Item 4.2.1 of the Provisional Agenda

PERSPECTIVE OF THE OCEAN SCIENCES SECTION PROGRAMME
IN LIGHT OF THE DRAFT IOC MEDIUM TERM STRATEGY

At the 39th Executive Council, IOC Vice-Chair Neville Smith presented the report of the Advisory Group for the IOC Ocean Sciences Section. The Executive Council instructed the Executive Secretary to distribute the Advisory Group’s report to the Member States in order to receive comments from Member States and assist the preparations for the 24th Session of the Assembly. In addition to this advice and response from Member States, the new IOC Medium-Term Strategy proposed in document IOCXXIV/2 Annex 5 defines a set of High-Level Objectives to which all Programme elements will contribute. This document presents the structure and priority actions of the Ocean Sciences Programme to respond to this new strategic framework, as well as the response to the report of the Advisory Group, and Member States’ input on the report:

I. The IOC Ocean Science Programme in the New Medium-Term Strategy

II. Integration with other UNESCO Activities

III. Partnership with other Scientific Programmes and Activities

IV. Implications from the Recommendations from the Advisory Group and Member States for the Ocean Science Programme

V. New Programme Overview and Strategy for Achieving Objectives

Member States will be invited to provide comments on the new structure and strategy for the ocean science programme.
I. THE IOC OCEAN SCIENCE PROGRAMME IN THE NEW MEDIUM-TERM STRATEGY

1. In discussing IOC ocean science priorities and programme actions, it is important to make a distinction between the Ocean Science Programme (OSP) of the IOC and the Ocean Science Section (OSS). The OSS is the section of the IOC secretariat charged with catalyzing, coordinating, and promoting ocean science issues of importance to Member States, and acts under the direction of the IOC Executive Secretary. The OSP represents the priority ocean science issues identified by Member States that require international cooperation and coordination, and which are carried out in a manner consistent with the procedures and practices of the Commission. There may be elements of the OSP for which there is little direct support from the OSS Secretariat, but which nevertheless represent critical elements of the Programme. For other elements, programme actions are undertaken directly by the Secretariat.

2. The objective is for Member States to agree on a strategy for the OSP that (i) identifies and prioritizes critical issues requiring international cooperation, (ii) is relevant to the mission of the IOC and supportive of other programmes of the IOC, UNESCO, and other UN bodies, (iii) has high impact and is of practical benefit to the Member States; and (iv) is feasible with available resources.

3. Resolution EC-XXXIX.1 outlines four high-level objectives for the IOC Medium-Term Strategy 2008–2013, namely:
   - Prevention and reduction of the impacts of natural hazards (HLO 1)
   - Mitigation of the impacts of and adaptation to climate change and variability (HLO 2)
   - Safeguarding the health of ocean ecosystems (HLO 3); and
   - Management procedures and policies leading to the sustainability of coastal and ocean environment and resources (HLO 4).

4. A detailed description of these high-level objectives and the IOC actions contributing to each objective can be found in IOC-XXIV/2 Annex 11 (Draft IOC Programme and Budget 2008–2009). The list below provides a highlight of the ocean science actions.

5. In support of these high level objectives, the OSP will catalyse, coordinate and communicate marine scientific research through (i) the establishment and implementation of working groups, panels and networks to address specific issues of marine scientific research; (ii) sponsorship of global research programs; (iii) provision of secretariat support, as requested, for UN interagency activities; and (iv) communications, publications, and outreach.

### High-Level Objective 1: Prevention and reduction of the impacts of natural hazards

6. The Integrated Coastal Area Management (ICAM) Programme will promote and coordinate the development of guidelines, good practices and capacity building activities focusing on the integration of risk assessments and coastal hazard mitigation techniques into coastal planning and management procedures.

7. Various activities coordinated through the IOC Tsunami Programme contribute to the science that underpins this HLO, including tsunami modelling and coastal inundation research and related hazard and vulnerability assessments.

8. Storm tides (surges) and waves also contribute to hazards, and research and development is coordinated with Expert Teams of the IOC and WMO Joint Commission of Oceanography and Marine Meteorology.
High-Level Objective 2: Mitigation of the impacts of and adaptation to climate change and variability

9. The WMO-ICSU-IOC World Climate Research Programme (WCRP) has as its primary objectives the determination of predictability of climate and the effect of human activities on climate. Research carried out under WCRP coordination underpins the assessments of the Intergovernmental Panel on Climate Change (IPCC) and coordinates and promotes the science of climate variability and change, its impacts, and our vulnerability to extreme events.

10. The GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC) coordinates scientific activities and recommendations for the scientific design of the sustained ocean observing system for climate, develops strategies for evaluation and evolution of the system, and supports global ocean observing activities through liaison and advocacy. The Panel provides a link between the activities of the IOC/OSP with GOOS and GCOS.

11. The International Ocean Carbon Coordination Project (IOCCP) promotes and coordinates the development of a global network of research activities and observations to improve understanding of the ocean's role in the global carbon cycle. Also contributes to GOOS actions.

12. Ocean Acidification — Through its symposium series, The Ocean in a High CO₂ World, the IOC provides a regular mechanism for assessing what is known about ocean acidification and its impacts on marine ecosystems. Also contributes to HLO 3.

13. The IOC Coral Bleaching Working Group of the GEF/WB Global Coral Reef Targeted Research and Capacity Building programme was established to develop indicators for coral bleaching and to examine specific physiological mechanisms for coral bleaching, as well as the local ecological factors that cause bleaching and its after-effects, and differences between direct human stresses and those related to climate change. Also contributes to HLO 3.

14. The Global Coral Reef Monitoring Network (GCRMN), sponsored by the IOC, works to improve management and conservation of coral reefs by providing manuals, equipment, databases, training, problem solving, and help with finding funds for reef monitoring, all coordinated in a global network. The project includes regular global assessments of the Status of Coral Reefs of the World. Also contributes to GOOS actions and HLO 3.

15. Global Ocean Ecosystem Dynamics (GLOBEC) programme, co-sponsored by the IOC, aims to advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the responses of the marine ecosystem to global change. Also contributes to HLO 3.

16. Understanding Sea-level Rise and Variability — WCRP and the IOC, along with many partner organizations, jointly organized a sea level workshop in 2006, which outlined the major research and observing activities necessary to reduce uncertainty in sea level predictions. Follow-up activities will include a workshop on the coastal and islands impacts of sea-level rise. This activity jointly touches the interests of the Ocean Sciences, Ocean Observations (GLOSS, GOOS, and JCOMM), and Tsunami Sections.

High-Level Objective 3: Safeguarding the health of ocean ecosystems

17. The UN Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects (GRAME), and in particular its initial phase (jointly with UNEP) – the Assessment of Assessments, will be led by Ocean Science Section of IOC. The AoA will provide a framework and options for the Regular Process itself which will be submitted to the UN General Assembly.
18. **Harmful Algal Bloom Programme** (HABP) aims at assisting Member States to understand and mitigate the effects of harmful algal blooms on national economies, aquatic living resources, public health and the aquatic ecosystem. This is achieved through a broad programme including capacity enhancement, five regional networks, working groups, Science and Communication Centres, publication of manuals and guides, and a research programme GEOHAB. The programme is multidisciplinary and relates to many scientific and societal issues in the coastal oceans.

19. **Global Ecology and Oceanography of Harmful Algal Blooms** (GEOHAB) research programme by the IOC and SCOR aims through a comparative system approach to advance our understanding of the mechanisms underlying the population dynamics of harmful algae and to enhance our ability to model and forecast harmful algal events through development of improved observation systems.

20. **Marine Biodiversity networks and research** - OSS (jointly with the UNESCO Division of Ecological and Earth Sciences) will continue to promote the development of high seas biodiversity research, providing scientific inputs to the UN Ad hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction. It will also promote capacity development for the monitoring of marine biodiversity in biosphere reserves. This action contributes to other UNESCO Main Lines of Action.

### High-Level Objective 4: Management procedures and policies leading to the sustainability of the coastal and ocean environment and resources

21. **The ICAM Programme** contributes through:

   (i) the development of approaches to mitigate the effects of climate change on coastal areas in West Africa, through a partnership with the Global Environment Facility (GEF), to perform adaptation actions in pilot sites particularly vulnerable to natural climate changes and to anthropogenic degradation in the short, medium and long term (erosion, mangrove destruction...). These actions will serve as an example for future regional and global application. The programme will assist countries in formulating national and regional strategies for coastal adaptation.

   (ii) the promotion of the ICAM Handbook on Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management, though the implementation of regional pilot projects in Latin America and Indian Ocean.

   (iii) the development and application of marine spatial planning techniques in support of ecosystem-based management in pilot sites (jointly with UNESCO Man and Biosphere Programme).

22. Actions under HLO 1-3 contribute to HLO 4.
Summary table

<table>
<thead>
<tr>
<th>IOC High Level Objectives</th>
<th>Ocean Science Programme Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HLO 1: Prevention and reduction of the impacts of natural hazards</strong></td>
<td>ICAM</td>
</tr>
</tbody>
</table>
| **HLO 2: Mitigation of the impacts of and adaptation to climate change and variability** | WCRP  
OOPC (jointly with GOOS)  
IOCCP  
Coral Bleaching WG  
GCRMN  
Ocean Acidification  
GLOBEC  
ICAM |
| **HLO 3: Safeguarding the health of ocean ecosystems** | GRAME  
HAB  
Marine Biodiversity |
| **HLO 4: Management procedures and policies leading to the sustainability of coastal and ocean environment and resources** | ICAM |

*Note: Ocean Science Programme Actions in bold are implemented directly by the Ocean Science Section, whereas other actions supported mainly through co-sponsorships.*

**II. INTEGRATION WITH OTHER UNESCO ACTIVITIES / ACTIONS**

23. Supporting the recommendations of the Overall Review of UNESCO’s Sciences Programmes, IOC/OSS will strengthen **interdisciplinary and intersectoral activities** with other science programmes of UNESCO, as well as with other sectors. These activities will be implemented in the following areas:

(i) **UNESCO Climate Activities** — Climate change is an important driver and is a priority issue in many of UNESCO’s programme areas, including the IOC, the International Hydrology Programme, the Man and the Biosphere Programme, Sustainable Energy Program, Education for Sustainable Development, and World Heritage. The IOC serves as the UNESCO focal point for in-house coordination and communication among these activities. The Website established provides a one entry point to Member States for information on climate issues (for more information: [http://ioc3.unesco.org/unesco-climate/index.html](http://ioc3.unesco.org/unesco-climate/index.html)).

(ii) **The Global Carbon Cycle** — One of the common issues addressed through several programmes at UNESCO is the global carbon cycle. The IOCCP recently joined the Ecological and Environmental Sciences division, the Global Carbon Project, and ICSU’s Scientific Committee on Problems of the Environment in producing a **“Policy Brief”** on the Global Carbon Cycle.

(iii) **The integration of freshwater management issues in coastal management programmes** — Building on the past collaboration established between ICAM and the International Hydrology Programme (IHP) of UNESCO, pilot projects will be developed and implemented demonstrating sustainable coastal groundwater practices through the
development of coastal management plans and procedures in areas of high freshwater/seawater interactions.

(iv) Marine Spatial Planning applications in Marine Biosphere/MPAs or World Heritage (WH) Sites — OSS will continue to promote the development of good practices on ecosystem-based, marine spatial management, particularly through the demonstration of marine spatial planning techniques in biosphere reserves, Marine Protected Areas and/or WH Marine sites as cutting edge science application. Those activities will be developed jointly with the Man and Biosphere (MAB) Programme and the World Heritage Centre (for more information: http://ioc3.unesco.org/marinesp/).

III. PARTNERSHIP WITH OTHER SCIENTIFIC PROGRAMMES/ACTIVITIES

24. The IOC co-sponsors several global research programmes or joint working groups with other organizations, which are included in the descriptions of the new programme structure of the section. IOC also works in close partnership with a number of international programmes on a regular basis to meet research and observation objectives.

25. Global Carbon Project — The Global Carbon Project was formed to assist the international science community to establish a common, mutually agreed knowledge base of the global carbon cycle supporting the policy debate and action to slow the rate of increase of greenhouse gases in the atmosphere. The IOC-SCOR International Ocean Carbon Coordination Project was started in 2003 as a pilot project with the Global Carbon Project. The IOCCP Chairman serves as a member of the GCP steering committee.

26. SOLAS — The Surface Ocean— Lower Atmosphere Study is an international research initiative to achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere, and how this coupled system affects and is affected by climate and environmental change. The IOC works with SOLAS on issues of air-sea CO2 fluxes via the International Ocean Carbon Coordination Project.

27. IMBER — The Integrated Marine Biogeochemistry and Ecosystem Research programme was developed to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades. The IOC works with IMBER on issues of ocean carbon uptake and transformation via the International Ocean Carbon Coordination Project.

28. CLIVAR — The Climate Variability and Predictability Project of the WCRP was developed to describe and understand the physical processes responsible for climate variability and predictability on seasonal, inter-annual, decadal, and centennial time-scales. The IOC works with CLIVAR in a number of areas including ocean uptake of CO2 (with the IOCCP), with the CLIVAR ocean basin panels in setting requirements for sustained ocean observations, and with the CLIVAR’s ocean synthesis efforts in promoting intercomparisons and the development of ocean indices.

29. WWRP/THORPEX — This is a research programme of the WMO, focused on variability on the time scales of weather. The THORPEX Programme of WWRP contains research that is of direct interest to the OSP and, in turn, WWRP has strong interests in OSP areas such as ocean and coastal prediction and extreme events.

30. PICES Section on Carbon and Climate — The Carbon and Climate section of the North Pacific Marine Science Organization (PICES) was developed in 2005 to coordinate ongoing and planned synthesis of carbon cycle studies in the North Pacific. This group works closely with the IOCCP.
31. **ICES-PICES-IOC Effects of Climate Change on the World’s Oceans** is an international symposium planned for 19–23 May 2008 (Gijón, Spain) focusing on ocean climate variability and change, interactions with biogeochemical cycles, the coastal environment, and on marine ecosystems. WCRP, GLOBEC, and IMBER are represented on the scientific committee. The symposium will contribute to an assessment of the impacts of climate variability and change on the marine environment, a recommendation of the Advisory Group (see section IV).

32. The **WMO World Climate Conference-3** (WCC-3) — IOC, along with other UN agencies and international partners has been asked to contribute to the organization of the WCC-3 *Predicting Weather and Climate for a Changing World* (tentatively 12–16 October 2009), with a focus on using predictions in decision-making and including a session on progress and plans of GCOS.

33. **PICES Section on HAB** — The Harmful Algal Bloom section of the North Pacific Marine Science Organization (PICES) was developed to network HAB research and management in the North Pacific. This group cooperates with the ICES-IOC Working Group on HAB Dynamics and is the entry point for cooperation with IOC on the Harmful Algal Event Data Base, HAEDAT.

34. **Harmful Algal Information System** — this joint HAB Programme— IODE data system is developed in partnership with ICES, PICES and ISSHA.

35. The **Global Ocean Data Assimilation Experiment** (GODAE) is a research effort in developing operational ocean prediction capability for climate and seasonal forecasting, marine safety, fisheries, industrial applications, and coastal/shelf management. The OOPC and GODAE are co-sponsoring a November 2007 meeting which will be a first step to using ocean assimilation models in evaluating the observing system. GODAE as an experiment will end in 2008 whilst research into other aspects of ocean data assimilation will need to continue, and GODAE has started two initiatives that will need follow-up starting in 2009.

   - Linking physical ocean assimilation models with biogeochemical and ecosystems models: an IMBER-GODAE initiative is starting in June 2007 to promote biogeochemistry and ecosystem model links with physical prediction systems,
   - Coastal prediction and links to open-ocean prediction though the Coastal and Shelf Seas Working Group (CSSWG) to promote actions for the assessment and demonstration of GODAE systems for regional, coastal, and shelf seas models and forecasting systems.

36. **GHRSST** (a GODAE High-resolution SST Pilot Project) and **Argo** are two semi-autonomous initiatives that coordinate science of direct relevance to the OSP.

37. The Advisory Group recommended the introduction of an underpinning, cross-cutting element in marine environmental modelling, as well as recognition of coastal research (see following section). These two issues could be addressed by the Ocean Science Programme, but the Ocean Science Section would require additional resources to provide meaningful follow-up to these new initiatives.

IV. **RECOMMENDATIONS FROM THE ADVISORY GROUP AND MEMBER STATES FOR THE OCEAN SCIENCE PROGRAMME IN LIGHT OF THE NEW STRUCTURE**

38. The Advisory Group was established to provide advice to the Head of the Ocean Sciences Section rather than on the Ocean Science Programme. However, the findings and recommendations of the Group also have clear implications for the Programme, and it is for the Member States to decide whether the priorities and structure of the Programme should be changed in line with the advice of the Advisory Group.
39. At the 39th Session of the Executive Council (Paris, 21–28 June 2006), the IOC Vice-Chairman, Dr Neville Smith, presented the report of the Advisory Group for the IOC Ocean Sciences Section. The Advisory Group called for modification of the structure of the Programme so as to clearly show both the strategic objectives and more explicitiy reflect the relevance of the Programme to the mandate of IOC and the needs of the Member States. In particular, the Advisory Group recommended the incorporation of several new aspects and/or an increased priority for certain ongoing actions, including:

(i) Impacts of climate variability and climate change on the marine environment and on its living resources and ecosystems;
(ii) Explicit recognition of coastal research as a primary element, including climatic impacts; direct human influences, integrated coastal management, natural marine hazards and coastal-zone forecasting;
(iii) Early introduction of marine assessment as a primary element, with emphasis on the science that will underpin the Global Marine Assessment and its Assessment of Assessments; and,
(iv) Introduction of an underpinning, cross-cutting element in marine environmental modelling.

40. Member States who reviewed the report and responded to Circular Letter 2209 emphasized the need for ocean science activities to be policy-relevant and with an emphasis on communicating results regularly to Member States. It was also stated that an increased emphasis on the scientific underpinnings of marine assessments would be a useful way to focus actions in support of policy-relevant applications. It was also stated that a stronger focus on climate impacts in the marine environment and ecosystems was an example of an interdisciplinary approach that would bring together several lines of Ocean Science Programme activity to address and area of international concern. Finally, the Member States cautioned against any expansion of the Section’s activities without a new strategic plan with priorities, identification of activities for termination, and allocation of new resources, including staff.

41. The new science structure and associated priorities proposed for the Medium-Term strategy translates most of the recommendations set out by the Advisory Group into specific actions of the Programme:

- High-Level Objective 2 (Mitigation of the impacts of and adaptation to climate change and variability) brings together eight programmes of the IOC that provide a strong basis for the Advisory Group recommended priority (i) (Impacts of climate variability and climate change on the marine environment and on its living resources and ecosystems);
- High-Level Objective 3 (Safeguarding the health of ocean ecosystems) places a strong emphasis on Advisory Report recommendation (iii) (Early introduction of marine assessment as a primary element, with emphasis on the science that will underpin the Global Marine Assessment and its Assessment of Assessments);
- The Advisory Group recommendation (ii) (Explicit recognition of coastal research as a primary element, including climatic impacts; direct human influences, integrated coastal management, natural marine hazards and coastal-zone forecasting) is an important issue for the IOC that cuts across all sections of the IOC. The coordination of this issue within the Ocean Science Section will draw on the scientific coordination needs being identified by the newly developed Panel for Integrated Coastal Observations (PICO) of the coastal module of GOOS.
- The Advisory Group recommendation (iv) (Introduction of an underpinning, cross-cutting element in marine environmental modelling) is currently being addressed outside direct IOC programmes by the GODAE-IMBER initiative (see Section III). Starting in 2009 after the end of GODAE, IOC may need to serve as a coordinating body for the work started under this initiative.
V. NEW PROGRAMME OVERVIEW AND STRATEGY FOR ACHIEVING OBJECTIVES

42. The Ocean Science Section Programme as defined in the new Medium-Term Strategy and as described in section I of this report effectively addresses most of the recommendations of the Advisory Group. The remaining programmatic areas are being investigated through new developments in coastal GOOS and other IOC coastal programmes, and through partnerships with scientific programmes carrying out scoping exercises to identify international coordination needs for marine environmental modelling. This emphasis on coordinating and providing a focus for underpinning science is an important aspect of the science strategy.

43. Specifically addressing Member States’ concerns that programmes be policy-relevant and provide regular communications to Member States about the results of IOC programmes, the Ocean Sciences Section will produce biennial Policy Briefs before each Assembly to provide the latest research results needed to inform decision-making. In partnership with the UNESCO Division of Ecological and Earth Science and the ICSU Scientific Committee on Problems of the Environment (SCOPE), the Ocean Science Section assisted in the development of a Policy Brief on the Global Carbon Cycle (available electronically at: http://ioc3.unesco.org/unesco-climate/carbonBriefsNo2.pdf; hardcopies of the brochure will be made available at the Assembly.) It is proposed that the Ocean Science Sector follow this format for its briefs. The first set of policy briefs would be developed for the 25th Session of the IOC Assembly and could include: Ocean Carbon and Ocean Acidification; Sea-Level; Harmful Algal Blooms; and Marine Biodiversity. Briefs provided by prime coordinating programmes like the WCRP will also be available to Member States.

44. In order to re-establish a closer connection between the programme areas of the IOC and the international ocean science community, the Executive Secretary proposes to organize an international ocean science conference in honour of the 50th anniversary of the IOC in 2010. This conference would be a XXIst Century new version of the Joint Oceanographic Assemblies (JOA) held earlier in IOC’s history, bringing together the marine science community, scientific NGOs and international scientific unions and bodies. The last JOA was held in Acapulco in 1988.

Staffing situation of OSS

45. Member States also expressed concern about the limited staffing and budget of the Ocean Science Section, and noted that the list of activities required of the section is growing. The staffing situation of the OSS has been stagnant over the last 3 biennia, and presently consists of two core professional staff:

- One Head of Section (P5 grade,) currently under recruitment;
- One Programme Specialist (P3 level) in charge of ICAM Programme.

Two additional posts are supported through extrabudgetary funds:

- One Programme Specialist (P4 grade, fixed term post) in charge of HAB;
- One Programme specialist (P4 grade, temporary post) in charge of Climate and Carbon Programmes.

46. In addition, in order for IOC to fulfil its role in the implementation of GRAME and its initial phase, the Assessment of Assessments, requests have been made to Member States (through the UN General Assembly and IOC Resolutions) to identify financial resources, including staff secondment, for this purpose.

47. A staffing strategy and operational budget plan needs to be developed that promotes investment in the work of the Secretariat and that takes account of the inevitable pressures provided by reduced regular budget staff resources and operating funds.