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Joint Group of Experts on the Scientific Aspects
of Marine Environmental Protection
(GESAMP)

REPORT OF THE THIRTIETH SESSION
Monaco, 22–26 May 2000

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

1 Introduction: The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its Thirtieth Session at the International Atomic Energy Agency's Marine Environment Laboratory in Monaco from 22-26 May 2000. GESAMP was established in 1969 by a number of United Nations Organizations as a Joint Group to encourage the independent, interdisciplinary consideration of marine pollution and environmental protection problems with a view to avoiding duplication of efforts within the United Nations system. At this meeting GESAMP considered the following main topics: 1) Marine Environmental Assessments; 2) Estimates of Oil Entering the Marine Environment from Sea-Based Activities; 3) Environmental Impacts of Coastal Aquaculture; 4)Evaluation of the Hazards of Harmful Substances Carried by Ships.

2 Marine Environmental Assessments: Two final draft reports were put forth to the Group for approval: 1) The LBA report "Land-based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment" (document GESAMP XXX/3/2); 2) The Biennial Report "A Sea of Troubles – Issues in Focus" (document GESAMP XXX/3/1).

The Group reviewed the LBA report and approved the final draft for publication as GESAMP Reports and Studies Series No. 71, and also as a commercial publication, with the understanding that certain amendments and suggestions given at this session be taken into account in the final version. The Group reviewed the biennial report and found the text, prepared by a professional writer on the basis of the draft report prepared by the Working Group and reviewed at GESAMP XXIX, very appropriate for the intended target audience. They suggested that the final Conclusions and Recommendations chapter should be published as an integral part of the biennial report but in a form which makes it clear that it is a product of the Working Group. GESAMP endorsed the final draft for publication in the GESAMP Reports and Studies series as No. 70, and as a commercial publication, with the understanding that the comments and amendments proposed at this session be incorporated in the final version.

3 Estimates of Oil Entering the Marine Environment from Sea-Based Activities:
GESAMP noted the progress achieved by its Working Group and welcomed its plan to finalize the report by December 2000. The Working Group co-operates with the U.S. National Academy of Sciences which is currently working on a report on oil discharges at sea and into the sea from North America.

4 Environmental Impacts of Coastal Aquaculture: The Working Group's final draft "Planning and Management for Sustainable Aquaculture Development (document GESAMP XXX/5) was reviewed by GESAMP. The discussion focused mainly on the degree of usefulness of a comprehensive Integrated Coastal Management (ICM) exercise specifically for aquaculture development as opposed to more locally applied ICM exercises and other management approaches. These comments were accommodated in the report and the Group approved it for publication as GESAMP Reports and Studies No. 68 with the understanding that the sponsoring Agency would ensure a thorough editorial process prior to publication.

5 Evaluation of the Hazards of Harmful Substances Carried by Ships: GESAMP appreciated the efforts of its Working Group in bringing the GESAMP evaluation procedure in line with the OECD Harmonized Integrated Hazard Classification System for Human Health and Environmental Effects of Chemical Substances. GESAMP approved the hazard profiles of new substances proposed for carriage at sea by chemical tankers or as packaged goods onboard freight vessels. After completion of its revised hazard evaluation procedure, GESAMP requested that the chairperson and Secretary of the Working Group finalize plans for publication of the revised evaluation system. Noting that the Working Group has been requested by IMO to review by 2002 the hazards of all substances listed in its International Bulk Chemical (BC) Code, GESAMP requested IMO to ensure that sufficient funds were available to carry out this work.

6 Matters of particular concern regarding the degradation of the marine environment: A number of issues of current and growing concern were raised with a view to bringing these to the attention of the marine environment community and, for some, suggesting that scoping activities take place intersessionally in order that more in-depth evaluations of these issues could be undertaken in the future. These issues, not in order of priority, were:

- potential problems of intentionally fertilizing certain regions of the coastal and open ocean in order to enhance primary production and draw down atmospheric CO_2 levels;
- genetic interaction between farmed and wild fish stocks which may result in a loss of natural genetic variability in wild species;
- the connection between ocean health and human health is more closely coupled than previously thought and deserves a more prominent place on the international environment agenda;
- overall lack of a consistent, internationally recognized and data-driven strategy to evaluate the level of success of integrated coastal management (ICM);
- off-shore oil and gas exploration can lead to localized contamination, and there is a lack of international cooperation on standardizing regulation and control measures for these contamination sources;
- the vicious cycle of more intense human exploitation of finite coral reef resources which reduces reef productivity, in turn leading to more desperate measures of resource extraction from the reefs;
- lack of integrated assessment methodologies to analyze, evaluate and prioritize the different types of marine environmental problems arising;
- necessity to review and evaluate environmental concerns on the extraction of methane hydrates as an energy source, and the consequences of their release to the marine and atmospheric environments;
- observed increase in toxicity of mixtures of polycyclic aromatic hydrocarbons as a result of UV-B irradiation and its potential relationship to ozone depletion;
- necessity of an evaluation of CO_2 sequestration options with emphasis on procedures for examining net benefits;
- need to classify poorly-defined, arbitrarily-grouped hazardous chemicals (e.g., POPs, "endocrine disruptors", etc.) with the aim of clarifying which chemicals among them are actually hazardous so that proper policy for their management in the marine environment can be formulated;
- need for improved statistics on a wide range of human activities (e.g., demography, tourism, recreation, shipping density, coastal development), so that trends in marine environmental degradation specifically caused by these activities can be adequately assessed;
- confusion in scientific and policy-making circles regarding GESAMP's original definition of the terms "Pollution" and "Contamination" requires clarification and possible reformulation.

7 Future of GESAMP: The Executive Director of UNEP has proposed that a thorough and independent review of GESAMP and its operational procedures be undertaken, before proposals for a possible new United Nations Memorandum of Understanding on GESAMP are formulated. The Group was made aware of this request and the Sponsoring Agencies' agreement to fund such a review. The Chairperson underscored the usefulness of the review and expressed his view that it would be one of the primary issues to be addressed during the next intersessional period. The Group offered various comments on how it thought GESAMP could most effectively operate to satisfy its end-users. Several experts emphasized that the persons forming the review team must be competent, independent and thorough in their evaluation. The Intersecretariat took note of all comments and agreed to organize the review.

RÉSUMÉ

1. Introduction : Le Groupe mixte d'experts chargé d'étudier les aspects scientifiques de la protection du milieu marin (GESAMP) a tenu sa trentième session au Laboratoire de l'environnement marin de l'Agence internationale de l'énergie atomique, à Monaco, du 22 au 26 mai 2000. Le GESAMP a été créé en 1969 par un certain nombre d'organismes des Nations Unies en tant que groupe mixte pour favoriser un examen indépendant et pluridisciplinaire des problèmes de pollution marine et de protection de l'environnement afin d'éviter un chevauchement d'efforts au sein du système des Nations Unies. À sa réunion, le GESAMP a examiné les grandes questions ci-après : 1) évaluations de l'environnement marin; 2) estimations des quantités de pétrole pénétrant dans l'environnement marin du fait des activités menées en mer; 3) impacts environnementaux de l'aquaculture côtière; 4) évaluation des dangers liés aux substances nuisibles transportées par les navires.

2. Évaluations de l'environnement marin : Deux projets de rapports ont été soumis au Groupe pour approbation : 1) le rapport LBA intitulé "Land-based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment" (document GESAMP XXX/3/2); 2) le rapport biennal intitulé "A Sea of Troubles – Issues in Focus" (document GESAMP XXX/3/1).

Le Groupe a examiné le rapport LBA et en a approuvé la publication en tant que n° 71 de la Collection Rapports et études du GESAMP, ainsi qu'en tant que publication commerciale, étant entendu que certains amendements et suggestions formulés lors de la session y seraient incorporés. Le Groupe a examiné le rapport biennal et a jugé que le texte, établi par un rédacteur professionnel sur la base du projet préparé par le Groupe de travail et revu à la vingt-neuvième session du GESAMP, était tout à fait adapté à l'audience visée. Il a suggéré que le chapitre "Conclusions et recommandations" soit publié en tant que partie intégrante du rapport biennal, mais sous une forme qui fasse bien apparaître qu'il a été produit par le Groupe de travail. Il en a approuvé la publication en tant que n° 70 de la Collection Rapports et études du GESAMP, ainsi qu'en tant que publication commerciale, étant entendu que les observations et amendements formulés lors de la session y seraient incorporés.

3. Estimations des quantités de pétrole pénétrant dans l'environnement marin du fait des activités menées en mer : Le GESAMP a noté les progrès réalisés par le Groupe de travail et s'est félicité de son intention de finaliser le rapport pour décembre 2000. Le Groupe de travail coopère avec l'Académie des sciences des États-Unis, qui est en train d'élaborer un rapport sur les rejets de pétrole en mer et dans la mer depuis l'Amérique du Nord.

4. Impacts environnementaux de l'aquaculture côtière : Le GESAMP a examiné le projet final du Groupe de travail intitulé "Planning and Management for Sustainable Aquaculture Development" (document GESAMP XXX/5). La discussion a porté principalement sur l'utilité d'un exercice global de gestion intégrée des côtes (GIC) concernant spécifiquement le développement de l'aquaculture par opposition à des exercices GIC et à d'autres méthodes de gestion de portée locale. Les observations ont été incorporées au rapport et le Groupe en a approuvé la publication en tant que n° 68 de la Collection Rapports et études du GESAMP étant entendu que l'organisation parrainante en assurerait la mise au point rédactionnelle avant publication.

5. Évaluation des dangers liés aux substances nuisibles transportées par les navires : Le GESAMP a apprécié l'effort réalisé par le Groupe de travail pour rendre la procédure d'évaluation du GESAMP conforme au Système harmonisé de l'OCDE de classification des dangers des substances chimiques pour les effets sur la santé humaine et sur l'environnement. Le GESAMP a approuvé les profils de danger des nouvelles substances qu'il est proposé de transporter par mer à bord de navires-citernes pour produits chimiques ou comme marchandises emballées à bord de cargos. Une fois achevée la révision de sa procédure d'évaluation des dangers, le GESAMP a demandé que le président et le secrétaire du Groupe de travail finalisent les plans pour la publication du système d'évaluation révisé. Notant que l'OMI a demandé au Groupe de travail d'examiner en 2002 les dangers présentés par toutes les substances figurant dans son Recueil international de règles sur les transporteurs de produits chimiques, le GESAMP a prié l'OMI de s'assurer que ces travaux bénéficieraient d'un financement suffisant.

6. Préoccupations particulières concernant la dégradation de l'environnement marin : Plusieurs questions dont on se préoccupe déjà ou de plus en plus ont été évoquées afin de les porter à l'attention des spécialistes de l'environnement marin et, pour certaines d'entre elles, de mener des activités exploratoires entre les sessions pour pouvoir à l'avenir les soumettre à des évaluations plus approfondies. Ces questions, non classées par ordre de priorité, sont les suivantes :

- Problèmes que pourrait poser la fertilisation intentionnelle de certaines zones côtières et de haute mer ayant pour but d'accroître la production primaire et de réduire les niveaux de CO_2 dans l'atmosphère;
- Interaction génétique entre les poissons d'élevage et sauvages pouvant entraîner une perte de variabilité génétique chez les espèces sauvages;
- Le rapport entre la santé des océans et la santé humaine est plus étroit qu'on ne le pensait précédemment et mérite une place plus proéminente sur l'ordre du jour international concernant l'environnement;
- Manque général d'une stratégie cohérente, reconnue au plan international et reposant sur des données pour évaluer le succès de la gestion intégrée des côtes (GIC);
- La prospection de gaz et de pétrole en mer peut provoquer une contamination localisée et aucune coopération internationale n'existe pour la normalisation des mesures de réglementation et de contrôle de ces sources de contamination;
- Cercle vicieux de l'intensification de l'exploitation par l'homme des ressources limitées des récifs coralliens, qui en réduit la productivité et aboutit à des mesures encore plus radicales d'exploitation de ces ressources;
- Manque de méthodologies intégrées d'évaluation pour analyser, évaluer et classer par ordre de priorité les différents types de problèmes qui se posent en matière d'environnement marin;
- Nécessité d'examiner et d'évaluer les préoccupations environnementales liées à l'extraction d'hydrates de méthane en tant que source d'énergie et les conséquences de leur rejet dans l'environnement marin et l'atmosphère;
- Augmentation observée de la toxicité des mélanges d'hydrocarbures aromatiques polycycliques du fait de l'irradiation par les UV-B et sa relation potentielle avec l'appauvrissement de la couche d'ozone;
- Nécessité d'une évaluation des options de retenue du CO_2, insistant sur les procédures d'examen des avantages nets;
- Nécessité de classer les produits chimiques mal définis, regroupés de façon arbitraire (POP, "perturbateurs endocriniens", etc.), pour déterminer quels sont ceux d'entre eux qui sont réellement dangereux de façon à formuler une stratégie correcte de gestion de ces produits dans l'environnement marin;
- Nécessité d'améliorer les statistiques pour une vaste gamme d'activités humaines (démographie, tourisme, loisirs, densité du trafic maritime, aménagement des côtes, etc.) de manière à pouvoir évaluer correctement les tendances concernant la dégradation de l'environnement marin due spécifiquement à ces activités;
- La confusion dans les milieux scientifiques et parmi les décideurs à propos de la définition initiale par le GESAMP des termes "pollution" et "contamination" nécessite une clarification et peut-être une reformulation.

7. Avenir du GESAMP : Le Directeur exécutif du PNUE a suggéré que soit entrepris un examen détaillé et indépendant du GESAMP et de ses modalités de fonctionnement avant que ne soient élaborées des propositions pour un éventuel nouveau mémorandum d'accord des Nations Unies sur le GESAMP. Le Groupe a été informé de cette suggestion et de l'accord des organisations parrainantes quant au financement d'un tel examen. Le président a souligné l'utilité de l'examen et estimé que ce devrait être l'une des questions à traiter en priorité pendant la prochaine intersession. Le Groupe a fait diverses observations sur la manière dont il pensait pouvoir fonctionner le plus efficacement possible pour donner satisfaction aux utilisateurs finals. Plusieurs experts ont souligné que les membres de l'équipe d'examen devaient être compétents, indépendants et minutieux dans leur évaluation. Le secrétariat mixte a pris note de toutes les observations et a accepté d'organiser l'examen.

ОСНОВНЫЕ ИТОГИ

1. Ведение: Объединенная группа экспертов по научным аспектам защиты морской среды (ГЕСАМП) провела 22-26 мая 2000 года в Монако в Лаборатории морской среды Международного агентства по атомной энергии свою тридцатую сессию. ГЕСАМП была образована в 1969 году несколькими учреждениями системы Организации Объединенных Наций в качестве объединенной группы для содействия независимому, междисциплинарному рассмотрению проблем загрязнения и защиты морской среды с целью избежать дублирования усилий в рамках системы Организации Объединенных Наций. На этом совещании ГЕСАМП рассмотрела следующие основные темы: 1) Оценки состояния морской среды; 2) Оценки попадания нефти в морскую среду в результате деятельности на море; 3) Экологическое воздействие аквакультуры в прибрежных зонах; 4) Оценка опасности вредных веществ, перевозимых морскими судами.

2. Оценки состояния морской среды: На одобрение Группе были представлены два окончательных проекта докладов: 1) доклад по НИД "Наземные источники и деятельность, воздействующая на качество и виды использования морской, прибрежной и соответствующей пресноводной среды" (документ GESAMP XXX/3/2); 2) двухгодичный доклад "Море и связанные с ним проблемы - вопросы в центре внимания" (документ GESAMP XXX/3/1).

Группа рассмотрела доклад о деятельности, осуществляемой на суше, и одобрила окончательный проект для публикации в Отчетах и исследованиях ГЕСАМП № 71, а также в качестве коммерческого издания при том понимании, что некоторые поправки и предложения, внесенные на данной сессии, будут приняты во внимание в окончательном варианте. Группа рассмотрела двухгодичный доклад и признала текст, составленный профессиональным автором на основе проекта доклада, который был подготовлен Рабочей группой и рассмотрен на 24-й сессии ГЕСАМП, вполне подходящим для предполагаемой аудитории. Было предложено, чтобы глава об окончательных выводах и рекомендациях была опубликована в качестве составной части двухгодичного доклада, но в такой форме, чтобы было ясно, что это - результат деятельности данной Рабочей группы. ГЕСАМП одобрила окончательный проект для публикации в Отчетах и исследованиях ГЕСАМП № 70 и в качестве коммерческого издания при том понимании, что замечания и поправки, предложенные на данной сессии, будут учтены в окончательном варианте.

3. Оценки попадания нефти в морскую среду в результате деятельности на море: ГЕСАМП отметила прогресс, достигнутый ее Рабочей группой, и приветствовала ее план завершить работу над докладом к декабрю 2000 года. Рабочая группа сотрудничает с Национальной академией наук США, которая в настоящее время работает над докладом по сбросам нефти в морскую среду как в открытом море, так и с территории Северной Америки.

4. Экологическое воздействие аквакультуры в прибрежных зонах: ГЕСАМП рассмотрела подготовленный Рабочей группой окончательный проект "Планирование устойчивого развития аквакультуры и управление им" (документ GESAMP XXX/5). В центре обсуждения был главным образом вопрос о степени полезности для развития аквакультуры, как таковой, всеобъемлющего мероприятия по Комплексному рациональному использованию прибрежной зоны (КРИПЗ) в отличие от мероприятий по КРИПЗ, носящих более локальный характер, и других подходов, касающихся рационального использования. Эти замечания были учтены в докладе, и группа утвердила его для публикаций в Отчетах и исследованиях ГЕСАМП № 68 при том понимании, что оказывающее поддержку учреждение обеспечит тщательное редактирование до публикации.

5. Оценка опасности вредных веществ, перевозимых морскими судами: ГЕСАМП положительно оценила усилия своей Рабочей группы, направленные на приведение процедуры оценки ГЕСАМП в соответствие с Согласованной комплексной системой классификации опасностей химических веществ для здоровья человека и окружающей среды (ОЭСР). ГЕСАМП одобрила профили

опасностей, связанных с новыми веществами, предложенными для перевозки морским путем в танкерах для химических продуктов или в качестве упакованных товаров на борту грузовых судов. По завершении работы над своей пересмотренной процедурой оценки опасностей ГЕСАМП предложила председателю и секретарю Рабочей группы завершить планы публикации этой пересмотренной системы оценки. Отмечая, что ИМО просила эту Рабочую группу провести к 2002 году рассмотрение опасностей, связанных со всеми веществами, перечисленными в ее международных правилах перевозки химических веществ насыпью, ГЕСАМП просила ИМО обеспечить выделение достаточных финансовых средств для проведения этой работы.

6. Вопросы, вызывающие особое беспокойство в связи с деградацией морской среды: Был поднят ряд актуальных и вызывающих все большую озабоченность вопросов, с тем чтобы довести их до сведения кругов, занимающихся проблемами морской среды, причем по некоторым из них предлагается в период между сессиями проводить предварительную оценку, с тем чтобы в будущем стал возможным более глубокий анализ этих проблем. К их числу относятся (не в порядке приоритетности):

- потенциальные проблемы, связанные с преднамеренным внесением удобрений в некоторых районах прибрежной зоны и открытого океана с целью повышения производства первичной продукции и понижения уровней атмосферного CO_2;
- генетическое взаимодействие между разводимыми и живущими в условиях дикой природы рыбными популяциями, которое может привести к утрате природного генетического разнообразия у диких видов;
- связь между санитарным состоянием океана и здоровьем человека оказалась более тесной, чем предполагалось ранее, и эта тема заслуживает более важного места среди международных экологических проблем;
- общее отсутствие последовательной, международно признанной и основанной на конкретных данных стратегии оценки уровня результативности комплексного рационального использования прибрежных зон (КРИПЗ);
- морские разведочные работы на нефть и газ на акватории могут приводить к локальному загрязнению, при этом международное сотрудничество по вопросам стандартизации мер регулирования и контроля в отношении этих источников загрязнения отсутствует;
- наличие порочного круга, когда возрастающая по своей интенсивности эксплуатация человеком ограниченных ресурсов коралловых рифов приводит к сокращению их продуктивности, что в свою очередь вызывает еще более интенсивную и безрассудную добычу ресурсов этих рифов;
- отсутствие методологии комплексной оценки для целей анализа и определения приоритетности различных по своему характеру проблем, возникающих в связи с экологией морской среды;
- необходимость рассматривать и оценивать экологические проблемы, связанные с добычей гидратов метана в качестве источника энергии, и последствия их сброса в морскую и атмосферную среды;
- наблюдаемое повышение токсичности смесей полициклических ароматических углеводородов под действием ультрафиолетового излучения и потенциальная связь этого повышения с истощением озонового слоя;
- необходимость анализа вариантов сокращения выброса CO_2 с уделением особого внимания процедурам изучения чистых выгод;
- необходимость классификации неудовлетворительно определенных и произвольно разбитых по группам опасных химических веществ (например, стойких органических загрязнителей, “нарушителей работы эндокринной системы” и т.д.) с целью уточнения, какие химические вещества из их числа фактически являются опасными, с тем чтобы можно было разработать соответствующую политику для обращения с ними в морской среде;

- необходимость совершенствования статистики по широкому кругу видов деятельности человека (таких, как демография, туризм, отдых, интенсивность судоходства, развитие прибрежных зон), с тем чтобы надлежащим образом оценить тенденции, связанные с деградацией морской среды, в особенности вызываемой этими видами деятельности;
- путаница, существующая в научных и в определяющих политику кругах в отношении выработанных ГЕСАМП первоначальных определений терминов “Pollution” (загрязнение) и “Contamination” (загрязнение), требует проведения работы по уточнению и, возможно, изменению формулировок.

7. Будущее ГЕСАМП: Исполнительный директор ЮНЕП предложил провести тщательное и независимое рассмотрение деятельности ГЕСАМП и ее оперативных процедур, прежде чем будут разработаны предложения о возможном новом меморандуме о понимании Организации Объединенных Наций в отношении ГЕСАМП. Группе было сообщено об этой просьбе и согласии финансирующих учреждений выделить средства на такое рассмотрение. Председатель подчеркнул полезность данного рассмотрения и выразил мнение, что оно будет одним из главных вопросов, которые предстоит решать в течение следующего межсессионного периода. Группа представила различные замечания относительно того, как, по ее мнению, ГЕСАМП могла бы наиболее эффективным образом функционировать, с тем чтобы удовлетворять требованиям конечных пользователей. Несколько экспертов подчеркнули, что лица, входящие в состав группы по рассмотрению, должны проводить оценку компетентно, независимо и тщательно. Совместный секретариат принял к сведению все замечания и согласился организовать рассмотрение.

RESUMEN EJECUTIVO

1 Introducción: El Grupo Mixto de Expertos sobre los aspectos científicos de la contaminación marina (GESAMP) celebró su trigésima reunión en el Laboratorio del OIEA para el Medio Ambiente Marino en Mónaco, del 22 al 26 de mayo de 2000. El GESAMP fue establecido en 1969 por varios organismos de las Naciones Unidas como Grupo Mixto para promover el análisis independiente e interdisciplinario de los problemas de la contaminación marina y la protección ambiental con miras a evitar la duplicación de esfuerzos en el sistema de las Naciones Unidas. En esta reunión el GESAMP examinó los siguientes temas principales: 1) Evaluaciones del medio marino; 2) Estimaciones de infiltraciones de hidrocarburos en el medio marino resultantes de actividades marítimas; 3) Consecuencias ambientales de la acuicultura costera; 4) Evaluación de riesgos de sustancias nocivas transportadas por buques.

2 Evaluaciones sobre el medio marino: Se presentaron dos proyectos de informe final al Grupo para su aprobación: 1) El informe LBA "Land-based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment" (documento GESAMP XXX/3/2; 2) El informe bienal "A Sea of Troubles - Issues in Focus" (documento GESAMP XXX/3/1).

El Grupo examinó el informe LBA y aprobó el proyecto final para publicarlo como documento Núm. 71 de la colección Reports and Studies, y también como publicación comercial, en el entendimiento de que en la versión final se tendrían en cuenta algunas enmiendas y sugerencias formuladas en esta reunión. El Grupo examinó el informe bienal y consideró que el texto, elaborado por un redactor profesional sobre la base del proyecto de informe preparado por el Grupo de Trabajo y examinado en la reunión GESAMP XXIX, resultaba muy apropiado para el público al que estaba dirigido. El Grupo sugirió que el capítulo de las conclusiones y recomendaciones finales debía publicarse como parte integrante del informe bienal, pero en una forma que pusiera en claro que era producto del Grupo de Trabajo. El GESAMP aprobó el proyecto final para su publicación como documento Núm. 70 de la colección Reports and Studies del GESAMP, y como publicación comercial, en el entendimiento de que las observaciones y enmiendas propuestas en esta reunión se incorporarían en la versión final.

3 Estimaciones de infiltraciones de hidrocarburos en el medio marino resultantes de actividades marítimas: El GESAMP observó los progresos alcanzados por su Grupo de Trabajo y acogió con beneplácito su plan de finalizar el informe a más tardar en diciembre de 2000. El Grupo de Trabajo coopera con la Academia Nacional de Ciencias de los Estados Unidos, que actualmente trabaja en un informe sobre descargas de hidrocarburos en el mar y en las profundidades del mar de América del Norte.

4 Consecuencias ambientales de la acuicultura costera: El GESAMP examinó el proyecto final del Grupo de Trabajo titulado "Planning and Management for Sustainable Aquaculture Development (documento GESAMP XXX/5). El debate se centró fundamentalmente en el grado de utilidad de un ejercicio exhaustivo de gestión costera integrada (GCI) concretamente destinado al desarrollo acuícola, a diferencia de ejercicios de GCI aplicados de manera más local y de otros enfoques de gestión. Estas observaciones se incluyeron en el informe, que el Grupo aprobó para su publicación como Núm. 68 de Reports and Studies del GESAMP, en el entendimiento de que el organismo patrocinador velaría por que se llevara a cabo una minuciosa labor editorial antes de la publicación.

5 Evaluación de riesgos de sustancias nocivas transportadas por buques: El GESAMP agradeció los esfuerzos de su Grupo de Trabajo ajustar el procedimiento de evaluación del GESAMP al sistema integrado y armonizado de la OCDE de clasificación de riesgos relacionados con los efectos sanitarios y ambientales de las sustancias químicas en los seres humanos. El GESAMP aprobó los perfiles de riesgo de las nuevas sustancias propuestas para su transporte por mar en buques cisterna de productos químicos o como productos envasados a bordo de buques de carga. Luego de finalizar su procedimiento revisado de evaluación de riegos, el GESAMP pidió que el Presidente y el Secretario del Grupo de Trabajo ultimaran los planes de publicación del sistema de evaluación revisado. Tras señalar que la OMI pidió al Grupo de Trabajo que examinara antes de 2002 los

riesgos de todas las sustancias enumeradas en su Código Internacional de Productos Químicos a Granel, el GESAMP pidió a la OMI que asegurara suficientes fondos para llevar a cabo esta tarea.

6 Cuestiones de particular interés relacionadas con la degradación del medio marino: Se plantearon varias cuestiones de interés creciente y actual con el fin de ponerlas en conocimiento de los círculos preocupados por el medio marino y, en el caso de algunas, para recomendar actividades entre reuniones de evaluación de su alcance y posibilitar su evaluación más exhaustiva en el futuro. Estas cuestiones, sin orden de prioridad, fueron las siguientes:

- posibles problemas asociados a la fertilización deliberada de ciertas regiones costeras y de alta mar con el fin de elevar la producción primaria y reducir los niveles atmosféricos de CO_2;
- interacción genética entre las poblaciones de peces de cría y en estado natural, y posibilidad de que dicha interacción reduzca la variabilidad genética natural en las especies salvajes;
- vinculación entre la sanidad marina y la sanidad humana, más estrecha que lo que antes se pensaba, y merecedora de ocupar un lugar más destacado en el programa internacional dedicado al medio ambiente;
- ausencia general de una estrategia coherente, internacionalmente reconocida y documentada para evaluar el grado de éxito de la gestión costera integrada;
- posibilidad de que la exploración de petróleo y gas en alta mar provoque una contaminación localizada, y escasa cooperación internacional en relación con las medidas destinadas a regular y controlar estas fuentes de contaminación;
- ciclo recurrente de explotación humana más intensa de los recursos finitos de los arrecifes de coral, lo que menoscaba la productividad de éstos y lleva a su vez a la adopción de medidas más extremas de extracción de esos recursos;
- ausencia de metodologías integradas de evaluación para analizar y evaluar los distintos tipos de problemas ambientales que se plantean en relación con el medio marino, así como para otorgarles prioridad;
- necesidad de examinar y evaluar los problemas ambientales asociados a la extracción de los hidratos de metano como fuente de energía, y consecuencias de su liberación a los medios marino y atmosférico;
- aumento de toxicidad observado en las mezclas de hidrocarburos aromáticos policíclicos como resultado de la radiación solar ultravioleta con efectos biológicos y su posible relación con el agotamiento de la capa de ozono;
- necesidad de una evaluación de las opciones de secuestro del CO_2 con especial hincapié en los procedimientos para examinar los beneficios netos;
- necesidad de clasificar los productos químicos peligrosos mal definidos y agrupados de manera arbitraria (por ejemplo, contaminantes orgánicos persistentes (POP), “disruptores endocrinos”, etc.) con el fin de esclarecer cuáles son los realmente peligrosos y formular una política apropiada para su gestión en el medio marino;
- necesidad de mejorar las estadísticas relacionadas con una amplia diversidad de actividades humanas (por ejemplo, demografía, turismo, recreación, densidad de transporte, desarrollo costero) con objeto de evaluar de forma adecuada las tendencias registradas en la degradación del medio marino concretamente causada por estas actividades;
- confusión en los círculos científicos y directivos con respecto a la definición original dada por el GESAMP a los términos “polución” y “contaminación”, y necesidad de una aclaración y una posible reformulación.

7 Futuro del GESAMP: El Director Ejecutivo del PNUMA ha propuesto que se lleve a cabo un examen minucioso e independiente del GESAMP y sus procedimientos operacionales antes de formular nuevas propuestas acerca de un posible memorando de entendimiento de las Naciones Unidas sobre el GESAMP. El Grupo fue notificado de esta petición y del acuerdo de los organismos patrocinadores de financiar ese examen. El Presidente destacó la utilidad del examen e indicó que sería una de las cuestiones primordiales que se abordarían durante el próximo período entre reuniones. El Grupo formuló varios comentarios sobre la forma en que consideraba que el GESAMP podría funcionar con más eficacia para satisfacer las necesidades de sus usuarios finales. Varios expertos destacaron que las personas que integren el grupo de examen deberán ser competentes, independientes y minuciosas en su evaluación. La Intersecretaría tomó nota de todos las observaciones y convino en organizar el examen.

1 INTRODUCTION

1.1 The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) held its thirtieth session from 22 to 26 May 2000 at the International Atomic Energy Agency (IAEA) Marine Environment Laboratory in Monaco under the Chair of Mr. P. Wells. Mr. R. Duce was Vice-Chairperson.

Opening of the session

1.2 The Chair of GESAMP, Mr. P. Wells, called the XXXth session of GESAMP to order at 9.30 a.m. on 22 May 2000.

1.3 Mr. H. Livingston, Director of the IAEA Marine Environment Laboratory (MEL), welcomed the participants to IAEA's new laboratory facilities in Monaco noting that it was one of the few occasions where this session had been held outside a main Agency headquarters, and certainly it was the first time that it was held in a laboratory actively involved in matters of relevance to GESAMP.

1.4 Mr. Livingston mentioned that last year the focal point for GESAMP within the IAEA moved into the Department of Nuclear Sciences and Applications of which MEL is a Division. This department has a good proactive record of interagency cooperation in the areas of health, food and environment – especially the marine environment – and so will continue to strongly support GESAMP. Furthermore, the primary mandate of MEL, the only marine laboratory in the UN system, is rooted in one of GESAMP's responsibilities – marine nuclear pollution. The Laboratory was founded in 1961 following an international conference in Monaco on ocean disposal of nuclear waste, and since then has expanded into broader aspects of marine pollution. In conclusion, he wished GESAMP a pleasant stay at MEL and much success in carrying out its tasks during this session.

Adoption of the Agenda

1.5 The agenda for this session as adopted, is given in Annex I to this report. The list of documents considered at the session is given in Annex II, and the list of participants is set out in Annex III.

2 REPORT OF THE ADMINISTRATIVE SECRETARY

2.1 The Administrative Secretary of GESAMP informed the Group of intersessional activities and events regarding administrative matters that might affect GESAMP's work.

2.2 After the XXIXth session of GESAMP in August 1999, the Joint Secretariat of the Group finalized its review of GESAMP's rules of procedures together with guidelines for their effective implementation. This review had been recommended in 1996 and reiterated in 1999 by the UN Commission on Sustainable Development (CSD) with a view to improving GESAMP's interaction with scientific representatives of governments and major groups.

2.3 The Joint Secretariat of GESAMP had originally thought that the revised memorandum on GESAMP should be forwarded as soon as possible to the Executive Heads of the Sponsoring Organizations of GESAMP and, after their signature, provide the basis for a re-formulated Group with new operational procedures. However, the problems encountered by GESAMP's MEA Working Group and related correspondence from the Chairperson of GESAMP and the Administrative Secretary, as well as a letter received shortly thereafter from the Executive Director of UNEP, have made it necessary to reconsider this matter.

2.4 In its recent letter, UNEP suggested that an "in-depth, independent evaluation of the Group be carried out by at least two experts: one representing governments, and the other one representing the scientific community". A list of nine tasks for the independent review was included in the letter covering a broad range of

topics regarding GESAMP's achievements, independence, transparency, membership, sponsorship and *modus operandi*. The Administrative Secretary, on behalf of all GESAMP Sponsoring Organizations, had welcomed UNEP's initiative and expressed their readiness to co-operate and to assist in the implementation of the proposed evaluation.

2.5 Noting that until completion of such an independent evaluation of GESAMP the activities of the Group might be restricted through uncertainties about future development, UNEP had been requested to provide the Group with additional details regarding the proposed evaluation under Item 8 of this session. The Administrative Secretary further proposed, and the Group agreed, that under this item the revised draft updated memorandum on GESAMP, mentioned in paragraph 2.3 above, be introduced.

2.6 The Administrative Secretary then drew attention to the first meeting of the United Nations Open-ended Informal Consultative Process on Ocean Affairs (UNICPO) which will be convened from 30 May to 2 June 2000. This process is intended to facilitate the annual review by the UN General Assembly of developments in ocean affairs by suggesting particular issues with an emphasis on identifying areas where co-ordination and co-operation at intergovernmental and inter-agency levels should be enhanced. These would include *inter alia* the development and management of marine resources, the protection and preservation of the marine environment, as well as the promotion of marine science and technology.

2.7 Regarding the strengthening of the protection of the marine environment from pollution caused by maritime activities, the Administrative Secretary noted that, based on GESAMP's hazard evaluation of chemicals, IMO agreed to revise the system of pollution categories and levels, and the classification of ship types for their transport due to improvements in ship technology including the introduction of efficient stripping of tanks. Thus there would be a greater appreciation of the relationship between the properties of chemicals and their impact on the marine environment as well as an agreed global harmonization of hazard criteria. IMO has also deferred any decision on a new system for pollution categorization until the results of applying the new GESAMP Hazard Profiles can be properly evaluated.

2.8 The Administrative Secretary informed the Group of recent developments regarding the accident about five months ago of the tanker ERIKA off the coast of France which caused great concern to the maritime communities and the public at large. The scale of the pollution and environmental damage was mainly due to the nature of ERIKA's cargo which was high-density fuel oil. A number of regulatory, technical and operational measures are being considered to reduce the risks of future similar accidents and related impacts.

2.9 The Group was further informed of the arrangements that are being made for convening a Diplomatic Conference in 2001 to phase out organotin compounds in anti-fouling paints used for ship hulls by the year 2008.

2.10 The Group further noted that provisions are being developed for the management and control of ballast water to minimize the risks of introducing alien species with ships. These will be considered by a Diplomatic Conference planned for the year 2003 with a view to adopting a new International Convention.

2.11 Several members of GESAMP expressed their appreciation for the above information, but suggested that future reports of the Administrative Secretary should also include a reflection of developments regarding the protection of the marine environment as undertaken by the other co-sponsoring organizations.

3 MARINE ENVIRONMENTAL ASSESSMENTS (MEA)

Report of the Chairman and the Technical Secretary on the activities of the Working Group

3.1 The Chairperson of the Working Group and the UNEP Technical Secretary of GESAMP introduced the document GESAMP XXX/3/3. The document reviewed the activities of the Working Group since its establishment in 1996, focusing on the activities leading to the preparation of the final drafts of the two MEA reports submitted for consideration and adoption by the present session of GESAMP. The document is attached as Annex IV to the present report of GESAMP.

3.2 The plans of the cosponsoring agencies for publicising the MEA reports was the only issue included in the above report that elicited considerable debate. These plans were considered as generally inadequate and the agencies were asked to increase their efforts to reach the planned target audience with the reports in a more efficient way.

3.3 The Scientific Director of GIWA (Global International Waters Assessment) referred to the contribution received through the Working Group from GESAMP in the development of GIWA, and expressed his hope that the established cooperation between GIWA and GESAMP would be further broadened.

Review and adoption of the final draft of the LBA report

3.4 The Group reviewed the final draft of the LBA report (Land-Based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment – document GESAMP XXX/3/2). The following major general comments were offered by the Group:

- there are some inconsistencies in the use of terminology and treatment of certain issues in various chapters and sections of the report;
- the importance and the role of the chemical industry as a land-based activity affecting the marine environment should be covered more prominently, and it should be recognised that in many instances industrial waste was released into the sewer systems without adequate treatment;
- the importance of persistent organic pollutants (POPs) and metals as marine contaminants is perhaps underestimated in the report;
- criteria used in assessing the scale and impact of selected activities or contaminants, and in setting priorities (ranking) for environmental problems should be more clearly explained;
- the Executive Summary and Chapter 1 (Introduction) of the report should be revised with the former focusing on "messages" contained in the report, and the latter serving as a "guide" to the report.

3.5 A large number of specific comments and suggestions was offered for each chapter and section of the draft LBA report. Explanations and clarifications were provided by the members of the Working Group most familiar with the questions raised through these comments. A record of the comments and suggestions was kept by the members of the Working Group in order to consider them during the finalisation of the report.

The most relevant specific comments were related to:

- the low priority assigned to radionuclides, POPs and other persistent toxic substances – Chapters 2 and 4;
- the time-scale of events which should be more precisely indicated (e.g., over what period was 50% of mangroves lost) – Chapter 2;
- the procedures (methods) used in the assessment of health risk associated with contaminated bathing water or seafood of marine origin – Chapter 3;
- the use and interpretation of data and information available through regional reports – Chapter 4;
- the need for the development of regional assessments yielding comparable results – Chapter 5;

- clarification and addition of information contained in Tables 6.1 and 6.2 in order to avoid their use out of the intended context – Chapter 6.

3.6 After reviewing the revised versions of the Executive Summary and Chapter 1 prepared during the session, GESAMP endorsed the final draft of the LBA report for publication in the GESAMP Reports and Studies Series as No.71 and as a commercial publication, with the understanding that:

- the amendments and clarifications proposed at the present session will be taken into account by the Working Group before the text of the report is finalised;
- UNEP shall arrange the technical/linguistic editing of the report prior to its publication;
- UNEP shall distribute the published report to all persons acknowledged as contributors to the preparation of the report;
- the documents listed in Annex II to the report will be available from UNEP marked as "Unpublished Internal Document. Not to be Cited".

The Executive Summary of the LBA report is attached as Annex V to this report.

Review and adoption of the final draft of the biennial report

3.7 The Group reviewed the final draft of the biennial report (A Sea of Troubles – Issues in Focus, document GESAMP XXX/3/1) written by a professional writer (except Chapter 7) on the basis of the draft of the report prepared by the Working Group and reviewed at GESAMP XXIX. The Group considered the text prepared by the professional writer as very appropriate for the intended target audience. A number of minor amendments were suggested and the writer was requested to take them into account before finalising the report for publication.

3.8 Chapter 7 of the report (Conclusions and Recommendations) was prepared by the Working Group in a form thought to be suitable for independent publication in scientific journals, or issued in other forms suitable for accessing a wider audience. The Group recommended that this chapter (Annex VI), with the amendments suggested at the present session, should be published as an integral part of the biennial report but in a form which would make it clear that it is a product of the Working Group (e.g., by using different font or colour of pages and hence different in style from the main report).

3.9 The Group endorsed the final draft of the biennial report for publication in the GESAMP Reports and Studies series as No. 70, and as a commercial publication, with the understanding that:

- the amendments and clarifications proposed at the present session will be taken into account by the writer of the report and the Working Group before the text of the report is finalised;
- UNEP shall distribute the commercially published report to all persons acknowledged as contributors to the preparation of the report;
- the bibliography will be deleted from the report and posted on the website;

3.10 GESAMP recommended that the report be translated to other languages in such a way as to capture the present style. The group agreed that, given the nature of the report, standard in-house editing by the responsible UN agency would be unlikely to achieve this objective.

4 ESTIMATES OF OIL ENTERING THE MARINE ENVIRONMENT FROM SEA-BASED ACTIVITIES

4.1 The IMO Technical Secretary introduced this topic, stating that the Working Group on oil inputs met for the fourth time in London in February 2000. The Group made significant progress during this meeting on the evaluation of all available data sources of oil inputs into the marine environment from sea-based activities, following the terms of reference approved by GESAMP in 1998.

4.2 A short report was tabled by the Chairperson of the Working Group. The report summarized status of the work of the group and some of the new sources of information used for the evaluation, for sections on: demographics of inputs; air emissions from ships; accidental spillages; scrapping of ships; operational discharges from ships; deliberate discharges of oil from ships; offshore exploration and production; and other sources of hydrocarbons into the sea.

4.3 Mention was made of the U.S. National Academy of Sciences' work in progress on the inputs, fate and effects of oil in the marine environment. Cooperation and information exchange are occurring between the two groups.

4.4 The report solicited the following comments (not in order of priority) for consideration by the Working Group:

.1 An effort should be made to obtain data from as many regions as possible;

.2 Additional data on sunken vessels in the Gulf of Mexico were available from the U.S. American Petroleum Institute;

.3 Consideration should be made of the various ways by which input statistics could be presented – annual or decadal – and the appropriate period for "average input statistics";

.4 For air emissions from shipping, data from the North Atlantic, the Baltic and the Mediterranean are available from by EMEP (UN/ECE/LRTAP/EMEP) (http://www.EMEP.INT);

.5 Consideration should be made of how to express the input figures comprehensively, given the differences in composition of the inputs (e.g., crude oil vs. trace hydrocarbons in production water). Normalization of units to give one overall input figure of "total hydrocarbons" other than by weight (i.e. metric tonnes), may prove to be impossible or misleading;

.6 Refinery effluent discharge data will be used irrespective of source of crude oil, and hydrocarbons in produced water will also be considered.

4.5 The plan for completion of the report by correspondence was presented. The report presented is shown in Annex VII.

5 ENVIRONMENTAL IMPACTS OF COASTAL AQUACULTURE

5.1 The Technical Secretary of the Working Group introduced the report "Planning and Management for Sustainable Aquaculture Development" (GESAMP XXX/5) which had been revised, following comments made on the previous draft presented at the XXIXth session of GESAMP. He also referred to Document GESAMP XXX/5.1 containing comments received from outside peer reviewers. GESAMP was invited to consider this report with a view to its approval.

5.2 The chairperson of the Working Group briefed the Group on the progress made and the essential changes introduced in the document.

5.3 The report was then reviewed by the Group. Comments mainly centered around the degree of usefulness of a fully fledged comprehensive ICM exercise for aquaculture development, versus more locally applied ICM exercises and other management tools and approaches.

5.4 Comments received from the Group were accommodated. The document was then approved for publication as Reports and Studies No. 68, on the understanding that the Secretariat would ensure a thorough editorial process prior to publication.

5.5 The Executive Summary of the document is attached as Annex VIII to this report.

6 EVALUATION OF THE HAZARDS OF HARMFUL SUBSTANCES CARRIED BY SHIPS

6.1 The thirty-sixth session of GESAMP's Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships (EHS) was held at IMO's Headquarters, London from 3–7 April 2000. The ten members of the Working Group, with backgrounds in ecotoxicology, environmental chemistry, occupational safety, mammalian toxicology and behaviour of chemicals in seawater, had been drawn from Japan, the United States and Europe.

Development of the revised GESAMP hazard evaluation procedure

6.2 The Chairperson of the Working Group recalled that prior to GESAMP's XXVIth session, the Marine Environment Protection Committee of IMO (MEPC) had supported an *ad hoc* panel exploring ways of revising the GESAMP hazard evaluation procedure. After more than two decades in use, it was felt that new scientific insights and the availability of new environmental data needed to be taken into account in the hazard evaluation. Selected Working Group members, experts from the chemical industry and a representative from Greenpeace had provided initial advice to the Working Group. At its XXVIIth session, GESAMP considered a proposal from the Working Group for a revised hazard evaluation procedure. Issues such as the bioaccumulation of chemicals in marine organisms and the application of chronic aquatic toxicity data in hazard evaluation were considered as well as appropriate scales of hazard. Additionally, GESAMP advised the Working Group to co-ordinate its activities with the global chemical classification scheme that was being developed by OECD for the UN Interagency Group on the Sound Management of Chemicals (IOMC). In response to this, members of the Working Group and IMO staff members participated in OECD meetings leading to the harmonised classification scheme for chemicals dangerous to the aquatic environment. As a result, the revised GESAMP hazard evaluation procedure was harmonized with that anticipated to be used by transport modes other than maritime shipping.

6.3 At its XXVIIIth session, GESAMP had approved the revised hazard evaluation procedure for publication, pending completion of remaining minor issues. The new procedure was published in 1999 as part of a paper in the journal *The Science of the Total Environment* (Vol. 237/238: 329–350). However, the proposed criteria for (mammalian) skin and eye irritation differed significantly from the IOMC harmonized criteria developed by OECD. Accordingly GESAMP at its XXIXth session recommended an outside expert panel to review these criteria – this matter was resolved intersessionally through informal meetings between the Chairperson, Secretariat and experts from different organizations. The Chairperson of the Working Group informed GESAMP that the revised Hazard Procedure was now complete and that its publication was planned as GESAMP Reports and Studies No. 64 in late 2000.

Revision of 660 International Bulk Chemicals Code substances

6.4 In 1998, MEPC requested the Working Group to re-evaluate the 660 bulk liquid substances contained in the International Bulk Chemical Code according to the revised GESAMP hazard evaluation procedures. The Chairperson of the Working Group and the IMO Technical Secretary of GESAMP informed MEPC at that time that such a review would take three years at a rate of 220 substances per year (1999–2001), providing that resources for an additional meeting each year were made available as well as additional support for secretariat activities. In 1999, support for a second meeting failed to materialise. MEPC in discussing the biennial budget of IMO found itself unable to increase resources for that work taking into account IMO's zero nominal growth targets. The most optimistic expectation, including valued donations from some administrations, was the maintenance of three meetings each year during the period 1999–2001. On behalf of the Working Group members, the Chairperson expressed his disappointment regarding the failure of IMO's constituent bodies to adequately support the review work they had commissioned. This view was supported by the Group.

6.5 Despite the above problems, more than 150 chemicals were re-evaluated at the thirty-sixth session of the Working Group for all of the columns essential for pollution categorization by IMO (bioaccumulation, biodegradation, acute aquatic toxicity and physico-chemical properties), bringing the total to 215 or 30% of the IBC Code. Regrettably, the columns related to mammalian toxicity, and intended to assist IMO in the assignment of carriage conditions for chemical tankers, had progressed less far (acute mammalian toxicity: 60 substances, bringing the total to 125; skin and eye irritation, 60 substances in total). GESAMP congratulated the members of Working Group on their achievements to date in the revision process and encouraged them to work towards increasing their resources from various national administrations and associations.

6.6 It was stressed by the Chairperson of the Working Group that a decision to proceed alphabetically with the list of substances had been taken after careful consideration of several alternatives, including a request from IMO bodies to assess high volume chemicals first. Regrettably, the lists submitted by two national administrations providing tonnage data differed substantially from each other, and the Working Group was unable to follow this course.

6.7 It was suggested by GESAMP that one solution would be to proceed as far as possible alphabetically and before the intended deadline of 2001 to assess all those of greatest concern from among the remaining substances. The Chairperson of the Working Group informed GESAMP that he expected that some one hundred of the 660 IBC Code substances would in any case have significant data gaps following the review. These comprised chemicals that were evaluated many years ago when environmental data were much scarcer, as well as many poorly characterised mixtures which pose a significant problem to regulatory agencies.

6.8 The Group noted that progress had been made in summarising the hard copy data files of substances at IMO in an electronic format for inclusion in a database. This work carried out by a consultant and officers of IMO had greatly facilitated the review work of the members. This database exercise is seen as essential in speeding up progress. When the database is up and running, the prospect of evaluating substances by correspondence, supported by inspection of the files by selected Working Group members, may become a reality.

6.9 GESAMP emphasized that in order to support the activities of the Working Group it was important for better contacts to be established with agencies such as ILO and WHO. One way of assuring this would be for IMO to become a member of IOMC. This was strongly encouraged.

6.10 GESAMP noted that its work regarding hazard evaluation was unique in the sense that it directly facilitated regulatory decisions within IMO and was provided by an independent body. The Chairperson of the Working Group responded that this process provided a level playing field for both administrations and industry.

6.11 In response to a query on how the Working Group addressed the issue of missing data, the Group was informed that a missing data list is being developed and being circulated among the branch associations of the chemicals industry in Japan, the United States and Europe.

6.12 The Group further noted that the work of the UN Committee on the Transport of Dangerous Goods in establishing its labelling criteria had been facilitated by the old GESAMP hazard profile which had been used by that body in assigning the label "pollutant" or "severe marine pollutant". GESAMP considered that even under a self-classification scheme such as foreseen within the globally harmonised system for hazard evaluation, the new hazard profiles might provide useful reference information for high volume chemicals and that the Working Group might usefully respond to requests from that body.

6.13 GESAMP approved the hazard profiles of chemicals set out in the report of the Working Group (GESAMP XXIX/3, annex 3). A list of members of the Working Group, its terms of reference and a short overview of its current activities is set out in Annex IX to this report.

7 MATTERS OF PARTICULAR CONCERN REGARDING THE DEGRADATION OF THE MARINE ENVIRONMENT

7.1 GESAMP discussed a number of issues which are of current and growing concern relative to the future degradation of the marine environment. In some cases GESAMP simply wants to bring these issues to the attention of the marine environment community. For other issues, as indicated, specific intersessional activities will take place to develop a more in-depth evaluation of these issues and specific recommendations on what future action GESAMP might take.

Intentional fertilization of the coastal and pelagic ocean

7.2 Plans are developing to artificially fertilize regions of the coastal and pelagic ocean, with the goal of enhancing primary productivity and thus drawing down carbon dioxide from the atmosphere as the carbon source for the phytoplankton produced. These proposed efforts would add either nitrogen or iron species to marine waters, depending on which nutrient is limiting. This is proposed as an effort to mitigate the increasing amounts of carbon dioxide in the atmosphere. Our detailed understanding of nutrient dynamics and of the potential negative impacts of the addition of such nutrients are only beginning to be developed. Small-scale studies of nutrient additions have now been undertaken in several regions of the pelagic ocean by international groups of ocean scientists. These have been very successful activities, but we are just now beginning to understand the biological, chemical, and physical consequences of such additions on these small scales (roughly 10 × 10 km). The negative effects of coastal eutrophication are well known, but again this has generally been on a rather small scale. Intersessional activities relative to this issue are given in Section 9.1.3.

Genetic interaction between farmed and wild fish stocks

7.3 There is a growing concern regarding the protection of the marine environment against aquaculture escapees. The problem of escapees could be summarised by the risk of decreasing the natural genetic variability of one or several species by introducing in the wild a great number of individuals presenting a higher inbreeding level resulting from domestication or from the practice of breeding programmes. This is already a major concern for the salmon in northern seas, e.g. in the Baltic, and, as some data already indicate, for sea bass in Greece. The need to ensure genetic confinement of domesticated species or transgenic organisms has led to new interest in sterility. The sterility of triploids (fish or shellfish) has thus come to the forefront. Indeed, some scientists stress that uses of triploid (three sets of chromosomes) fish should be especially favoured when gene flow between aquacultural stocks and wild populations is to be reduced in order to preserve wild genetic resources, or to ensure the protection of selective breeding progress. Such a strategy would also be of a great interest in case of the development of transgenic organisms. However, it seems clear that this solution must be

examined with great care before being used. GESAMP understands that SCOPE/IUBS is beginning a study of this issue, and the Group would be pleased to cooperate in the future on this matter with members of SCOPE/IUBS.

The connection between ocean health and human health

7.4 These issues have been treated with varying degrees of rigor by GESAMP, including in the reports under review at this session. However, it is apparent that an evolving understanding of the importance of the relationship between ocean and human health strongly suggests that it is a theme that should take a more central place in GESAMP deliberations. The recent U.S. National Academy of Science report, *Monsoons to Microbes*, highlights the need for a specific and directed international research agenda. A recent international meeting in Bermuda (www.bbsr.edu/Ocean_Human_Health) argued vigorously in support of a more determined international focus on these themes while describing the main threats as POPs, metals, algal toxins, pathogens, pharmaceuticals, and possibly GMOs. These interface themes are exceptionally well suited to sponsorship by a broad diversity of GESAMP sponsoring agencies, including, but by no means limited to FAO, WHO, UNEP, IAEA and UNESCO/IOC.

Assessment strategies for integrated coastal management

7.5 For nearly thirty years various national and international groups have worked to develop management strategies directed toward more integrated approaches in coastal environments. Indeed, GESAMP has produced two reports on such themes. What is more fundamentally lacking is a consistent, internationally recognized and data-driven strategy to evaluate the level of success of integrated coastal management. While there is a growing recognition of this fact within certain national governments, regional associations and within certain parts of the donor community, international standards for evaluation are effectively lacking. Again, the diversity of interests represented by the GESAMP sponsoring agencies is well suited for a comprehensive approach on this question.

Contamination from off-shore oil and gas exploration

7.6 Off-shore oil and gas exploration and exploitation may cause contamination of the sea. This contamination includes, for example, oil leakage, brine, and heavy metals (especially mercury and arsenic). Such activities are now continuously expanding in several areas of the South China Sea, covering the exclusive economic zone of several nations. Elevated mercury concentration in fish in the vicinity of natural gas platforms in the Gulf of Thailand have been reported. Control measures are now underway. However, different nations have different degrees of pollution control and regulation. This could lead to a higher risk of contamination, in some regions. International cooperation is needed for promoting marine environmental protection actions on this matter.

Coral reef degradation: New perspectives

7.7 GESAMP pointed out that the state of the world's coral reefs is worsening with each year. Destructive fishing practices such as the use of dynamite and cyanide continue unabated in many areas. This has occurred despite legislation already in place prohibiting such activities, and it results in the obvious destruction to the reefs themselves. Furthermore, intense human exploitation of finite reef resources has greatly diminished useful productivity. Decreased productivity in turn, results in more desperate measures of extraction, hence, a vicious cycle emerges. For many poor people the issues involved, such as cost–benefit and long term considerations, are not as straightforward as usually described in the scientific literature. There are many complex human and social factors involved including economic and political dimensions. An effective way to address the problem, and to try to solve it, merits more than the usual rhetoric contained in typical "coastal zone management" programmes in various countries. The issue contains elements of development economics and how this ties in intimately with effective resource conservation. If economic wealth is created or brought into the coastal zone, there is a real potential for alleviating pressure on already finite or dwindling resources. For example, serious

attention must be given to activities that create wealth or add value, such as tourism, aquaculture and manufacturing, with due attention to environmental protection.

Methodologies for prioritizing marine environmental problems

7.8 During GESAMP XXX the issue of prioritisation of problems was often raised. This question should be extended to the analysis of not only present impacts, but also potential risks such as those posed by large-scale mining, oil exploitation, and nuclear power generation. At all levels the varied and complex nature of the information and problems under consideration by GESAMP require much more attention to the development of integrated assessment methods able to compare, in transparent and consistent ways, the different issues. This is necessary in order to establish priorities, to consider scenarios resulting from different courses of action, and to identify the main uncertainties in the available information. These methods could be developed in cooperation with or based on the work carried out within other frameworks (e.g., IGBP, IPCC, LRTAP), and would clearly help in the work of developing regional assessments. In this regard, GESAMP could work with GIWA in the development of such methods.

Methane hydrates

7.9 GESAMP believes that it would be timely to obtain an overview of contemporary interests (commercial and scientific) in the topic of methane clathrates, including methane hydrates, in marine sediments. Such an overview should provide an appreciation of commercial assessments of methane hydrates as energy sources, and any associated development plans and environmental concerns regarding the consequences of methane hydrate releases to the marine and atmospheric environments. Furthermore, it should give some indication of the scale and period of likely commercial development.

Photo-oxidation products of PAH and their toxicity

7.10 There is now laboratory confirmation that the toxicity of mixtures of polycyclic aromatic hydrocarbons is increased as a result of photo-oxidation stimulated by increased UV-B irradiation (CEFAS, 2000)[1]. This enhanced toxicity had long been predicted by researchers at the Institut für Meereskunde, Kiel, but now quantitative evidence of the effect is available. However, the concentration at which such enhanced toxicity has been demonstrated is relatively high (~1 µg/l of total PAHs). Nevertheless, the fact that such enhanced toxicity could occur in marine regions of UV-B irradiation (i.e., the surface ocean) means that this effect should be borne in mind when considering the consequences of increased UV-B irradiation associated with stratospheric ozone depletion.

Carbon dioxide sequestration

7.11 There is continued interest in evaluating the consequences and benefits of sequestering anthropogenically-derived carbon dioxide in the deep ocean as a means of mitigating increases in atmosphere carbon dioxide associated with fossil-fuel combustion. An earlier GESAMP Report contained an evaluation of this topic. In the context of other proposals such as stimulation of surface ocean production through the addition of limiting macro and micro nutrients and other land-based options for CO_2 sequestration, it might be appropriate for GESAMP to consider an evaluation of CO_2 sequestration options with special emphasis on the procedures for examining net benefits. Such a proposal, however, might constitute a duplication of similar studies undertaken within the framework of STAP and IPCC.

[1] [Ref: CEFAS 2000. The photoactivation of polycyclic aromatic hydrocarbons (PAHs). Do such mechanisms effect the viability of marine fish larvae? Ministry of Agriculture Fisheries and Food, U.K.; Rural and Marine Environment, Final Report AE1126, April 2000, 33pp.]

Chemical classification and related terminology

7.12 GESAMP is increasingly concerned by the tendency to group chemicals, perceived to possess particular hazardous properties, using poorly-defined and often arbitrary criteria. This complicates, and sometimes precludes, scientific evaluation of these chemical groups that is prerequisite to developing advice on related research and management requirements. Examples are 'persistent organic pollutants' (POPs), 'endocrine disruptors' and other loosely-defined chemical categories that have no basis either in chemistry or toxicology. There is a need to examine the provenance of such terms and classifications and to carefully consider their significance to policy formulation and chemicals management aimed at marine environmental protection. There is also a need to develop and promote alternative, more scientific classifications and terminologies for chemicals of environmental concern.

Improved information on human activities affecting the marine environment

7.13 The assessment of trends in marine environmental degradation is persistently hampered by a lack of information on how human activities – that are the underlying causes of degradation – are, themselves, changing with time. Thus, the patterns and trends with regard to particular impacts and conditions cannot always be compared with trends in human activities to which they are related. The statistics required cover such key issues as demography, tourism, coastal development, marine recreation, habitat loss and shipping density. In some cases statistics are entirely absent, in others they are not compiled on a geographic basis that is specific to coastal and marine areas. Advice to governments, local authorities and sectoral bodies, explaining the relevance of such statistics to marine environmental assessment, is needed and could include proposals on methodologies for collecting, processing, transmitting and storing the information in ways that best facilitate the assessment process.

GESAMP definition of the terms "Pollution" and "Contamination"

7.14 GESAMP noted that some confusion has arisen in the current literature and within the general public as regards GESAMP's original definitions of the terms "Pollution" and "Contamination". It was suggested that a scoping exercise be carried out during the intersessional period and the issue revisited during the next session with the aim of clearly defining these two terms.

8 FUTURE OF GESAMP

8.1 The Chairperson, summarizing the events and recommendations which formed the basis of the current review of GESAMP's operational procedures, noted that UNEP in its letter of 22 May 2000 provided additional details for the evaluation of GESAMP proposed in March 2000 by its Executive Director. UNEP, confirming its support for an evaluation, was eager to ensure that all the Sponsoring Organizations of GESAMP support such an evaluation. Details of and the necessary arrangements for the evaluation should be done by the Administrative Secretariat in cooperation with the Co-sponsoring Organizations. A list of proposed terms of reference included the following:

- A review of GESAMP achievements, and the impact, use and benefits of its reports;
- A review of the scope of the scientific advice provided by GESAMP including its policy relevance, and the need to include social and economic dimensions (including public health) in its work;
- Thorough consultations with GESAMP and non-GESAMP experts as well as selected key governments, GESAMP sponsoring agencies and other interested relevant governmental and non-governmental organizations;
- An examination of GESAMP *modus operandi*, including a review of its composition, methods of work, role and functions;
- Examination of financial arrangements and sponsorship of GESAMP;

- A review of the independence of the scientific advice given by GESAMP to the sponsoring UN agencies, and the contribution of GESAMP to each agency's work programme;
- Consideration of the procedures of transmitting the GESAMP reports to wider audiences, including governments;
- A review of the role of the GESAMP Secretariat (Administrative Secretary and Technical Secretaries) and that of the Chair and Vice Chairpersons;
- Consideration of the desirability and possible involvement in GESAMP activities of government nominated experts;
- Review of the linkages between the various GESAMP assessment exercises and the assessments undertaken by other agencies;
- Recommendations and proposals for any changes, as necessary and appropriate, taking into account the requirements and expectations of GESAMP from each of its sponsors;
- Establishment of periodical evaluations of the achievements and short-comings of GESAMP by independent reviewer(s).

8.2 The Chairperson welcomed the opportunity for the evaluation and expressed his view that this evaluation of GESAMP was one of the primary activities facing the Group over the forthcoming intersessional period. The Intersecretariat Meeting of GESAMP had agreed that members of the Group should be given the opportunity to express their opinions about the future of the Group, and how GESAMP could most effectively operate to satisfy the needs of its users.

8.3 In an ensuing discussion several members of the Group proposed questions to be asked during the review, and made additional comments as follows:

.1 What are the comparative advantages of GESAMP and the opportunities available to it?

.2 What are the barriers to capitalizing upon those advantages and opportunities?

8.4 Regarding the role and type of experts which should be included in the "review team", several experts emphasized that these persons must be competent, independent and thorough in their evaluation.

8.5 The Group agreed with the suggestion that the new Chairperson would write to the Executive Director of UNEP regarding the future role of GESAMP. This would be in addition to any correspondence on this matter by the Secretary-General of IMO in his role as the executive head of the Administrative Secretariat of GESAMP.

9 FUTURE WORK PROGRAMME

9.1 Scoping activities

.1 Ballast water management

The Technical Secretary of IMO informed GESAMP of the need for evaluating methodologies for Ballast Water Management control to minimize the risks of alien species transfer, including the elaboration of guidance for setting criteria and standards reflecting the efficacy of such ballast water control measures. GESAMP agreed that a feasibility study proposed by IMO will be prepared by Mr. Rick Boelens during the intersessional period for consideration at GESAMP XXXI.

.2 Aquatic environmental hazard assessment methods for application in seafood safety risk assessment and management

The Technical Secretariat of FAO introduced a proposal on aquatic (ecotoxicological and microbiological) environmental hazard assessment methods for application in seafood safety risk assessment and management, for discussion by GESAMP members (Document GESAMP XXX/9). Emphasis was given to the need for a critical review and preparation of technical guidelines on practical and cost-effective ecotoxicological and other environmental hazard assessment methodologies which are being applied in aquatic environmental sciences, with a view to facilitate their application for the purposes of seafood safety risk assessment and management. A scoping exercise was proposed for the intersessional period to identify the tasks and terms of reference of a possible GESAMP Working Group.

The Group discussed the relevance, wider scope and context of the suggested theme. The specific need for a review of such aquatic environmental assessment methodologies for the general purposes of seafood safety risk assessment and management was recognized and general support was given to the initiative, particularly in view of the need for such criteria and guidelines in developing countries. The Group supported the view that the proposed work would be significant to issues related to human health and the oceans (see paragraph 7.4). It also agreed that the focus of this task should be on assessment methodologies, however, the scope should include considerations of their cost-effective and practical applications in seafood safety risk management.

It was felt that the proposal could provide new ways to manage seafood safety. The focus of assessing exposure to chemicals and microbial contaminants through food has so far been on assessing intake. The current proposal adds a new layer by evaluating pathways for exposure through a better understanding of contaminant movement before real intake occurs. While monitoring strategies may need to change, the proposed approach may allow risk management to be carried out at an earlier stage and provide a tool for integrating human health and ecological risk assessment.

The focus of the work should be on methodologies and model evaluation for contaminant transfer through various compartments and its potential for bioaccumulation. This would include assessment of data requirements, applicability of model assumptions to different regions of the world, and the predictive power for actual intake and exposure.

It was agreed that the FAO Technical Secretariat would further pursue this initiative, in cooperation with interested organisations and GESAMP Members, by identifying potential experts, including a potential chairperson, who would prepare during the intersessional period a scoping document which will define specific elements to be considered, and propose terms of reference of a possible Working Group based on an assessment of coverage and feasibility of the tasks to be undertaken. This scoping document will be presented to the next Session of GESAMP. UNESCO-IOC, WHO and UNEP expressed their interest to cooperate in this task.

.3 Intentional fertilization of the coastal and pelagic oceans

The Technical Secretary of UNESCO-IOC informed GESAMP that IOC would help to support a joint GESAMP/SCOR (ICSU Scientific Committee on Oceanic Research) scoping activity to evaluate whether a joint Working Group on the issue of fertilization of coastal and pelagic waters was desirable. An objective evaluation of this issue with the support of both UN agencies and ICSU bodies would be an appropriate way to proceed. GESAMP will contact SCOR in this regard.

9.2 Intersessional work

Taking into account the above considerations, GESAMP noted the intersessional work planned as follows:

.1 **Evaluation of the hazards of harmful substances carried by ships**
(Working Group 1)

Lead Agency:	IMO
Co-sponsors:	UNEP, FAO, WHO
Chair:	T. Bowmer
Members:	T. Höfer, D. James, M. Marchand, S. Micallef, M. Morrissette, F. Pederson, T. Syversen, M. Wakabayashi, J. Crayford, N. Soutar

The thirty-seventh session of the Working Group will be held from 30 April to 4 May 2001.

.2 **Marine environmental assessments**
(Working Group 26)

Lead Agency:	UNEP
Co-sponsors:	IMO, FAO, UNESCO-IOC, WHO, IAEA, UN, WMO
Chair:	S. Keckes
Members:	L. Awosika, M. Bewers, R. Boelens, S. Charmasson, R. Duce, L. Jeftic, R. Engler, M. Huber, D. Insull, H. Yap

A final meeting of the Editorial Board is planned for 27 May in Monaco, the day after the closure of GESAMP XXX, to deal with any revisions to the reports recommended by GESAMP during the XXXth session.

After the final meeting of the Editorial Board:

- the biennial report will be finalized by the editor/writer and UNEP will take care of its publication in the GESAMP Reports and Studies series; and
- the LBA report will be technically/linguistically edited by the editor/writer and UNEP will take care of its publication in the GESAMP Reports and Studies series.

Assuming that UNEP's negotiations with an appropriate commercial publisher will be successfully completed, UNEP will supervise the publication of the biennial and the LBA reports. UNEP will also take care of the distribution of published reports to members of the Working Group and the persons acknowledged as contributors to the preparation of the reports, including reviewers, as well as to individuals and organisations deemed by UNEP as appropriate.

The Working Group would be prepared to undertake further work once commitments and funding for further assessments or other matters on its Terms of Reference are assured.

.3 **Environmental impacts of coastal aquaculture**
(Working Group 31)

Lead Agency:	FAO
Co-sponsors:	UNEP, UNESCO/IOC, WHO and with support of IUCN
Chair:	J. Hambrey
Members:	P. Menasveta

Work of the Group will continue by correspondence (e-mail) for the forthcoming intersessional period.

.4 **Estimates of oil entering the marine environment from sea-based activities**
(Working Group 32)

Lead Agency:	IMO
Co-sponsor:	UNESCO-IOC
Chair:	P. Wells
Members:	J. Campbell, P. Johnston, J. Koefoed, F. Molloy, D. Etkin, T. Wilkins

Work of the group will continue by correspondence/e-mail.

The next draft is being prepared for distribution for the Working Group and reviewers by late 2000. The work is expected to be completed in mid 2001, and the final report will be tabled for approval at GESAMP XXXI, 2001.

.5 **Endocrine disrupting substances in the aquatic environment: Impacts on aquatic life and human health**
(Working Group 27)

Lead Agency:	IMO
Co-sponsor:	WHO, FAO, UNEP
Chair:	T. Bowmer
Members:	To be determined

The GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships jointly with the European Inland Fisheries Advisory Commission (EIFAC) and in cooperation with WHO will produce a short working paper on this subject matter.

10 OTHER MATTERS

10.1 Co-operation with GIWA

The Chairperson of the GESAMP MEA Working Group informed the Group about the co-operation between this Working Group and GIWA during the intersessional period. As an *ex officio* member of the GIWA Steering Group designated by GESAMP XXIX, he participated in a number of the GIWA Steering Group meetings, in the meeting of the Task Team on development of GIWA assessment methodology, as well as in GIWA-related activities carried out during the intersessional periods of the GIWA Steering Group. In addition, three members of the MEA Working Group also participated in various GIWA meetings and activities. Furthermore, *curricula vitae* of GESAMP members who had expressed interest to work in GIWA subsidiary bodies (sub-regional and mega-regional groups and thematic task teams) were provided to the GIWA Secretariat. He urged GESAMP to actively promote the involvement of GESAMP members in the GIWA bodies as an important precondition for future, closer co-operation needed for preparation of the GESAMP assessment reports. The Group designated the Vice-Chairperson of GESAMP to represent the Group in the GIWA Steering Group and requested him to promote participation of GESAMP experts in GIWA activities.

10.2 GESAMP web-site

The GESAMP Chairperson stressed the need to keep maintaining and regularly updating the GESAMP web-site (http://www.gesamp.imo.org) which was recently moved under the IMO home page. He urged all the GESAMP members and Technical Secretaries to contribute to this matter as much as possible. It was agreed

that the web-site should provide up-dated information on GESAMP meetings and other activities, contain the published GESAMP reports, and ensure cross-links with web sites of all GESAMP sponsoring agencies. It was also agreed that in future the Internet address of the GESAMP web site should be given in one of the cover pages of GESAMP Reports and Studies,. IMO as the Administrative Secretariat of GESAMP was requested to ensure an easy search of the GESAMP web site on Internet. Furthermore, IMO was asked to establish a GESAMP list mail-server open for access by all members of GESAMP and the Intersecretariat.

11 DATE AND PLACE OF NEXT SESSION

GESAMP noted that its XXXIst session will be hosted by the United Nations at its headquarters in New York and agreed that it would be held from 13 to 17 August 2001.

12 ELECTION OF CHAIRPERSONS

12.1 GESAMP unanimously elected Mr. R. Duce as Chairperson and Mr. M. Huber as Vice-Chair for the next intersessional period and the XXXIst session of GESAMP.

12.2 The Group expressed its gratitude to the outgoing Chairperson Mr. P. Wells for his outstanding service to GESAMP during his term as Chair.

12.3 The Group further thanked Mr. M. Nauke who after more than twenty years of service retired as the IMO Technical Secretary of GESAMP. It likewise expressed its thanks to Mr. O. Khalimonov who retired as the Administrative Secretary of GESAMP.

13 REPORT OF THE THIRTIETH SESSION

13.1 The report off the XXXth session of GESAMP was considered and adopted by the Group on the last day of the session. It contains in Annexes IV to IX summaries, outlines or draft studies prepared by GESAMP Working Groups. The summaries are included for information and were not considered by the Group with a view to their approval.

13.2 The XXXth session of GESAMP was closed by the Chair at 5:00 p.m. on 26 May 2000.

ANNEX I

AGENDA

1 Adoption of the agenda

2 Report of the Administrative Secretary

3 Marine environmental assessments

4 Estimates of oil entering the marine environment from sea-based activities

5 Environmental impacts of coastal aquaculture

6 Evaluation of the hazards of harmful substances carried by ships

7 Matters of particular concern regarding the degradation of the marine environment

8 Future of GESAMP

9 Future work programme

10 Other matters

11 Date and place of next session

12 Election of Chairpersons

13 Report of GESAMP XXX

ANNEX II

LIST OF DOCUMENTS

Agenda Item	Document	Submitted by	Title
1	GESAMP XXX/1	Admin. Sec.	Provisional agenda
3	GESAMP XXX/3/1	UNEP	A Sea of Troubles – Issues in Focus
3	GESAMP XXX/3/2	UNEP	Land-based Sources and Activities Affecting the Quality and Uses of The Marine, Coastal and Associated Freshwater Environment
3	GESAMP XXX/3/3	UNEP	Report of the Chairman and the Technical Secretary on the Activities of the Working Group on Marine Environmental Assessments (MEA)
4	GESAMP XXX/4	IMO	Report of the Working Group on Estimates of Oil Entering the Marine Environment from Sea-Based Activities
5	GESAMP XXX/5	FAO	Planning and Management for Sustainable Coastal Aquaculture Development
5	GESAMP XXX/5/1	FAO	Peer Reviewers' comments on Report GESAMP XXX/5
6	GESAMP XXX/6	IMO	Evaluation of the Hazards of Harmful Substances Carried by Ships – Report of the 36th Session of the Working Group
7	GESAMP XXX/7	Chairman	Matters of Particular Concern Regarding the Degradation of the Marine Environment
8	GESAMP XXX/9/1	FAO	Future Work Programme – Aquatic (Ecotoxicological and Microbiological) Environmental Hazard Assessment Methods for Application in Seafood Safety Risk Assessment and Management

ANNEX III

LIST OF PARTICIPANTS

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ANNEX IV

REPORT OF THE CHAIRMAN AND THE TECHNICAL SECRETARY ON THE ACTIVITIES OF THE WORKING GROUP ON MARINE ENVIRONMENTAL ASSESSMENTS (WG/MEA)

1 Background

The Working Group (WG) was formally established at the **XXVI session of GESAMP** (Paris, 25–29 March 1996) at the request of UNEP. All eight agencies sponsoring GESAMP agreed to co-sponsor the WG, with UNEP assuming the role of the lead agency.

During the XXVI/XXVII intersessional period the **first meeting of the WG** (Geneva, 17–18 May 1996) was held to consider the possible approaches and arrangements which may be used in the preparation of the reports but no substantive activities on the preparation of the reports were initiated.

The **XXVII session of GESAMP** (Nairobi, 14–18 April 1997) reconstituted the WG, adopted its terms of reference (Appendix I) and the outlines of three reports (biennial, LBA and SOME[2]) expected to be prepared by the WG, and instructed the WG to focus on the preparation of the biennial and the LBA reports.

During the XXVII/XXVIII intersessional period the drafts of the biennial report and the selected chapters of the LBA report were prepared by correspondence among the members of the WG, with valuable inputs from experts that are not members of the WG.

The **XXVIII session of GESAMP** (Geneva, 20–24 April 1998) reviewed the second draft of the biennial report and the first drafts of 3 substantive chapters of the LBA report and provided guidance for the continuation of work on both reports, with a view to their adoption at the XXIX session of GESAMP.

During the XXVIII/XXIX intersessional period two meetings of the WG were held: a short **second meeting of the WG** in conjunction with GESAMP XXVIII (Geneva, 25 April 1998) and the **third meeting of the WG** (Geneva, 2–7 November 1998) which was, for all practical purposes, the first substantive meeting of the WG. At the second meeting of the WG, an Editorial Board was established to co-ordinate the work on the preparation of the biennial and the LBA reports. During the intersessional period, the Editorial Board met three times (Geneva, 3–14 August 1998; Geneva, 9–14 November 1998; Geneva, 14–22 June 1999). Due to problems reviewed in section 5 of the present report, the outputs of the intersessional activities fell short of those expected according to the workplan and timetable endorsed by GESAMP XXVIII.

The **XXIX session of GESAMP** (London, 23–26 August 1999) reviewed the fifth draft of the biennial report, the revised drafts of two substantive chapters of the LBA report and the revised outlines of two additional chapters of the LBA report. The Group provided a series of general and specific comments and recommendations concerning both reports and stressed the importance of taking into account the regional programmes of action on land-based activities. GESAMP also endorsed the development of co-operative arrangements between the WG and the project on the Global International Waters Assessment (GIWA). The Advisory Committee on Protection of the Sea (ACOPS) was welcomed as an additional co-sponsor of the WG.

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[2] The "biennial report" was expected to be a short general report on the state of the marine environment, written in non-technical language and prepared for politicians, policy-makers, high-level managers and general public. The "LBA report" was expected to respond to the request of UNEP for a technical report on land-based activities affecting the marine and coastal environment that could be submitted to the intergovernmental review meeting on the progress in the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA/LBA). The "SOME report" was intended to respond to one of the main terms of reference of GESAMP relating to the preparation of comprehensive periodic reports on the state of the marine environment.

During the XXIX/XXX intersessional period three meetings of the Editorial Board were held: one in London (26 August–3 September 1999), during and immediately after GESAMP XXIX; one in Barcelona (15–19 November 1999); and one in The Hague (7–9 February 2000), following the **fourth meeting of the WG** (The Hague, 31 January–5 February 2000). The original membership of the WG was expanded by five additional experts, a writer/editor (Geoffrey Lean) was appointed by UNEP to assist the WG in the preparation of the reports, and the peer review of advanced versions of the reports was organised. The **final drafts of the biennial and the LBA reports** were prepared and are submitted for the consideration of GESAMP XXX under the titles:

- **A Sea of Troubles : Issues in Focus**; and
- **Land-Based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment**

2 Membership of the Working Group

During the reconstitution of the WG at GESAMP XXVII, ten experts were designated as members of the WG: Michael Bewers (Canada), Richard Boelens (Ireland), Sabine Charmasson (France), Robert Duce (USA), Danny Elder ((USA), Robert Engler (USA), Michael Huber (Australia), David Insull (UK), Stjepan Keckes (Croatia) and Helen Yap (Philippines). Stjepan Keckes was elected as the Chairman of the WG.

In order to improve the geographic balance and the balance of expertise in the WG, the following five experts were subsequently co-opted as members: Lawrence Awosika (Nigeria), Francisco Brzovic Parilo (Chile), Ljubomir Jeftic (Croatia), Terry Jones (Seychelles) and Hillel Shuval (Israel).

Michael Bewers, Robert Duce, Michael Huber, David Insull, Ljubomir Jeftic and Stjepan Keckes constituted the Editorial Board of the WG.

3 Organisation and method of work

The meetings held in the intersessional periods or in conjunction with the sessions of GESAMP were essential to ensuring progress on the preparation of the drafts of the reports submitted to GESAMP. Nevertheless, the heaviest burden was on the members of the Editorial Board. They acted as co-ordinators responsible for the preparation of the biennial report and the individual chapters of the LBA report through an iterative process involving the preparation of successively evolving drafts using inputs and suggestions from all members of the WG. This work was made possible only by use of modern communication technologies as it required frequent exchange of views and substantive information among the members of the WG and the members of the Board in particular.

Published documents and easily verifiable facts were the main source of information used in the preparation of both reports. As an additional source of information, a number of analyses were prepared by some members of the WG and used as unpublished internal documents of the WG (see Annex 2 of the LBA report).

The substantive inputs anticipated from members of GESAMP who are not members of the WG, as well as from the Technical Secretaries, were – with a few notable exceptions – limited. This was, to a certain degree, compensated by inputs solicited by the individual members of the Editorial Board and received from experts not associated with GESAMP.

Of particular benefit was the peer review of fairly advanced versions of the drafts of the biennial and the LBA reports. This involved approximately 100 individuals representing a wide professional and geographical balance (politicians, high-level policy-makers, managers, natural and social scientists, and members of “general

public" from all five continents and island states). The set of 82 detailed comments and suggestions received from reviewers was carefully analysed and considered by the whole WG at its fourth meeting in The Hague (January/February 2000) and subsequently taken into account by the Editorial Board in the finalisation of the drafts of both reports.

Some of the views expressed in the final drafts of the biennial and the LBA reports may be perceived as overly critical, controversial and at variance with some traditionally held opinions and official policies of governments and intergovernmental bodies, including the sponsoring agencies of GESAMP. However, the WG felt that by so doing, it was adhering to its commission and making a greater contribution to the development of a more rational and balanced approach to the protection of the marine and coastal environments. The inclusion of environmental economics and policy consideration, problems associated with fisheries and public health risks – issues usually not treated by GESAMP reports – can be considered as additional contributions towards this goal.

The final draft of the biennial report submitted to GESAMP XXX (except Chapter 7) was written by the editor/writer on the basis of the fifth draft of the biennial report (dated 29 July 1999)[3] that had been prepared by the WG. Chapter 7 of the report (Conclusions and Recommendations) was prepared at the last (February 2000) meeting of the Editorial Board in a form that was amenable to independent publication in scientific journals, as a "foldout" or other form suitable for accessing a wider audience.

The final draft of the LBA report was prepared by the Editorial Board.

Aside from the preparation of the biennial and the LBA report, no attempt has been made either by the Editorial Board or by the WG as a whole to consider the preparation of the SOME report that had originally been part of the WG's mandate, or to undertake any other tasks specified in the WG's terms of reference (see Appendix I).

4 Financial and technical assistance provided to the Working Group

All eight GESAMP agencies expressed readiness to sponsor the WG. However the magnitude of their contributions differed:

- UNEP, as GESAMP's lead agency of the WG, provided the technical secretary of the WG (Omar Vidal), acted as the focal point for concentration and exchange of documentation (Arthur Dahl), negotiated the publication of the reports with potential publishers and provided most of the financial and technical assistance. More specifically, UNEP: (i) provided financial assistance to 13 members of the WG, as partial compensation for time spent working on the reports; (ii) covered the cost of attendance at the sessions of GESAMP and the meetings of the WG (including the meetings of the Editorial Board) of 5 members of the WG (Francisco Brzovic Parilo, Ljubomir Jeftic, Terry Jones, Stjepan Keckes and Helen Yap); (iii) met the costs related to the hosting and technical support of the meetings held in Geneva and in The Hague; (iv) covered the cost of the analysis of regional LBA reports; and (v) shared with WMO the costs associated with the editing of the reports.

- UNESCO/IOC covered the cost of attendance of two members of the WG at the sessions of GESAMP and the meetings convened under the WG (Michael Bewers and Michael Huber).

- IMO: (i) covered the cost of attendance of two members of the WG at the sessions of GESAMP and the meetings convened under the WG (Richard Boelens and Robert Engler); and (ii) hosted and met the costs related to the technical support of the WG meeting held in London.

[3] This draft has been reviewed by the XXIX session of GESAMP (London, 1999).

- IAEA covered the cost of attendance of one member of the WG at the sessions of GESAMP and the meetings convened under the WG ((Sabine Charmasson). IAEA is also expected to host and cover the costs related to the technical support of the final meeting of the Editorial Board subsequent to GESAMP XXX.

- WMO: (i) covered the cost of attendance of one member of the WG at the sessions of GESAMP and the meetings convened under the WG (Robert Duce); (ii) provided financial assistance for the attendance of 6 members of the Editorial Board at the Barcelona meeting of the Editorial Board; and (iii) agreed to cover partially the costs associated with editing of the reports.

- FAO covered the cost of attendance of one member of the WG at the sessions of GESAMP and the meetings convened under the WG (David Insull).

- WHO: (i) provided financial assistance to one member of the WG (Hillel Shuval), as a partial compensation for his time spent working on the reports; and (ii) covered the cost of his attendance at the meetings of GESAMP and the meetings convened under the WG.

- UN covered the cost of attendance of one member of the WG at the sessions of GESAMP and the meetings convened under the WG (Lawrence Awosika).

Aside from the technical and financial assistance received from the GESAMP-sponsoring agencies, the WG was assisted by:

- ACOPS (Advisory Committee on Protection of the Sea): joined, in 1999, the WG as one of its co-sponsors and provided financial assistance for the preparation of the Chapter of the LBA report on "Regional Perspectives"; and

- Centro de Investigacion y Desarrollo (CID): hosted and provided technical assistance for the meeting of the Editorial Board in Barcelona.

5 Major problems encountered in the work of the Working Group

The major problem encountered by the WG was the disruption caused by the uncertainties about continuing support from the main sponsor of the WG (UNEP) and the apparent lack of interest of the GESAMP Secretariat as a whole in addressing the problems repeatedly represented by the WG since the XXVIII session of GESAMP. These problems became very acute at the time of the November 1998 meeting of the WG. It led to a unanimous decision of the WG to discontinue further work on the biennial and the LBA reports following that meeting unless and until the sponsoring agencies credibly demonstrated that the necessary support would be forthcoming. It took the sponsoring agencies fully five months (November 1998 – March 1999) to resolve this problem, but in the meantime time needed for the completion of the biennial and the LBA reports by GESAMP XXIX had been irretrievably lost.

Following GESAMP XXVII it was noted that the membership of the WG was unbalanced both geographically and in respect to expertise in several fields that were considered essential (i.e., environmental economics, public health, third world perspectives). Partly for the reasons reviewed in the paragraph above, the search for suitable experts who could be appointed as additional members of the WG was considerably delayed. This problem was resolved, but only in early 1999, by co-opting five additional experts as members of the WG.

As noted above, the WG did not receive adequate support from GESAMP members who were not members of the WG or the GESAMP Technical Secretaries. Most importantly, there was little response to requests to review drafts circulated for comments and suggestions.

The WG expected that all members of the WG will attend GESAMP XXX. It is regrettable that two members of the WG who are not experts of GESAMP (both from developing world!) will not be able to attend because no funds were available to cover the costs of their attendance.

6 Other activities

GESAMP XXIX appointed the chairman of the WG as the *ex officio* representative of GESAMP on the Steering Group of GIWA and requested him to ensure the development of cooperation between GIWA and GESAMP through the involvement of the WG in GIWA's activities. The chairman participated in two meetings of the GIWA Steering Group (Kalmar, 27–28 September 1999 and 12–14 March 2000), and in a meeting of GIWA's Task Team for the development of GIWA's methodology (Plymouth, 11–13 January 2000). By participation in these meetings and through several concrete proposals prepared in consultation with the members of the WG, GESAMP contributed to the development of GIWA. Several members of the WG are being considered as potential members of the regional and issue-specific task teams of GIWA that will be established in the near future.

The draft of Chapter 6 of the LBA report (Conclusions and Priorities for Action) was presented – as a "Draft not to be cited" and with a note indicating its origin and the context in which it had been prepared – to the meeting of the Expert Group convened by UNEP (The Hague, 26–28 April 2000) to prepare the first intergovernmental review of the GPA/LBA.

Information on the preparation of the biennial and the LBA reports has been submitted, through the Technical Secretary of the WG, to the Second World Water Forum (The Hague, 17–23 March 2000).

The last (February 2000) meeting of the Editorial Board recommended that the Chairman of GESAMP should explore the interest of relevant journals to publish the conclusions and recommendations (i.e., Chapter 7) of the biennial report. The chairman of the WG later reminded the Chairman of GESAMP about this recommendation. No information has been received about any action that may have been taken by the Chairman of GESAMP on this matter.

The same meeting of the Editorial Board recommended that the sponsoring agencies consider the possible use of a press conference, press releases, flyers and/or other means of publicity in relation to the formal launching and promotion of the biennial and the LBA reports.[4] The chairman of the WG reminded the members of the GESAMP Secretariat about this recommendation. The planned actions indicated in replies received to date are not encouraging as they are considered inadequate to publicise the reports and their findings to the envisaged wide range of audience (i.e., politicians, policy-makers, managers, scientist and general public).

The response to the recommendations of the Editorial Board referred to in the preceding two paragraphs leave the impression that a golden opportunity to provide some deserved (and badly needed) publicity to GESAMP's work will be unfortunately lost due to negligence and/or disinterest among those to whom the recommendations were addressed.

Arrangements for the commercial publication of the biennial and the LBA reports are being handled by the United Nations Offices in Nairobi (UNON), in close consultation with UNEP's GPA Coordination Office, the Communications and Public Information Unit and the Division of Environmental Assessment and Early Warning, on behalf of UNEP and GESAMP. The "requesting proposal" prepared by UNON and UNEP was dispatched to a number of potential publishers on 12 May 2000.

[4] See also the recommendation recorded in paragraph 9.2.1 of the report of GESAMP XXVII.

7 Follow-up to GESAMP XXX

The WG is aware that the drafts of the biennial and the LBA reports submitted to the present session of GESAMP are still deficient in several respects and expects the Group's guidance on how to remedy these shortcomings. A final meeting of the Editorial Board is planned for 27 May in Monaco, the day after the closure of GESAMP XXX, to deal with any revisions to the reports recommended by GESAMP during the XXX session.

After the final meeting of the Editorial Board:

- the biennial report will be finalised by the editor/writer and UNEP will take care of its publication in the GESAMP Reports and Studies series; and

- the LBA report will be technically/linguistically edited by the editor/writer and UNEP will take care of its publication in the GESAMP Reports and Studies series.

Assuming that UNON's negotiations with an appropriate commercial publisher will be successfully completed, UNEP will supervise the publication of the biennial and the LBA reports. UNEP will also take care of the distribution of published reports to members of the WG and the persons acknowledged as contributors to the preparation of the reports, including reviewers, as well as to individuals and organisations deemed by UNEP as appropriate.

8 The future (if any) of the WG

GESAMP XXX is expected to decide the future of the MEA WG. Two basic options may be considered: termination or continuation.

Should GESAMP decide to maintain the existence of the WG, it should re-examine and revise, as necessary, the originally approved terms of reference (see Appendix 1) and reconstitute the membership of the WG accordingly.

During an informal session of the WG (The Hague, 5 February 2000) the maintenance of the established links between GESAMP and GIWA – and the broadening of cooperation with GIWA – were considered desirable. The prevailing view of the same session of the WG regarding the original terms of reference was that:

- with the completion of the biennial and the LBA reports, items 1(a) and 1(b) of the terms of reference are fulfilled;

- if a decision is taken by GESAMP to embark on the preparation of the SOME report (item 1(c) of the terms of reference), it should be undertaken in close cooperation with the preparation of GIWA's assessments;

- the expertise available within GESAMP may be useful for improving the reliability, comprehensiveness and utility of the assessments being prepared in the framework of GIWA and GPA/LBA (item 2(a) of the terms of reference);

- GESAMP may be the appropriate interagency advisory body to examine several issues related to item 2(b) of the terms of reference, such as: (i) the potential ecological impact of large scale ocean fertilisation experiments; (ii) environmental impact of deliberate sequestration of CO_2 by the oceans; and (iii) GESAMP's definition of marine pollution which probably merits revision partly because it is at variance with definitions adopted by a number of international agreements.

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APPENDIX I

TERMS OF REFERENCE

(paragraph 6.9.1 of the Report of GESAMP XXVII – Nairobi, 14–18 April 1997)

1. To undertake:

   (a) short, general ***biennial assessments***, including highlights of major current and emerging issues:

   (b) assessment of land-based sources and activities affecting the quality and uses of the marine, coastal and associated freshwater environment [***LBA report***]; and

   (c) periodic comprehensive assessments of the condition of the marine environment (***SOME reports***), with emphasis on the effects of, and threats posed by, anthropogenic activities.

2. To develop scientific approaches:

   (a) for improving the reliability, comprehensiveness and utility of assessments; and

   (b) to meet expectations of the international community for a more balanced geographic coverage of assessments, including, *inter alia*:

   * new concerns and perspectives;

   * improved insight regarding trends; and

   * the social and economic consequences of impacts on the marine environment, its resources and amenities; and vice versa.

3. To identify actions, including adoption of new scientific and innovative approaches for sustainable protection and development of the marine environment, its resources and amenities within the context of existing and planned international and regional agreements.

4. To promote and keep under review the conduct of regional assessments, and to provide scientific and technical guidance to facilitate improved global assessments.

5. To identify, recommend and apply better indices of environmental conditions to assess environmental changes and trends.

ANNEX V

EXECUTIVE SUMMARY

(of the report on Land-Based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment)

1. Environmental processes are complex in nature with interactions occurring both within and between the biosphere and abiotic environment. Consequently, ***environmental problems are inextricably linked to or influenced by one another*** and do not recognise political boundaries. This is particularly the case for the problems of the marine environment that cannot be remedied without taking into account the ecological interdependence of oceans, coastal areas and associated freshwater systems.

2. Environmental processes and ecological systems are strongly influenced by and, in turn, influence social and economic systems. A high proportion of the world's population lives in coastal areas, and many more derive benefit from the use of marine and coastal resources, employment linked with coastal and maritime activities, and coastal recreational opportunities. However, ***population pressure, consumption patterns and increasing demand for space and resources, combined with poor economic performance and the impoverishment of a large part of the global population, undermine the sustainable use of oceans, coastal areas and their resources***.

3. On a global scale, the environmental problems of the oceans and coastal areas, and their causes, have remained largely unchanged for several decades. Although there have been some notable successes in addressing problems caused by some forms of marine pollution and in improving the quality of certain coastal areas, ***on a global scale marine environmental degradation has continued and in many places even intensified.***

Persistent Problems

4. Marine pollution stemming from land-based sources and activities has previously been a predominant concern. However, improved appreciation of the scale of other forms of damage and threats to the marine and coastal environment has resulted in a more balanced perspective. Today, aside from the impacts expected in the long-term from global climate change, the following are considered to be ***the most serious problems affecting the quality and uses of the marine and coastal environment attributable directly or indirectly by land-based activities:***

- ***alteration and destruction of habitats and ecosystems;***
- ***effects of sewage on human health;***
- **widespread and increased eutrophication;**
- ***decline of fish stocks and other renewable resources; and***
- ***changes in sediment flows due to hydrological changes.***

5. Keeping in mind the specific purpose of the report, it focuses on issues defined as particularly relevant to the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA/LBA).[5] Therefore, certain problems which, on balance, may be considered equally important (e.g., problems of fisheries) are not covered in any greater detail in the report.

[5] The GPA/LBA was adopted by an intergovernmental conference convened by UNEP in Washington D.C., 23 October – 3 November 1995 (UNEP(OCA)/LBA/IG.2/7). The coordination of the implementation of the GPA/LBA was assigned to UNEP.

Alteration and destruction of habitats and ecosystems

6. Increasing habitat destruction and ecosystem alteration either by physical (e.g., landfills, sedimentation), chemical (e.g., pollution) or biological means (e.g., introduction of non-indigenous species) constitutes ***the most widespread, and frequently irreversible, human impact on the coastal zone.***

7. Poorly planned coastal urban and industrial development, including the indiscriminate exploitation of coastal resources and the development of recreational, harbour and aquaculture facilities, have considerably changed the natural coastline and reduced the areas previously covered by dunes, wetlands and mangroves. These ecosystems and the wildlife inhabiting such areas suffer world-wide and in many places fisheries are affected due to the degradation of fish spawning and nursery grounds.

8. Sewage and various chemical compounds released into the marine environment may significantly affect members of ecosystems and, in extreme cases, this may lead to the destruction of whole ecosystems. The chemical compounds of pre-eminent contemporary concern are nutrients, substances disrupting endocrine functions, a group of substances classified as persistent organic pollutants (POPs), petroleum hydrocarbons (largely from major accidental oil spills at sea) and, in a few cases, metallic compounds, such as those of mercury, cadmium, tin and copper.

9. The effects of the accidental or deliberate introduction of non-indigenous organisms range from reduction or even extinction of indigenous species, damage to fisheries, and wholesale ecosystem changes. Documented economic losses caused by the introduction of non-indigenous species are in hundreds of millions of US dollars.

10. Natural marine and coastal ecosystems represent tangible economic goods and provide valuable services, such as waste treatment/assimilation, storm protection, food production, raw materials, recreation amenities, genetic resources, employment opportunities. ***The global value of marine and coastal ecosystems goods and services is estimated as about double of value of terrestrial ecosystems' goods and services, and is comparable with the level of global GDP.***

Effects of sewage on human health

11. Sewage contamination of the coastal marine environment leads to significant incidence of human disease – infectious diseases related to bathing/swimming in marine coastal waters, infectious diseases related to the consumption of seafood harvested in coastal waters, and diseases associated with contamination of shellfish and other seafood. In addition, human exposures to toxins associated with algae blooms impose significant risks. Aside from being an aesthetic nuisance and ruining amenity values in many coastal areas, it is a ***major source of nutrients and pathogens, posing considerable risks to the health of bathers and consumers of marine foodstuff***. Outbreaks of cholera, typhoid and other illnesses are frequently traced to pathogen-contaminated seafood and bathing waters. These health risks are particularly high in areas where carriers of pathogens are common among the local population and sewage treatment and disposal systems are inadequate.

12. Contaminated seafood and bathing waters are significant contributors to the human "global disease burden" measured as losses associated with premature death and with the length and severity of disabilities caused by exposure to contaminated seafood and bathing waters. The associated ***economic losses are estimated to be among the major losses attributable to specific diseases.***

Eutrophication

13. The input of nutrients (nitrogen and phosphorous substances in particular) into the sea from land-based activities is on the increase globally and has led to eutrophication (i.e., increased biological production) of coastal and near-shore waters. It is ***among potentially the most damaging of all human influences on the***

oceans both in terms of scale and consequences. The predominant anthropogenic sources of nutrients are agricultural and industrial activities (fertiliser residues, wastes from animal husbandry, sewage, industrial effluents and atmospheric emissions).

14. Eutrophication involves the increased growth of phytoplankton and can favour the growth of toxic or otherwise harmful species. The decay of excessive plankton biomass increases the consumption of oxygen dissolved in the sea and occasionally causes periodic or permanent oxygen depletion leading to mass mortality of fish and other organisms. Algal blooms involving toxin-producing species are frequently the cause of very serious human health problems, when toxins are ingested through contaminated seafood.

15. While excessive nutrient inputs can turn marine areas into wasteland, large reductions in natural input of nutrients (e.g., by damming rivers) can also adversely affect the productivity, including fish abundance, of coastal waters.

Changes in sediment flows

16. Increased or decreased input of sediments from rivers or other runoff into the sea continue to ***affect significantly shorelines and habitats***. Deforestation, soil erosion or the diversion of water courses increases sedimentation rates along the coast and in many places this adversely affects wetlands, deltaic habitats and bottom dwelling communities (e.g., coral reefs, seagrass beds). On the other hand, reduction of the natural supply of sediments (e.g., by reduced flow of rivers) to coastal waters leads to accelerated coastal erosion.

Changing Perspectives

Scientific perspectives

17. ***Changing perspectives on the delivery of contaminants to the ocean.*** Increasing amounts of atmospherically-derived fixed nitrogen are entering the coastal zone and may be an important contributing factor to coastal eutrophication. Changing patterns of the production of reactive nitrogen from combustion and fertiliser generation and utilisation may also cause increased nitrogen deposition to nitrogen-limited regions of the open ocean. Significant quantities of natural substances and contaminants, especially nutrients, are added to the coastal zone via submarine groundwater discharge in many regions of the world. These can bypass the normal estuarine "filtering" process that takes place for riverine inputs and mix directly into coastal and off-shore waters.

18. ***Effects of other changes on marine biological systems***. Human impacts on coral reefs have been increasing steadily. Concerns are being raised about the apparent increasing incidence of new coral reef diseases, unprecedented disease outbreaks, and diseases in new locations. In addition, coral bleaching is causing widespread mortality in reef communities and severely compromises their ability to recover from human-derived stress. Concern also is increasing about endocrine-disrupting chemicals (EDCs) in the coastal environment, including PCBs, tributyl tin, and alkyl phenols. Caution is needed because of their chemical stability in the environment. However, more research is required to determine the relationship between these persistent chemicals and their effects on marine organisms.

19. ***Climate and global change.*** With a projected mean surface temperature increase of 1–3.5 degrees C by 2100, significant changes to the marine environment are likely. Frequency changes of extreme meteorological events (droughts, floods, hurricanes) could lead to significant damage to nearshore ecosystems. Higher temperatures and humidity may lead to increased incidences of diseases and food-borne infections. Sea level changes may lead to loss of low-lying coastal habitats. Changing ocean/atmosphere circulation patterns could affect fish population dynamics. Changes in ice cover and stratospheric ozone may lead to increased stress on many polar species.

Regional perspectives

20. The regional programmes, including those specifically developed for the implementation of GPA/LBA, are at different stages of development and are formulated in quite different terms. Regional priorities, for example, are variously expressed in terms of contaminant classes, source categories, or institutional actions. Several regions identify a set of priority issues but regard it as inappropriate to prioritise among them. Regions also vary considerably in the identification of objectives, strategies, and actions.

21. As expected, ***regional priorities are specific to the conditions in each region***, but there is general agreement among regions on the prioritisation of issues. ***Sewage is clearly the highest priority in most regions.*** In terms of GPA/LBA sources, agricultural runoff and industrial facilities are also high priorities. In terms of contaminant classes and physical alteration, the generally highest priorities after sewage are, in approximate rank order, nutrients, sediment mobilisation, POPs, heavy metals, and physical alteration. The regional programmes tend to give higher priority than GESAMP to POPs and heavy metals, and less to physical alteration. This may reflect an expectation of increasing trends in POPs and heavy metal contamination, a recognition that global transport of these contaminants may necessitate action even in the absence of major impacts within a region, or the widespread international attention to POPs and heavy metals.

22. The majority of examined regional programmes state objectives, strategies, and actions in very broad terms; often the stated objective is simply to reduce or prevent degradation. Some regions do identify somewhat more concrete objectives (e.g. "complete an assessment based on existing data"). The generality of objectives in most regional programmes, however, is likely to make it difficult to assess their progress.

23. Common themes in regional strategies are environmental planning and management frameworks, awareness and education, information systems, development of regional guidelines, criteria, and standards, improved waste management systems, adoption and transfer of technologies, development of regional and international agreements, and the implementation of existing agreements, standards, and legislation. GESAMP considers these generally appropriate, and suggests that ***particular emphasis should be placed on improved planning and management frameworks, improved awareness and education, and, perhaps most importantly, the enhanced implementation of existing mechanisms***.

24. Actions identified in the RPAs range from quite specific (e.g., "identify gaps in existing legislation") to very general (e.g., "regional actions to be devised"). The degree to which actions are logically matched to specific identified strategies and objectives varies, but in a number of regions might be improved. Among the most common actions in the RPAs is monitoring and assessment. Most regions have significant information constraints so is probably appropriate, but GESAMP suggests more emphasis on assessing environmental impacts in addition to contaminant releases or environmental concentrations. It is also important to note that ***the information that is already available often provides a sufficient basis for action, which should not be postponed pending additional information***.

25. The time-frames envisaged by the regional programmes developed specifically for the GPA/LBA are in general relatively short when compared with similar programmes developed in the framework of some well established programmes (e.g., OSPAR). This reflects the need for **urgent action**, but also undue optimism. The longer and more realistic time frames adopted by the well established programmes reflects the need for long-term commitment.

Strategies and Measures

26. The ***policies required for effective environmental management*** will vary among countries, but there is a framework of common policy elements, including:

- ***cross-sectoral, holistic management;***
- ***rational, equitable, and sustainable allocation of resources;***

- ***clear commitment by both government and the public;***
- ***poverty alleviation; and***
- ***regional and global international cooperation.***

27. Given an appropriate policy framework, there are many tools and measures that can be applied to address the impacts of LBAs upon the coastal and marine environment. Sustainable development of coastal and marine areas requires selecting a suite of these tailored to local, national, and regional circumstances, within a framework of cross-sectoral management. ***The suitability of a given measure usually depends less upon its inherent technical merits than upon its benefits and costs relative to other measures, the priority of the issue that the measure addresses, and most importantly, the prospects for effective implementation.***

28. There are three main types of policy instruments to induce implementation: regulations, economic instruments, and instruments to induce voluntary action. Regulation is familiar, has a perceived high degree of certainty, and is compatible with existing legal frameworks, but imposes a high enforcement burden, is inflexible and often is economically inefficient and fails to provide incentives for continuing improvements. Economic instruments increase economic efficiency by devolving decision-making to the target sector, provide incentives for continuing improvement, increase flexibility, and in some cases reduce the enforcement burden. Their disadvantages include political barriers to setting charges and taxes high enough to alter environmentally damaging behaviour, or to provide subsidies and other incentives for desirable behaviour, and perceived uncertainty about their cost-effectiveness. Voluntary action by industry may, again, reduce the enforcement burden, increase economic efficiency, enhance flexibility, and allow the use of industry knowledge to develop industry-specific solutions consistent with business goals.

29. Other requirements and incentives to induce the implementation of environmental protection measures include cost-effective, appropriate public and private investment; institutional measures such as reorganisation to promote cross-sectoral approaches, the establishment of environmental management agencies, the enactment of environmental legislation, and the reform of property rights; societal measures such as public education, consultation and participation, and access to courts to enable civil suits related to environmental protection; and the application of various management tools (e.g. cost–benefit analysis, EIA).

30. ***The guiding principles in selecting from the available technical and management measures to address each of the GPA/LBA contaminant classes should be to identify and prioritise the environmental problems to be addressed, and to select measures that provide the highest overall net benefit.*** The measures must also have a high probability of successful and sustained implementation in a particular socio-economic and cultural setting.

31. During the last few decades considerable progress has been made in understanding the nature, magnitude and threats stemming from human impacts on the marine and coastal environment. Although the level of uncertainty shrouding certain issues remains substantial, ***today's knowledge and available technology generally provide an adequate basis for action to remedy the present situation, while still allowing the ocean to be used for socially beneficial purposes including controlled disposal of certain wastes.***

32. There are some differences of emphasis in this Report from those in the GPA/LBA. One of the differences in emphasis is the importance given by GESAMP to the need for the kinds of institutional strengthening required by developing countries to enable them to take to control land-based activities. Others concern the emphasis given within the GPA/LBA to two priority actions, the establishment of a Clearing House mechanism that would identify information needs and sources of information and the mobilisation of funds.

Conclusions and Proposed Actions

33. ***The economic costs of not taking action to control land based activities are enormous.*** The international dimensions of the problem are clear. There is wide recognition of the global implications of the

economic and biodiversity losses, as there is also of the fact that there is a need for financial and technical cooperation between developed and developing countries to protect the marine environment. Moreover, the transboundary effects of land-based activities in many regions call for cooperation among the concerned countries.

34. ***The root causes of marine environmental damage resulting from the negative effects of land-based activities are poverty and poorly managed social and economic development, and unsustainable consumption patterns.*** Institutional failure allows these conditions to have a powerful effect, most importantly when governments are unwilling or unable to correct the market failure that occurs when markets do not fully reflect the value of resources. A major part of the reason why governments fail to act is their reluctance to adopt the necessary measures that yield benefits in the long-term when they are pressed to meet short-term needs. Governments may also be reluctant to channel financial and human resources from other areas of government responsibility, such as defense.

35. ***At the global level, the most serious problems associated with land-based activities are sewage, physical alteration and destruction of habitat, excessive nutrient inputs, and sediment mobilisation.*** Litter, heavy metals, hydrocarbons and radionuclides, although often meriting a high priority at local levels, are not considered to rank as priorities at the global level. Persistent organic pollutants are currently and deservedly receiving attention at the international level but are considered not to merit global priority as habitat destruction, sewage, eutrophication and changes in sediment mobilisation. The current preoccupation with POPs at the international level should not divert attention from anthropogenic causes of more immediate ,serious and widespread damage to the marine environment.

36. At the technical, management and policy levels ***the most urgent actions to control land-based activities*** to improve the quality of the marine environment are:

- ***prevent habitat destruction and loss of biodiversity through education combined with the development or enforcement of legal, institutional and economic measures appropriate to local circumstances; and establish protected areas for habitats and sites of exceptional scenic beauty of cultural value;***
- ***with respect to pollution, primary management attention should be devoted to sewage, nutrients (especially nitrogen) and sediment mobilisation; and***
- ***national policies have to be designed that take account of the economic value of environmental goods and services and provide for the internalisation of environmental costs.***

ANNEX VI

PROBLEMS AND SOLUTIONS

The following section has been written by the Marine Environmental Assessments Working Group of GESAMP. Many of the problems and the solutions to them listed here have been widely published elsewhere. Nevertheless, they are important and no apologies are needed for repeating them.

Man's impact on the oceans is most severely felt in coastal areas, including the coastal terrestrial strip and the adjacent waters. **Action:**

- protect and manage seas and coasts as an integral part of the development process, taking full account of their net benefit to society;
- integrate the management of coastal areas and associated watersheds, thereby recognising the interdependence of freshwater (including groundwater), coastal and marine systems; and
- focus management effort on physical alteration, sewage, nutrients (especially nitrogen) and sediment mobilisation in relation to land-based activities.

The open ocean is much less affected than coastal areas, although it is contaminated with substances that are widely dispersed by atmospheric transport, such as nitrogen, lead, mercury and persistent volatile organic substances. **Action:**

- reduce activities resulting in the transport of pollutants to the ocean;
- keep a watch on the exploitation of deep-sea non-living resources, oceanic responses to climate change and the delivery of nitrogen into the open ocean, and take appropriate action;
- assess the consequences of interventions likely to result in large-scale effects, such as fertilisation of oceanic surface waters and sequestration of carbon dioxide in the deep ocean, before they are implemented;
- recognise that global approaches are required to address problems in the open ocean.

Many fisheries have free and open access, encouraging overcapitalisation and overexploitation. **Action:**

- adopt and enforce measures to equate fishing capacity and effort with optimum sustainable yields of stocks;
- address artisanal over-fishing through appropriate measures including creating opportunities for alternative employment; and
- reduce through, inter alia, more selective fishing methods and better enforcement of restrictions.

Coastal habitats have already been severely impaired and are threatened with further damage. **Action:**

- minimise habitat destruction and the loss of biodiversity by the development and/or enforcement of legal, administrative and economic measures appropriate to local circumstances;
- establish protected areas for habitats, sites of exceptional scenic beauty and cultural value; and
- where the degradation of habitats has already occurred, or cannot be prevented, and natural recovery is unlikely, initiate restoration where it is likely to be successful.

Risks to public health from exposures to contaminated seafood and coastal waters are more significant than previously appreciated. Existing quality standards for bathing waters and seafood do not provide adequate protection. **Action:**

- re-evaluate coastal bathing water and seafood quality standards in the light of recent evidence of risks associated with exposures;
- invest in appropriate technologies and procedures to prevent or reduce human exposures to contaminated seafood and bathing waters;and
- invest in costly treatment technologies and impose stringent quality standards only where they are needed to meet environmental and public health objectives and are appropriate to local circumstances.

Integrated coastal management (ICM) – encompassing associated freshwater catchments – is increasingly recognised as an effective approach to managing and protecting the marine and coastal environment. It merits wider application both in resolving existing problems and in dealing effectively with new ones. **Action:**

- promote co-ordinated, cross-sectoral, and holistic approaches to managing environmental resources and amenities taking full account of environmental, public health, economic, social and political considerations;
- make environmental impact assessment (EIA), risk management, and cost–benefit analysis integral elements of the decision making process and incorporate the value of ecosystem services wherever possible;
- seek the active involvement and participation of all major stakeholders (local authorities, the private sector and particularly the interested public) in the design and implementation of ICM;
- regularly review management systems and their implementation and adjust priorities, targets and methods as necessary; and
- strengthen institutional capacities through training and retraining programmes.

If existing global and regional environmental agreements had been implemented as intended, coastal areas would not be in the deplorable state they are today. National legislative frameworks to achieve national goals and implement multilateral agreements are weak in many countries and are often inadequately enforced. **Action:**

- governments should adapt national legal instruments so that they conform with the provisions of internationally endorsed agreements;
- national and international attention should be focussed on compliance with existing international agreements rather than on the development of new ones unless there is compelling justification for them;
- governments need to adopt a consistent and coordinated approach to their dealings with different international organisations and agreements;
- international bodies responsible for the implementation of global environmental agreements should improve the coordination of their secretariats and governing bodies to this end; and
- further attention should be devoted at the regional level to harmonising national approaches and measures, and to collaborating cost-effectively; the full potential of voluntary commitments and targets should be explored, including with the private sector, as well as further legally-binding instruments.

There is a need to improve the balance of attention devoted to different environmental sectors (ocean, land, atmosphere) and to ensure that full account is taken of the overall consequences of interventions designed to prevent or correct problems in individual sectors. **Action:**

- do not foreclose options for ocean disposal without due consideration of the impact on other sectors of environment and overall net benefits; and
- refrain from an unwarranted preoccupation with issues of relatively minor consequence for the marine environment (e.g. ocean disposal of oil production platforms, authorised discharges of radioactive wastes) and focus attention on issues of substantive concern (e.g. physical alterations, coastal development and habitat loss).

The economic value of goods, services and amenities provided by the environment is poorly appreciated and grossly underestimated by managers and policy-makers. It is only rarely taken into account in developmental plans and activities. **Action:**

- take account of the economic value of environmental goods and services wherever possible;
- insist that the costs of environmental degradation should be borne by those who cause it; and
- broaden user fees to include hitherto "untaxed", cost-free uses of the environment and its resources.

Public information and education on environmental problems in the ocean is inadequate; furthermore, the media and special interest groups frequently direct unwarranted attention to peripheral and trivial issues, thus diverting attention from issues of substance. **Action:**

- the media, governments, special interest groups and scientific organisations should fulfill their responsibilities to provide reliable public information and education about marine (and other) environmental issues to enable the public to assess the relative significance of problems and threats.

Every human activity involves a certain degree of risk. Risk is unavoidable: there is no "zero risk" option. **Action:**

- strive to minimise risk and, whenever in doubt, apply a precautionary approach; and
- involve natural and social scientists in the assessment of relative risk and weigh options on the basis of their net benefits.

The public sector often has difficulty in mobilising funds for investment in environmental protection, and the private sector is playing an increasingly visible and important role. **Action:**

- stimulate private sector involvement and investment by using appropriate economic incentives and creating legal and administrative frameworks to promote and protect such investments.

National capabilities to cope with the problems of the marine and coastal environment are inadequate in most developing countries. **Action:**

- governments, aided by the international community should strengthen the capabilities of national institutions to manage the marine and coastal environment effectively; and
- governments should provide national institutions with the authority and human and financial resources needed to carry out their tasks.

International cooperation and assistance, including the transfer of knowledge, experience, technology and financial resources, benefits both the industrialised and less developed countries and is essential in boosting capabilities of developing countries to protect the environment. **Action:**

- the international community should improve the flow and quality of official development assistance to less developed countries and devote a larger part of this aid to protecting oceans and coastal areas through genuine partnerships between "donor" and "recipient" countries.

ANNEX VII

ESTIMATES OF OIL ENTERING THE MARINE ENVIRONMENT FROM SEA-BASED ACTIVITIES

A: Outline of the draft Study

Executive Summary

1 Introduction

1.1 Scope of Task
1.2 Statistical Material on Inputs

2 Approaches to Methods and Analyses of Data and Information on Oil Inputs

3 Inputs from Ships

3.1 Ships Operational Discharges
3.1.1 Engine Room
3.1.1.1 Machinery Space Bilges
3.1.1.2 Fuel Oil Sludge
3.1.1.3 Oily Ballast from Fuel Tanks
3.1.1.4 Air Emissions (VOCs)

3.2 Accidental Spillages from Ships
3.2.1 Oil Production and Transport
3.2.2 Spillages versus Production
3.2.3 Regional Analysis
3.3 Dry Docking
3.4 Scrapping of Ships
3.5 Discharges in Emergencies
3.6 Sunken Vessels

4 Offshore Exploration and Exploitation

4.1 Operational Discharges
4.1.1 Machinery Spaces
4.1.2 Drilling Discharges
4.1.3 Produced Water
4.1.4 Air Emissions
4.2 Accidental Spillages
4.2.1 Offshore Installations and Structures
4.2.2 Pipelines

5 Other Sources

5.1 Coastal Refineries
5.2 Reception Facilities
5.3 Waste Disposal at Sea
5.4 Fuel Dumps from Aircraft
5.5 Rocket Launches

5.6 Outboard Motors
5.7 Natural Oil Seeps
5.8 Unknown Point Sources

6. Analysis, Synthesis, Interpretation

7. Summary and Conclusions

8. Recommendations

9. Bibliography

B: Terms of Reference of the Working Group

The Terms of Reference approved by GESAMP are as follows:

1. to estimate current annual amounts of oil entering the marine environment from sea-based activities, taking into account that:

1.1 "oil" would be defined as in MARPOL 73/78, Annex 1;

1.2 sea-based activities would include all forms of shipping, especially in oil tankers and carriers, other commercial and non-commercial ships, as well as transportation through marine pipelines. They would further include offshore and coastal exploration and production, atmospheric emissions from such sea based activities, coastal refineries and storage facilities, oil contaminated material disposed of at sea, and natural marine oil seeps;

1.3 the annual input estimates would consider both historical and extant data, methods for deriving those estimates and associated uncertainties; and

1.4 the annual input estimates would consider the amounts of oil entering the sea through operational discharges and accidental spillage in relation to quantities transported by ships, through pipelines, etc., or in relation to offshore and coastal oil exploitation, and related industrial operations.

to focus particularly on improving the estimates of oil entering the marine environment from transportation sources, as one test of the efficacy of the MARPOL 73/78 Convention, and other conventions where appropriate, pertaining to the prevention of marine pollution from oil, and the safety of life at sea.

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ANNEX VIII

PLANNING AND MANAGEMENT FOR SUSTAINABLE COASTAL AQUACULTURE DEVELOPMENT
(Reports and Studies, GESAMP, No. 68)

EXECUTIVE SUMMARY

Background and rationale

1. Aquaculture production is growing at more than 10% per year, compared with 3% for terrestrial livestock and 1.5 % for capture fisheries. This growth is expected to continue. Asian aquaculture farmers continue to contribute about 90% of the world's aquaculture production, and more than 80% of total aquaculture yield is being produced in low-income food-deficit countries (LIFDCs).

2. Coastal aquaculture is dominated by the production of aquatic plants (seaweeds) and molluscs. However, a wide range of diverse coastal aquaculture systems has been developed in Asia, Europe, and the Americas, operating at different intensities and scales of production.

3. Aquaculture has great potential for the production of food, alleviation of poverty and generation of wealth for people living in coastal areas, many of whom are among the poorest in the world. The rapid growth of aquaculture in recent years has been consistent across sub-sectors, from low-input/low cost products of importance for subsistence and direct food security, to medium and high value products for national and international markets, which are important for improved living standards and foreign currency earning. The great diversity of the sector encompasses very small scale to very large-scale enterprise, implying that aquaculture can contribute significantly to a wide range of development needs.

4. However, significant problems can be associated with coastal aquaculture development. These include unsuccessful development, where the potential for development is not realised, especially among the poorer sectors of society; the vulnerability of aquaculture to poor water quality and aquatic pollution, caused by industrial, domestic, agricultural and aquacultural (i.e. its own) wastes; and over-rapid development, where the undoubted successes of the sector have been tarnished by environmental and resource use issues, social problems, disease, and in some cases, marketing problems.

5. Although some of the social and environmental problems may be addressed at the individual farm level, most are cumulative – insignificant when an individual farm is considered, but potentially highly significant in relation to the whole sector. They are also additive – in the sense that they may add to the many other development pressures in the coastal zone.

6. These cumulative and additive problems can only be addressed through better planning and management of the sector – by government, in collaboration with producer associations or industry organisations. A precondition for better and more effective planning is also better organisation and representation of the sector.

7. Crucial elements in a more planned approach include:

- improvements in siting, design, technology, and management at the farm level (requiring a set of incentives and constraints to promote these changes);
- better location and spatial distribution of the sector as a whole (implying some form of zoning and associated incentives and constraints relating to location);
- better water supply for the sector as a whole;
- better fish health management including disease and stock control at individual farm and sector levels;

- improved communication and information exchange;
- improved access to markets and trade opportunities;
- more equitable distribution of the benefits derived from coastal aquaculture development.

8. In practice many of these are unlikely to be achieved without effective integration with planning and management of other sectors. The framework normally proposed to achieve this is integrated coastal management (ICM).

Review of experience

9. Investors have responded to the problems associated with coastal aquaculture through more rigorous project appraisal. Governments have responded mainly with specific regulations relating to farm operation (such as effluent limits, design standards, best management practices, and codes of conduct). In some cases they have responded with more rigorous requirements for social and environmental impact assessment.

10. These farm level measures have often been ineffective. Promotion of environmental assessment in particular has failed to address the problem of over-rapid and unplanned development of aquaculture in some countries. There are two reasons for this. Firstly, as noted above, the impacts associated with aquaculture are often insignificant when a farm is considered in isolation. Secondly, in the absence of any broadly agreed environmental quality standards, assessments of the significance of impacts have been highly subjective and inconsistent.

11. A range of more comprehensive approaches to coastal resources management have been proposed as frameworks for addressing the wider issues of sustainable coastal resource use, the minimisation of conflict, and optimal allocation of resources, including in particular land and water. These range from sector related environmental planning and management initiatives (enhanced sector planning), to more ambitious integrated coastal management (ICM) programmes.

12. There have been two main types of enhanced sectoral initiative for coastal aquaculture. The first has used geographic information systems (GIS) and remote sensing as the basis for defining suitable locations or zones for aquaculture. The second has focused on estimates of environmental capacity in order to define appropriate scale and location for sustainable aquaculture development. Many of these initiatives have failed – through lack of any broader planning or management framework – to translate the findings into practical incentives and constraints to promote more sustainable development. This failure points to the need for broader and more integrated planning frameworks.

13. There are many examples of more integrated coastal zone management (CZM) or integrated coastal management (ICM) initiatives, some of which have encompassed aquaculture. The objectives of such initiatives typically include: the optimal allocation of resources to competing activities or functions; the resolution or minimisation of conflict; the minimisation of environmental impact; and the conservation of natural resources. Given the problems listed above, it is clear that they have great relevance to aquaculture.

14. Unfortunately the performance of more comprehensive forms of ICM in practice has been disappointing, particularly in relation to aquaculture. There are often significant institutional and political barriers to integration. The sheer power of vested financial and economic interests may undermine more participatory and integrated approaches.

15. The scope of comprehensive ICM can make it a long and often complex exercise and thus may undermine its effectiveness in dealing with urgent environmental issues, such as over-rapid aquaculture development.

16. In these cases, locally focused integrated management initiatives (e.g. relating to an estuary or lagoon system) are likely to be more effective, and should lead to the identification of specific needs in terms of greater vertical integration (i.e. with higher level policy or legislation). Indeed, these locally-focused integrated management approaches are viewed by many as an effective application of ICM principles and practices.

17. In other situations, where the nature of the resources or existing resource management systems precludes more locally based initiatives, enhanced sectoral approaches may be the most appropriate, but much more attention needs to be paid to implementation in these cases.

18. More comprehensive ICM may be effective as a starting point where coastal aquaculture is in the early stages of development, where institutions for resource management are flexible or un-developed, where appropriate legal and institutional frameworks are in place or can be developed rapidly, and where scientific and technical capacity is substantial.

Guiding principles

19. Despite this lack of a universal model, it is possible to present a set of widely agreed guiding principles which may be applied whatever the administrative level or scope of the planning initiative.

20. The first is the requirement for a clear planning objective. In broad terms, this would normally be to promote or facilitate sustainable development. Although there are many definitions and more interpretations, one of the earliest, simplest, most widely quoted and agreed, is: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Ensuring that activities do not exceed the carrying capacity of the environment is one practical interpretation of this objective. Ensuring that the sum total of natural and economic capital is maintained or increased through time is another. Agreeing (at national or local level) on a practical interpretation of this in relation to aquaculture must be one of the first steps in any planning and management initiative.

21. Two principles were given emphasis at the Rio Summit and should be observed. ***The precautionary approach*** means that we should more carefully plan and rigorously evaluate developments that have uncertain and potentially damaging implications for the environment. The ***polluter pays principle*** is subject to a range of interpretation, from a requirement upon polluters to pay the costs of monitoring and management, through the requirement to pay the costs of clean-up, to the responsibility to pay for the cost of environmental damage as well as that of clean-up.

22. ***Integration or co-ordination*** with other sector activities or plans, with national sector plans, and with integrated coastal management plans is essential.

23. Wide ranging ***public involvement*** is important, meaning not only consultation and information exchange, but also direct involvement or participation of stakeholders in the decision making process, especially in relation to defining overall objectives and associated targets and standards. Related to this, particular attention should be paid to the promotion of ***effective representative organisations***.

24. Thorough ***assessment of costs and benefits*** (financial, economic, social, environmental) of aquaculture in a specific area (e.g. estuarine or lagoon system) should be undertaken; as should comparative assessment of costs and benefits of aquaculture relative to other resource uses.

25. Some assessment of ***environmental capacity*** is desirable, although this may be difficult and costly. The scope and accuracy of this assessment will depend critically on resources and time available.

26. ***Regulation*** is difficult, especially with respect to large numbers of small-scale developments, and offers limited incentive for improved environmental performance. It may be made more effective if responsibility for

design, implementation and enforcement is located at the proper administrative level, and full use is made of self-management and self-enforcement capacity by industry and farmers' associations.

27. ***Incentives*** (financial, market, infrastructure) can be designed to stimulate innovation and improvements in environmental management, and should be used wherever possible. However, incentives may need to be underpinned or reinforced through complimentary regulation.

28. Emphasis should be on the control of ***effects***, rather than the scale of activity. This allows for economic growth at the same time as providing an incentive for improved environmental performance.

29. More integrated planning and management is extremely complex, and the outcomes from each stage of the process are likely to be flawed or inadequate in some way. If the planning process is not to fail, it must learn and adapt. This requires an ***iterative*** approach of action-monitor-evaluate-adapt-action- and so on. This applies to all forms of action associated with the planning process: research, setting objectives and targets, specific planning interventions, and designing new institutional structures and procedures.

30. Many integrated planning initiatives have foundered through lack of appropriate institutional structures or capacity for developing or implementing the plan. ***Institutions*** and capacity must be considered at all stages, but especially in relation to implementation.

Legal and institutional frameworks

31. The importance of legal, procedural and institutional frameworks designed to facilitate sustainable aquaculture development is emphasised in the FAO Code of Conduct for Responsible Fisheries. Again, there are no universally applicable models. The nature of any improvements will depend on existing laws, traditions, and institutional structures. The key point is to develop or adapt a system that allows for the comprehensive application of the principles set out above.

32. Where the introduction of new legislation is difficult, or will cause excessive delay, guidelines for developing new initiatives may be introduced prior to specific legislation, as a means of testing out different approaches.

33. The ideal framework would allow for vertically (national to local) and horizontally (across sectors) integrated policy-making, assessment and planning with a significant role for strategic, sector or regional (integrated) environmental assessment as an input to the planning process. Such a framework should allow for adaptation in both directions, i.e. national policy should inform local planning; local planning and public involvement should inform the development or adaptation of policy at higher levels.

The planning process

34. The planning process is broadly similar, irrespective of the degree to which it is integrated (enhanced sectoral planning or ICM), and whether it takes place at local, district, regional or national level:

- Stage setting and planning involves the identification and analysis of issues; the definition of provisional (working) goals and objectives; the selection of strategies and specific instruments to meet the objectives; and the selection or design of implementing structures.
- Formalisation involves the agreement and formal adoption of the plan or program, and securing of implementation funding.
- Implementation involves deployment of specific planning instruments and development actions, the promotion, facilitation, and if necessary enforcement of policies and regulations, and monitoring of the effects of the plan.
- Evaluation involves analysis of progress against targets and objectives, and problems encountered.

35. In practice stage I. can be further broken down into a set of operational components:

- Identifying the means/mechanism and level of planning; followed by initiation;
- Gaining the trust, involvement and commitment of key stakeholders;
- Understanding the development context (natural and human resources and economy);
- Understanding the development options;
- Defining goals and objectives, including environmental quality standards;
- Identifying development priorities and acceptable practices;
- Defining broad development strategies (strategic planning) to promote development priorities and practices;
- Designing/agreeing specific planning and management instruments (incentives and constraints) to promote development priorities and practices;
- Designing and agreeing monitoring, reporting, evaluation and response procedures;
- Building necessary institutional capacity, and if necessary new institutions.

36. A variety of tools and methods are available to help inform and facilitate each of these components.

37. Initiation must be done with great care. The "who and how" of planning is likely to have a significant impact on support for the plan and compliance with its provisions. A variety of tools may be used in this first exploratory phase, including stakeholder and institutional analysis. Public involvement and participation from the outset is crucial.

38. Understanding the development context can be extremely complex and great care should be taken to avoid data collection for its own sake. There are several examples of very detailed resource assessment for aquaculture development planning, which have fallen into this trap. The collection of information and research about human and natural resources should be undertaken in parallel with broad public involvement and issues identification, so that the research and information collection can be focussed and steadily refined. Logically, this should be done within a broader ICM, or locally integrated initiative, rather than within a sectoral planning framework.

39. The estimation of environmental capacity is of particular relevance to aquaculture, to the problem of cumulative impact, and to promoting sustainable development in general. It is therefore discussed in detail in part 2 of this report. An assessment of environmental capacity should be undertaken, even if only at the most elementary level, if promoting sustainable development is to have any practical meaning. Given its complexity however, and its relevance to other activities in the coastal zone, it is better done within a broader ICM, rather than sectoral planning framework.

40. Again it is important not to be too ambitious. A very rough estimation of environmental capacity, followed by monitoring of key indicators so that the estimate can be steadily refined, may be much more rapid and cost effective than a major research initiative.

41. Describing development options is rarely done thoroughly or objectively, despite the fact that this is relatively straightforward. Financial analysis is essential, and if quantities, as well as value of inputs and outputs are included in financial models or projections, important indicators of resource use efficiency and socio-economic benefit can be generated. This information, along with more qualitative descriptions of site/location requirements, markets, risk, access and equity issues, can be used to generate an analysis of comparative economic advantage and an overall "sustainability profile". This can be done at the sector level, but the information generated will also be invaluable for broader ICM initiatives.

42. Defining goals and objectives again requires broad stakeholder participation. Agreement on goals and objectives (before specific development cases are addressed) can be a significant factor in conflict avoidance and resolution. It is also important to agree on specific targets and standards relating to these objectives. These

may then serve as the basis for more consistent social and environmental assessment, as the rationale for specific planning interventions, and as a baseline against which progress (in terms of improved performance of the sector) can be measured. Once again, this is costly and difficult to do at the sector level.

43. Identifying development priorities and acceptable practices can be done using a range of formal and informal tools including social and environmental assessment; cost benefit analysis; and participatory/multi-criteria decision making. The success of these approaches, especially for comparing economic and environmental costs and benefits, will depend critically on the thoroughness of the issues identification; the quality of the technical-economic assessment; and the existence of agreed objectives and targets/standards. It will also depend on effective communication and exchange of information so that all those involved in the decision making process are well informed.

44. The foregoing should provide the basis for a planning and management strategy, which might include, for example:

- zones with development and environmental objectives specifically related to aquaculture and other compatible activities;
- environmental quality standards or targets associated with these zones;
- allocation of environmental capacity, in terms of waste production/emission limits, for aquaculture and other activities within these zones; and
- production targets related to development potential, and social-economic objectives.

45. A set of planning interventions in the form of incentives and constraints (planning instruments) will be required to implement the strategy and ensure that objectives are met, standards are not breached, and environmental capacity is not exceeded. Incentives and constraints might relate to :

- location and siting of aquaculture development;
- waste emissions;
- the quantity or quality of inputs used (e.g. food, chemicals);
- design, technology and management practices;
- stock movement and disease management; and
- the level of activity or production.

46. The incentives and constraints may take the form of:

- rules and regulations, and associated enforcement measures;
- economic instruments (e.g. grants, subsidies, tax breaks, taxes, bonds, price intervention, product labelling);
- infrastructure provision (such as water supply, effluent treatment); and
- services (such as disease certification; marketing; training; advice; extension).

47. It is important that these are agreed with all stakeholders if compliance is to be maximised. Particular attention is paid to economic and market instruments in the report, since these are more likely to take the form of incentives rather than constraints (which are often difficult to enforce).

48. Monitoring and evaluation are of paramount importance with such a complex process. This should be straightforward if clear objectives, targets and standards have been set. However it is also important to monitor and evaluate the standards themselves, especially environmental standards, since the link between them and people's perception of the quality of the environment may be weak. For example, water quality standards in receiving waters are often based on national guidelines or international precedent, and rarely relate directly to local environmental quality values and objectives. It may be useful to develop "state of the environment"

reporting in order to examine overall effects of development activities on the wider environment, the relevance of particular standards, and the utility of indicators.

49. Monitoring should also apply at a more immediate level to the planning and implementation process. There will be many indicators relating to the success of specific procedures or interventions, and these should be set out in the monitoring programme. In addition, it is vital to agree on the nature of the response if standards are breached, procedures fail, or targets are not met.

50. The plan must be flexible. Procedure must be established for communicating the results of monitoring and evaluation to stakeholders, and adapting and modifying the plan in the light of experience. At minimum this may involve slight adjustments to planning interventions. In the extreme it may involve developing completely new policy, laws and institutions.

51. The report presents policy guidelines for all the stages described above, describes and discusses specific tools which can be used in support of the planning process, with emphasis on those of particular relevance to coastal aquaculture development, and provides examples and case studies relating to both the planning approaches and the application of specific tools. It has not been possible to cover all areas in detail, and in this case the reader is referred to other guidelines or reviews for further information.

ANNEX IX

EVALUATION OF THE HAZARDS OF HARMFUL SUBSTANCES CARRIED BY SHIPS

1 Review of current activities

The Working Group held its 36th session at IMO Headquarters, London, from 3 to 7 April 2000 under the chairmanship of Mr Tim Bowmer. At that session the Working Group streamlined its revised evaluation procedures regarding the effects of chemicals transported by ships on skin and eye, taking into account the results of intersessional debates between members of the Working Group and experts from other fora.

The Working Group continued the re-evaluation of substances listed in IMO's International Bulk Chemical (IBC) Code, on the basis of its new procedures. During its session in April 2000 more than 140 products listed in the IBC Code were evaluated. In addition, the Working Group considered the hazards of many new substances which have been proposed for bulk transport at sea.

Taking into account the workload related to the review of chemical hazards on the basis of OECD's recently established harmonized classification system, the Working Group started to develop a comprehensive database which would allow the quick exchange of data and information between the members of the Working Group.

Plans for the publication of the revised hazard evaluation procedures approved by GESAMP at its twenty-eighth session are being prepared by the chairman of the Working Group in close co-operation with the secretariat.

The thirty-seventh session of the Working Group will be held from 30 April to 4 May 2001.

2 Terms of Reference of the Working Group

To examine and evaluate available data and to provide such other advice as may be requested, particularly by IMO, for evaluating the environmental hazards posed by harmful substances carried by ships, in accordance with the rationale approved by GEAMP for these purposes.

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