – Mote Marine Lab)

*The degradation times of these materials will vary depending, in part, on the environmental conditions in which they were deposited.

Most plastics will become brittle when exposed to ultra-violet light and break down into smaller pieces. Pieces less than 5 mm are commonly called microplastics (Seltenrich, 2015). Microplastics come from a variety of sources, including larger plastic litter that degrade into smaller pieces. In addition, microbeads⁵, a type of microplastic, are very tiny pieces of manufactured polyethylene plastic that are added to some facial cleansers and toothpastes (NOAA, 2018). Tiny particles of plastic may be consumed by animals such as hard

⁴At least one species of bacteria is known to consume polyethylene terephthalate, the plastic used to make water bottles (Yoshida et al., 2016)

⁵Microbeads are commercially available from 0.01 mm to 1 mm in size and have replaced natural ingredients such as walnut kernels. Microbeads have been banned in some countries.

corals (Hall et al., 2015), zooplankton (Cole et al., 2013) and fishes (Davison and Asch, 2011), and may eventually be passed up the food chain into humans.

The sustainable management of marine litter is more urgent than ever. This is because of the potential for marine litter to weaken the resilience of marine ecosystems to other threats such as climate change, overfishing and declines in water quality (Lamb et al., 2018). These threats may act synergistically with marine litter to reduce the capacity of marine ecosystems to resist disturbance as well as reduce rates of recovery.

The Role of PERSGA in Managing Marine Litter

PERSGA coordinates environmental programs and activities in cooperation with member countries. The program titled 'Protection of the Marine Environment from Land-Based Activities' is an important component of the PERSGA framework. This program is linked to the 'Protocol Concerning the Protection of the Marine Environment from Land-Based Activities in the Red Sea and Gulf of Aden (2005)⁶'. According to Article 7 of the Protocol, contracting parties commit themselves to take actions to eliminate solid waste and to cooperate with each other and international agencies to achieve this aim (refer to Box 2 for specific wording on the commitment).

PERSGA has prepared this RAP, in collaboration with member countries, to meet, in part, their commitments to the Protocol. More broadly, this RAP aims to contribute to the sustainable management of marine litter in the PERSGA region. In context of this RAP, sustainable management of marine litter means developing cost-effective ways to prevent litter from entering the marine environment and to remove litter when it has.

The activities of PERSGA and member countries to tackle marine litter should not be considered in isolation. Instead, these activities should be seen in terms of a global partnership to mitigate the effects of marine litter, especially plastics, worldwide. For instance, the RAP will allow member countries to contribute to achievement of the UNDP's Sustainable Development Goal (SDG) 14. Target 14.1 of Goal 14 states 'By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution'. The activities associated with this RAP could be used to collect data relating to indicators of Goal 14, such as measuring floating plastic debris (14.1.1)⁷.

⁶In accordance with Article III of the Jeddah Convention, this Protocol was formulated.

⁷<https://sustainabledevelopment.un.org/sdg14>

Background to this RAP

This RAP is designed to complement PERSGA's coral RAP (PERSGA, 2003) and mangrove RAP (PERSGA, 2004), both of which acknowledge the threat of marine litter to coral assemblages and mangroves communities, respectively. In the coral and mangrove RAPs, marine litter is addressed under the section titled 'Impact from Shipping and Marine Pollution'. In this RAP, the objective and actions relating to marine litter from vessels are similar to the earlier RAPs but are now placed in the section titled 'Legal and Institutional Framework'. Further, this RAP follows a similar report structure as those earlier RAPs to maintain institutional consistency.

This RAP also builds on the report titled 'Marine Litter in the PERSGA Region' (PERSGA, 2008) which lists actions and strategies to prevent and remove litter. Since publication of PERSGA (2008), some of the proposed actions, such as the development of a regional protocol to survey litter on beaches, have been implemented. To maintain consistency with PERSGA (2008), some of the same actions are reproduced in this RAP. However, this RAP differs from PERSGA (2008) by expanding the number of strategies (called components) to address the issue of marine litter.

Similar to the coral and mangrove RAPs, this RAP is a regional commitment to address the threat of marine litter in the PERSGA region. In collaboration with member countries, this RAP will be coordinated at a regional level by PERSGA. Although the RAP will be coordinated at a regional level, implementation of many of the actions recommended in the RAP must be done at the national level through National Action Plans (NAP). This is because:

1. The impact of marine litter varies among member countries;
2. Actions will vary in terms of national priority;
3. Fine-scale planning, such as budgeting, is beyond the scope of this RAP; and
4. Countries will vary in their capacities to implement actions.

NAPs will be used to:

- List priority actions according to member country needs;
- Highlight the national capacity to implement actions;
- Identify training needs to implement actions;
- Present realistic budgets to implement actions;
- Determine time-frames and set performance indicators for results and outcomes for NAPs;
- Illustrate how NAPs will be integrated into national strategies, and
- List national stakeholders involved and their roles.

To coordinate the RAP and interface between government and donors, an Interagency Task Force⁸ should be established. The Interagency Task Force would be made up of staff from PERSGA and the national agencies assigned to be

⁸In the Coral and Mangrove RAPs, the Interagency Task Force is called a 'steering committee'. A benefit of the Interagency Task Force is assigning responsibility of the implementation of the RAP and NAPs to individuals at both the regional and national levels.

responsible for managing litter at the country level. The Interagency Task Force could convene in person or via conference calls, to discuss progress with actions listed in the RAP and NAPs. The Interagency Task Force would also evaluate progress of the RAP and NAPs.

Framework for Action

In this RAP a framework is proposed to implement actions in a logical and structured way. This framework consists of the following steps: identify broad components to address marine litter, describe associated objectives, identify the actions to achieve objectives and evaluate if actions were implemented and objectives achieved. The framework is shown conceptually in Figure 1 and the terminology explained in the text.

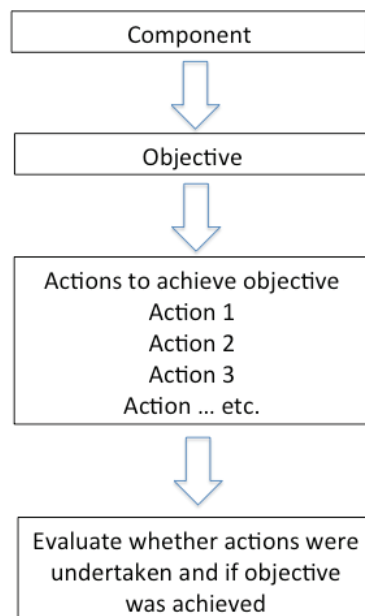


Figure 1: Framework to address the issue of marine litter

There are seven broad components (or strategies) proposed to tackle the issue of marine litter in the PERSGA region. The components are:

1. Integrated Management Framework
2. Awareness and Education
3. Legal and Institutional Framework
4. Encouraging Public-Private-Partnerships
5. Removing Marine Litter
6. Research and Monitoring
7. Capacity Building and Training

As noted earlier, this list of seven components has been expanded from three components listed in PERSGA (2008). Expanding the list of components was necessary to provide a more comprehensive list of strategies required to tackle the growing threat of marine litter.

With the exception of Component 1 'Integrated Management Framework', the components are not necessarily listed in order of priority. For instance, given the limited amount of quantitative data on the source, composition and fate of marine litter in the PERSGA region, the component titled 'Research and Monitoring' might be a natural priority to be implemented following Component 1. Without a detailed understanding of the source of marine litter at a local scale it will not be possible to determine the most appropriate actions to prevent further litter entering the marine environment. In addition, obtaining data on the composition and quantity of marine litter will permit the establishment of baseline data from which to evaluate if litter-preventative actions have been successful at reducing litter in the marine environment.

Each component is linked to a key objective. Objectives allow components to be expressed in terms of what is actually being sought or aimed at. Where appropriate, objectives are consistent with earlier PERSGA documents pertaining to the management of marine litter.

To achieve each objective, multiple actions will be required. Some of the actions need to be enacted at regional level by PERSGA, while others actions are more appropriately enacted at the national (i.e. country) level. The urgency of implementation will vary. The following priority ranks are used to categorise the level of urgency for each action listed in this RAP⁹:

- Very High Priority (very urgent action where immediate action is desirable or the action (e.g. establishment of an Interagency Task Force) is required to facilitate further actions) (preferably commencing within 1 year of RAP being approved);
- High Priority (urgent action) (preferably commencing within 2 years);
- Medium Priority (preferably commencing within 3 years);
- Low Priority (preferably commencing within 4 years).

Ranking actions in this way is useful because it allows a phased approach to the implementation of actions. It is also useful to help identify where limited budgets might initially be focused. Time-frames are benchmarked against the time when the RAP is formally approved.

To identify the most appropriate actions for this RAP and to evaluate their priority for implementation, PERSGA undertook two tasks prior to publication of this RAP. First, a questionnaire (Appendix 1) was sent to individuals in all member countries seeking information on the types of actions needed to address marine litter in their respective countries and to learn what was already being done at the

⁹These ranks are designed to be more straightforward than those used in the coral and mangrove RAPs, which used: Very Urgent Action, Urgent Action; and Priority Action.

national level to address this issue. Second, in April 2018, a workshop was held at the PERSGA office in Jeddah, Saudi Arabia, where participants from all member countries and PERSGA staff collectively reviewed the draft RAP and prioritised actions. The results of these two tasks have been incorporated into this RAP.

This RAP recognises the need for evaluation of achievement of objectives and actions. Expected results, associate time-frames¹⁰ and performance indicators are offered for each component to provide broad-level guidance in terms of an evaluation. More specifically, however, the evaluation should focus on two aspects: outputs and outcomes. Evaluating outputs means checking actions have been implemented while evaluating outcomes relates to assessing if the abundance of marine litter has declined as a result of actions. It is beyond the scope of this RAP to describe in detail how the evaluation will be done. Instead, the detailed methodology will need to be presented in a ‘monitoring and evaluation plan’ to be developed soon after the RAP is approved. This monitoring and evaluation plan will operationalise the objectives and actions by linking these to quantifiable indicator variables and targets. The plan will also list the methods to measure indicators and who should do the measuring and evaluation. It is recommended that this RAP be reviewed in its entirety ten years after its formal approval by PERSGA. However, it is desirable that the RAP and NAPs are periodically reviewed and updated as required before 10 years.

Lastly, there is the important issue of how the actions listed in this RAP will be financed. Actions at the national level will generally be funded at the country level. However, as noted in PERSGA (2008), the protection of the marine environment from litter cannot be achieved through government actions alone or by depending entirely on public funds. This is a reason why a strategy in this RAP is to promote private companies and other non-government entities to undertake actions to reduce the impact of marine litter at the national level. In terms of regional scale actions listed in this RAP, PERSGA could integrate some of these into its existing work plans. However, to implement all actions listed in the RAP will require a large financial commitment. Therefore, the initial focus will be to establish budgets for actions with the highest priority. Potential sources for finance include: Central government budgets of the member countries; International donor agencies; the private sector (companies); and donations and grants. A financial plan identifying a roadmap to fund the actions in this RAP will need to be developed after the RAP is approved.

The Actions

In this section, actions are presented for the seven components described earlier. For simplicity, actions are presented in Tables. Each Tables has the following column headings:

- Column 1: #: Action number

¹⁰The time-frames proposed for expected results will be benchmarked against the date when the RAP is formally approved by PERSGA.

- Column 2: Action description
- Column 3: Lead (e.g. Lead agency: PERSGA or Member Countries (MC))
- Column 4: Priority rank (e.g. Very High, High, Medium or Low)
- Column 5: Expected results (ER) (what is expected following the action)
- Column 6: Time-frames for ER (Time-frames for expected results)
- Column 7: Performance indicators (used to measure achievement of outputs or outcomes)

‘Priority ranks’ identify the level of urgency proposed for each action. Expected results (ER) identify what is expected follow implementation of the action. The ‘time-frames for ER’ are indicative only, and do not reflect the definitions used for the priority ranks (refer to ‘Framework for Action’). This is because the definitions for priority ranks relate to the time when the action should commence, whereas ‘time-frames for ER’ relate to when the outcomes of actions should be achieved. For instance, an action with a priority rank of Very High should commence within one year of the approval of the RAP, but the ‘time-frames for ER’ for that same action will usually be one or more years after the commencement date. In situations where it is not practical to nominate a time-frame for outcomes or outputs, the phrases ‘To be determined’ or ‘As soon as realistically possible’ are used. These can be updated when the timing of outcomes or outputs can be more precisely estimated.

Component 1: Integrated Management Framework

The issue of marine litter, including its environmental, social and economic impacts, and the actions to prevent and remove marine litter are varied and complex. This is especially relevant in the PERSGA region where member countries have different marine litter priorities and vary in their capacities to address the threat of marine litter. In addition, different stakeholders will be involved to help implement actions at both the regional and national levels, and to be successful, must work together collaboratively. Adding to this complexity is that some country members have international obligations relating to marine litter. Consequently, to sustainably manage marine litter in the PERSGA region will require careful integration of multiple actions and the coordination of multiple stakeholders and partners. To help achieve this outcome, implementing this RAP and associated actions will require a structured management framework. This structured management framework begins with PERSGA’s coordination of the RAP at the regional scale, while appointed national agencies, from each member country, will implement actions at the national level. National agencies, in consultation with Focal Points, will be responsible for the development of the NAPs. National agencies will need to coordinate with PERSGA on training and capacity building. PERSGA and national agencies will also need to work closely to evaluate the implementation of NAPs to ensure actions are implemented and objectives are being achieved. The proposed Interagency Task Force will be instrumental in helping coordinate and harmonise actions at the regional and national scale.

The objective of Component 1 is: *To promote integration and coordination of PERSGA initiatives to sustainably manage marine litter in the PERSGA region.* There are seven actions proposed to achieve this objective. These are shown in Table 3.

Table 3: Integrated Management Framework Actions.

#	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Appoint a national agency from each member country to manage and control marine litter activities at the national level.	MC	Very High	Each member country appoints national agency to be responsible for marine litter	Within 2 years	A national agency appointed from each member country
II	Develop a regional Interagency Task Force on marine litter.	PERSGA	Very High	PERSGA forms a Task Force made up of members from PERSGA and appointed national agencies	Within 2 years	All members appointed to Task Force
III	Develop a template and guidelines for preparing a NAP.	PERSGA	Very High	PERSGA develops a regional template to assist member countries prepare their NAPs	Within 2 years	Template for NAP
IV	The appointed national agency from each member country to take responsibility for developing and implementing a NAP.	MC	Very High	Each member country prepares a NAP	Within 2 years [or linked to template]	Approved NAP
V	Provide national agencies with technical support to develop their NAPs.	PERSGA	Very High	PERSGA organises a NAP writing workshop or consultant to visit national agencies to	Within 2 years	NAP writing workshop or a consultant has met with each national agency to support the writing of the NAP

					provide support for NAP		
VI	Periodically review and evaluate how the NAPs are being implemented in each member country.	PERSGA	High	Review NAPs	Within 3 years [and on-going]	Each NAP reviewed every two years	
VII	Establish a monitoring and evaluation plan (M&E Plan) that describes when and how the RAP will be evaluated in terms of achieving objectives and actions.	PERSGA	Medium	PERSGA prepares a 'M&E Plan'	Within 4 years	M&E Plan	

Component 2: Awareness and Education

Awareness is knowledge or perception of a situation or fact. Raising awareness of the general public, including fishers, vessel operators and decision makers to the issue of marine litter is an important step in preventing the intentional and unintentional disposal of litter in the marine environment. One way to increase awareness is through education, which is the act or process of imparting or acquiring general knowledge.

Some PERSGA member countries have considerable experience in raising public awareness on marine litter. Activities to raise public awareness about the problem of marine litter in the region started as far back as the 1990s in Yemen (DouAbul et al., 1999) and possibly earlier in other member countries. In early 2000, PERSGA conducted beach clean-up campaigns during 'PERSGA Day' (26 September) in member countries. Associated with these campaigns were activities to raise awareness of the threat of marine litter to the PERSGA region. In 2007, PERSGA launched the "Clean-up Our Seas" initiative (refer to Box 1). This initiative was the most important event undertaken by PERSGA within its framework of raising awareness to protect the marine environment from litter. In 2011, PERSGA developed a Regional Strategy (RS) for environmental awareness for sustainable development in the Red Sea and Gulf of Aden. Under this RS, clean-up campaigns were conducted. Consequently, with this long history of marine litter prevention and clean-up activities there is regional expertise and experiences that should be shared among member countries.

The threat from marine litter is increasing, which is leading to worldwide campaigns to address the issue of marine litter. One such campaign is #CleanSeas campaign promoted by UN Environment. A primary aim of this campaign is to raise awareness of the threat of plastics in the marine environment and the encouragement of policies to reduce plastic use. Participating in global initiatives such as this has the benefit of providing a forum to share ideas and resources.

The cost of producing awareness and education material is not cheap and may be beyond the resources of some PERSGA country members. Consequently, consideration could be given to pooling resources and getting awareness and educational material produced by PERSGA for distribution to all member countries. Appendix 2 provides links to websites with examples of marine litter educational and awareness material used in other parts of the world. Some of these could potentially be modified for use in the PERSGA region.

Box 1: PERSGA Clean-Up Our Seas campaign

Since 2007, PERSGA has initiated a regional litter campaign under the slogan of “Clean-up Our Seas”. The aim of the “Clean-up Our Seas” campaign is to raise awareness of the impact of marine litter on the marine environment in the PERSGA region. This initiative was first undertaken in collaboration with the UN Environment Regional Seas Programme/GPA Unit. A variety of awareness materials were distributed to participants and included posters, t-shirts with logos and caps. Beach clean-up events were launched in Yemen and Djibouti in coordination with national Focal Points and local stakeholders such as school students. An underwater marine litter clean-up campaign was also launched in Jeddah, Saudi Arabia, in coordination with the national Focal Points and a private dive centre (Figure 2).

Figure 2: Underwater clean-up event, Jeddah, Saudi Arabia.



The objective of Component 2 is: *Raise government and public awareness of the impact of marine litter to the marine environment, economy and human health through the implementation of education and awareness programs and literature.* There are nine actions proposed to achieve this objective. These are shown in Table 4.

Table 4: Raising Awareness and Education Actions

#	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Develop and publish marine litter educational and awareness material, for a range of stakeholders, which can be shared among member countries.	PERSGA	High	Production of general educational material	Within 3 years	Educational material (to be determined)
II	Produce, publish and / or disseminate education and awareness materials specific to each member country, using electronic media, information sheets, brochure, booklets, videos, CDs and other media for: <ul style="list-style-type: none"> • School children relating to impacts of littering on beaches and human health; • Fishermen on impacts of abandoned fishing gear and other litter on marine resources and habitats; • Diving centres on impacts to marine life and habitats; • Private companies on how the material they sell or produce can contribute to litter in the marine environment; • Policy makers and other decision-makers on negative effects of marine litter and importance of actions to sustainably manage marine litter. 	MC	Very High	Production of country-specific educational material	Within 2 years	Education material (to be determined per country)
III	Organise awareness workshops on the impact of marine litter for various stakeholders, such as teachers and government officials.	MC	High	Litter awareness workshops in each member country for various stakeholders	Within 3 years	At least one awareness workshop per country
IV	Organise workshops to improve media/awareness raising skills to allow information on marine litter to be disseminated effectively to the public and to develop advocacy skills to influence government policy.	PERSGA	High	PERSGA convenes a workshop on media/awareness/advocacy skills	Within 3 years	At least one regional workshop on media and advocacy skills

V	Develop strong linkages with key government departments to inform officials/decision-makers about important information relating to the environmental effects of marine litter.	MC	High	Meetings with minister or deputy minister for environment in relation to marine litter	Within 3 years	At least one meeting with the minister/ deputy minister for environment per year
VI	Develop strong linkages with newspaper reporters/editors to encourage them to communicate information about the environmental and health impacts of marine litter.	MC	High	Meetings with local newspaper editors to discuss potential stories relating to marine litter	Within 3 years	At least one newspaper article on marine litter per year (per member country)
VII	Use 'Al-Sambouk' (PERSGA newsletter) to regularly share with member countries the results of actions to prevent and remove litter in the PERSGA region.	PERSGA	High	Publish marine litter articles in 'Al-Sambouk'	Within 3 years	At least two articles on marine litter per year
VIII	Encourage member countries to continue to undertake activities associated with PERSGA's 'Clean-up Our Seas' campaign.	PERSGA	High	PERSGA organises a beach clean-up activity in each member country per year	Within 3 years	At least one-PERSGA sponsored beach clean-up campaign per year
IX	Encourage member countries to participate in international campaigns such as the #CleanSeas campaign.	PERSGA	High	Each member country to participate in the #CleanSeas campaign	Within 3 years	Each member country makes at least one commitment under #CleanSeas (e.g. inform citizens or pass new laws)

Component 3: Legal and Institutional Framework

All PERSGA member countries have national and municipality (e.g. state or city) laws or decrees, which provide a legal foundation for the management of litter (PERSGA, 2008). In addition, PERSGA member countries are signatories to the PERSGA Protocol Concerning the Protection of the Marine Environment from Land-Based Activities (LBA Protocol) Article 7 Management of Solid Wastes (refer to Box 2).

Box 2: Article 7 ‘Management of Solid Wastes’

“Parallel to the Global Programme of Action, wastes or marine litter dumped in the coastal zone should be taken into consideration to avoid the risks imposed on marine life. According to the Assessment Report, dumping solid wastes in the coastal zone of the Protocol Area represents a major cause of damage to coastal and marine habitats as well as the destruction of its aesthetic values. This ultimately results in negative impacts on coastal development, particularly the tourist industry. Incineration of wastes is a process that produces numerous persistent, toxic and biologically accumulative emissions.

Therefore, the Contracting Parties commit themselves as follows to:

1. Taking all appropriate action to ensure elimination, to the greatest extent possible, of the solid wastes and litter reaching the marine and coastal environment by prevention or reduction of solid waste generation and by introduction of enhancements to waste treatment, including methods of collection and recycling and final disposal thereof.
2. Cooperating with each other, and with international organizations, on exchange of information relevant to the practices and experiences relating to solid waste management, recycling, reuse, and cleaner production processes.”

Most PERSGA member countries are also signatories to the MARPOL convention¹¹. The International Convention for the Prevention of Pollution from Ships (MARPOL is short for marine pollution) is one of the most important international marine environmental conventions. MARPOL Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) is most relevant to this RAP. Annex V applies to all ships¹², which means all vessels operating in the marine environment, from merchant ships to fixed or floating platforms to non-commercial ships like pleasure crafts and yachts. In relation to this RAP, the most important part of Annex V is the obligation of governments to ensure provision of litter reception facilities at ports and a complete ban of dumping plastic into the ocean. The effectiveness of ships to comply with the discharge requirements of MARPOL depends largely upon the availability of adequate port reception facilities, especially within special areas, which includes the Red Sea. However, the Red Sea Special Area requirements have not yet taken effect because of lack of notifications from MARPOL Parties whose coastlines border the Area regarding the existence of adequate reception facilities¹³.

Another important international convention relating to marine litter is the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (commonly referred to as the London Convention) with its 1996 Protocol (the London Protocol). The London Convention/Protocol covers the control of dumping of waste at sea that has been generated on land. It requires the signatories to prohibit dumping of persistent plastics and other non-biodegradable materials into the sea.

The adequacy of national laws to address the current scale of marine litter, and the capacity of local institutions to regulate and enforce these laws has not been formally evaluated in the PERSGA region. However, the large amounts of house hold and industrial litter on beaches adjacent to some large coastal towns in the PERSGA region (PERSGA 2008, 2014) would suggest that the laws or the capacity to enforce laws or both are currently inadequate. In terms of international law, NAS (2009) suggests that MARPOL and the London Convention and Protocol provide adequate coverage to reduce litter entering the marine environment, but their implementation and enforcement need to be improved.

The objective of Component 3 is: *To review and, if necessary, improve the legal basis for preventing litter entering the marine environment.* There are 12 actions proposed to achieve this objective. The actions are shown in Table 5.

¹¹At the time of preparing this RAP, Yemen and Somalia were not signatories to MARPOL.

¹²Unless expressly provided otherwise.

¹³MEPC.1/Circ.778/Rev.2; 6 April 2017: MEPC Circular from the IMO

V	Develop strong linkages with key government departments to inform officials/decision-makers about important information relating to the environmental effects of marine litter.	MC	High	Meetings with minister or deputy minister for environment in relation to marine litter	Within 3 years	At least one meeting with the minister/ deputy minister for environment per year
VI	Develop strong linkages with newspaper reporters/editors to encourage them to communicate information about the environmental and health impacts of marine litter.	MC	High	Meetings with local newspaper editors to discuss potential stories relating to marine litter	Within 3 years	At least one newspaper article on marine litter per year (per member country)
VII	Use 'Al-Sambouk' (PERSGA newsletter) to regularly share with member countries the results of actions to prevent and remove litter in the PERSGA region.	PERSGA	High	Publish marine litter articles in 'Al-Sambouk'	Within 3 years	At least two articles on marine litter per year
VIII	Encourage member countries to continue to undertake activities associated with PERSGA's 'Clean-up Our Seas' campaign.	PERSGA	High	PERSGA organises a beach clean-up activity in each member country per year	Within 3 years	At least one-PERSGA sponsored beach clean-up campaign per year
IX	Encourage member countries to participate in international campaigns such as the #CleanSeas campaign.	PERSGA	High	Each member country to participate in the #CleanSeas campaign	Within 3 years	Each member country makes at least one commitment under #CleanSeas (e.g. inform citizens or pass new laws)

VIII	Enforce the London Protocol by member countries that have ratified the Protocol.	MC	High	Enforcement of London Protocol by signatory member countries	Within 3 years	Audit results demonstrating Protocol is being enforced by member countries
IX	Facilitate a workshop to assist member countries review and report their obligations under Article 7 of the LBA Protocol.	PERSGA	High	PERSGA convenes a workshop on Article 7 of LBA Protocol	Within 3 years	Regional workshop
X	Facilitate a workshop to assist member countries to review existing legislation and, if necessary, develop new legislation to prevent litter entering the marine environment.	PERSGA	Very High	PERSGA convenes a workshop on reviewing and writing legislation	Within 2 years	Regional workshop
XI	Facilitate a workshop to assist member countries understand their obligations to MARPOL and the London Protocol.	PERSGA	High	PERSGA convenes a workshop on MARPOL and London Protocol	Within 3 years	Regional workshop
XII	Advocate for member countries to introduce legislation that ban cosmetics and similar products containing microbeads.	PERSGA	High	PERSGA, in collaboration with national agencies, advocates for the introduction of legislation that bans products containing microbeads	As soon as realistically possible	Member countries introduce legislation that ban cosmetic products containing microbeads.

*At the time of writing this document Jordan was a signatory to the London Convention but not the Protocol.

Component 4: Encouraging Public-Private-Partnerships

Passing new laws to better manage marine litter is likely to be a slow process, especially where there is resistance among some stakeholders. Laws will also be ineffective without monitoring compliance and undertaking enforcement. Further, government initiatives to prevent or remove marine litter, on their own, may be inadequate if public funds are limited. A complementary approach is to encourage private companies to take voluntary initiatives to address the issue of marine litter independent of government laws and regulations. For instance, coastal tourist resorts could be encouraged to stop selling single-use plastic water bottles and instead provide their guests with reusable bottles that can be re-filled using water dispensers. Another potential approach is to discourage local supermarkets from distributing out single-use plastic bags, which is one of the most common items of litter found on beaches and on the seafloor in the PERSGA region. There are already excellent examples in PERSGA region where public-private partnerships are working to reduce the risk of litter entering the marine environment. One example includes the ban of single-use plastic bags in the Red Sea Governorate, Egypt. Successful actions in PERSGA member countries could be termed 'Flag-Ship Demonstration Actions' and potentially trialled among other member countries. Appendix 3 identifies examples where NGOs and private companies have or are undertaking actions to mitigate marine litter in the PERSGA region.

The objective to achieve Component 4 is: *Encourage public-private partnerships to address marine litter by removing, preventing and/or recycling marine litter in the PERSGA region.* There are eight actions proposed to achieve this objective. The actions are shown in Table 6.

Table 6: Encouraging Public-Private Partnership Actions

#	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Encourage private companies to take initiatives, such as a voluntary phase-out of single-use bags, water bottles and straws and other plastic items.	MC	Very High	Each member country encourages private companies to voluntarily phase-out single-use plastic bags and other items	Within 2 years	At least one private company per member country that has phased out single-use plastic bags
II	Evaluate the success of such initiatives by private companies in the PERSGA region and to determine if suitable for adoption as 'Flag-Ship Demonstration Actions' by other member countries.	PERSGA	High	PERSGA compiles case studies on private companies in member countries that have voluntarily acted to phase-out or reduce the use of single-use plastic items	Within 3 years	A report on case studies and recommendations
III	Propose 'Flag-Ship Demonstration Actions' in the PERSGA region that have been successful at reducing the risk of marine litter entering the marine environment (e.g. phasing-out plastic bags) or resulting in the removal of litter from the environment (e.g. recycling strategy)	PERSGA	Very High	PERSGA lists exemplary efforts by private companies to reduce plastic use and name these 'Flag-ship Demonstration Actions'	Within 2 years	Report identifying and justifying choice of 'Flag-Ship Demonstration Actions'
IV	Member countries to trial and monitor 'Flag-Ship Demonstration Actions'	MC	Medium	'Flag-Ship Demonstration Actions' trialled in member countries	Within 4 years	At least one 'Flag Ship Demonstration Action' trialled in each member countries

V	Member countries to involve a range of stakeholders (e.g. private individuals, NGOs, private companies) to implement actions associated with their NAPs.	MC	Very High	NAPs should include one or more actions that involve private companies to reduce marine litter	Linked to preparation of the NAPs	At least one action in each NAP to involve private companies to reduce marine litter
VI	Member countries to trial novel actions to prevent and or remove marine litter*.	MC	Medium	Member countries trial novel actions to reduce marine litter in the region	Within 4 years	At least one-member country to trial a novel action
VII	Develop an award that PERSGA gives out on an annual basis to a company or NGO for outstanding contribution to the prevention or the removal of marine litter in the PERSGA region.	PERSGA	Very High	PERSGA develops a 'Marine Litter Reduction Award'	Within 2 years	PERSGA Marine Litter Reduction Award given to a private company or NGO each year
VIII	Develop a registrar (list) of 'Flag-Ship Demonstration Actions' to be shared with member countries.	PERSGA	Very High	PERSGA maintain and distribute to member countries a registrar of 'Flag-Ship Demonstration Actions'	Within 2 years	The registrar

*A novel action is an action that has not been previously tried in a PERSGA member country.

Component 5: Removing Marine Litter

The primary aim of Components 2, 3 and 4 is to prevent additional litter entering the marine environment in the first instance. However, actions are required to remove and then adequately dispose of marine litter that has already accumulated in the marine environment. Worldwide, the most common item of marine litter is plastic. According to Eunomia (2016), the weight of plastic on the seafloor is on average 70kg/km² while on beaches it is 2,000 kg/km². Consequently, one of the most straightforward and cost-effective approaches to remove plastics and other forms of marine litter from the environment is beach clean-ups. A beach clean-up is where marine litter is collected from a beach and taken to a legally designated disposal site. A beach clean-up can be a volunteer or work-related activity that take place as a one-off activity or, preferably, on a regular basis at the same location. In many locations worldwide, people do beach clean-ups but in other locations specially designed vehicles are used.

Another potential approach to remove litter from the environment is litter-traps on storm water drains (Willis et al., 2017). As the name suggest, these traps capture litter in storm water drains before the litter is discharged into the ocean. The practical application and cost effectiveness of litter-traps in the PERSGA region would need to be evaluated, especially given that major rainfall events are uncommon. Fences placed around open landfills or garbage dumps near the coast might act in a similar way to trap windblown litter before it enters the ocean. Litter collected on or at the base of fences could be remove periodically.

Removing marine litter from the seafloor is less straightforward, but possible. This has been attempted off Jordan (Al-Najjar and Al-Shyab, 2011), but the cost effectiveness of such an approach remains to be assessed.

When litter is collected from the beach it is important that it is disposed of effectively so it can no longer return to the marine environment or cause other environmental damage. Options include landfills, incinerators or, preferably, recycling.

Component 5 is similar to Component 6 ‘Monitoring and Research’ in that they both involve collecting litter from the marine environment. However, the focus of Component 5 is on the removal and disposal of litter without the need for counting and categorising litter. This is a valid goal, especially if coastal resort managers or mayors of coastal towns do not have scientifically trained staff to count and categorise litter, but simply want to remove unsightly litter from beaches used by tourists and or local people. In contrast, Component 6 includes a scientific evaluation of the type and amount of litter collected in order to help inform management.

The objective to achieve Component 5 is: *To clean-up litter from the marine environment*. There are six actions proposed to achieve this objective. The actions are shown in Table 7.

Table 7: Removing Litter Actions

#	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Undertake a review of methods to remove litter from beaches and rank their suitability for adoption in the PERSGA region. Methods could include mechanical approaches and the evaluation should also examine cost-effectiveness.	PERSGA	Very High	PERSGA commissions a review of methods used to remove litter from beaches and other coastal habitats	Within 2 years	Report describing the review and recommendations
II	Develop national strategies to encourage coastal land-owners or managers (resorts, village councils, municipalities) to incorporate into their work plans the need to regularly collect and remove litter from their areas of operation.	MC	High	Each member country develops a national strategy to get private companies to remove litter in their areas of operation	Within 3 years	National Strategy from each member country
III	Develop national strategies to ensure litter taken to landfill or other locations cannot easily enter or re-enter the marine environment.	MC	Very High	Each member country develops a national strategy to improve the performance of litter disposal approaches	Within 2 years	National Strategy from each member country
IV	Develop guidelines for removing litter safely (by the collector) and cost-effectively (to a suitable disposal site or recycling plant).	PERSGA	High	PERSGA to develop guidelines to help companies remove litter effectively from coastal areas	Within 3 years	Guideline Report
V	Workshop to share ideas on how marine litter can be safely and cost-effectively removed from beaches in the PERSGA region.	PERSGA	Very High	PERSGA to convene a workshop to review guidelines to effectively remove litter	Within 2 years	Workshop

VI	Develop registrar of all locations where stakeholders, including private companies, are regularly removing litter from beaches and other locations in the PERSGA region.	PERSGA	Very High	PERSGA to develop a registrar of locations where stakeholders are regularly removing litter from beaches	Within 2 years [and ongoing]	A registrar
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Component 6: Research and Monitoring

Research and monitoring programs are essential to address the threat of marine litter in the PERSGA region. In this RAP, the term ‘research’ refers to short-term hypothesis driven experiments designed to evaluate the effectiveness of specific management interventions to prevent or remove marine litter. For instance, the use of litter traps on storm water drains could be experimentally assessed to determine their effectiveness. Universities or consultants could undertake such experiments if funds were available. Research could also include observational studies to quantitatively evaluate the source and composition of litter from different locations. There is limited research on the source and composition of marine litter in the PERSGA region (Gladstone et al., 2012). Examples of quantitative studies on marine litter from the PERSGA region include Al-Najjar and Al-Shiyab (2011) who evaluated the density of litter on the seafloor off Jordan, and Marti et al. (2017) who quantified the abundance of plastic fragments in surface waters off Saudi Arabia. PERSGA has also undertaken rapid beach surveys to obtain a synoptic understanding of the amount and composition of marine litter in member countries (Box 3).

In this RAP, the term ‘monitoring’ relates to long-term studies focusing on quantifying trends in litter accumulation or to evaluate compliance with a management threshold. In terms of the latter, monitoring could be designed to inform if the amount of counted litter exceeded a management threshold. Such a threshold could include an unacceptable amount of litter on a popular tourist beach that if exceeded would trigger a beach clean-up by the responsible agency.

PERSGA has instigated a regional survey program to investigate the types, sources and extent of marine litter accumulation on beaches. It has also developed a standardised survey and monitoring methodology for evaluating litter on beaches (PERSGA, 2014). The methodology is modelled on Cheshire et al. (2009) in order to ensure alignment with methods used in other regional seas. PERSGA has also begun to establish baseline on litter abundance and composition for beaches in most member countries. However, there is a need for a regional survey program to evaluate and establish baseline for the amount and type of litter on the seafloor in the PERSGA region.

Box 3: PERSGA Survey and Monitoring Program for beach litter.

Since 2012, PERSGA has conducted rapid visual surveys to assess the amount of litter along mainland beaches in various parts of the PERSGA region. These surveys were undertaken in coordination with the national Focal Point of each member country and with assistance from a national team in each country. In 2012, PERSGA conducted rapid visual surveys in Sudan, Jordan, Djibouti and Yemen. Similar surveys were conducted in Saudi Arabia in 2016 and in Egypt in 2018. During the surveys, the percent cover of litter on beaches was estimated for each site. In addition, litter types were recorded, along with length and width of each surveyed beach.

After conducting the rapid visual surveys, regional beach-monitoring programs were established in Djibouti and Sudan. PERSGA, in coordination with the Focal Points of these member countries, identified sites to be monitored. Monitoring started in Sudan in late 2015 (Figure 3) and in Djibouti in 2016. At each site, litter was collected, categorised, counted and weighed. PERSGA is planning similar monitoring in the other member countries in the future.

Figure 3: Beach clean-up and monitoring activity, Sudan.



The objective for Component 6 is: *Undertake research to determine the source, density and composition of marine litter in each PERSGA member country.* There are 15 actions proposed to achieve this objective. The actions are listed in Table 8.

Table 8: Research and Monitoring Actions

#	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Promote PERSGA's regional survey program to investigate the extent of marine litter accumulation on beaches in all member countries.	PERSGA	Very High	PERSGA to promote its regional litter survey program	Within 2 years	An increase in the # of locations surveyed
II	Expand the regional survey program to investigate the types, sources and extent of marine litter accumulation on the seafloor and, if practical, in the water column for all member countries. This will complement the program already in place to address litter on beaches.	PERSGA	High	PERSGA expands its regional survey program to investigate litter on the seafloor, in the water column and inland just beyond the beach	Within 3 years	Litter surveys of the seafloor and in the water column from at least two locations per member country
III	Develop a comprehensive manual on standardised protocols to evaluate marine litter in the following environments: seafloor (shallow and deep water); sea surface; in the water column; on beaches and areas immediately beyond beaches.	PERSGA	High	PERSGA develops a comprehensive manual of survey protocols for litter on beaches, seafloor, water column and areas inland of the beach.	Within 3 years	Approved manual
IV	Organise regional workshops on standardised protocols to evaluate marine litter as per previous action.	PERSGA	High	PERSGA convenes workshop(s) to discuss protocols as per previous action	Within 3 years [or linked to the timing of the manual]	Workshop on standardised protocols

V	Map marine litter hotspots/regional accumulation zones (both above and sub-surface) in the PERSGA region that can be targeted for future research and or management.	PERSGA	High	PERSGA GIS unit creates and regularly updates GIS layers showing litter hotspots.	Within 3 years [and on-going]	GIS litter hotspot layers
VI	Expand the number of beaches in the PERSGA region where marine litter baseline has been established.	MC	High	Member countries undertake baseline beach surveys each year	Within 3 years	At least one new baseline site per member country per year
VII	Regularly (1-2 years) re-survey beaches that have baseline data.	MC	High	Member countries re-survey baseline sites	Within 3 years	Baseline sites surveyed at least once every two years
VIII	Establish a database recording long-term trends in litter abundance and type at beaches in all member countries.	PERSGA	High	PERSGA develop database for litter survey data and to communicate results to member countries	Within 3 years	Baseline database. Graphs showing litter abundance trends [updated following surveys]
IX	Encourage and support local marine institutes and universities to undertake research to determine the direct and indirect ecological impacts of marine litter of marine organisms and habitats in the PERSGA region.	MC	Very High	Each member country engages with a local university to undertake research projects on the direct or indirect impact of marine litter	Within 2 years	At least one university study on the impact of marine litter per country
X	Encourage and support local marine institutes and universities to undertake research to determine the social and economic impacts of marine litter in the PERSGA region.	MC	Very High	As above – but relating to social and economic impacts	Within 2 years	As above – but relating to social and economic impacts
XI	Encourage and support local marine institutes and universities to conduct research on protective and regulatory measures for protecting the coastal and marine environments from litter arising from urban or rural areas.	MC	Medium	Each member country engages with a local university to undertake research projects to reduce litter impacts	Within 4 years	At least one university study on measures to reduce litter in each member country

XII	Record and disseminate (to member countries) evidence of human health being compromised by marine litter.	PERSGA	Very High	PERSGA to record and disseminate evidence of human health being compromised by marine litter	Within 2 years	Database of locations where litter is or maybe compromising human health Email communications to member countries for each incident
XIII	Record and disseminate (to member countries) evidence of economic impacts from marine litter in the PERSGA region.	PERSGA	Very High	As above – but relating to economic impacts	Within 2 years	As above – but relating to economic impacts
XIV	Analyse cost/benefits of all forms of litter recycling in member countries.	PERSGA	Very High	PERSGA to instigate study that examines the cost-benefit for recycling in member countries	Within 2 years	Approved final report of study
XV	Work with UN Environment or other international partner to integrate SDG Indicator 14.1.1 into an existing or future monitoring program.	PERSGA	High	PERSGA to work with UN environment to integrate SDG 14 into the region's research and monitoring activities	Within 3 years	Floating plastic debris (density) included as indicator in manual of standardised manual

Component 7: Capacity Building and Training

Staff in national agencies responsible for implementing NAPs may require new skills and knowledge to accomplish some actions. PERSGA could facilitate this through training material and programs, workshops convened by subject matter experts, on-line courses and developing guidelines. Courses could cover subjects ranging from raising awareness about microplastics to explaining advanced litter monitoring techniques. Workshops could be convened to assist member countries understand their obligations in relation to MARPOL, the London Convention and Protocol. For instance, an expert in international maritime law could be hired to help member countries work towards fulfilling MARPOL's Red Sea Special Area requirements. A workshop could also be convened to help member countries draft effective legislation to manage marine litter and to prepare regulations to help enforce the legislation. Standardised guidelines could be prepared for a range of activities such as monitoring litter on the seafloor. Capacity building and training needs will be better known following the drafting of NAPs by member countries. Training modules produced by external sources, such as UN Environment, can also be reviewed and utilised where appropriate. Choice of training should be strategic rather than ad-hoc. For this reason, a key priority action is for member countries, in collaboration with PERSGA, to list training needs based on the needs of their NAPs.

The objective for Component 7 is: *Identify capacity limitations and training needed to implement actions*. There are three actions proposed to achieve this objective. The actions are listed in Table 9.

Table 9: Capacity Building and Training Actions

	Action	Lead	Priority rank	Expected results (ER)	Time frames for ER	Performance indicators
I	Each member country prepares a list of priority training and capacity building needs to assist them to implement their NAPs.	MC	Very High	Member countries provide a list of training and capacity building needs to achieve their NAPs	To be determined (linked to completion of NAP)	List of training needs from each member country
II	Develop and provide regional training courses on marine litter for member countries that will help them implement their NAPs.	PERSGA	Very High	PERSGA develops a regional training program to meet the training needs of member countries [linked to previous action]	Linked to previous action	Approved training program commensurate with the needs of member countries
III	Review marine litter training courses worldwide for potential use in the PERSGA region.	PERSGA	Very High	PERSGA review and select, where appropriate, online litter training courses to help member countries achieve actions in their NAPs.	Within 2 years	Review training courses suitable for the PERSGA region

Reference

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Appendices

Appendix 1: Questionnaire template

Questionnaire sent 28 January 2018 to Focal Points in each member country.



Regional Organization for the Conservation of the Red Sea and Gulf of Aden

Questionnaire for preparation of:

Regional Action Plan for the Sustainable Management of Marine Litter in the Red Sea and Gulf of Aden

1. Country:
2. Organization/Authority:
3. Your name, title (Mr, Dr. .etc) and role:
4. What is the main authority or department responsible for the prevention and removal of marine litter in your country? Both from land and boats?
5. What is the main laws or decrees to prevent and remove marine litter in your country?
6. Is there a national action plan (a document that describes objectives and actions to manage marine litter or solid waste) in your country? If yes, can we have a copy of it?
7. Are there national actions in you country to prevent (or stop) litter from entering the marine environment (e.g. actions such as marine litter awareness brochures for schools)? If so, please provide specific details (who, when, where and how?):
8. Are there national actions in your country to remove litter from the marine environment (e.g. annual beach litter clean-ups at tourism beaches) If so, please provide specific details:
9. Have any private companies (e.g. shopping centres) or municipalities (provinces or governorates or city councils) in your country banned the use of plastic items such as bags and straws? If so, who are they and what did they do?
10. Is there a non-government organisation (NGO) in your country that is working with government or private companies to prevent and remove marine litter? If so, please describe.
11. Is there any proposal to ban the use of some plastic items (e.g. bags, bottles, straws, wrapping etc.) in your country (or in parts of the country)?
11a. If so, by whom:

12. Describe the two <u>top factors that limit the ability</u> to manage marine litter in your country (e.g. no effective management of household rubbish collecting in cities; lack of enforcement of laws; lack of knowledge to implement strategies; limited resources to undertake actions; etc.):
13. What do you believe to be the three top priorities for <u>preventing</u> marine litter entering the marine environment in your country? [please provide specific details]
14. What are the three top priorities for <u>removing</u> marine litter in your country?
15. Please list three or more activities that you believe PERSGA could do to support your country deal with marine litter. For instance, this could include providing training in marine litter survey techniques or develop environmental awareness material that could be shared among member countries.

Applicant's Name

Mobile No.

E-mail Address:

Thank you very much for your cooperation.

Appendix 2: Beach litter awareness and educational resources

Litter awareness material on the worldwide web could potentially be adapted for use by PERSGA member countries. Examples are shown below. Copy write issues should be checked.

Marine litter Network

<http://marinelitternetwork.com/resources/reports/>

#CleanSeas

<http://www.cleanseas.org/>

Marine Debris Program NOAA

<https://marinedebris.noaa.gov/activities-and-curricula>

Tangaroa Blue

<http://www.tangaroablue.org/resources/education-kit.html>

DUML Community Science

<https://sites.duke.edu/communityscience/marine-debris/marine-debris-classroom-resources/>

Australian Marine Conservation Society

<https://www.marineconservation.org.au/pages/plastic-pollution-how-you-can-help-take-action-now.html>

Pinterest

<https://www.pinterest.com.au/pin/332281278728202995/>

Appendix 3: Tackling marine litter in the PERSGA region

Initiatives by NGOs and private companies to prevent and remove marine litter in the PERSGA region have already started. Some of these are described at the following websites.

Banning of single-use plastic bags in the Red Sea Governorate, Egypt

<http://www.egyptindependent.com/red-sea-governorate-bans-plastic-bags/>

Recycling of plastics and other litter – initiative by an NGO in the Red Sea

<http://www.hepca.org/media/news/2009/12/recycling-red-sea-hepca-solid-waste-management/103>

Removing marine litter from the seafloor – Jordan

<http://jreds.org/default.aspx?page=affiliation&t=exhibitionplastic>

International Coastal Clean Up – Saudi Arabia

http://act.oceanconservancy.org/site/DocServer/ICC_2006_Report_Saudi_Arabia.pdf?docID=3325

