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**Ad hoc open-ended expert group
on marine litter and microplastics**

First meeting

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Item 6 of the provisional agenda*

**Environmental, social and economic costs and
benefits of the response options**

**Discussion paper on environmental, social and economic costs
and benefits of different response options**

Note by the secretariat

I. Introduction

1. Pursuant to resolution 3/7 of the United Nations Environment Assembly of the United Nations Environment Programme at its third session, on marine litter and microplastics, the ad hoc open-ended expert group on marine litter and microplastics will base its work on the following programme of work to further examine the barriers to and options for combating marine plastic litter and microplastics from all sources, especially land-based sources:

- (a) To explore all barriers to combating marine litter and microplastics, including challenges related to resources in developing countries;
- (b) To identify the range of national, regional and international response options, including actions and innovative approaches, and voluntary and legally binding governance strategies and approaches;
- (c) To identify environmental, social and economic costs and benefits of different response options;
- (d) To examine the feasibility and effectiveness of different response options;
- (e) To identify potential options for continued work for consideration by the United Nations Environment Assembly.

2. The present note was prepared by the secretariat to provide the ad hoc open-ended expert group with relevant information to discuss and identify the environmental, social and economic costs and benefits of selected regional and international response options. A summary table of the identified costs and benefits is set out in the annex to the present note.

3. The present note should be read in conjunction with the document entitled “Combating marine plastic litter and microplastics: an assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches”,¹ and in particular sections 3–5 thereof.

* UNEP/AHEG/2018/1/1.

4. The above-mentioned assessment document was prepared in response to resolution 2/11 of the Environment Assembly at its second session, in which the Environment Assembly requested the Executive Director of the United Nations Environment Programme to undertake an assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches to combat marine plastic litter and microplastics. The assessment set out several possible future options including binding and non-binding approaches, to better address marine litter and microplastics.
5. The present note considers the following options presented in the assessment: to maintain the status quo (option 1); to review and revise existing frameworks to address marine plastic litter and microplastics and add a component to coordinate industry (option 2); and to create a new global architecture with a multi-layered governance approach, which comprises two phases (option 3). Option 1 was not recommended by the assessment advisory group, but will still be briefly presented in the present note since it calls for strengthening the implementation of current efforts. However, the national-level response options are not analysed in the present note.
6. Section II of the present note provides a brief overview to the discussion paper and section III provides a short background on the economic, social and environmental impacts and costs of marine plastic litter.
7. The ad hoc open-ended expert group is invited to consider the present note along with other relevant resolutions, decisions and reports on marine litter and microplastics in order to gain an understanding of the costs and benefits associated with future options and to further identify environmental, social and economic costs and benefits of different response options.

II. Purpose of the discussion paper

8. The purpose of the discussion paper is to shed light on the different costs and benefits associated with actions listed under response options 1–3 of the assessment to combat marine plastic litter at the regional and international levels. The paper will mainly focus on international policy response options among the range of national, regional and international response options.²
9. It is not currently possible to carry out a detailed analysis that would lead to monetary figures under different options, but rather the purpose is to start to identify examples of costs and benefits related to future actions. In addition, many of the examples of costs and benefits at the national level are similar to the ones at the regional and international levels given that a “new international architecture” may be implemented at the national level. It is therefore not feasible in this discussion paper to try to identify and analyse all costs and benefits associated with specific national-level response options. This may be done in a future phase in more detail and with more resources focusing on the national response options identified and recommended by the ad hoc open-ended expert group.
10. When defining costs and benefits, it is important to keep in mind that they may be experienced by Governments or the business/private sector. In the annex to the present document, examples of costs and benefits are listed and a distinction is made between different beneficiaries/bearers of the cost where necessary. In addition, when addressing the issue of marine plastic litter and microplastics, some new business opportunities will arise, which are listed under social benefits.
11. To gain a better understanding of the costs associated with options 1–3, it is useful to list the types of gaps that were identified in section 3 of the assessment. At the regional and global levels, those gaps include the following: gaps in mandate to manage upstream intervention; gaps in geographical scope; gaps in recognition of risks to human health; gaps in solid waste management and wastewater treatment; gaps in regulation of dumping; gaps on management of microplastics; gaps in the regulation of industry pollution and emissions into waterbodies; and gaps in the adoption of due diligence within the plastics industry. Those gaps are to be filled or addressed in the possible future options on marine plastic litter and microplastics.

III. Introduction to the impacts and costs of marine plastic litter

12. Increasing levels of marine plastic litter in the world’s oceans are leading to significant environmental, economic and social impacts globally. Much of the literature on marine debris

¹ UNEP/AHEG/2018/1/INF/3.

² See document UNEP/AHEG/2018/1/3.

examines the prevalence and forms of marine litter, but little is mentioned about the nature and magnitude of costs that the plastic component of marine litter and microplastics impose on society.

13. Two factors are the main reasons for this. First, limited information is available for the identification and measuring of the environmental and economic costs or the social impacts of impaired human welfare caused by marine plastic litter. Second, a more comprehensive analysis and measurement of the social impacts requires specific and complex studies using economic and econometric approaches to valuation. Historically, most policy interventions have been examined within a technical or “engineering” context and without the supplemental perspective and analysis of the costs and benefits of alternative actions.

14. In addition, more and better life-cycle assessments, particularly for products and polymers of special concern, are needed. Life-cycle assessments are also needed for the evaluation of alternative materials and product redesign for the full cycle of a product, which does not end when the product is discarded.

15. In table 1 below, some of the most common impacts are listed under four different categories, of which the fourth category (public safety) could also be considered as an extension of social costs. It is important to keep in mind that these impacts have associated costs, which could be avoided.

Table 1

Examples of environmental, social, economic and public safety impacts of marine plastics litter

<p>1. Environmental</p> <ul style="list-style-type: none"> • Entanglements and ghost fishing • Ingestion (intestinal blockage, malnutrition and poisoning) by fish and other marine animals • Blockage of filter feeding mechanisms of whales and other marine animals from small particulate (neustonic) plastic debris • Physical damage and smothering of reefs, seagrasses, mangroves and other habitats • Vector for marine pests including invasive species • Reduced resilience to climate change owing to cumulative impacts 	<p>2. Social</p> <ul style="list-style-type: none"> • Loss of aesthetics and/or visual amenity • Loss of indigenous values • Antagonism against perceived polluters • Perceived or actual risks to health and safety, including from additives and microplastics • Food security • Perceived or actual risks to human health including from microplastics and from exposure to hazardous chemicals in containers washed ashore
<p>3. Economic</p> <ul style="list-style-type: none"> • Abatement costs by local government • Cost to tourism (loss of visual amenity and obstruction to beach use) • Cost to vessel operators (downtime and damage owing to entanglements) • Losses to fishery and aquaculture operations owing to damage or entanglements • Costs for cleanup, animal rescue operations, recovery and disposal 	<p>4. Public safety (social)</p> <ul style="list-style-type: none"> • Navigational hazards (loss of power or steerage at sea is potentially life threatening) • Hazards to swimmers and divers (entanglements) • Cuts, abrasion and stick (puncture) injuries • Leaching of poisonous chemicals

16. With regard to purely economic impacts, marine litter causes a range of impacts that increase the costs associated with both marine and coastal activities, and reduce the economic benefits derived from them.³ One way to look at those costs in more detail is to divide them into different categories, such as preventive costs, direct damage costs (including losses and opportunity costs), remedial costs (e.g. cleanup and disaster events) and indirect costs (e.g. ecosystem services).

17. The direct economic costs from marine litter refer to the additional expenditures incurred by different economic sectors and are directly related to impacts from marine litter. The indirect economic costs from marine litter refer to the negative impacts on the marine environment, human health and productivity across different marine sectors, and ultimately the gross domestic product of each country.

³ Bergmann et al., *Marine Anthropogenic Litter* (Cham, Springer, 2015).

18. Valuations of the costs of damage frequently estimate the value of the impacts on marine industry users. The costs of damage borne by marine industries is a small fraction of the gross domestic product in the marine economy and was estimated in 2009 to be \$1.26 billion per annum for the marine industries in the Asia-Pacific region.⁴ In 2014, the United Nations Environment Programme estimated the damage to the value of marine environments globally to be at least \$8 billion per annum.⁵
19. Another study in 2014 concluded that reducing marine debris even by 25 per cent at beaches in and near Orange County, United States of America, could save residents roughly \$32 million during three months in the summer by not having to travel longer distances to other beaches.⁶ In 2012 it was estimated that communities in California, Oregon and Washington, United States of America, spent around half a billion dollars per year to control litter and reduce marine debris.⁷
20. Some efforts have also been made in estimating the environmental costs of plastics production. According to one study, the “environmental cost to society of consumer plastic products and packaging was over \$139 billion in 2015, equivalent to almost 20 per cent of plastic manufacturing sector revenue, and is expected to grow (to \$209 billion by 2025) if current trends persist”.⁸
21. The cost estimates of the damage resulting from marine plastic litter fill an important informational role in relating the dimension and seriousness of the problem to government and to the political system for action, gaining greater attention the larger the monetary value.
22. However, the potentially avoidable damage costs are all losses to the economy, meaning that the prevention of marine plastic litter can reduce the amount of economic resources being consumed by damage and increase the benefits from environmental and ecosystem flows. Prevention can also reduce the costs of remediation, which are another layer of costs attributable to removing marine litter.
23. The goal of all actions, including the actions in the options presented in the assessment and in this paper, should therefore be prevention, which can bring economic benefits through reducing the costs to industries as well as environmental damage, which are “avoidable costs.”^{4,5}
24. The annex to the present note lists some of the direct and indirect costs and benefits that can be identified within the response options outlined in the assessment. Some of the costs are immediate expenditures, such as the costs of increasing human resources, and some of the costs and benefits will be observed in the future when the effect of actions can be observed.
25. The annex also shows that part of the short-term economic costs is related to increased expenditures of negotiating, establishing and managing the new coordinated approaches to combat marine litter, whereas the short-term social costs are related to increased workloads of people involved in the establishment of response options. Other types of economic and social costs include increased costs to the industry and social impacts related to the unstableness of possible losses and/or shifts in employment, as well as social costs related to perceived inconvenience of tougher environmental legislation such as bans on disposable plastic bags, levies on plastic products and other instruments.
26. Short-term environmental costs are related to an increase in air travel for negotiating or establishing new coordinating mechanisms, as well as costs arising from the use of traditional alternative materials in consumer goods and packaging (carbon footprint of production, water use and transportation).
27. On the other hand, there will be multiple short and especially long-term benefits arising from the more coordinated approach, including economic savings from the reduction of duplication, social benefits from increased awareness and benefits arising from new business opportunities. Long-term benefits include cutting costs through a more efficient use of plastic, developing new revenue streams through closed-loop business models and ultimately all environmental benefits that will be achieved

⁴ McIlgorm, A., Campbell, H.F., Rule, M.J., *Understanding the economic benefits and costs of controlling marine debris in the APEC region* (Coffs Harbour, National Marine Science Centre (University of New England and Southern Cross University), 2009).

⁵ United Nations Environment Programme, *Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry* (United Nations Environment Programme, 2014).

⁶ NOAA, “Assessing the Economic Benefits of Reductions in Marine Debris: A Pilot Study of Beach Recreation in Orange County, California” (2014).

⁷ Stickel, B. H., A. Jahn and W. Kier, “The Cost to West Coast Communities of Dealing with Trash, Reducing Marine Debris”, Kier Associates for the United States Environmental Protection Agency (2012).

⁸ Lord, R., *Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement* (Trucost, 2016).

through the reduction of plastic waste to the environment, such as increased resilience to impacts of climate change, reduction in carbon emissions and reduction in cumulative impacts to ecosystems, including invasive species.

28. In general, all impacts related to marine litter as presented in table 1 and the costs related thereto could and should be avoided, and hence could be considered as benefits of any instrument that manages to address them. However, the present note does not try to identify the current economic, social and environmental costs to society in detail even though they are costs that are currently being observed and felt under the current situation and the “status quo” scenario (option 1).

IV. Recommendations and suggested actions

29. The present note provides examples of costs and benefits arising from a few selected approaches/response options, but measures need to be taken at all levels, including at the national, regional and international levels, to address marine litter and microplastics. Coordinated action is encouraged in order to maximize the use of available resources and to avoid duplicated efforts as shown in the examples in the present note.

30. The ad hoc open-ended expert group is invited to consider the present note and other relevant reports, decisions and resolutions for deliberation at its first meeting to further identify the environmental, social and economic costs and benefits of different response options including at the national level.

Annex

The proposed response options as per the assessment and economic, social and environmental costs and benefits identified under them

Option 1: Maintain status quo		
Response options (as per the assessment):	Costs (currently observed costs are not listed here, but examples are given in table 1)	Benefits
<p>1. <i>Strengthen the implementation of existing instruments, including the Regional Seas Programmes and relevant multilateral environmental agreements.</i></p>	<p>Economic: Minimal but possible costs related to increased meeting costs (additional days) in the relevant multilateral environmental agreements.</p> <p>Social: Increased workloads for government officers in relation to increased enforcement under international agreements.</p> <p>Possible antagonism against countries/parties that stay outside the strengthened frameworks.</p> <p>Environmental: Not identified assuming no additional meetings would be held.</p>	<p>Economic: It has been expressed that the actions under “status quo” will not be enough, but possible long-term savings through avoiding preventive, direct damage and remedial costs could be observed assuming that the strengthened implementation of current instruments takes effect.</p> <p>Social: Increased awareness of the issue in multilateral environmental agreements.</p> <p>Environmental: Possible minor environmental benefits in the long-term through reduced input of marine plastic litter to the environment.</p>
<p>2. <i>Monitor developments under the Basel Convention that aim to further address marine plastic litter and microplastics within the scope of the Convention.</i></p>	<p>Economic: Increased staff costs for the Basel Convention Secretariat if new posts are established specifically concentrating on marine plastic litter.</p> <p>Social: Monitoring of developments might increase workloads for national Governments and industries.</p> <p>Environmental: n/a</p>	<p>Economic: n/a</p> <p>Social: Increased awareness of the issue among people from the Government and the Basel Convention.</p> <p>Environmental: n/a until new instruments are in place and take effect.</p>

Option 2: Review and revise existing frameworks to address marine plastic litter and microplastics and add a component to coordinate industry		
Response options (as per the assessment):	Costs	Benefits
<p>1. <i>Expand the mandate of an existing international body to include the coordination of existing institutions in the field of marine-plastic-related action. The coordination shall include:</i></p> <ul style="list-style-type: none"> • <i>Building linkages between relevant instruments, e.g. the Basel Convention.</i> • <i>Harmonizing international legal instruments and approaches in Regional Seas Programmes.</i> • <i>Promoting the implementation of the Sustainable Development Goals, specifically Goal 14.</i> • <i>Encouraging and coordinating industry-led solutions and commitments.</i> 	<p>Economic: Costs related to increased human resources in the coordinating institution, including the Regional Seas secretariats.</p> <p>Costs associated with organization of negotiations under multiple international agreements.</p> <p>Social: Increased workloads of existing staff and secretariats of different conventions.</p> <p>Increased workloads to government officers in relation to negotiations under international agreements.</p> <p>Environmental: Carbon footprint from increased number of physical coordination meetings.</p>	<p>Economic: Cost savings from the more coordinated approach – no duplication of actions.</p> <p>Social: Better coordination, collaboration and effectiveness of international multilateral organizations.</p> <p>Increased awareness of the issue and existing mechanisms with a clearer path forward to address the issues affecting various public and private sectors.</p> <p>Environmental: Benefits arising from the implementation of Sustainable Development Goal 14 and industry initiatives.</p> <p>Benefits gained through the contribution to other Sustainable Development Goals such as 14.2, 6.3, 11.6, 12.4 and 12.5.</p>
<p>2. <i>Strengthen and add measures specific to marine plastic litter and microplastics in Regional Seas Programmes and other applicable instruments (see table 3, section 2 in the assessment for a summary of options).</i></p>	<p>Economic: Cost of increased human resources capacity in the Regional Seas secretariats.</p> <p>Social: Increased workload in the Regional Seas secretariats does not necessarily translate into increased human resources.</p> <p>Increased workloads to government officers in relation to the work and meetings under the Regional Seas Programmes.</p> <p>Environmental: Carbon footprint from increased number of physical coordination meetings.</p>	<p>Economic: Cost savings from the more coordinated approach – no duplication of actions.</p> <p>Social: Better coordination, collaboration and effectiveness of international multilateral organizations.</p> <p>Improved reporting and transparency on the issue.</p> <p>Environmental: Reduced input of marine plastic litter to the environment through enforced measures.</p>
<p>3. <i>Revise for example the Honolulu Strategy to encourage improved implementation at the national level and agree on indicators of success.</i></p>	<p>Economic: Costs arising from increased coordination, including human resources and physical meetings for the preparation of, implementation of and reporting on the strategy.</p> <p>Social: Possible antagonism against countries and companies who stay outside the framework.</p> <p>Environmental: Possible increased carbon footprint if coordination meetings are held in person.</p>	<p>Economic: Reduction in future (higher) abatement costs through effective assignment of funding in the near future to relevant issues.</p> <p>Social: Harmonized toolkit for national-level implementation and common guidelines. Provides guidance to non-governmental organizations and other stakeholder activities.</p> <p>Environmental: Benefits for the environment resulting from strengthened implementation of environmentally sound policies.</p>

<p>4. <i>Adopt a voluntary agreement on marine plastic litter incorporating at least the following measures:</i></p> <ul style="list-style-type: none"> • <i>Standardize global, regional and national reporting on production, consumption and final treatment of plastics and additives.</i> • <i>Introduce voluntary national reduction targets.</i> • <i>Develop/improve global industry guidelines (e.g. for the management of polymers and additives or the adoption of global labelling and certification schemes).</i> 	<p>Economic: Cost of developing the agreement. Cost of monitoring, evaluating and managing the agreement. Additional costs to the industry owing to reporting, treatment of plastics, certification schemes and other actions. Additional costs to national Governments and regional organizations owing to increased reporting requirements. Social: Possible social costs owing to reduced employment in certain types of industries. Possible antagonism against countries and companies that stay outside the framework. Environmental: Possible environmental costs of the use of traditional alternative materials in consumer goods and packaging (such as carbon footprint of production and transport, water use and lumber). Possibly limited environmental benefits owing to the non-participation of key stakeholders in the voluntary agreements.</p>	<p>Economic: Cutting costs through more efficient use of plastic, developing new revenue streams through closed-loop business models that recover plastic as a useful resource. Savings from reduced abatement costs by local government, benefits from increased tourism, reduced costs to vessel operators and fishery and aquaculture operations. Social: Attracting customers by demonstrating more sustainable products. Increased awareness among the general public owing to certification schemes and increased transparency in the production and consumption of plastics. Reduced exposure to harmful chemicals during use of plastic products and end-of-life processes. Fewer resources required for campaigning against industry and government. Improved toolkit to hold industry accountable for undesirable products. Fewer resources for volunteer cleanups. Environmental: Benefits to ecosystems owing to reduced production and leakage of the most problematic products and polymers (see table 1).</p>
Option 3: A new global architecture with a multi-layered governance approach		
Response options (as per the assessment):	Costs	Benefits
<p>1. <i>Establish a new international legally binding architecture.</i></p>	<p>Economic: Costs associated with international negotiations for the development of a new agreement. Establishment and running cost of the fully functioning secretariat. Social: Increased workload and heavy burden of negotiating the new agreement for Governments and observers. Possible conflicts between stakeholders and among Governments and industries. Environmental: Carbon footprint from increased number of physical coordination meetings.</p>	<p>Economic: Long-term benefits of reduction in abatement measures and a shift of economic burden to industry. Industry savings from adopting a circular economy. Social: Encouragement that Governments and industry are committed to significantly reducing, if not eliminating, the distressing impacts of plastics. Knowledge that future generations have access to a healthy environment, food security and good health. Environmental: Reduction in transboundary movement of plastics and microplastics.</p>

<p>2. <i>In parallel, launch option 2 to take action in the interim and gain experience that supports the development of the legally binding architecture. The legally binding architecture could be implemented in two phases:</i></p>	<p>All costs associated with option 2 above.</p>	<p>All benefits associated with option 2 above.</p>
<p>3. <i>Phase I: Develop voluntary measures, including:</i></p> <ul style="list-style-type: none"> • <i>Introduction of self-determined national reduction targets.</i> • <i>Development/improvement of industry-led design standards that promote recovery and recycling.</i> 	<p>Economic: Increased costs from the monitoring and reporting of national reduction targets (government). Piloting of economically viable solutions for closing the materials loop (industry). Social: Damage done to the reputation of brands targeted by campaigners owing to non-compliance with agreed standards. Environmental: Possible environmental costs of the use of traditional alternative materials in consumer goods and packaging (carbon footprint of production, water use and transportation).</p>	<p>Economic: Cost reductions through a more efficient use of plastic, developing new revenue streams through closed-loop business models that recover plastic as a useful resource. Avoided costs of cleanups and other voluntary actions. Greater investment in prevention, leading to overall reduction in costs. Social: Improved market acceptance through greater accessibility of sustainable and eco-labelled products. New and more financially sustainable business opportunities in the long-term, leading to improved job markets, particularly in the informal sector. Environmental: Reduced leakage of plastics to the environment, including release of chemicals. Increased recycling and reuse rates that reduce use of non-renewable and virgin materials.</p>
<p>4. <i>Phase II: Develop a binding agreement, to include:</i></p> <ul style="list-style-type: none"> • <i>Ratification/accession procedures to confirm commitment by States.</i> • <i>An obligation to set self-determined national reduction targets.</i> • <i>Develop and maintain national inventories on production, consumption, final treatment and trade of plastics and additives.</i> • <i>Fixed timelines to review and improve national reduction targets.</i> • <i>A duty to cooperate to determine global technical standards to ensure basic-level environmental and quality controls by industry.</i> • <i>A duty to cooperate to determine global industry standards for reporting, labelling and certification.</i> 	<p>Economic: Cost of additional negotiation rounds (binding agreement and global industry standards). Increased costs for Governments and industry owing to new reporting requirements, monitoring, development of and compliance with global standards and new/amended legislation. Administration of labelling and certification schemes. Increased regulation and monitoring of trade in non-hazardous plastic waste. Administration and contributions to a global funding mechanism to assist remediation in those countries, particularly small island developing States, that are an accumulation zone for marine plastic litter. Such contributions can be part-funded by industry. Social: Perceived inconvenience of tougher environmental legislation such as bans on disposable plastic bags and levies on plastic products.</p>	<p>Economic: Improved and more efficient coordination between all stakeholders. Investment in marine litter prevention has double cost savings through reduced damage costs (direct and indirect) and reduced cleanup costs. The costs would otherwise increase into the future as the volume and impact of marine plastic litter increases. Savings from reduced abatement costs, benefits from increased tourism, reduced costs to vessel operators and fishery and aquaculture operations. Improved transparency nationally, regionally and globally owing to new global monitoring and reporting standards. Ongoing improvements to all benefits owing to scheduled strengthened national targets. Social: Transparency in reduction targets, inventories, additives, standards, labelling and certification.</p>

<ul style="list-style-type: none"> • <i>Measures to regulate international trade in non-hazardous plastic waste.</i> • <i>Compliance measures (monitoring and reporting).</i> • <i>Legal basis set for mechanisms for liability and compensation, funding and information sharing.</i> • <i>Consideration of the needs of developing countries and regional differences (e.g. exemptions and extensions).</i> 	<p>Possible reduction in competition by industry owing to increased chemicals and pollution regulations.</p> <p>New taxes and costs affecting industry may be transferred to customers.</p> <p>Possible increased costs and disruption to the plastic supply chain caused by resource scarcity and price volatility.</p> <p>Environmental: Possible environmental costs of the use of traditional alternative materials in consumer goods and packaging (such as the carbon footprint of production and transport, water use and lumber).</p>	<p>Liability and compensation schemes for those that are most affected.</p> <p>Disclosure on plastics use being made mandatory provides a tool for society to hold industry accountable.</p> <p>Avoiding the opportunity cost associated with the use of non-renewable resources that may not be available to future generations.</p> <p>Transfer of government (public) costs to industry.</p> <p>Knowledge that products (e.g. fleeces, cosmetics) are not harming the environment through loss of microplastics.</p> <p>Environmental: Once the binding instrument is in place and the measures start to take effect, the environmental benefits could be derived from healthy marine and coastal ecosystems (see table 1 for examples of environmental impacts and related costs).</p> <p>Note: these should also be observed as a result of phase I under option 3.</p> <p>Examples:</p> <p>Increased resilience to impacts of climate change.</p> <p>Reduction in carbon emissions.</p> <p>Reduction in cumulative impacts to ecosystems, including invasive species.</p> <p>Improved ecosystem services overall (visual, recreational, extractive, etc.)</p>
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