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Item 4.3 of the provisional agenda**

REPORT OF THE EXPERT WORKSHOP TO PREPARE PRACTICAL GUIDANCE ON PREVENTING AND MITIGATING THE SIGNIFICANT ADVERSE IMPACTS OF MARINE DEBRIS ON MARINE AND COASTAL BIODIVERSITY AND HABITATS

INTRODUCTION

1. At its eleventh meeting, the Conference of the Parties to the Convention on Biological Diversity, in decision XI/18 A, requested the Executive Secretary, in collaboration with Parties, other Governments, relevant organizations and indigenous and local communities, to organize an expert workshop to prepare practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats that can be applied by Parties and other Governments in their implementation of the programme of work on marine and coastal biodiversity. In the same decision, the Conference of the Parties requested the Executive Secretary to invite Parties, other Governments and relevant organizations**,** including the Convention on Migratory Species, to submit information on the impacts of marine debris on marine and coastal biodiversity and habitats, to compile and synthesize submissions by Parties, other Governments and relevant organizations, along with additional scientific and technical information, as an input to an expert workshop and to submit the compilation and the practical guidance of the expert workshop for consideration by a meeting of the Subsidiary Body prior to the twelfth meeting of the Conference of Parties.

2. Pursuant to that request, the Executive Secretary convened, with financial support from the European Commission, an expert workshop to prepare practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats in Baltimore, United States of America, from 2 to 4 December 2014.

3. With the financial support of the European Commission, the CBD Secretariat commissioned a consultancy to support the scientific and technical preparation for the workshop. The results of this technical preparation were made available in the background document on the preparation of practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats (UNEP/CBD/MCB/EM/2014/3/INF/2).

* Previously circulated as UNEP/CBD/MCB/EM/2014/4/2.

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4. The workshop was attended by experts from Australia, Costa Rica, Côte d'Ivoire, Egypt, the European Union, Kenya, Nigeria, Norway, the Philippines, Saint Lucia, the United States, the American Chemistry Council, the Brazilian Marine Litter Association, the Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Food and Agriculture Organization of the United Nations (FAO), the GEF Scientific and Technical Advisory Panel, the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA), the Secretariat of the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), Alliance of Marine Mammal Parks and Aquariums, and Northwest Pacific Action Plan (NOWPAP). The full list of workshop participants is attached as annex I.

ITEM 1. OPENING OF THE MEETING

5. On behalf of the Government of the United States, the host of the workshop, Mr. Matthew A. Malone, International Relations Officer, Office of Ocean and Polar Affairs, Bureau of Oceans and International Environmental and Scientific Affairs of the United States Department of State, delivered opening remarks. He began by noting that the problem of marine debris was already pervasive, still growing and gaining increasing attention. He noted also that the Government of the United States was actively involved in the problem domestically, with several federal agencies working on the issue, and a key player in international efforts. He emphasized that marine debris was a global problem that required a coordinated global response. He recalled that, in June 2014, the State Department had held the Our Ocean Conference in Washington, D.C., hosted by Secretary John Kerry and attended by representatives from more than 90 countries, as well as non-governmental organizations and marine experts. The result of that Conference had been the Our Ocean Action Plan,[1] which outlined goals in three areas, one of which was reducing marine pollution. Specifically, the Action Plan included a goal to "significantly reduce the input of debris, especially plastics, into the marine environment so as to achieve measurable reductions of marine debris by 2025." The State Department was now working with interagency partners, as well as with the private sector and the NGO community, to advance this action plan, and was already looking forward to the next Our Ocean conference, to be held in Chile in October 2015. In addition to the Action Plan, a number of promising new partnerships and initiatives were announced at the Our Ocean Conference, including the United States Environmental Protection Agency's Trash Free Waters programme. This national programme was developing a set of collaborative actions and projects to prevent and reduce trash from entering the country's waters and ultimately the world's oceans. He also indicated that the United States was committed to engaging with the international community to address the issue of marine debris. He recalled the Fifth International Marine Debris Conference, held in Honolulu, Hawaii, in 2011, which had brought together international partners to collaborate on solving the problem of marine debris. Organized by the National Oceanic and Atmospheric Administration (NOAA) in partnership with the United Nations Environment Programme (UNEP), the Conference had resulted in the Honolulu Strategy,[2] and partners were then actively implementing actions in its three goal areas – reduction, prevention and management of at-sea sources; the same for land-based sources; and removal and processing of accumulated marine debris. Additionally, that conference had been a catalyst for the development of the Global Partnership on Marine Litter under the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities.[3] He wished participants a productive workshop and an enjoyable stay in Baltimore, and thanked them for their efforts and cooperation in addressing that urgent issue.

6. On behalf of the Executive Secretary of the Convention on Biological Diversity, Mr. Braulio F. de Souza Dias, Ms. Jihyun Lee, Environmental Affairs Officer, delivered opening remarks. Mr. de Souza

[1] See http://www.state.gov/documents/organization/228005.pdf.

[2] The Honolulu Strategy, A Global Framework for Prevention and Management of Marine Debris, available at http://www.unep.org/gpa/documents/publications/honolulustrategy.pdf.

[3] A/51/116, annex II.

Dias welcomed experts from countries and organizations and thanked the Government of the United States for hosting the important workshop. He emphasized the importance of the Secretariat's collaboration with the United States, which had significant experience in addressing the impacts of marine debris on marine and coastal biodiversity and habitats. He also acknowledged with great appreciation the kind financial support of the European Commission, which allowed the convening of the workshop, and thanked the United Nations Environment Programme, the Scientific and Technical Advisory Panel of the Global Environment Facility (GEF-STAP), and the Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals for their collaboration. He emphasized that marine debris harmed marine organisms and negatively impacted the environment and human well-being. He noted that the workshop had been convened in response to a request by the Conference of the Parties to the Convention on Biological Diversity at its the eleventh meeting, in 2012, to provide Parties and other Governments with guidance to support science-based decision-making to address that urgent issue. Preventing and mitigating the impacts of marine debris was an essential aspect of achieving several of the Aichi Biodiversity Targets, in particular Target 8, which called for pollution, including from excess nutrients, to be brought to levels that were not detrimental to ecosystem function and biodiversity by 2020. The urgent need to address marine debris had emerged as a global priority in recent years, as evidenced by increased calls for action from various global forums. This workshop would provide a critical opportunity to support Governments in responding to these global calls for action. He concluded with a wish for a fruitful and productive workshop.

7. Mr. Malone (United States) then led a brief round of introductions by the participants in the workshop.

ITEM 2. ELECTION OF THE CO-CHAIRS, ADOPTION OF THE AGENDA AND ORGANIZATION OF WORK

8. After a brief explanation by the Secretariat on procedures for electing the workshop co-chairs, Mr. Moustafa Mokhtar Ali Fouda (Egypt) and Ms. Nancy Wallace (United States), were elected as the workshop co-chairs, as proposed by experts from Côte d'Ivoire and Egypt, respectively, and seconded by experts from Nigeria, Australia and UNEP.

9. Jihyun Lee (CBD Secretariat) briefed the meeting on the objectives and expected outputs of the workshop and introduced the background information compiled for it.

10. Participants were then invited to consider the provisional agenda, as contained in document UNEP/CBD/MCB/EM/2014/3/01, and the proposed organization of work, as contained in annex II to document UNEP/CBD/MCB/EM/2014/3/1/Add.1, and adopted them without any amendments.

11. The workshop was organized in plenary sessions and break-out group sessions. The co-chairs nominated the following rapporteurs for the plenary session, taking into consideration their expertise and experience, in consultation with the Secretariat of the Convention on Biological Diversity.

(a) Agenda item 3 (Review of the impacts of marine debris on marine and coastal biodiversity and habitats): Ms. Denise Hardesty (Australia) and Mr. Lev Neretin (GEF-STAP);

(b) Agenda item 4 (Preparation of practical guidance on preventing and mitigating significant adverse impacts of marine debris on marine and coastal biodiversity and habitats): Ms. Stefanie Werner (European Union) and Mr. Simon Harding (CBD Secretariat resource person).

ITEM 3. REVIEW OF THE IMPACTS OF MARINE DEBRIS ON MARINE AND COASTAL BIODIVERSITY AND HABITATS

12. Mr. Simon Harding (Secretariat resource person) delivered a theme presentation on the background study of the impacts of marine debris, as contained in UNEP/CBD/MCB/EM/2014/3/INF/2.

13. Ms. Denise Hardesty (Australia) delivered a presentation on Australia's policy response to marine debris.

14. Mr. Yacouba Sankare (Côte d'Ivoire) delivered a presentation on marine debris in West Africa: case study from Côte d'Ivoire.

15. Mr. Geir Gabrielsen (Norway) delivered a presentation on marine debris studies in Norway/Svalbard.

16. Ms. Lavina Alexander (Saint Lucia) delivered a presentation on marine litter in the wider Caribbean region.

17. Mr. Al Orolfo (Philippines) delivered a presentation on the Manila Bay Coastal Clean-up.

18. Mr. Peter Kershaw (GESAMP) delivered a remote presentation on the impacts of microplastics on the marine environment.

19. Summaries of the above presentations are provided in annex II.

20. Through open discussion in the plenary, workshop participants then shared their global, regional and national experience with, and knowledge of, marine debris and its impacts on marine and coastal biodiversity and habitats.

21. The discussions focused on the following issues, among others:

(a) Major types and sources of marine debris, including land-based and sea-based sources;

(b) Impacts of marine debris on marine and coastal biodiversity and habitats;

(c) Monitoring, modelling and mapping to address the impacts of marine debris on marine and coastal biodiversity and habitats;

(d) Major knowledge gaps regarding sources and impacts of marine debris.

22. Results of the workshop discussion under this agenda item are contained in annexes III and IV.

ITEM 4. PREPARATION OF PRACTICAL GUIDANCE ON PREVENTING AND MITIGATING SIGNIFICANT ADVERSE IMPACTS OF MARINE DEBRIS ON MARINE AND COASTAL BIODIVERSITY AND HABITATS

23. Mr. Simon Harding (Secretariat resource person) delivered a theme presentation on the background document on preparation of practical guidance (UNEP/CBD/MCB/EM/2014/3/INF/2).

24. Ms. Stefanie Werner (European Union) delivered a theme presentation on prevention and management of marine litter in Europe.

25. Ms. Nancy Wallace (United States) delivered a theme presentation on the Marine Debris Programme of the National Oceanic and Atmospheric Administration.

26. Ms. Heidi Savelli (GPA) delivered a theme presentation on marine litter and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.

27. Ms. Monika Thiele (CMS Secretariat) delivered a theme presentation on the management of marine debris as related to the Convention on Migratory Species.

28. Mr. Petri Suuronen (FAO) delivered a theme presentation on managing abandoned, lost or otherwise discarded fishing gear.

29. Ms. Sunwook Hong (NOWPAP) delivered a theme presentation outlining the ways in which marine debris had been addressed in the North-West Pacific Action Plan (NOWPAP) region.

30. Mr. Lev Neretin (GEF-STAP) delivered a theme presentation on marine debris as a global environmental problem and introduced a solutions-based framework focused on plastic.

31. Ms. Emily Tipaldo (American Chemistry Council) delivered a presentation on the plastics industry's support for solutions.

32. Summaries of the above presentations are provided in annex II.

33. The participants shared their views on and suggestions for the preparation of practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats, through plenary and breakout group discussions.

34. The discussions focused on the issues below, among others:

(a) Experiences and approaches with regard to land-based sources, including measures related to waste prevention, including potential redesign of products, reduction, reuse and recycling as well as other waste management measures;

(b) Experiences and approaches with regard to sea-based sources, including measures related to fisheries and maritime transport;

(c) Main overarching approaches of regulatory and voluntary measures, infrastructure, education and awareness;

(d) Private sector engagement and producer responsibility;

(e) Improving awareness, collaboration and stewardship among international, regional, national and local stakeholders, and across sectors;

(f) Addressing capacity gaps and resource needs to implement measures for prevention and mitigation;

(g) Enhancing synergies and promoting collaboration on the prevention and mitigation of the impacts of marine debris on marine and coastal biodiversity and habitats between biodiversity-related conventions and other relevant international and regional agreements and organizations.

35. The results of the workshop discussion under this agenda item are contained in annex VI.

ITEM 5. OTHER MATTERS

36. Participants noted the value of the background document made available by the Secretariat (UNEP/CBD/MCB/EM/2014/3/INF/2) and agreed to provide to the Secretariat, within the next month, their comments and suggestions for further refining that document and for possible publication as a CBD Technical Series.

ITEM 6. ADOPTION OF THE REPORT

37. Participants considered and adopted the workshop report, with some changes, on the basis of a draft report prepared and presented by the co-chairs.

ITEM 7. CLOSURE OF THE MEETING

38. In closing the workshop, the co-chairs thanked the workshop participants for their active and valuable contributions, the hosting government for their hospitality, the rapporteurs and the resource persons for their hard work and timely and professional support, and the staff of the Secretariat for their effective and efficient work in servicing the meeting. The meeting participants highly commended the able leadership of the two co-chairs in steering the meeting discussion and actively engaging diverse inputs from all the participants.

39. The meeting was closed at 5:35 p.m. on Thursday, 4 December 2014.

Annex I

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Annex II

SUMMARY OF THEME PRESENTATIONS[4]

Agenda item 3. Review of the impacts of marine debris on marine and coastal biodiversity and habitats

Impacts of marine debris on marine and coastal biodiversity and habitats
(by Mr. Simon Harding, Secretariat resource person)

Mr. Harding's presentation summarized the main findings of the background document on the preparation of practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats (UNEP/CBD/MCB/EM/2014/3/INF/2), prepared as part of the background information for this workshop. Additional material from the previous CBD/GEF-STAP review in 2012[5] was also included. The subjects covered included the effects of different types of marine debris on marine biodiversity in terms of ingestion and entanglement of species and individuals, the number of threatened species and the proportion of selected species groups affected. An update on the latest research on microplastics covered the effects of uptake on marine invertebrates in laboratory-based research, highlighting studies of ingestion, trophic transfer and toxic effects of microplastic particles. Floating marine debris was described as a novel habitat and a means to increase the distribution of marine species, including invasive alien species. Potential and actual ecosystem-level effects of marine debris and examples of recent socioeconomic impacts were summarized.

Australia's policy response to marine debris
(by Ms. Britta Denise Hardesty, CSIRO Oceans and Atmosphere Flagship)

In 2003, "Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris" was listed as a key threatening process under Australia's Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The resulting Threat Abatement Plan provides a framework for abatement of injury and fatality to marine vertebrate species caused by marine debris. It is currently under revision. Australia's research response and findings include: (a) the majority of coastal debris in Australia is from local sources, not the high seas. Debris is concentrated near urban centres; (b) consumer behaviour and illegal dumping are primary causes of marine debris in Australia; and (c) debris has significant impacts on Australian wildlife. For example, derelict fishing gear in the Gulf of Carpentaria has entangled between 5,000 and 15,000 turtles and an unknown number of soft-bodied animals, such as dugongs and sharks, and seabirds eat everything from balloons to glow sticks, industrial plastic pellets, hard plastic, foam, metal hooks and fishing line. CSIRO researchers and colleagues found that 43 per cent of short-tailed shearwaters have plastic in their gut. Young birds were more likely to ingest debris and ate more pieces of debris than adult birds; (d) CSIRO scientists are working to determine the global risks of marine debris to seabirds and turtles and to identify global "hotspots" for impact. Globally, one third of marine turtles and two thirds of seabirds have ingested debris, with numerous species showing increased ingestion of plastic; (e) other high-priority taxa for risk analyses include whales, dolphins and seals; (f) policies can reduce the problem. Incentives are effective: South Australia, which has a container-deposit scheme, has one quarter the number of beverage containers in its waste, when compared to the country as a whole. Local initiatives are also effective; prosecution for dumping significantly reduces marine debris in coastal regions. Ms. Hardesty noted that risk analysis is a useful tool for addressing the marine debris issue. Using models that incorporate plastic production, coastal human population density, species distributions and species behaviour enable researchers to

[4] "Marine debris" and "marine litter" are used interchangeably in this report, reflecting the inputs to this workshop from participants from different regions.

[5] *Impacts of Marine Debris on Biodiversity: Current Status and Potential Solutions*, CBD Technical Series No. 67, http://www.cbd.int/doc/publications/cbd-ts-67-en.pdf.

identify "hotspot" of concern, as well as target species likely to be affected by the impacts of marine debris, including ingestion and entanglement.

Marine debris in West Africa: Case study from Côte d'Ivoire
(by Mr. Yacouba Sankare, Côte d'Ivoire)

In Côte d'Ivoire, marine debris pollutes lagoons, mangroves, beaches, and marine waters both coastal and offshore. Plastic debris is the most abundant type, estimated to amount to 30,000 to 40,000 tons per year, while plastic bags represent 20,000 to 30,000 tons per year. The sources are both land- and marine-based. They impact negatively the country's ecosystems and habitats, destroy its flora and fauna, and finally reduce the aesthetic appeal and amenities of these areas to users, consequently exerting a negative impact on the economy, particularly in the tourism and fisheries sectors. Despite the local monitoring of marine debris, many gaps exist, including targeted legislation, funding, and a strategy and action plan. The impacts, including on human health, the economy, and the proliferation of invasive alien species, need to be studied in order to understand the complexities of this problem.

Marine debris studies in Norway/Svalbard
(by Mr. Geir Wing Gabrielsen, Norway)

Marine litter along the Norwegian coast and on Svalbard has been monitored for the past ten to 15 years as part of Norway's obligation as a Contracting Party to the 1992 OSPAR Convention. Beaches in the southern part of Norway are mostly influenced by consumer plastic (land-based), whilst the beaches in northern Norway and Svalbard are mostly influenced by plastic debris from fisheries and the shipping industry. Fishing nets are not only a threat for marine organisms but may also be a threat to terrestrial animals (reindeer and birds), which may become entangled by nets lying on the beaches. Plastic ingestion has been studied in northern fulmars, *Fulmarus glacialis*, from Svalbard. Plastic ingestion by Svalbard fulmars does not follow the established decreasing trend away from human marine impact. Of 40 individuals sampled, 87.5 per cent had ingested plastic, averaging 0.08g or 15.3 pieces per individual. Plastic ingestion levels in Svalbard exceed the ecological quality objective defined by OSPAR for European seas, highlighting an urgent need for mitigation of plastic pollution in the Arctic and international regulation of future commercial activity. Future studies on plastic in the Arctic aim to verify establishment of a sixth gyre in the Barents Sea, quantify plastic content in sea ice in the polar basin and study the relationship between plastic ingestion and tissue contaminant loads in fulmars. Studies on fulmars will also include studies on endocrine disruptor effects and immune system changes as a result of plastic ingestion.

Marine litter in the Wider Caribbean region: An overview
(by Ms. Lavina Alexander, Saint Lucia)

Marine litter is a significant pollution issue for the Wider Caribbean Region (WCR), affecting the ecological and aesthetic quality of the coastal and marine environment, damaging valuable natural wildlife resources and sensitive habitats, affecting the quality of life of local inhabitants and visitors, and impacting the economy and sustainability of the entire region. Data on the quantity and composition of marine litter in the WCR is derived from activities hosted in the region, concurrent with the International Coastal Cleanup, an annual event coordinated by the United States–based non-governmental organization Ocean Conservancy. Information on marine debris to date has identified a dominance of land-based sources of marine litter, with plastics as the leading material encountered. Successful management of the problem of marine litter requires a comprehensive understanding of the issue, including identifying its dominant forms, its abundance and potential sources, and most importantly, the human behaviour and activities producing it. A successful foundation for a marine pollution prevention initiative would include effective documentation and monitoring to assess the types and amounts of marine litter, coordinated public education programmes and waste management strategies, and the implementation of national policies supported by international treaties and conventions, national legislation and regulations, as well as governmental and private sector compliance and enforcement. This can lead to the reduction and

abatement of the marine litter problems impacting the continental coastal regions and small islands of the Caribbean region.

Manila Bay coastal clean-up
(by Mr. Al O. Orolfo, Philippines)

The Department of Environment and Natural Resources (DENR) of the Government of the Philippines, through its Manila Bay Coordinating Office, is responsible for addressing the degradation of Manila Bay. The contributing factors to its degradation are: (a) water pollution; (b) overexploitation of resources and degradation of habitats and historic, cultural, religious, archaeological and unique geological sites; and (c) barriers related to partnership and governance. These actions taken by the DENR were in response to the Philippine Supreme Court en banc decision of 2008, which compels all 14 defendant agencies to clean-up, rehabilitate and preserve Manila Bay. The Writ of Continuing Mandamus was reinforced when the Supreme Court gave specific directives with timelines for finalization to each agency. The envisioned end result of the comprehensive rehabilitation of Manila Bay is now embodied in the adopted five-year Operational Plan for the Manila Bay Coastal Strategy. Implementation of the Plan started in 2013, and it is expected to achieve its major goals by 2017.

The impacts of microplastics on the marine environment
(by Peter Kershaw, independent adviser - marine environmental protection; Chair of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection – GESAMP)

Small plastic particles, less than 5 mm in diameter, are commonly called microplastics. They may be manufactured for particular applications, such as cosmetic products and abrasives, ("primary") or result from fragmentation of larger items ("secondary"). Microplastics are distributed throughout the ocean, occurring on shorelines, in surface waters and seabed sediments, from the Arctic to Antarctic. They may accumulate at remote locations, such as mid-ocean gyres, or close to population centres, shipping routes and other major sources. They have been found inside the bodies of a wide variety of marine organisms, including invertebrates, fish, birds and mammals, with earliest reports of plastics in birds from the 1960s. Plastics often contain chemicals added during manufacture and can absorb and concentrate contaminants such as pesticides from the surrounding seawater. There is emerging evidence of transfer of chemicals from ingested plastics into tissues. Ingested microplastics can affect the physiology of the host organism and potentially compromise its fitness. The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) has undertaken a global assessment of sources, fate and effects of microplastics in the marine environment, with the report due for publication in early 2015. The GESAMP Working Group is set to continue, with one new focus being the impact on commercial fish and shellfish species.

Agenda Item 4. Preparation of practical guidance on preventing and mitigating significant adverse impacts of marine debris on marine and coastal biodiversity and habitats

Practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity
(by Mr. Simon Harding, Secretariat resource person)

Mr. Harding gave a brief overview of ways to prevent and mitigate marine debris by providing selected examples of best environmental practices, recent technological developments and proposed approaches. Suggestions and examples were provided for the following subject areas: (a) reuse, reduction and cleaner production; (b) extended producer responsibility; (c) incentives for collection, recycling and responsible disposal; (d) other economic and regulatory instruments; (e) resources, not waste; (f) engagement with industry; and (g) environmental education and awareness. Overall, four main approaches were suggested as key aspects that should be part of an integrated and well-coordinated marine debris strategy: the use of regulatory measures; voluntary (non-regulatory) measures; the availability of adequate infrastructure; and targeted education and awareness campaigns. The importance of addressing plastic marine debris was also highlighted as a key area that needs attention at multiple levels.

Prevention and management of marine litter in Europe
(by Ms. Stefanie Werner, European Union)

Marine life and habitats in European Seas are facing severe anthropogenic stressors, including overfishing, eutrophication, underwater noise and marine litter. The Marine Strategy Framework Directive (MSFD) came into force in July 2008 as the environmental pillar of the Integrated Maritime Policy of the European Union. The overarching aim of the MSFD consist of the achievement of good environment status (GES) for European Union marine waters by 2020 by following an ecosystem-based, adaptive and integrated approach to the management of human activities. Eleven qualitative descriptors for determining GES have been included in Annex I of the Directive. Descriptor 10 reads: "Properties and quantities of marine litter do not cause harm to the coastal and marine environment." Besides targeting the negative biological impacts caused by marine litter, the Directive also requires socioeconomic impacts to be addressed. A European Union expert group was set in place in order to assist Member States in the implementation of Descriptor 10 and its associated indicators. So far, the European Union Technical Group on Marine Litter has produced guidance for harmonized monitoring approaches to assess trends in the amounts of marine litter on beaches, in the water column and on the sea floor as well as of microparticles, including, where possible, analysis of the composition, spatial distribution and sources. To predict the impacts on marine life, protocols were developed for ingestion by indicator species (seabirds, turtles and fish) and the use of plastics as nest material in breeding colonies of seabirds and associated mortality rates due to entanglement. The group is currently working on providing further information and guidance on sources, riverine inputs and the quantification of harm.

Available data from ongoing monitoring, mainly of beach litter, provides insight on major sources and top findings of items and materials comprising marine litter. In July 2014, the European Commission proposed an aspirational marine litter reduction target as part of the 7th Environmental Action Programme. It calls for a 30 per cent reduction by 2020 of the 10 most common types of litter found on beaches as well as of fishing gear found at sea, with the list adapted to each of the four marine regions in the European Union. The full implementation of the proposed measures in the revised European Union waste legislation package could deliver litter reductions of 13 per cent by 2020, and additional reductions could be achieved by making wise decisions in ongoing or planned revisions of other Directives, such as the Port Reception Facilities Directive. Regional Action Plans on Marine Litter, which have already been adopted for the Mediterranean Sea (Barcelona Convention) and the North-East Atlantic (OSPAR), are being developed for significant reductions of marine litter. The adoption of a Regional Action Plan on Marine Litter for the Baltic Sea (HELCOM) is envisaged for spring 2015, while marine litter in the Black Sea (Bucharest Convention) is at this stage part of an overarching strategic action plan. Different kinds of actions are included in the plans in order to combat litter from land- and sea-based sources, to remove litter from the different marine compartments, as well as rivers and estuaries, and to raise awareness and foster outreach on the issue of marine litter. The core actions are those that require common actions by Contracting Parties and joint work with other international organizations, NGO's, the industry and other stakeholders. Other kinds of actions are in the competence of other bodies, such as the International Maritime Organization or Regional Fisheries Advisory Boards, and are addressed through dialogues, Memorandums of Understanding and the preparation of joint proposals. A third category covers actions within national remit, which are presented in voluntary pick lists to be used by European Union Member States within the Programmes of Measures they currently have to define and implement to fulfil the requirements of the MSFD.

The Marine Debris Program of the National Oceanic and Atmospheric Administration
(by Ms. Nancy Wallace, United States of America)

The Marine Debris Program (MDP) of the National Oceanic and Atmospheric Administration (NOAA) is the federal lead for addressing marine debris in the United States. Established in 2006 by Congress through the Marine Debris Act, this national programme focuses on efforts to investigate and solve the adverse impacts of marine debris. In order to meet its legislative mandates and mission, the MDP develops activities around five programmatic themes: prevention through education and outreach,

research, removal, emergency response, and regional coordination. The staff supports these activities and projects in partnership with state and local agencies, tribes, non-governmental organizations, academia, and industry across the country. For example, the MDP is currently supporting curriculum development and informal education initiatives that encourage behaviour change in the nation's youth, removal of abandoned and derelict fishing gear and vessels, and research into the impacts of marine debris—particularly chemicals in plastics and habitat damage from derelict crab traps. In December 2012, Congress passed legislation reauthorizing the MDP. The new, amended Marine Debris Act largely preserved the MDP's mandates to research, prevent, reduce and remove marine debris, but it added a new core function: addressing severe marine debris events. The act recognizes the need to address the unusual amounts and types of marine debris following events such as tsunamis or hurricanes and NOAA's critical role, placing the MDP at the forefront of coordination and scientific support for these events.

Marine litter and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
(by Ms. Heidi Savelli, GPA)

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), established in 1995, is a non-binding intergovernmental mechanism covering nine source categories, one of which is marine litter. The Global Partnership on Marine Litter (GPML), launched during the United Nations Conference on Sustainable Development (Rio+20), in June 2012, is a voluntary open-ended partnership for international agencies, Governments, businesses, academia, local authorities, non-governmental organizations and individuals. Besides being supportive of the Global Partnership on Waste Management, GPML seeks to protect human health and the global environment by reducing and managing marine litter, through several specific objectives. The United Nations Environment Programme (UNEP) provides the Secretariat of GPML, in line with the mandate received in the Manila Declaration on Furthering the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities,[6] and leads on the focal area on land-based sources of marine litter. The Food and Agriculture Organization of the United Nations (FAO) and the International Maritime Organization (IMO) lead the focal area on sea-based sources of marine litter.

GPML is initially guided by the Honolulu Strategy,[7] and works as a "coordinating forum" for all stakeholders working in the area of marine litter prevention and management, thereby assisting stakeholders to complement each other's efforts. Various activities are ongoing at the global, regional, national and municipal levels, including the development of marine litter action plans as well as a demonstration project in Samoa. In its recent resolution 1/6 on marine plastic debris and microplastics, the United Nations Environment Assembly (UNEA) had requested the Executive Director of UNEP to present a study to it at its second session, in May 2016.[8] Various parallel components will be implemented, feeding into this study. Supporting components include a massive open online course on marine litter, an innovation challenge and a campaign on marine litter.

Overview of Marine Debris Management Recommendations by the Convention on Migratory Species
(by Ms. Monika Thiele, Convention on Migratory Species)

Ms. Thiele gave a short overview of the Convention on Migratory Species (CMS) and specific recommendations for addressing the impacts of marine debris on marine migratory species (marine mammals, seabirds, marine turtles and sharks). CMS is a UNEP-administered treaty that came into force in 1983 and has 120 parties. It covers migratory species across their entire range, using various regional and global agreements and species listings under Appendices I and II. Some of the specific subagreements

[6] United Nations Environment Programme, document UNEP/GCSS.XII/INF/10.

[7] The Honolulu Strategy, A Global Framework for Prevention and Management of Marine Debris, available at http://www.unep.org/gpa/documents/publications/honolulustrategy.pdf.

[8] See UNEP/EA.1/10, annex I.

that have linkages to the marine debris management issue are: Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS), Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), Agreement on the Conservation of Albatrosses and Petrels (ACAP), Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA), the Pacific Island Cetacean Memorandum of Understanding, Western African Aquatic Mammals Memorandum of Understanding, and Dugong Memorandum of Understanding. The most relevant recent decisions include: Resolution 10.4 on Marine Debris, Resolution 10.15 Global Programme of Work for Cetaceans and the newest Resolution 11.30 on Marine Debris Management. Partnerships with other multilateral environmental agreements, non-governmental organizations and academia play a key role in implementing CMS agreements. In 2014, a three-part Marine Debris Assessment Report was commissioned by the CMS Scientific Council, in response to CMS Resolution 10.4 on Marine Debris. The CMS Marine Debris Assessment (2014) was conducted to review the issue of marine debris across three major categories: (a) information gaps in management of marine debris impacts on migratory species; (b) commercial vessel best practices; and (c) effectiveness of public awareness and education campaigns. The outcomes of this report helped to shape the new CMS Resolution 11.30 on Marine Debris Management, which was just adopted at COP 11 in Quito, (4 to 9 November 2014).

Drawing from the language in CMS Resolution 11.30, overarching recommendations to CBD for engagement on the marine debris issue included: (a) Promote synergies between international bodies (e.g., Regional Seas Conventions, CMS, CBD, IWC, IMO, FAO, ISO) to help harmonize existing international policy instruments, which will help build a stronger global platform for cooperation, capacity-building, implementation and outreach. Specifically, consider the creation of an inter-convention working group to help build a comprehensive global framework for action; (b) create innovative partnerships and stakeholder engagement opportunities to address marine debris across the fishing, shipping and tourism industries; (c) conduct research to better understand which populations of migratory species are most affected by marine debris and serve as a scientific information platform for sharing knowledge; (d) develop targeted public awareness and outreach campaigns that affect behavioural change and conduct monitoring evaluations of those campaigns; and (e) identify upstream preventative measures to keep waste from entering the marine environment in the first place.

Managing abandoned, lost or otherwise discarded fishing gear
(by Mr. Petri Suuronen, FAO)

Mr. Suuronen explained that ghost fishing is a process by which abandoned, lost or otherwise discarded fishing gear (ALDFG) can continue to catch fish and other animals. Ghost fishing is often indiscriminate, impacting both commercial fish stock as well as endangered, threatened and protected species, including marine mammals, seabirds, sharks and turtles. Some types of ALDFG can continue to catch fish and other animals for several years, although the ghost-fishing period is generally significantly shorter. ALDFG is causing various types of ecological and economic problems and is also a concern because of its potential to become a navigational hazard, with associated safety risks. Because of these multiple impacts, there is the need for all concerned stakeholders to come together to mitigate the impacts of ghost fishing.

The solution to ghost fishing is neither simple nor short-term. There remain significant gaps in information on the amounts and impacts of ALDFG for many regions and fisheries. FAO believes that there are multiple pathways to reducing the impacts of ALDFG. These include: development and broader use of reliable, cost-effective tools to reduce the possibility of ghost fishing occurring (by reducing loss of gear); implementation of standardized markings for fishing gears to identify fishery of origin and to increase gear visibility (not to identify offenders); supporting implementation of harmonized “no-cost” reporting of ALDFG by the fishing industry; development of best practices to locate and remove (when appropriate) ALDFG from the aquatic environment; promoting and raising awareness of the impacts of ghost fishing on biodiversity, safety at sea and loss of wealth; increased use of experienced fishing

masters and crews as an integral and key element of ALDFG mitigation work; and provision of adequate, safe, onshore disposal facilities that accept ALDFG.

Experiences and approaches to addressing marine debris in the NOWPAP region
(by Ms. Sunwook Hong, Northwest Pacific Action Plan – NOWPAP)

The objectives of the Northwest Pacific Action Plan (NOWPAP) Regional Action Plan on Marine Litter are to prevent the input of marine litter into the marine and coastal environment; to monitor the quantities and distribution of marine litter; and to remove existing litter. Rapid assessment of debris in watersheds in Japan has succeeded in encouraging the active involvement of local residents, providing key information for cost-efficient removals. The use of floating receptacles, such as barges and vessels that are made available for the disposal of nets in the Republic of Korea is a less costly and more effective way to deal with derelict fishing gear than incentive programmes for fishermen ("buyback programmes"). Fragile Extended Polystyrene (EPS) floats used in fish aquaculture have been completely replaced by highly durable ones (with a lifespan of at least 10 years) in one particular area of Japan, becoming a success story of industry involvement. EPS floats used for bivalve aquaculture in Korea have been one of the most serious sources of beach debris and microplastics. Our Sea of East Asia Network (OSEAN), a non-governmental organization from the Republic of Korea, has been seeking solutions to this problem. National monitoring of marine debris has been conducted, using different methodologies, across this region. OSEAN is promoting regional monitoring using a harmonized protocol. Japan has established a high-level interministerial committee. The Japanese NGO Japan Environmental Action Network has organized summits in Japan annually since 2003, providing a platform for information-sharing, communication and collaboration among NGOs and local/national governments. The impacts of marine debris on wildlife in the coastal areas of the Republic of Korea have been studied by OSEAN, identifying harmful debris items and vulnerable species. Various education and public relation programmes have been implemented in four countries.

Marine debris as a global environment problem: Introducing a solutions-based framework focused on plastic
(by Mr. Lev Neretin, GEF-STAP)

Mr. Neretin explained that solutions to the marine debris issue, particularly plastic debris, require application of a much broader management approach than application of waste management practices on land because both its causes and the responsibility for mitigation encompass plastics production, use and disposal of the items that become marine debris. Problems and solutions often originate not only in coastal communities, but also far inland. They are rooted in unsustainable production and consumption patterns, including the design and marketing of products internationally without appropriate consideration for their environmental persistence or their ability to be recycled in the locations where they are sold. In addition, there can be considerable geographical separation between production, which is typically centred in relatively developed economies, and consumption/disposal, which is global.

Recognizing that marine debris is not merely a waste management issue is fundamental to addressing its underlying causes. As such, addressing the marine plastic debris problem through a complete life-cycle approach is one of the potential testing grounds for the green economy concept – which promotes approaches using fewer resources per unit of economic output, and reducing the environmental impact of any resources that are used or economic activities that are undertaken, without compromising growth. Applied to plastics, this means promoting structural economic changes, which would reduce the consumption of plastic, increase the production of environmentally friendlier materials, increase reuse and recycling, promote investments in alternative conversion technologies and new materials and products, and support an enabling environment, including capacity-building, new regulations and standards.

Solutions should be identified through cooperation and dialogue between industry, government and consumers and should consider the five R's (reduce, reuse, recycle, redesign and recover) at different geographical scales: global, regional, national and local (e.g., communities, individual industries).

Potential actions to consider encompass any or all parts of the supply and value chain and assessment of the full life cycle of plastic products. The framework requires a series of key stages in order to achieve a reduction in the quantity of material being produced and includes the following steps: problem identification, stakeholder dialogue with supply chain entities, facilitation, identification of knowledge gaps, development of institutional mechanisms, and strategic planning and mainstreaming. This framework could be applied equally to land-based and sea-based sources of marine debris and should be underpinned by robust efforts to identify and monitor/model marine debris source categories. The latter allows connecting efforts at reducing and preventing plastic waste upstream on land and in the sea with its fate downstream in the marine environment.

Marine debris: Plastics industry support for solutions
(by Ms. Emily Tipaldo, American Chemistry Council, ACC)

Ms. Tipaldo began by pointing out the many benefits that plastics deliver to society. For society to receive these benefits, plastics must be recovered properly so that litter does not threaten the marine environment. Plastic packaging weighs less, requires less energy use and emits less greenhouse gas than alternatives. At the Fifth International Marine Debris Conference (5IMDC), held in Honolulu, Hawaii, in 2011, the plastics industry had committed to: (a) finding solutions for the problem of marine debris through partnerships; (b) conducting research to understand scope, origin and impacts; (c) promoting enforcement of existing laws to prevent marine litter; (d) spreading knowledge of efficient waste management systems; (e) enhancing recycling/energy recovery opportunities; and (f) stewarding plastic pellets from supplier to customer. She outlined a number of partnerships and sponsorships the industry had been involved in, as well as education campaigns and policy measures it had supported; she also highlighted the growth of recycling in the United States. Finally, ACC and Plastics Europe have supported the global assessment of the sources, fate and effects of microplastics in the marine environment, by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection – GESAMP, and agree with its action-oriented recommendation to "utilize end-of-life plastic as a valuable resource as an important part of an overall waste reduction strategy".

Annex III

SUMMARY OF THE DISCUSSION ON THE IMPACTS OF MARINE DEBRIS ON MARINE AND COASTAL BIODIVERSITY AND HABITATS

With regard to the impacts of marine debris on marine and coastal biodiversity and habitats, the meeting reviewed and noted the following, drawing from the background document as contained in UNEP/CBD/MCB/EM/2014/3/INF/2 as well as individual presentations described in annex II

1. Marine debris is usually defined as any persistent, manufactured or processed solid material discarded, disposed of, lost or abandoned in the marine and coastal environment.[9] This includes materials transported into the marine environment from land by rivers, drainage or sewage systems or winds.[10] Marine debris originates from different sea- and land-based sources.

2. Marine debris is not only an aesthetic problem; it incurs socioeconomic costs, threatens human health and safety, and impacts on marine organisms. It is broadly documented that entanglement in, or ingestion of, marine debris can have negative consequences on the physical condition of marine animals and even lead to death. Ingestion of plastics is also of concern as it may provide a pathway for the transport of harmful chemicals into the food web. Additionally, marine debris is known to damage, alter or degrade habitats (e.g., by smothering) and to be a possible vector for the transfer of alien species.[11]

3. Marine debris continues to have an impact on a wide range of marine fauna, with many new records of affected species reported every year, particularly attributed to the ingestion of, and entanglement by, various forms of plastic. The total number of marine species known to be affected is also likely to be substantially underestimated. Negative effects on individuals are more obvious in cases of entanglement, where external injuries or death can often be observed. Determining the effect of ingesting marine debris on an individual can be more difficult, and the consequences of ingestion are still not fully understood. Sublethal effects of entanglement and ingestion that alter the biological and ecological performance of individuals have been documented. Marine and coastal species that show a high incidence of debris ingestion or entanglement may be susceptible to population-level effects. This could have negative consequences for species with small populations, particularly those that are considered endangered and/or exposed to multiple stressors. Identifying the impacts of marine debris at the ecosystem level is a critical area for attention and should include the evaluation of the loss of ecosystem services that can be attributed to this stressor. Marine debris (in the form of derelict fishing gear) can also affect terrestrial species (e.g., reindeer in Svalbard, water buffalo in Australia and others).

4. Microplastics[12] have been accumulating in the marine environment over the last four decades and are likely to increase in abundance given the current dependence of a growing human population on the use of persistent plastics. They are a persistent pollutant that is already present in all marine habitats from

[9] Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel – GEF (2012). *Impacts of Marine Debris on Biodiversity: Current status and Potential Solutions*, Montreal, Technical Series No.67, 61 pp.

[10] JRC Scientific and Technical Reports. 2010. Marine Strategy Framework Directive Task Group 10 Report Marine Litter. EUR 24340 EN – 2010.

[11] OSPAR Commission, Regional Action Plan for Prevention and Management of Marine Litter in the North-East Atlantic (OSPAR Agreement 2014-1).

[12] Microplastic is defined as pieces or fragments smaller than 5 mm (JRC Scientific and Technical Reports. 2010. Marine Strategy Framework Directive Task Group 10 Report Marine Litter. EUR 24340 EN – 2010). The breakdown of these items results in numerous tiny plastic fragments, which are called secondary microplastics. Other microplastics that can be found in the marine environment are categorised as primary microplastics due to the fact that they are produced either for direct use, such as for industrial abrasives, or cosmetics or for indirect use, such as pre-production pellets or nurdles (OSPAR Commission, Regional Action Plan for Prevention and Management of Marine Litter in the North-East Atlantic, OSPAR Agreement 2014-1).

pole to pole and from the ocean surface to the seabed, and available to every level of the food web from primary producers to higher-trophic-level organisms, whether ingested directly or through prey. The trophic transfer of microplastics through benthic and pelagic food webs is also a subject increasingly receiving attention as there is a potential for the transfer and accumulation of both plastics and toxic chemicals. Ingestion of microplastic debris may cause endocrine disruption in Arctic seabirds (e.g., fulmars) due to the high concentrations of persistent organic pollutants/polychlorinated biphenyls.[13] [14] There is some emerging evidence of transfer of chemical additives from ingested plastics into tissue. Chemical fingerprinting of flame retardants shows their transfer into seabird tissues. However, actual health effects are not clear and are very likely to be species specific. Therefore, broad conclusions should not be derived from a few studies on a limited number of species. There is also concern that the ingestion of microplastics, as well as macro- and mesoplastics, can cause physical effects such as internal abrasion, blockage and injury, and may also provide a pathway for the uptake of harmful chemicals (e.g., of additives contained in plastic products) by marine organisms.

5. Marine debris can also serve as a vector for the transport of invasive alien species and may facilitate the dispersal of pathogens. Debris in the sea can be rapidly colonized by microbes to form a biofilm on the surface, effectively becoming an artificial microbial substrate. Debris can also be transported via animals through ingestion and subsequent egestion.

6. The considerable gaps in knowledge of marine debris in terms of the sources, distribution and quantity of marine debris items, and their impacts on marine and coastal biodiversity and habitats, is limiting the ability to address the problem effectively. There is a lack of information on the amount of debris entering the marine environment and degradation or fragmentation rates for debris under a range of conditions. There is limited information available for the physical and chemical consequences of debris on marine species through ingestion/uptake.

[13] Teuten, E. L., Rowland, S. J., Galloway, T. S., Thompson, R. C. (2007). "Potential for plastics to transport hydrophobic contaminants". *Environmental Science and Technology* 41, 7759-7764.

[14] Teuten, E. L., Saquing, J. M., Knappe, D. R. U., Barlaz, M. A., Jonsson, S., Björn, A., Rowland, S. J., Thompson, R. C., Galloway, T. S., Yamashita, R., Ochi, D., Watanuki, Y., Moore, C., Viet, P., Tana, T. S., Prudente, M., Boonyatumanond, R., Zakaria, M. P., Akkhavong, K., Ogata, Y., Hirai, H., Iwasa, S., Mizukawa, K., Hagino , Y., Imamura, A., Saha, M., Takada, S. (2009) "Transport and release of chemicals from plastics to the environment and to wildlife". *Philosophical Transactions of the Royal Society B*: 364, 2027-2045.

Annex IV

KNOWLEDGE GAPS AND, RESEARCH AND MONITORING NEEDS[15]

The workshop participants identified the following knowledge gaps, drawing upon the main knowledge gaps identified for marine debris sources, pathways, impacts and management approaches, as contained in appendices 4a and 4b of UNEP/CBD/MCB/EM/2014/3/INF/2

Addressing knowledge gaps regarding land-based sources of marine debris

1. The actual quantity of plastic marine debris entering the ocean from land-based sources is not known. Production data from the various industry sectors could provide data to help quantify the amount of material entering the marine environment. Better reporting and understanding of industry production and recovery rates, loss (material input and output data) or wastage would support this. There are a number of regions with extensive knowledge and data gaps, namely Latin America, Africa, Asia, the Arctic and Antarctic.[16] For these regions, baseline data on the main sources, quantities and impacts of land-based sources of marine debris is needed.

2. The impacts of marine debris on marine and coastal habitats should also be quantified in terms of the number of species directly or indirectly affected through habitat loss or degradation. There is also a lack of harmonized monitoring, analysis and reporting of marine debris, particularly for macro- and microplastics. The meeting noted a need for a harmonized approach to monitoring, analysis and reporting at the global level based on standard methodologies, taking into consideration existing work by regional seas organizations and other regional initiatives.

3. Assessing debris distribution through a combination of modelling and monitoring at index sites, coordinated regionally with standardized methodologies, is required to establish a global baseline. There is a need to develop and conduct habitat modelling for different indicator species, including migration routes and critical habitats (feeding/breeding/nursery), and to combine this information with debris distribution maps to estimate debris encounter rates and contribute to species risk assessments. An agreed methodology is necessary for such a baseline exercise.

4. There is a need for better knowledge of the rate of degradation or fragmentation of different types of debris under a range of environmental conditions (light, temperature, in air/water, at depth), and of the final products of the degradation or fragmentation process for the purpose of finding alternative materials.

5. The detection of invasive alien species on floating marine debris and the prevention of their establishment along new coastlines or in new regions will enable more effective management to reduce population and ecosystem alteration due to invasion by non-native species.

6. Socioeconomic research to better understand consumer preferences, perceptions and attitudes can help to inform targeted outreach programmes, which should also include evaluations of programme/campaign success and be designed according to local/cultural context.

7. Socioeconomic evaluation of the impacts of marine debris on various coastal and maritime sectors will provide an evidence base for better decision-making at national and regional levels. For plastics, it is suggested to use available tools or develop low-cost alternatives for the reliable identification of different polymer types and their recyclability to facilitate recycling and more cost-effective waste management.

8. Social factors (e.g., lack of institutions, facilities, experience and awareness, carelessness, poor knowledge of consequences, poor gear design, inconvenient devices), which may lead to the production of marine debris, should be understood at the local or national level.

[15] Summaries of the group discussion for marine debris from land-based and sea-based sources that are described in different sub-sections can be applicable to discussion under the other subsection.

[16] Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel – GEF (2012). Impacts of Marine Debris on Biodiversity: Current status and Potential Solutions, Montreal, Technical Series No.67, 61 pp.

Addressing knowledge gaps regarding sea-based sources of marine debris

9. The knowledge gaps associated with sea-based sources of marine debris can be grouped into three main categories: (a) the types and magnitudes of marine debris generated and its location; (b) the valuation of the marine debris (e.g., replacement costs, disposal costs, lost time); and (c) the impacts of the marine debris on habitat and/or species through entanglement, ingestion, and/or transport of invasive alien species.

10. It is worth noting that there are reasonable estimates of debris densities in some regions. The workshop participants noted that modelling efforts have expanded these limited data to provide more reliable estimates of relative debris densities globally and less reliable absolute densities. For fisheries and other sources of specific types of debris, there are either global-scale data on distribution and density, or reasonable proxies that can be used to describe the pressures. Incorporating these data into modelling efforts will improve our ability to manage this threat to marine biodiversity and habitats.

11. In data-poor situations, a staged approach using semi-quantitative approaches, such as expert judgement or community-based surveys, and then moving to more in-depth analysis in situations identified as high-risk can yield useful insights. One important consideration may be the ability to provide advice to policy makers in the short term, while recognizing the inherent uncertainties in such short-term or data-poor analyses.

12. A risk analysis can be applied in both data-rich and data-poor environments. One of the primary approaches that can be applied is to model the overlap between species range and purported threats (e.g., ALDFG or other debris). One can then apply the overlap to estimate the exposure of species to the pressure (i.e., debris). These exposure estimates can then be included in a statistical model that relates empirical records of entanglement or ingestion to exposure, along with other important factors, such as foraging strategy, species, or other biologically relevant factors. Using a model that is validated with empirical data, where available, one can then predict for potential ingestion or entanglement rates, which are expected to occur at a range of scales, and it can focus on single taxa or multiple taxonomic groups or from local areas to broad geographic regions.

13. In order to increase knowledge and information on the sources, volumes and areas of accumulation of sea-based debris, the workshop noted the need:

(a) To develop a risk assessment of impact by modelling the overlap between areas where debris accumulates and marine species habitats and migration routes;

(b) To understand and quantify the impact of sea-based debris on marine and coastal species, and identify potential hotspots of gear loss and their associated biodiversity impacts.

14. Such information will enable better targeted management for improved outcomes. One of the key knowledge gaps identified by the meeting is the lack of information regarding the volumes, locations and areas of accumulation of sea-based debris. To address this knowledge gap will require consolidation of information from a variety of sources, such as the rates of loss from transport vessel, as well as environmental conditions and regions of high areas of loss.

15. Aquaculture is considered to increasingly contribute to the marine debris problem. Major knowledge gaps are:

(a) The amount and types of debris associated with aquaculture;

(b) The correlation of the presence of aquaculture with the occurrence of marine debris;

(c) The impacts of marine debris associated with aquaculture.

Monitoring, modelling and data application

16. Global qualitative estimates suggest that 80 per cent of marine debris comes from land-based sources, with the remaining 20 per cent associated with sea-based sources.[17] However, the relative proportions of sea-based and land-based sources of marine debris can vary considerably at the national and/or regional scale. For example, in Norway, there is a higher proportion of sea-based sources (fishing-related materials) in northern waters, while debris in southern waters is dominated by land-based sources. For the OSPAR region in general, it can be said that sea-based sources, such as shipping and fishing, dominate the findings. But in many cases the impact of sea-based marine debris on biodiversity and habitats may be greater than that of land-based sources.

17. The meeting identified the following monitoring strategies:

(a) To evaluate possible population-level impacts that consider in a coordinated way the migration routes and the distribution of species and populations;

(b) To include species life stages and the specific vulnerability to marine debris (e.g., monitoring of juveniles to quantify the burden on adults);

(c) To address sublethal effects while taking into account that a broad range of interacting natural and human factors determines the survival and reproductive success of individual animals;

(d) To take into account that in the case of highly endangered species, direct harm caused by marine debris on one individual can easily have an effect on the entire population.

18. Modelling is a useful tool for marine debris management and mitigation. It can be used with spatial mapping to estimate debris distribution, encounter rates between debris and species, and support the production of global risk assessments, especially for threatened species. Forecasting through modelling has estimated that 95 per cent of seabirds will be ingesting plastic by 2050.[18] The decreasing sea-ice cover in the Barents Sea may lead to the development of a sixth oceanic gyre that could become a sink for floating marine debris, with associated impacts on marine biodiversity.

19. There are still extensive data gaps in some regions with a lack of baseline information on marine debris sources, quantities and impacts. Even where monitoring is in place, there is commonly an under-reporting of microparticles, including microplastics. There is an urgent need for the determination of reliable standardized and affordable monitoring methodologies for microdebris.

20. Data for the deep sea and seabed is also particularly lacking, although recent findings suggest that the deep sea is a major sink for debris, including microplastic.[19] Existing deep-sea survey programmes should be engaged to collect information on marine debris.

21. Technology access, sharing and utilization are essential to support monitoring efforts (e.g., plastic particle detection in water attached to vessels, use of remote sensing for identifying debris accumulation).

22. Sufficient data to determine whether there are marine debris impacts at the population level, in combination with other major stressors, is required, particularly for vulnerable and threatened species. Scenario modelling for vulnerable and/or endangered species can be used to estimate the effects of marine debris impacts (e.g., ingestion, including toxicity, entanglement) at the individual/population level, using

[17] According to the Öko-Institut, international data demonstrate that land-based sources of marine debris in the marine environment comprise 75 per cent to 90 per cent of total marine litter items mainly on beaches (Öko-Institut, Study on Land-sourced Litter (LSL) in the marine environment, 2012). However, no valid data is available for volume in kilograms or for the water column or the sea floor.

[18] Hardesty, BD, C Wilcox, TJ Lawson, M Lansdell and T van der Velde (2014). Understanding the effects of marine debris on wildlife. A Final report to Earthwatch Australia.

[19] Woodall, L.C., Sanchez-Vidal, A., Canals, M., Paterson, G.L., Coppock, R., Sleight, V., Calafat, A., Rogers, A.D., Narayanaswamy, B.E., Thompson, R. 2014. "The deep sea is a major sink for microplastic debris". *Royal Society Open Science*. 1: 140317.

the best available information from laboratory and field-based research. Using empirical data to ground truth models will improve their utility.

Overall

23. Understanding the population-level effects of marine debris is an additional layer of information in understanding the impacts of marine debris on marine and coastal biodiversity and habitats. Figures and evidence provided in scientific literature on ingestion and entanglement may not necessarily reflect the actual number of species and individuals affected by marine debris. The current records used are often based on incidental observations or on small sample sizes. Consequently, information on the impacts on individuals needs to be assessed jointly and must be evaluated in the light of the welfare of individuals and raised to the population level in order to gain a coherent assessment of population-level impacts and to inform relevant conventions and regional agreements.

24. There is a need to further identify sources, pathways and distribution of marine debris to assess individual- and population-level effects on potentially impacted species.

25. There are knowledge gaps regarding impacts on habitat. Some impacts on habitats are readily apparent, such as smothering and other damage to coral reefs and other benthic habitat. Other impacts resulting, for example, from microplastics on beaches or in the water column, are difficult to observe. This is even more so applicable for those types of impacts that are smaller-scale or less visible. While adverse impacts of sea-based debris are often readily apparent, certain beneficial impacts also exist. Wrack lines and naturally occurring floating debris play a role in the life cycles of certain marine fauna. This is an area where knowledge gaps exist and further study is warranted.

26. Further research is needed on the trophic transfer of marine microdebris in food webs to determine whether there is a bioaccumulation effect for plastics and harmful chemicals that are contained or attached as well as on the impacts of marine debris on terrestrial and freshwater species in rivers, watersheds or along coastlines.

27. Large volunteer-based (citizen science) datasets (e.g., International Coastal Cleanup results) are not used to their full extent and are not often used adequately in their potential to inform government policy. Lack of standardized methodologies for monitoring constrains the assessment of results from different programmes.

28. The meeting also noted information gaps in the following as potential sources of marine debris that may have impacts on marine biodiversity:

- Offshore development activities, including extractive industries
- Sacrificial fishing gear, including fish-aggregating devices

Annex V

PREPARATION OF PRACTICAL GUIDANCE ON PREVENTING AND MITIGATING SIGNIFICANT ADVERSE IMPACTS OF MARINE DEBRIS ON MARINE AND COASTAL BIODIVERSITY AND HABITATS

The workshop participants identified the following elements for practical guidance on preventing and mitigating significant adverse impacts of marine debris on marine and coastal biodiversity and habitats, drawing upon existing work in various relevant global and regional processes

I. To address land-based sources of marine debris

1. Preventing waste from reaching the marine and coastal environment is the most effective way to address the problem of marine debris. While the focus should be on prevention, these efforts should be complemented by enhanced efforts to improve solid waste management strategies and plans. Recognizing the need to address existing data and knowledge gaps on the impacts of marine debris on biodiversity, immediate action should be taken to prevent and mitigate the impacts of debris in the marine and coastal environment.

Empower communities and relevant stakeholders/civil society groups at the local level

2. Community involvement and targeted outreach programmes to promote sustainable waste management practices should be designed in response to specific regional or national needs. Litter containment (e.g., litter booms, trash traps) and clean-up schemes could be used to sensitize and engage (upstream) communities (e.g., analyse the main types of wastes and their origin). It is important to take into account the role and impact of temporary settlements, which usually lack adequate waste management, and whether nearby waterways contribute to the influx of waste. Awareness-raising, relocation to alternative areas away from riversides, with support and access to utilities, are approaches to be considered.

3. Communities can also be involved in monitoring and enforcement through citizen science and "environmental champions" schemes, where individuals document problem areas, such as illegal dumping or entanglement incidents, with photos and additional data, which are submitted via mobile phone applications or social media to relevant authorities. When local communities are involved in monitoring and clean-ups, they ultimately share the financial benefits resulting from the increased number of visitors, thereby supporting the sustainability of these types of initiatives. The development of alternative livelihoods may be considered – this could include upscaling of waste, provided that a market exists for these products to be sold.

4. Local community-based laws/regulations can be useful to improve waste disposal, recycling and management at the local level for coastal communities as well as those upstream in watersheds.

Engage the private sector

5. Industries are essential partners in addressing marine debris issues at multiple levels: global, regional, national and local. Recognition that marine debris is not merely a waste management issue is fundamental to addressing the underlying causes of this debris. As such, addressing the marine plastic debris problem through a complete life-cycle approach is essential. Applied to plastics, this includes: promoting structural economic changes that would reduce plastics consumption; increasing production of environmentally friendlier materials (in terms of raw material and additives applied); supporting development of alternative materials up to readiness for marketing; increasing recyclability, recycling and reuse; preventing planned obsolescence; designing for reparation; promoting investments in alternative conversion technologies and new materials and products; and supporting an enabling environment, including capacity-building, new regulations and standards. Solutions should be identified through cooperation and dialogue between industry, government and consumers, and should consider the five R's at different geographical scales: global, regional, national and local (e.g., communities, individual industries). It is also necessary to encompass any or all parts of the supply and value chain and to assess

the full life cycle of plastic products. The framework requires a series of key stages in order to achieve a reduction in the quantity of material being produced and includes five steps: problem identification, stakeholder dialogue with supply chain entities, identification of knowledge gaps, development of institutional mechanisms, and strategic planning and mainstreaming. Specific action elements include, inter alia:

(a) Reporting on plastic use in products, packaging, operations and supply chains;

(b) Reporting on the progress and final outcome of industry-funded projects to address the impacts of marine debris;

(c) Labelling plastic for tracking, public information and recovery purposes;

(d) Declaring additives for public safety and to enable recyclability;

(e) Designing innovative products and processes to increase resource efficiency and recycling of plastics;

(f) Collaborating in the identification of low-cost technologies to identify and separate polymers for recycling;

(g) Supporting research and development efforts to investigate environmental impacts of plastics on the marine environment and to design new or improved "green chemistry" alternatives and to assess cost-effective production on a commercial scale;

(h) Utilizing existing regulatory frameworks and developing legislation to facilitate sustainable management of plastic, such as through extended producer responsibility and waste management infrastructure, especially in developing countries, and providing support for the implementation of new policies and programmes, drawing on examples of relevant best practices;

(i) Comprehensive, evidence-based policies and enforcement of existing laws to prevent marine debris that will help improve user compliance with best waste management practices;

(j) Collaborative partnerships and networks with stakeholders, including suppliers, industry associations, academic bodies, governments, environmental protection organizations, multilateral organizations including, multilateral environmental agreements, to promote industry-wide change and action toward preventing and mitigating the impacts of marine debris;

(k) Communication and awareness about marine debris at a global level through the engagement of various stakeholders, including multi-national industries, engaging industries in public education and outreach, and building partnerships with local governments;

(l) Pursuing public-private partnerships, adapted and implemented on the regional and national level, to increase citizen awareness, to promote industries' responsibility for eco-efficient waste-management systems and practices, including voluntary certification systems by third parties;

(m) Setting quantifiable, environmental and operational targets for reducing marine debris based on scientific assessments of impacts, and partnerships between industries and the scientific community to better understand and evaluate the scope, origins and impact of solutions to marine debris;

(n) Monitoring the movement of imported plastic, especially non-recyclable plastic, into countries that may not have existing infrastructure to dispose of these materials.

Mainstream marine debris issues into national regulatory and policy frameworks

6. Linking the marine debris issue to the Aichi Biodiversity Targets (Target 8),[20] would encourage countries to include marine debris in their national biodiversity strategies and action plans (NBSAPs) and

[20] The 20 Aichi Biodiversity Targets are headline targets of the Strategic Plan for Biodiversity 2011-2020, which was adopted by the Conference of the Parties to the CBD at their tenth meeting (COP 10), in decision X/2. Target 8 states that: by 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

provide information on the progress of implementation through the CBD national reporting process. The most effective way of improving and addressing regulatory and legal gaps in marine debris prevention and management is to mainstream these issues into the existing national regulatory and policy frameworks. Engaging various ministries and agencies and promoting partnerships with various stakeholders on marine debris-related issues may contribute to addressing the challenge in a more holistic way, using, for example, the ecosystem approach, including area-based management; cost-benefit analysis; and tools such as economic valuation, while taking into account the additional time required for approaches such as integrated marine and coastal area management to be operational. Mainstreaming the marine debris issue, such as oil-spills contingency planning for sensitive biological areas, should also be of great priority. The lack of specifically dedicated legislation was highlighted in relation to marine debris. While legislation often exists for solid waste (though not necessarily always enforced), legislation rarely mentions marine debris, in particular regarding extended producer responsibility (EPR) policies or stormwater and waterway policies specifically for litter retrieval. This is particularly relevant for small island developing States and coastal municipalities. Each country should enhance their enforcement of existing waste legislation. It is important to transfer and implement schemes known to be successful at reducing land-based sources, such as deposit return schemes, bans or user fees and levies for targeted items (e.g., plastic bags), and to draw on examples of best practices in terms of implementation, such as coordination with public-awareness campaigns.

7. Putting in place long-term action plans is necessary to ensure sustainability of the programmes. Target-setting could be an option, where certain percentages of waste redirected for recycling exist, such as in Member States of the European Union (defined recycling quotas), and underway, such as in the Philippines, which is aiming to redirect 50 per cent of its waste by 2016. Taking an upstream prevention approach, by engaging with municipalities located in watersheds may be another priority area. All the relevant stakeholder groups should be involved and coordinated in developing such action plans and strategies, in order to promote their ownership of the programme.

8. Considering the transboundary nature of marine debris, countries can consider transboundary conservation area management schemes. While social and legislative differences may exist, countries can have agreements on how to manage more effectively areas of high biodiversity.

9. While communities, civil society and private sector may be involved in recovery and clean-up, it is important that Governments provide incentives (e.g., “rice for plastic waste” scheme in the Philippines) for their involvement as well as infrastructure for collection and disposal and feedback/progress/impact analysis. This could be closely linked to EPR policies, which would help overcome a possible lack of capacity in terms of infrastructure.

10. Working with the public in terms of monitoring and enforcement through mobile phone applications and social media has proven to be quite successful in some countries. In order to increase awareness, information related to marine debris and solid waste management could be included in national curricula at different levels and education of other relevant sectors, such as shipping, fishing and tourism.

Enhance international and regional cooperation

11. Increased coordination and information-sharing among relevant United Nations agencies, international organizations, multilateral environmental agreements (MEAs), and regional seas conventions and agreements, is critical to secure necessary political, policy, technical and financial support for global, regional, national and local actions that contribute to the implementation of existing global commitments, such as the Honolulu Strategy,[21] the outcome document of the United Nations Conference on Sustainable Development (Rio+20),[22] United Nations Environment Assembly resolution 1/6 on marine plastic debris and microplastics and MEA-related resolutions on addressing the impacts of

[21] The Honolulu Strategy, A Global Framework for Prevention and Management of Marine Debris, available at http://www.unep.org/gpa/documents/publications/honolulustrategy.pdf.

[22] General Assembly resolution 66/288, annex.

marine debris. For example, the Global Partnership on Marine Litter may provide a platform for increasing such cooperation at the global and regional levels.

Influencing consumer choice and behaviour

12. The "Green marketing" or "eco-labelling" approach can successfully promote change in consumer behaviour and increase consumers' ability to choose more sustainable products that are easier to recycle or have less impact on the environment.

II. To address sea-based sources of marine debris

Abandoned, lost or otherwise discarded fishing gear (ALDFG)

13. Workshop participants took note of ongoing activities and publications of various global and regional processes (e.g., Food and Agriculture Organization of the United Nations, International Maritime Organization, United Nations Environment Programme, International Whaling Commission, Convention on Migratory Species, the European Union and the Baltic Marine Environment Protection Commission – HELCOM).

14. Existing ALDFG programmes have identified particular gear types that have higher levels of biodiversity impact. Collecting, centralizing and managing information on gear loss rates from fisheries as well as geographic regions of increased biodiversity impacts from ALDFG will help to reduce loss rates and subsequent impacts. These locations can be correlated with areas of known biodiversity hotspots. Such analyses can help identify priority areas where marine debris and ALDFG loss rates should be addressed due to the potential high level of impacts to marine biodiversity. Upon completion of this mapping exercise, effective communication of results to interested stakeholders could serve to aid management to prevent losses.

15. The process elements of identifying priority areas are outlined below. In order to target regional features of ALDFG, the development of pilot projects is recommended. These should include:

(a) Proper outreach, education and promotion of ALDFG programmes that are suitable to regional specific contexts;

(b) An information-gathering phase in the form of pilot projects that include semi-structured interviews with local fishers in all regions, to gain information on reasons for gear loss, on the extent of the problem, potential hotspots and potential solutions. Draft surveys will be developed for artisanal fisheries around the world that will be adjusted by regional experts to effectively address the cultural sensitivities of each area. This should also include modelling projects that glean from previously conducted research;

(c) Establishment of local and regional ALDFG-reporting systems could be encouraged through legislation and incentives, building on existing reporting systems;

(d) Implementation of pilot projects aimed at surveying and removing derelict fishing gear items in hotspots, as identified in (b), should also include capacity-building so as to ensure sustainable and effective ALDFG prevention and recovery programmes. It is recommended to use data collection methods previously used in successful ALDFG programmes that have provided substantial evidence to support the need for continued removal of ALDFG in the area. Such data can assist stakeholders in deciding how to prioritize the gear types to be targeted for removal, and the locations where these efforts should take place. This data can be used as a basis for a growing dataset that can be summarized and used to substantiate continued efforts in outreach campaigns.

16. Further efforts are needed to understand the economic losses resulting from ALDFG. ALDFG has been proven to continue to fish for years, and possibly for decades. The amount of commercially important species that are caught and killed by this fishing gear is probably significant. The lost revenue from these species should be quantified as a tool to show the overall impacts of marine debris and garner support for solutions to reduce the ALDFG in the marine environment. In addition to commercially important species, there is also evidence that species targeted in recreational fishing activities, forage fish

and habitats can be also impacted by ADLFG. These impacts should also be researched to determine the full economic impact of this marine debris.

17. The participants noted the potential importance of lost-gear reporting as a means to further understand and mitigate the issue of lost fishing gear. Lost-gear reporting (without punitive consequences) by fishing sectors would provide important baseline data that is not currently available in a reliable and comprehensive way.

18. Gear marking plays an important role in identifying those fisheries and fisheries types that are most prone to gear loss. Assessments of marked gear provide knowledge that helps to detect geographic ADLFG hotspots and to predict their potential biodiversity-related impacts. This will promote improved management to reduce the risk of entanglement prior to occurrence. Gear marking also helps to identify gear types most prone to cause navigational hazards. Important research gaps can be met by gear marking. Technology (at a range of costs) is already available but there is high likelihood of resistance from some fishing communities due to the fear of punitive consequences for ecological damage. Confidence-building among the industry is required, which can be supported by establishing incentive schemes.

19. In considering the adoption of gear-marking measures, the workshop participants noted the following action elements:

(a) Making low-cost technology available to incentivize the use of it;

(b) Establishing priority research areas;

(c) Cost analysis of gear marking within fishery business models;

(d) Creating international standards for gear marking and derelict gear reporting management;

(e) Engaging the gear manufacturing sector;

(f) Establishing monitoring structures and level of oversight for marked gear use in international waters.

20. The workshop participants noted the role of investigating and promoting public-private partnerships in ports to provide innovative ways to reuse old fishing gear and provide disposal options for fishers. Derelict fishing gear has financial value as a resource material, however, disposal facilities are often missing. Challenges to this approach are the complex logistical needs for transporting and processing reclaimed gear to the next step in the recycling supply chain. To further this approach, countries are encouraged to adopt measures to:

(a) Assign value to derelict gear as a commodity;

(b) Connect fishing communities with innovative projects that utilize derelict gear;

(c) Establish an economy for derelict gear as a product (e.g. Net-Works);

(d) Engage the seafood industry in public-private partnerships that generate economic value for derelict gear;

(e) Strengthen and reinforce community-based management of reused fishing nets;

(f) Raise consumer awareness of entanglement, ingestion and other harmful consequences to the marine ecosystem of derelict fishing gear in order to promote commercial support for prevention, retrieval, and re-use of derelict gear.

Area-based management as a potential tool to minimize loss of fishing gear from gear conflicts and boating interactions

21. The workshop participants noted the role of area-based management measures as a potential tool to minimize loss of fishing gear from gear conflicts and boating interactions.

22. To this end, the following measures are suggested:

(a) Area-based management tools should address the impacts of recreational fisheries, including artisanal and small-scale fisheries activities;

(b) Ensure the involvement of all stakeholders, including indigenous peoples and local communities.

Vessel-associated inputs

23. Taking into consideration the challenges to the adequate management of on-board generated waste in ports around the world and their potential to generate marine debris that has an impact on marine and coastal biodiversity and habitats, the following measures are suggested:

(a) To collaborate with the International Maritime Organization with the aim of developing and improving the capacity of port reception facilities, including waste management infrastructure, particularly in developing countries;

(b) To work on the development and further establishment of cost recovery systems that incentivize the landing of on-board generated waste and damaged fishing gear, such as the wider application of the no-special fee system;

(c) To work towards sufficient recording and reporting, such as through garbage record books on-board fishing, commercial and recreational vessels;

(d) To prepare (or use existing materials) to promote best environmental practices for management and disposal of on-board generated waste, to reduce its potential impact on marine and coastal biodiversity and habitats.

Aquaculture

24. In order to apply precautionary measures, in particular related to weather and emergency conditions, the following measures are suggested:

(a) To develop strategies to reduce the amount of marine debris originating from aquaculture and to mitigate its impacts (e.g., incentives such as certifications that include elements of sustainable aquaculture; legal instruments; gear marking);

(b) To redesign aquaculture infrastructure to reduce debris or to reform the aquaculture sector to suit emerging sustainable goals;

(c) To develop criteria for best practices that are linked to funding opportunities.

III. Emerging issues

Wet storage

25. The meeting also noted the issue of “wet storage”. Wet storage is the storage of employable fishing gear in the marine environment. Wet storage of net gear can have a greater impact on marine biodiversity than dry storage. The participants suggested the identification and documentation of best practices with the intent to reduce the impacts on marine biodiversity through continued fishing by unattended gear, or by gear that becomes lost due to unanticipated extended soak time.

Recreational fishing and tourism sector

26. The meeting took note of the increasing number of recreational fishing and marine tourism activities and their potential to create marine debris. Participants felt the need to gain an overview of the extent of these activities and to develop approaches for coherent regulation and awareness-raising.

Inclusion of marine debris considerations in labelling and certification schemes

27. As part of awareness-raising and public outreach, it was suggested to promote green labelling and certification schemes that take into account the possibility that seafood products will create marine debris.

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