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SUBSIDIARY BODY ON SCIENTIFIC, TECHNOLOGICAL AND TECHNICAL ADVICE
Sixth meeting
Montreal, 12-16 March 2001

DRAFT RECOMMENDATIONS FOR THE CONSIDERATION OF THE SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE AT ITS SIXTH MEETING

Note by the Executive Secretary

This present note is a compilation of the various draft recommendations that have been suggested by the Executive Secretary in the working documents prepared for the sixth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). These elements are presented in line with the provisional agenda for the meeting (UNEP/CBD/SBSTTA/6/1), with an indication of the symbol of the working document from which they have been drawn.

In general, the text of the draft recommendations has been drawn directly from the suggestions in the corresponding document, with minor editorial corrections as necessary. In some cases, however, particularly where it is suggested that SBSTTA may wish develop text on the basis of elements contained in the working documents, the suggested recommendation has been reworded to reflect the possible outcome of that work. This is in no way intended to prejudge the outcome of the discussions, but simply to indicate the final form that the recommendation by SBSTTA might take.

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The Subsidiary Body on Scientific, Technical and Technological Advice *takes note* of the progress report of the Executive Secretary on the ad hoc technical expert groups (UNEP/CBD/SBSTTA/6/2).

Item 3.2 of the provisional agenda: Assessment processes - progress report on ongoing assessment processes (UNEP/CBD/SBSTTA/6/3)

The Subsidiary Body on Scientific, Technical and Technological Advice *takes note* of the progress report on ongoing assessments of relevance to the Convention on Biological Diversity, including, in particular, the Millennium Ecosystem Assessment; the Global International Waters Assessment (GIWA); and the Forest Resources Assessment 2000 (UNEP/CBD/SBSTTA/6/3).*

* Bearing in mind that the substantive discussions on the subject are to take place under item 5.1 of the provisional agenda (Scientific assessments), the Subsidiary Body may wish to incorporate this text into its recommendation under that item (see page 19 below).

Item 3.3 of the provisional agenda: Marine and coastal biological diversity: progress report on the implementation of the programme of work, including the integration of coral reefs (UNEP/CBD/SBSTTA/6/4)

The Subsidiary Body on Scientific, Technical and Technological Advice

1. *Endorses* the following text as operational objective 2.3, for the integration of coral reefs into programme element 2 of the programme of work on marine and coastal biological diversity:

> *Operational objective 2.3. : To gather and assimilate information on, build capacity to mitigate the effects of, and to promote policy development and implementation strategies to address the impacts of coral bleaching and related mortality on coral-reef ecosystems and the human communities which depend upon coral reef services, including through financial and technical assistance.*

2. *Invites* the Executive Secretary to promote and implement the specific work plan on coral bleaching, as contained in annex I to the present recommendation, to be implemented in close collaboration with the International Coral Reef Initiative and its partners;

3. *Welcomes* the continued collaboration between the Secretariat of the Convention on Biological Diversity and regional seas programmes of the United Nations Environment Programme (UNEP), and endorse the efforts of the Executive Secretary to develop joint work plans with these Programmes, particularly in relation to coral reefs and operational objective 2.3 of the programme of work on marine and coastal biological diversity;

4. *Takes note* of the analysis of the effects of the physical degradation and destruction of coral reefs as contained in annex II to progress report on the implementation of the programme of work on marine and coastal biological diversity, including the integration of coral reefs (UNEP/CBD/SBSTTA/6/4);

5. *Requests* the Executive Secretary integrate fully the issue of the physical degradation and destruction of coral reefs into the programme of work on marine and coastal biological diversity and to develop a specific work plan on the issue, based on the elements suggested in annex III to the progress report on the implementation of the programme of work on marine and coastal biological diversity (UNEP/CBD/SBSTTA/6/4)* and taking into account the comments made at the sixth meeting of Subsidiary Body on Scientific, Technical and Technological Advice.

Annex I

SPECIFIC WORK PLAN ON CORAL BLEACHING

Objective (i.e., operational objective 2.3 of the programme of work on the biological diversity of marine and coastal ecosystems): To gather and assimilate information on, build capacity to mitigate the effects of, and to promote policy development and implementation strategies to address the impacts of coral bleaching and related mortality on coral-reef ecosystems and the human communities which depend upon coral reef services, including through financial and technical assistance.

Activities

1. Information gathering

(a) Implement and coordinate targeted research programmes, including predictive modelling, that investigate: (1) the tolerance limits and adaptation capacity of coral-reef species to acute and chronic increases in sea-surface temperature; (2) the relationship among large-scale coral-bleaching events, global warming, and the more localized threats that already place reefs at

* Annex II to the present draft recommendation.

risk; and (3) the frequency and extent of coral-bleaching and related mortality events, as well as their impacts on ecological, social and economic systems.

Ongoing initiatives

(i) The "Ad Hoc Study Group on Indicators of Coral Bleaching and Subsequent Effects" was established September 2000 under the auspices of IOC/UNESCO with three major objectives: to develop possible molecular, cellular, physiological, and community indicators of coral bleaching that are reliable in their ability to detect early stress signals; examine potential mechanisms of reef corals for adaptation/acclimatization to global environmental change; investigate long-term response of reef corals to large scale changes in environmental variables. The group will meet annually for three years and distribute findings through annual reports and a final publication.

(ii) The Global Coral Reef Monitoring Network (GCRMN) is a global network of coral reef scientists, Governments and local communities for monitoring and assessment of coral reefs, in terms of both biophysical and socio-economic parameters needed for management. GCRMN is co-hosted by the Australian Institute of Marine Science and the World Fish Center (ICLARM). ICLARM also host ReefBase, the official database of GCRMN, with data of over 8,000 coral reefs over the world. UNEP, together with IOC/UNESCO, is a sponsor of the GCRMN and a member of the GCRMN Management Group and the GCRMN Scientific and Technical Advisory Committee.

(iii) GCRMN has developed a comprehensive *Status of Coral Reefs of the World* report to be updated every two years, with the most recent edition published in October 2000.

(iv) UNEP, through GCRMN, emphasizes the importance of monitoring socio-economic parameters to achieve sustainable use of coral reef ecosystems. A socio-economic manual has recently been developed (October 2000) for monitoring of these parameters for enhanced management capacity.

(v) Contributing to GCRMN are existing regional projects. Regional coral reef monitoring networks within GCRMN exist for the Indian Ocean and the Wider Caribbean funded by World Bank, with the goal of assisting in the conservation of the rich biodiversity of coral reefs and their socio-economic value, and in the sustainable management of their resources, through a monitoring network.

(vi) Under the International Coral Reef Action Network (ICRAN), the World Conservation Monitoring Centre (WCMC) and ICLARM are exploring the integration and availability of map-based products through the WCMC website and through ReefBase.

(vii) Some projects within the CORDIO programme in the Indian Ocean region focus on determining the socio-economic impacts of coral mortality and options for mitigating these through management and development of alternative livelihoods.

Specific tasks in addition to ongoing initiatives

(i) Provide scientific information on the survival of reef-building corals under global warming to allow some prediction of the adaptation and survival of the biological diversity of coral reefs in coming decades;

(ii) Compile information on existing networks, databases and websites which can provide up-to-date information of the status of coral reefs and their threats; and assess the quality of the data they contain and methodologies used for data collection and analysis;

(iii) Strengthen networks for data collection and dissemination of information on coral-reef status and interpretation of long-term trends resulting from global climate change and anthropogenic stresses to assist effective management and conservation;

(iv) Develop further target research programmes that investigate the impacts of coral bleaching and coral mortality events on social and economic systems;

(v) See activity (k) (i) below.

(b) Implement and coordinate baseline assessments and long-term monitoring to measure the biological and meteorological variables relevant to coral bleaching, mortality and recovery, as well as the socio-economic parameters associated with coral-reef services.

Ongoing initiatives

(i) The objectives of the Ad Hoc Study Group on Indicators of Coral Bleaching and Subsequent Effects under activity (a) above include the identification of biological indicators that would facilitate long-term monitoring.

(ii) GCRMN currently serves as a network for coral reef assessments and monitoring of biological variable relevant to coral bleaching, mortality and recovery, as well as many socio-economic parameters associated with coral-reef services (see activity (a)).

(iii) Data repository and dissemination systems such as ReefBase may offer time-line biological data.

(iv) GCRMN, in coordination with the World Bank, IUCN, the Australian Institute of Marine Science and UNEP regional seas programmes is targeting existing or planned marine protected areas as the focus of some of their monitoring activities. The sites may offer valuable baseline data and serve for long-term monitoring.

(v) GCRMN is currently developing rapid assessment methodology for socio-economic and biophysical parameters in the Eastern African region, especially for use in developing countries where limited resources do not always allow for regular high-intensive monitoring.

(vi) The UNEP Division of Environmental Information, Assessment and Early Warning coordinates a variety of information available from remote sensing technologies and organizations that facilitates dissemination of such information. They are well suited to coordinate assessment of meteorological variables relevant to coral bleaching, mortality and recovery.

(vii) WCMC and ICLARM are exploring the integration and availability of map-based products through the WCMC website and through ReefBase.

Specific tasks in addition to ongoing initiatives

(i) Identify pilot projects that establish training programmes and survey protocols and enhance availability of expert advice at a range of scales, including classification of scale data.

(ii) Support ongoing assessment and monitoring initiatives, such as those of UNESCO, ICRAN, the regional seas conventions and action plans, GCRMN, UNEP and CORDIO.

(c) Develop a rapid response capability to document coral bleaching and mortality in developing countries and remote areas including establishment of training programmes, survey protocols, expert advice, and contingency fund or rapid release of special project funding.

Ongoing initiatives

(i) The objectives of the Ad Hoc Study Group on Indicators of Coral Bleaching and Subsequent Effects referred to under activity (a) above include the identification of physiological early-stress indicators in corals.

(ii) The Sida-SAREC and World Bank programme on coral-reef degradation in the Indian Ocean, was initiated as a response to the 1998 coral-bleaching event (CORDIO).

(iii) GCRMN is currently developing rapid assessment methodology for socio-economic and biophysical parameters in the Eastern African region, especially for use in developing countries where limited resources do not always allow for regular high-intensive monitoring (ReefCheck).

(iv) Within the ICRAN strategic plan, it is intended that these capabilities will be developed and made widely available.

(v) The UNEP Division of Environmental Information, Assessment and Early Warning coordinates a variety of information available from remote sensing technologies and organizations that facilitates dissemination of such information.

Specific tasks in addition to ongoing initiatives

(i) Develop standardized training modules and manuals on detection and documentation of coral-bleaching events, mortality or recovery monitoring

(ii) Organize annual meetings in each region on coral-reef assessment and monitoring methods with particular emphasis on documenting coral bleaching, bleaching related mortality and subsequent recovery. These should be integrated into existing programmes, where possible (regional seas conventions and actions plans may have the best capacity to implement these measures).

(d) Encourage and support countries in the development and dissemination of status-of-the-reefs reports and case-studies on the occurrence and impacts of coral bleaching and related mortality.

Ongoing initiatives

(i) GCRMN has developed a comprehensive *Status of Coral Reefs of the World* report to be updated every two years, with the most recent edition published in October 2000. This report is largely based of national and regional contributions.

(ii) The Secretariat of the Convention on Biological Diversity, in accordance with decision V/3, paragraph 7, invited Parties to submit case-studies for dissemination through the clearing-house mechanism. The national reporting mechanism of the Convention on Biological Diversity facilitates the collection of information on the status of coral reefs and case-studies on the occurrence and impacts of coral bleaching.

(iii) The CORDIO Status Report 2000 offers reporting opportunities on the status of the reefs for Indian Ocean countries. The dissemination of this information through the CORDIO newsletter has facilitated further communication and coordination on local impacts.

Specific tasks in addition to ongoing initiatives

(i) Support and expand existing networks and initiatives at the regional and national level conducting coral-reef status assessments and monitoring.

(ii) Strengthen dissemination of existing assessment and monitoring information on status of coral reefs and their threats through existing networks (Under the ICRAN strategic plan, this is a core role of GCRMN and ReefBase).

(e) Extend the use of early-warning systems for coral bleaching by:

(i) Enhancing current NOAA AVHRR Hot Spot mapping by increasing resolution in targeted areas and carry out ground-truth validation exercises;

(ii) Encouraging space agencies and private entities to maintain deployment of relevant sensors and to initiate design and deployment of specialized technology for shallow-oceans monitoring;

(iii) Making the products of remote sensing readily accessible at low cost to coral-reef scientists and managers worldwide with a view to those scientists and managers that are based in developing countries.

Ongoing initiatives

(i) The UNEP Division of Environmental Information, Assessment and Early Warning coordinates a variety of information available from remote sensing technologies and organizations that facilitates dissemination of such information.

(ii) Under the ICRAN, WCMC and ICLARM are exploring the integration and availability of map-based products through the WCMC website and through ReefBase that include satellite and aerial imagery.

Specific tasks in addition to ongoing initiatives

(i) Expand the use of existing early warning systems (e.g. NOAA early warning mapping) and support the development of Web-based early warning systems.

(ii) Develop local community capacity for remote and local level validation exercises.

(iii) Develop mechanisms to make accessible high-resolution multi-spectrum imagery worldwide.

2. Capacity-building

(f) Support the training of and career opportunities for marine taxonomists, ecologists, and members of other relevant disciplines, particularly at the national and regional level.

Ongoing initiatives

(i) Various ongoing training activities not necessarily related to coral bleaching but to coral conservation issues, e.g. the Ramsar Wetlands for the Future training initiative for Latin America and the Caribbean; the regional seas programme for Caribbean protected areas managers; various activities supported by aid agencies and global and regional development banks.

(ii) Many other training activities are carried out as components of wider projects and programmes. GCRMN is building capacity for coral-reef monitoring and assessments through training workshops, especially in developing countries.

Specific tasks in addition to ongoing initiatives

(i) Further incorporate or support the issue of coral reefs and bleaching in the capacity building activities of multilateral environmental agreements (e.g. Ramsar Convention, Cartagena Convention) and of their respective contracting parties.

(ii) Develop standardized training modules and manuals on detection and documentation of coral-bleaching events and subsequent recovery.

(iii) Organize annual meetings in each region on coral-reef assessment and monitoring methods with particular emphasis on documenting coral bleaching, bleaching related mortality and subsequent recovery. These should be integrated into existing programmes, where possible.

(iv) Create scholarship trust funds in each region of the regional seas programmes to provide scholarships at graduate/postgraduate level to at least two people per region to undertake studies on coral-reef ecology and management.

(v) Promote exchange programmes between countries and/or regions.

(vi) Promote further coordination and collaboration of ongoing regional activities.

(vii) Promote the inclusion in national reports under the regional seas conventions, the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change a section for reporting of ecological and socio-economic impacts of coral-bleaching events.

(viii) Add coral bleaching to the national biodiversity strategies and action plans under the Convention on Biological Diversity.

(g) Encourage and support multidisciplinary approaches to coral-reef research, monitoring, socio-economics and management.

Ongoing initiatives

(i) ICRI and GCRMN activities are intended to encourage and support multidisciplinary approaches to coral reef research, monitoring, socio-economics and management.

(ii) Regional seas programmes through the ICRAN strategic plan and existing programmes like CORDIO, and the UNEP Caribbean Environment Programme are increasing regional capacity towards monitoring, socio-economics and management, as related to coral bleaching. The four regions currently active under the ICRAN strategic plans are South—East Asia, Pacific, Caribbean and Eastern Africa.

Specific tasks in addition to ongoing initiatives

(i) Develop a formal network of agencies in developed and developing countries, which agree to an annual exchange of staff in areas relevant to coral-reef management.

(ii) Gather and assimilate information on existing training programmes on integrated coastal area management, best practices and related issues to sustainable management of coral reefs.

(iii) Develop and/or expand training opportunities for fishers, protected area managers and related marine resource managers at the national and regional levels, on resource assessment, monitoring, user impact, ecosystem approaches to marine and coastal resource management, surveillance and enforcement, local community integration, and in setting and measuring the achievement of management performance goals and indicators.

(iv) See activity (k) (ii) below.

(h) Build stakeholder partnerships, community participation programmes, and public-education campaigns and information products that address the causes and consequences of coral bleaching.

Ongoing initiatives

(i) ICRI and the International Tropical Marine Ecosystems Management Symposium (ITMEMS) are building the foundation of new ICRI action.

(ii) A number of existing education and capacity-building projects within the regional seas programmes serve to raise awareness regarding coral bleaching.

(iii) IUCN, the Secretariat of the Convention on Biological Diversity, USAID and WWF have produced a publication *Management of Bleached and Severely Damaged Coral Reefs*, to contribute to effective and immediate management action to aid reef protection and regeneration, and to enhance research to develop the necessary tools and measures for long-term success. In addition, the publication is intended to raise awareness of the urgent need to take all possible actions to reduce the impact of climate change on coral reefs.

(iv) The WWF approach to worldwide coral reef conservation (CoralWeb): training of resource managers, increasing education, raising awareness, and implementing site-based reef management projects to help groups of stakeholders achieve their goals in reef management and sustainable economic development, including through the development of alternatives to destructive practices.

(v) The International Coral Reef Information Network (ICRIN) is the primary public awareness mechanism of the ICRI, and thus serves to disseminate public information products that address the causes and consequences of coral bleaching.

Specific tasks in addition to ongoing initiatives

(i) "Bridge the gap between global and local action through the creation of national and sub-regional coral-reef initiatives" (see ICRI and the International Tropical Marine Ecosystems Management Symposium on Building the Foundation of New ICRI Action).

(ii) Package relevant information from status-of-reefs reports, *Reefs at Risk*, etc., into effective practical materials for general public, the media, private sector and policy makers

3. Policy development / implementation

(i) Use existing policy frameworks to implement the multiple conservation measures outlined in the Renewed Call to Action of the International Coral Reef Initiative, and develop and implement comprehensive local-to-national-scale integrated marine and coastal area management plans that supplement marine protected areas.

Ongoing initiatives

As an example, relevant regional activities within the Wider Caribbean are carried out, *inter alia*, in the framework of:

- The Cartagena Convention and its protocols on oil spills, land-based sources of marine pollution and specially protected areas and wildlife
- Regional ICRI Framework for Action
- Association of Caribbean States (ACS)
- Central American Commission on Environment and Development (CCAD)
- CARICOM

Specific tasks in addition to ongoing initiatives

(i) Assess relevant actions of existing frameworks and how these are directly addressing the integrated marine and coastal areas management, in particular coral-reef issues.

(ii) Integrate in existing policies at the regional and national levels the priority issues identified by ICRI and the International Tropical Marine Ecosystems Management Symposium (ITMEMS).

(iii) Make use of the regional seas programmes and other regional agreement (i.e. shipping, fisheries, trade and land-based sources of marine pollution) as vehicles to develop and implement policies related to coral-reef management and protection.

(j) Identify and institute additional and alternative measures for securing the livelihoods of people who directly depend on coral-reef services.

Ongoing initiatives

Some projects within the CORDIO programme in the Indian Ocean region focus on determining the socio-economic impacts of coral mortality and options for mitigating these through management and development of alternative livelihoods. Development is needed of further target research projects that investigate the impacts of coral bleaching and mortality events on social and economic systems in other regions.

Specific tasks in addition to ongoing initiatives

(i) Compile information on the socio-economic impacts of coral bleaching on communities dependent on coral reefs.

(ii) Support and expand existing projects that assess the impacts of coral bleaching on communities dependent on coral reefs, such as the CORDIO project in the Indian Ocean.

(iii) Develop pilot projects for transitioning dependent communities to alternative and sustainable livelihoods.

(k) Initiate efforts to develop joint actions among the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, and the Convention on Wetlands to:

(i) Develop approaches for assessing the vulnerability of coral-reef species to global warming;

(ii) Build capacity for predicting and monitoring the impacts of coral bleaching and related mortality;

(iii) Identify approaches for developing response measures to coral bleaching;

(iv) Provide guidance to financial institutions, including the Global Environment Facility (GEF), to support such activities.

Ongoing initiatives

(i) The Executive Secretary has transmitted the view to the United Nations Framework Convention on Climate Change (UNFCCC) that there is significant evidence that climate change is a primary cause of the recent and severe extensive coral bleaching, and that this evidence is sufficient to warrant remedial measures being taken in line with the precautionary approach. In this regard, the Secretariat of the Convention on Biological Diversity, the Secretariat of the UNFCCC, and the Intergovernmental Panel on Climate Change (IPCC) have initiated dialogue to explore the integration of biological diversity concerns into the implementation of the UNFCCC and its Kyoto Protocol.

(ii) GEF Caribbean project on climate change adaptation (CPACC project).

Specific tasks in addition to ongoing initiatives

(i) Promote and implement joint work plans with other relevant agreements, organizations and initiatives, including the Commission on Sustainable Development, FAO, regional seas conventions and action plans, regional trade and economic organizations, the Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-based Activities, ICRI and the Man and Biosphere Programme. In particular, assess and coordinate activities that have been agreed within multilateral environmental agreements about coral reefs.

(ii) Gather the outputs of the Caribbean GEF project on climate change adaptation (CPACC project) as a contribution to activities (k) (i)-(iv) above, and disseminate relevant findings through the clearing-house mechanism and other mechanisms.

(iii) Further development of response measures to coral bleaching and potential guidance to financial institutions, including the GEF may be needed.

(l) Encourage FAO and regional fisheries organizations to develop and implement measures to assess and mitigate the impacts of sea-surface temperature rise on fisheries.

Specific tasks

(i) Investigate potentially deleterious effects of changes in oceanographic patterns and resulting impacts on target fish stocks resulting from sea-surface temperature rise.

(ii) Establish no-fishing zones and limitation on fishing gear to protect breeding grounds and provide fish with a refuge.

(iii) Enforce legislation prohibiting destructive fishing practices that further damage coral-reef ecosystems.

(iv) Investigate strategies for management of coral-reef fisheries that are demonstrably sustainable with respect to fished stocks and the ecosystems that produce them (in collaboration with FAO).

(m) Emphasize that coral bleaching can be monitored as an early warning of the impacts of global warming on marine ecosystems and that the collapse of coral-reef ecosystems could impact ecological processes of the larger marine system of which coral reefs are a part.

Specific tasks

(i) Recognizing that coral bleaching is a cumulative stress response (i.e. global warming is the most widespread stressor, but known human induced stresses exacerbate events), develop education programmes addressing an ecosystem approach to coral-reef management and the relation between ecological parameters of coral reefs, sea-surface temperature rise and other human-induced stresses.

(ii) Investigate the relationship between coral-bleaching events and long-term meteorological data.

(iii) Develop educational programmes on the relationship between coral reefs and larger marine systems (e.g. impacts of coral-reef loss on fisheries, local communities etc).

(n) Emphasize the interdependencies and uncertainties in the relationships among marine, terrestrial, and climatic systems.

4. Financing

(o) Mobilize international programmes and mechanisms for financial and technical development assistance, as well as national and private sources to support implementation.

Specific tasks

(i) Promote programmes that identify the relationships among financial and technical development assistance and environmental project funding.

(ii) Identify financial and technical assistance mechanisms of national and private sources to assistance communities impacted by coral bleaching.

Ways and means: Activities under this operational objective will be implemented primarily at the national and regional levels under the guidance of the Executive Secretary and SBSTTA, and in collaboration with relevant organizations and agencies, recognizing the value of the capacity established through ICRI and its operational units.

Timing of expected outputs: 2000 onwards (minimum three-year time schedule)

Annex II

DRAFT ELEMENTS OF A WORK PLAN ON PHYSICAL DEGRADATION AND DESTRUCTION OF CORAL REEFS

Objective (to be integrated into the programme of work on the biological diversity of marine and coastal ecosystems as operational objective 2.4): To assess the biological and socio-economic consequences of physical degradation and destruction of coral reef ecosystems; and to identify and promote management practices, methodologies and policies to reduce and mitigate impacts upon marine and coastal biological diversity and to restore and rehabilitate damaged coral reefs.

Activities

(a) *Assessments and indicators*. To provide a comprehensive analysis of the status and trends of global coral-reef ecosystems, including determination of indicators for continued monitoring and determination of ecological and socio-economic impacts of coral-reef degradation and destruction.

(b) *Management*. To identify management practices, technologies and policies that promote the conservation and sustainable use of coral-reef ecosystems and their associated marine biological diversity, with a view to addressing recognized threats (i.e., overfishing, coastal development, destructive fishing practices, land-based pollution, marine-based pollution and recreational use) and identifying sustainable management approaches.

(c) *Capacity-building*. To strengthen the capacities of Parties, regions, local communities and other stakeholders, to manage sustainably coral-reef ecosystems and their associated marine biological diversity so as to maintain their ecosystem benefits and to promote awareness and responsible action to prevent and mitigate physical degradation and destruction of coral reefs and its effects on marine biological diversity.

(d) *Financing*. To recognize and promote existing programmes and mobilize further mechanisms for financial and technical development assistance to support implementation of activities addressing the physical degradation and destruction of coral reefs.

(e) *Education and public awareness*. To educate and inform the public, policy makers and other stakeholders of ecological and socio-economic values of coral-reef ecosystems and the importance of an ecosystem approach towards their conservation and sustainable management.

Ways and means. Activities under this operational objective will be implemented primarily at the national and regional levels under the guidance of the Executive Secretary and SBSTTA, and in collaboration with relevant organizations and agencies, recognizing the value of the capacity established through ICRI and its operational units.

Item 3.4 of the provisional agenda: Biological diversity of inland water ecosystems - progress report on the implementation of the programme of work (UNEP/CBD/SBSTTA/6/5 and Add.1)

The Subsidiary Body on Scientific, Technical and Technological Advice

1. *Takes note* of the progress report on the implementation of the programme of work on biological diversity of inland water ecosystems (UNEP/CBD/SBSTTA/6/5 and Add.1);

2. *Recommends* that the Conference of the Parties endorses the incorporation of the following elements in the programme of work of biological diversity of inland water ecosystems in the light of the report of the World Commission on Dams *Dams and Development: A New Framework for Decision-Making*, released on 16 November 2000:

(a) Under the heading "Watershed management" (paragraph 9 (a) of the programme of work):

> "(iii) Make use of, as appropriate, the strategic priorities and guidelines in the final report of the World Commission on Dams as tools to incorporate social, environmental (including biological diversity), technical, economic and financial issues in the process of decision-making for water and energy development and the planning and operation of dams."

(b) Under the heading "Environmental impact assessments" (paragraph 9 (g) of the programme of work):

> "(iii) Encourage environmental flow assessment as an integral part of the impact assessment process for dams to ensure release of the environmental flow to maintain downstream ecosystem integrity and community livelihoods. Make use of, as appropriate, the guidelines of the World Commission on Dams on "Environmental flow assessment" and "Maintaining productive fisheries".
>
> "(iv) Encourage launching baseline ecosystem assessments for rivers where dams are currently in the planning phase to ensure that the necessary basic data will be available to support the environmental impact assessment process and the development of effective mitigation measures when the projects reach this stage."

Item 4 of the provisional agenda: Invasive alien species (UNEP/CBD/SBSTTA/6/6, UNEP/CBD/SBSTTA/6/7 and UNEP/CBD/SBSTTA/6/8)

The Subsidiary Body on Scientific, Technical and Technological Advice

I. PROGRESS REPORT ON MATTERS IDENTIFIED IN DECISION V/5, PARAGRAPHS 5, 11 AND 14, AND AN ANALYSIS OF NATIONAL REPORTS

1. *Requests* the Executive Secretary, to consider the comments received on the interim guiding principles and, in consultation with relevant organizations, develop proposed wording for guiding principles for consideration by Conference of the Parties at its sixth meeting;

2. *Invites* Parties that have not provided their national reports in response to paragraph 8 of decision V/19 to do so as soon as possible, and to continue to provide case-studies, for dissemination through the clearing-house mechanism.

II. COMPREHENSIVE REVIEW ON THE EFFICIENCY AND EFFICACY OF EXISTING MEASURES FOR THE PREVENTION, EARLY DETECTION, ERADICATION AND CONTROL OF INVASIVE ALIEN SPECIES

Having reviewed the note by the Executive Secretary on the comprehensive review on the efficiency and efficacy of existing measures for the prevention, early detection, eradication and control of invasive alien species,

1. *Notes* gaps and inconsistencies among existing measures to address the threats of invasive alien species to biodiversity;

2. *Notes* relevant tools to address the threats of invasive alien species to biodiversity, including risk assessment procedures;

3. *Notes* existing terminology and *decides* to compile a non-legally binding list of terms most commonly used.

III. OPTIONS FOR FUTURE WORK

Recommends that the Conference of the Parties, at its sixth meeting:

With regard to the Guiding Principles for the implementation of Article 8(h)

Recognizing that invasive alien species represent one of the primary threats to biodiversity, especially in fragile ecosystems including those that have been geographically and evolutionary isolated, such as small island developing States; and that risks may be increasing due to increased global trade, transport, tourism and climate change;

Reaffirming that full and effective implementation of Article 8(h) is a priority,

1. *Adopts* the Guiding Principles;

2. *Urges* Parties, other Governments and relevant organizations to promote and implement the Guiding Principles;

With regard to the development of an international instrument

Acknowledging the contribution to the implementation of Article 8(h) of existing international instruments, such as the International Plant Protection Convention (IPPC), and relevant international organizations such as the Office International des Epizooties, the regional plant protection organizations, the Food and Agriculture Organization of the United Nations (FAO), the International Maritime Organization (IMO), the World Health Organization (WHO) and other international organizations that develop relevant standards and agreements,

Noting, however, in the light of the comprehensive review of the efficiency and efficacy of existing legal instruments applicable to invasive alien species, that there are certain gaps and inconsistencies in the international regulatory framework from the perspective of the threats of invasive alien species to biological diversity;

3. *Recommends* that Parties and other Governments, as appropriate, ratify the revised International Plant Protection Convention;

4. *Welcomes* the preparation by the International Maritime Organization of an international instrument to address the environmental damage caused by the introduction of harmful aquatic organisms in ballast water;

5. *Invites* the International Plant Protection Convention (IPPC), the Office International des Epizooties, the Food and Agriculture Organization of the United Nations (FAO), the International Maritime Organization (IMO), the World Health Organization (WHO) and other relevant international instruments and organizations, as they elaborate further standards and agreements, or revise existing standards and agreements, including for risk assessment/analysis, to consider incorporating criteria related to the threats to biological diversity posed by invasive alien species; and *invites* such instruments and organizations to report on any such ongoing, planned, or potential initiatives;

6. *Decides* to consider further, the need for, and, as appropriate modalities of, additional instruments, to address specific gaps in the international regulatory framework from the perspective of the threats of invasive alien species to biological diversity, and [*requests* SBSTTA] [*establishes* a [expert][working] group] to provide advice on this matter, and to report back to the Conference of the Parties at its seventh meeting, taking into account further relevant information arising from the implementation of the present decision;

With regard to other options:

Reaffirming the importance of national invasive alien species strategies and action plan, and of international collaboration to address the threats to biodiversity of invasive alien species,

Noting the range of measures (UNEP/CBD/SBSTTA/6/7) and the need to strengthen national capacities and international collaboration,

(a) National invasive alien species strategies and action plans

7. *Urges* Parties and other Governments, in implementing the Guiding Principles, and when developing, revising and implementing national biodiversity strategies and action plans to address the threats posed by invasive alien species, to:

(a) Identify national needs and priorities;

(b) Review, in the light of the Guiding Principles, relevant policies, legislation and institutions to identify gaps, inconsistencies and conflicts, and, as appropriate, adjust or develop policies, legislation and institutions;

(c) Enhance cooperation between the various sectors that might provide pathways or vectors for the unintended transfer of invasive alien species, in order to improve prevention, early detection, eradication and/or control of invasive alien species, and in particular, ensure communication between focal points of respective relevant international instruments;

(d) Promote awareness of the threats to biological diversity and related ecosystem goods and services posed by invasive alien species and of the means to address such threats, to policy makers at all levels of government, and in the private sector; quarantine, customs and other border officials; and the general public;

(e) Facilitate the involvement of all stakeholder groups, including in particular local and indigenous communities and the private sector, in national invasive alien species strategies and action plans, and in decisions related to the use of alien species that may be invasive; and

(f) Collaborate with neighbouring countries, and other countries, as appropriate, in order to address threats of invasive alien species to biological diversity in ecosystems that cross international boundaries, to migratory species, and to address matters of common regional interest;

8. *Encourages* Parties and other Governments, in undertaking this work and, in particular, when developing priority actions, to consider the need to:

(a) Develop capacity to use risk assessment/analysis to address threats of invasive alien species to biological diversity, and incorporate such methodologies in environmental impact assessments, and strategic environmental assessments, as appropriate and relevant;

(b) Develop economic incentives, and other policies and tools, to promote activities to reduce the threat of invasive alien species;

(c) Integrate national strategies and action plans that address the threats of invasive alien species, into national biodiversity policies, strategies and action plans, and into sectoral and cross-sectoral policies, strategies and plans, taking into account the ecosystem approach;

(b) International cooperation

9. *Urge*s Parties, Governments and relevant organizations, to consider the potential effects of global change on the risk of invasive alien species to biodiversity, and related ecosystem goods and services, and, in particular:

(a) *Invites* the United Nations Framework Convention on Climate Change to consider this matter when it considers measures for adaptation to and mitigation of climate change;

(b) *Invites* the World Trade Organization, through its Committee on Trade and the Environment, to take into account the impacts of trade and trade liberalization; and

(c) *Invites* the Food and Agriculture Organization of the United Nations, the World Health Organization, the United Nations Development Programme, the United Nations Environment Programme, the World Bank and other development agencies to consider the impacts of land-use change, agriculture, aquaculture, forestry, health and development policies and activities;

10. *Invites* the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar), the Convention on the Conservation of European Wildlife and Natural Habitats, the World Heritage Convention, and the Man and the Biosphere Programme of the United Nations Educational, Scientific and Cultural Organization, in collaboration with relevant organizations to promote further the implementation of Article 8(h) within their mandates, *inter alia*, through the development of guidance, best practices and pilot projects that address the threats of invasive alien species to particular sites or habitats, including means to enhance the capacity of ecosystems to resist or recover from alien species invasions;

11. *Urges* Parties, Governments and relevant organizations, at the appropriate level, with the support of relevant international organizations to promote and carry out, as appropriate, research and assessments on:

(a) The impact of alien invasive species on biological diversity;

(b) The socio-economic implications of invasive alien species particularly the implications for indigenous and local communities;

(c) The development of environmentally benign methods to control and eradicate invasive alien species, including measures for use in quarantine and to control fouling of ship-hulls.

(d) The costs and benefits of the use of biocontrol agents to control and eradicate invasive alien species;

(e) Means to enhance the capacity of ecosystems to resist or recover from alien species invasions;

(f) Priorities for taxonomic work, *inter alia*, through the Global Taxonomy Initiative (see UNEP/CBD/SBSTTA/6/6, paras. 94 and 95); and

(g) Criteria for assessing risks from introduction of alien species to biological diversity at the genetic, species and ecosystem levels;

12. *Requests* the Executive Secretary to compile information on topics listed under paragraph 11 above, in collaboration with relevant organizations;

13. *Urges* Parties, Governments and relevant organizations, at the appropriate level, to develop and make available technical tools and related information to support efforts for the prevention, early detection, eradication and/or control of invasive alien species:

14. *Requests* the Executive Secretary, within the availability of resources, and in collaboration with relevant organizations to support the development and dissemination of technical tools and related information on the prevention, early detection, eradication and/or control of invasive alien species through, *inter alia*:

(a) Compilation and dissemination of case-studies submitted by Parties, other Governments and organizations, best practices and lessons learned, drawing upon, as appropriate, tools listed in information document UNEP/CBD/SBSTTA/6/INF/2 and the "toolkit" compiled by the Global Invasive Species Programme (UNEP/CBD/SBSTTA/INF/10);

(b) Further compilation and preparation of anthologies of existing terminology used in international instruments relevant to invasive alien species, and to develop, and update as necessary, a non-legally binding list of terms most commonly used;

(c) Compilation and making available lists of procedures for risk assessment/analysis which may be relevant in assessing the risks of alien invasive species to biodiversity, habitats and ecosystems;

(d) Identification and inventory of existing expertise relevant to the prevention, early detection, eradication and/or control of invasive alien species, which may be made available to other countries, including the roster of experts for the Convention on Biological Diversity;

(e) Development of databases and facilitate access to such information to all countries, *inter alia*, through the clearing house mechanism;

(f) Development of systems for reporting new invasions of alien species and the spread of alien species into new areas;

15. *Requests* the Executive Secretary when reporting on the thematic work programmes of the Convention to report specifically on how the threats and impacts of invasive alien species will be addressed;

16. *Considers the need* for arrangements to provide financial resources, in accordance with Articles 20 and 21 of the Convention, for activities and capacity building, particularly in developing countries and countries with economies in transition paying particular attention to the needs of the least developed countries and small island developing States.

Item 5.1 of the provisional agenda: Scientific assessments - development of methodologies and identification of pilot studies (UNEP/CBD/SBSTTA/6/9 and Add.1)

The Subsidiary Body on Scientific, Technical and Technological Advice

1. *Decides* to initiate a number of small-scale pilot scientific assessment projects from among those listed below to be undertaken in preparation for the sixth meeting of the Conference of the Parties, in accordance with paragraph 29 (b) of decision V/20, in order to: (i) advance assessments on some priority issues that have been already identified, and (ii) test a range of methods and modalities for assessments:

(a) A pilot assessment using an ad hoc technical expert group and the roster of experts under the Convention, for example, on special issues related to forest biological diversity;

(b) Rapid assessment on an urgent issue, for example, the integration of biological diversity considerations in the implementation of the United Nations Framework Convention on Climate Change and its Kyoto Protocol, drawing upon expertise in the Intergovernmental Panel on Climate Change (IPCC), as well as the roster of experts under the Convention on Biological Diversity;

(c) A pilot project on the development of rapid assessment methods for the biodiversity of inland waters ecosystems;

(d) A pilot assessment project on the impacts of invasive alien species, building upon the desk study on status and trends prepared for the sixth meeting of SBSTTA;

2. *Decides* to consider the Millennium Ecosystem Assessment as one of the pilot scientific assessment projects referred to in decision V/20, paragraph 29;

3. *Invites* the Millennium Ecosystem Assessment, the Global International Waters Assessment and Forest Resources Assessment, respectively, to integrate the following topics in their work:

(a) The interrelationship between climate change and biodiversity;

(b) Development of an improved picture of inland water biological diversity, its uses and threats; and status and trends of marine and coastal biological diversity;

(c) Further aspects of forest biodiversity as identified by SBSTTA on the basis of the work of the ad hoc technical expert group on forest biological diversity;

4. *Requests* the Executive Secretary to make the necessary arrangements, taking into account available resources, to initiate selected pilot assessment projects, drawing on the project briefs provided in the annex to the present recommendation;

5. *Decides* to consider, at future meetings, the results of these pilot assessments.

Item 5.2 of the provisional agenda: The Global Taxonomy Initiative - draft work programme

As a means to promote the implementation of the Global Taxonomy Initiative (GTI) to address the taxonomic impediment to conservation and management of the world's biodiversity identified in decisions II/2, III/10, IV/I D and V/9, the Subsidiary Body on Scientific, Technical and Technological Advice *recommend*s that the Conference of the Parties:

1. *Endorse*s the draft work programme for the Global Taxonomy Initiative annexed to the present recommendation;

2. *Urges* Parties, Governments, international and regional organizations, and other relevant organizations to promote, and, as appropriate, carry out, the programme of work;

3. *Considers* the need for arrangements to provide financial resources, in accordance with Articles 20 and 21 of the Convention on Biological Diversity, for activities and capacity-building for the implementation of the programme of work.

Annex

PROPOSED PROGRAMME OF WORK FOR THE GLOBAL TAXONOMY INITIATIVE

A. Overall objectives

1. What has the Conference of the Parties asked the GTI to be?

1. Decision III/10 on Identification, Monitoring and Assessment, established the need for specific action under the Convention in capacity building in taxonomy, through the endorsement of recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).

2. In decision IV/1 D, the Conference of the Parties endorsed, as initial advice, a set of Suggestions for Action to develop and implement a Global Taxonomy Initiative. The Conference of the Parties stressed the urgent need for the further implementation of recommendation II/2 of the Subsidiary Body on Scientific, Technical and Technological Advice concerning capacity-building in all fields of taxonomy to assist in the implementation of the Convention, through the incorporation of targeted actions in its work plan, including promoting regional activities to set regional agendas.

3. In decision V/9 the Conference of the Parties have adopted a range of activities for the GTI, including the preparation of a work programme for the Global Taxonomy Initiative defining timetables, goals, products and pilot projects. The format adopted has taken into account that provided in decision V/20 on operations of the Convention, which specifies the following parameters:

(a) Planned activities;

(b) The expected products;

(c) The timing of each of these activities and products;

(d) The actors carrying out these activities and cooperation with relevant organizations;

(e) The mechanisms used to realize and/or support the goals and activities, or to generate the expected products; and

(f) Financial, human-resource and other capacity requirements.

4. In addition the Conference of the Parties has urged that "pilot projects" for the GTI be submitted to the Executive Secretary and the Global Taxonomy Initiative coordination mechanism by Parties, Governments and relevant organizations by 31 December 2001 (decision V/9).

2. What should the GTI achieve?

5. The GTI should seek to provide the key information required for the implementation of the Convention on Biological Diversity, particularly Article 7 on Identification and Monitoring, through

increasing the fundamental biological data essential to underpin the conservation, sustainable use and equitable sharing of the benefits from the utilization of biological diversity. That is, to address the problems of insufficient knowledge of all components of biological diversity (including their classification, description, value and function) and lack of taxonomic capacity, to overcome what has been termed "the taxonomic impediment".

6. In formulating the programme of work to achieve this end the GTI should provide the global platform to help accelerate current taxonomic efforts in areas identified as high priority by countries and regional groupings of countries.

7. The proposed GTI programme of work has been designed to focus on supplying the needed taxonomic information to support the major work areas of the Convention, and the need to support capacity building to ensure the ability of countries to undertake the priority taxonomic work required to implement the Convention.

8. This programme of work is proposed to fulfil the following functions:

(a) To contribute to the implementation of the Convention's strategic plan (in preparation).

(b) To set operational objectives with clear expected outputs and ways and means through which to achieve the set objectives;

(c) To provide the rationale for the choice of the operational targets, with indications of opportunities for further elaboration of the programme of work; and

(d) To serve as a guide to all biodiversity stakeholders on specific objectives to which they can contribute or collectively; at the local, national or international level.

3. Operational objectives

9. In considering the following five operational objectives, it will be necessary to address capacity building specifically with regard to human resources, system and infrastructure needs in taxonomy, at the local, national, regional and global levels.

Operational objective 1: Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention.

Operational objective 2: Provide focus to help build and maintain the human resources, systems and infrastructure needed to collate and curate the biological specimens that are the basis for taxonomic knowledge.

Operational objective 3: Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

Operational objective 4: Within the work on cross cutting issues of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

Operational objective 5: Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring countries of origin gain access to information concerning elements of their biodiversity.

10. Diagram 1 summarizes the rationale and linkages between the above operational objectives.

11. It is important to note that the planned activities described in sections B and C below are designed to be mutually reinforcing in achieving the overall objective of the GTI, and outputs from one objective will help facilitate greater achievement of the other activities.

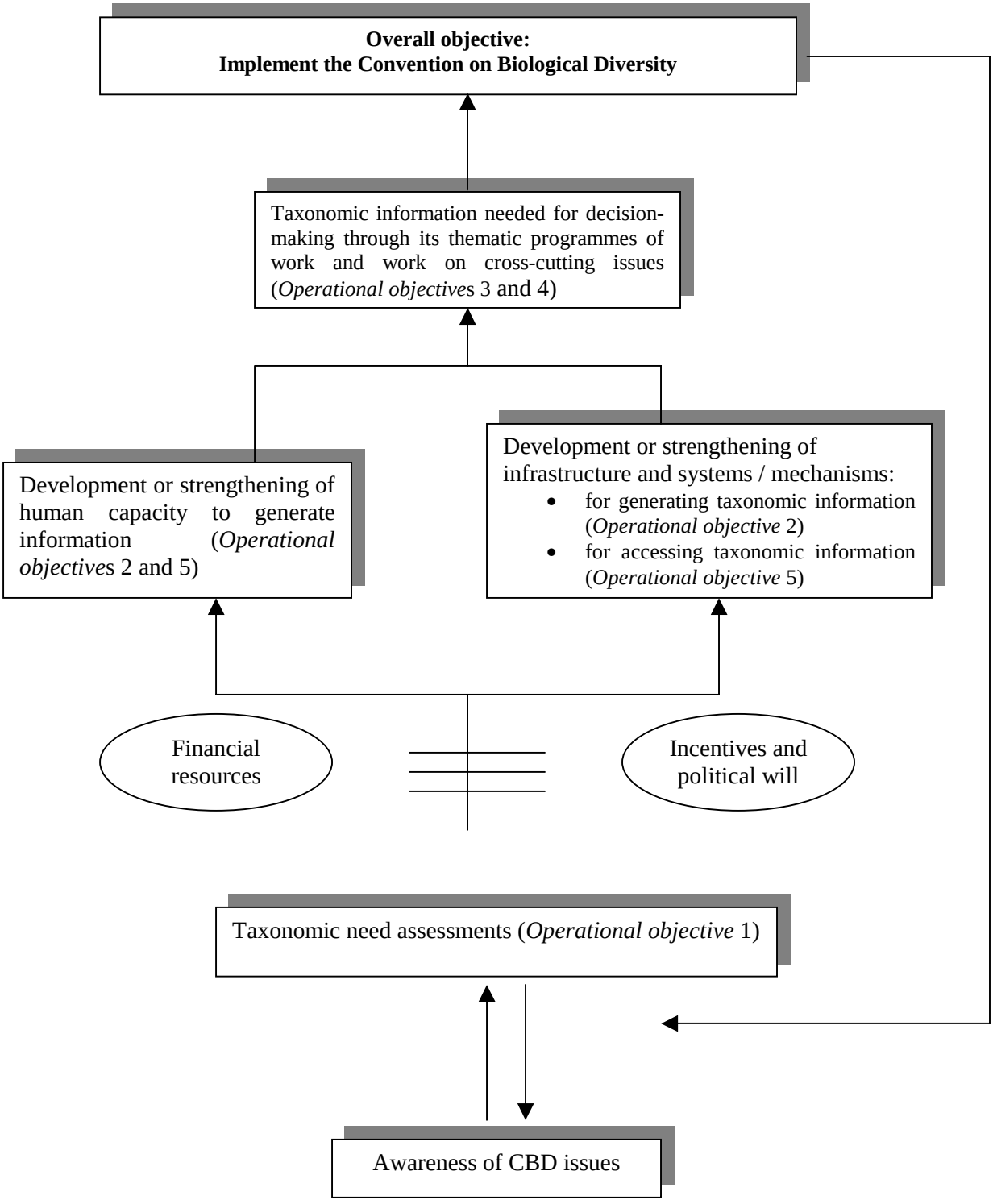

Diagram 1. Rationale and linkages between the five operational objectives of the proposed programme of work

B. *Taxonomic needs assessments at the national, regional and global levels*

1. Operational objective 1 - Assess taxonomic needs and capacities at national, regional and global levels for the implementation of the Convention

1.1. Planned activity 1: Country-based taxonomic needs assessments and identification of priorities

(i) Rationale

The COP in decision IV/1 D recognized the need for each country to conduct a national taxonomic needs assessment. Furthermore in Decision V/9 the COP urged Parties, Governments and relevant organizations to undertake as a priority activity, assessments of national taxonomic capacity to identify and, where possible, quantify national and regional-level taxonomic impediments and needs. Assessments should be undertaken within the framework of undertaking the necessary planning to produce or update national biodiversity strategies and action plans under the Convention. To this end the needs assessments will be required to clearly articulate how the lack of taxonomic information and/or capacity is an impediment to the implementation of national biodiversity strategies and action plans.

The GEF has been requested to support developing countries in undertaking the necessary needs assessments upon which to base action (Decision III/5 provides additional guidance to the GEF to provide financial resources to developing countries for country-driven activities and programmes, targeting capacity-building, including taxonomy, to enable developing countries to develop and carry out an initial assessment for designing, implementing and monitoring programmes. Dec V/9 urges eligible Parties and consortia of eligible Parties to seek resources for the agreed priority actions, including needs assessments through the financial mechanism).

(ii) Outputs

Each country would provide through their national biodiversity strategies and action plans, as well as through national reports to the COP, a report on their taxonomic capacity and priority needs, which would then be disseminated through the Convention's clearing-house mechanism.

(iii) Timing

Decision V/9 the COP urged Parties, Governments and relevant organizations to undertake this priority activity but did not set a specific timeframe. As this is a fundamental part of the process of clearly identifying solutions to current lack of capacity it is very important, where possible, for all countries to complete their needs assessment by October 2001 for compilation by the Executive Secretary for consideration by the sixth meeting of the Conference of the Parties.

(iv) Actors

National Governments with the support of national and international organizations and institutions as needed, would take primary carriage of this activity. The Executive Secretary would compile completed assessments into an information paper for the sixth meeting of the Conference of the Parties.

(v) Mechanisms

The GEF was requested to provide funds for countries to undertake their needs assessments as part of a broader biodiversity information requirements process. An approach for the development of a standardised framework and instruments will facilitate compilation and comparison of information for baseline assessments and ongoing monitoring. As initial advice a list of issues to be addressed has been developed by DIVERSITAS, and was provided to the fourth meeting of SBSTTA (UNEP/CBD/SBSTTA/4/INF/7).

(vi) Financial, human resources and other capacity requirements

National Governments will be required to fund this activity, potentially with additional support from the GEF and donors.

(vii) Pilot projects

The development of guidelines for the preparation of country-based taxonomic needs assessments, with specific advice on the integration within the overall implementation of national biodiversity strategies and action plans, is proposed as a pilot project to be undertaken by a relevant international organization or consortium of organizations.

1.2. Planned activity 2: Regional taxonomic needs assessments and identification of priorities

(viii) Rationale

Ideally country level needs assessments provide the core input into the development of an assessment of regional capacity, the gaps in capacity across the region, and finally the setting of priority actions to fill the gaps. In many regions of the world it will be advantageous to pool resources and to act cooperatively in building taxonomic capacity to support conservation and decision-making. Regional activities in taxonomy have been supported by COP in decisions III/10, IV/1 D and V/9, which all identify regional level activities as a major activity for the GTI. Decision III/10 endorsed recommendation II/2 of the SBSTTA which sought to prioritise strengthening of regional and sub-regional networks for taxonomy, regional collaboration and regional and sub-regional training programmes. Decision IV/1 D stressed the urgent need for the further implementation of recommendation II/2 of the SBSTTA concerning capacity-building in all fields of taxonomy to assist in the implementation of the Convention, through the incorporation of targeted actions in its work plan, including promoting regional activities to set regional agendas. Decision V/9 urged for the identification of national and regional priority taxonomic information requirements. Furthermore Decision V/9 called for short-term activities, including regional meetings of scientists, managers and policy makers to prioritize the most urgent global taxonomic needs and facilitate the formulation of specific regional and national projects to meet the needs identified.

(ix) Outputs

Combined with best available information on national taxonomic needs (if possible national taxonomic needs assessments), regionally agreed plans of action, that provide identified priorities, will provide a clear focus for activities under the GTI. To develop such plans of action regional workshops will be held, under the general guidance of the Executive Secretary and the GTI coordination mechanism. The challenge of the workshops will be to blend academic advice and perspective with country needs to fulfil its obligations under the Convention.

(x) Timing

Two regional workshops, one in Africa and one in Central America, are currently planned for 2001 funded by the Swedish International Development Agency (SIDA). Planning for a workshop in Asia and North America hopefully to also be held in 2001 has begun.

Ideally the GTI should endeavour to hold all regional workshops by the end of 2001, preferably by October 2001 as input to discussion in COP-6.

(xi) Actors

National governments, taxonomic institutions and global, regional and bilateral funding agencies are the main actors in the development of regional taxonomic needs assessments and priorities.

(xii) Mechanisms

Existing or proposed regional biodiversity projects, as well as national biodiversity strategies and action plans will provide a key mechanism for identification of the most urgent taxonomic information requirements at the regional level. The development of regional taxonomic needs assessments and priorities is best facilitated through regional workshops supported by prior research into country level capacity, compiled into regional syntheses. Active regional networks of taxonomists would be best placed to facilitate the compilation of national needs assessments into cohesive regional syntheses.

(xiii) Financial, human resources and other capacity requirements

The government of Sweden has agreed to fund two regional workshops in 2001. Additional workshops in Asia, North America and Europe are being actively discussed, though no identified sources of funding have been agreed at this stage.

(xiv) Pilot projects

Existing or proposed activities (or elements of activities) in some regions could be considered as pilot studies in the preparation of regional based taxonomic needs assessments, such as SABONET and SAFRINET in southern Africa, and BOZONET in Eastern Africa. However these existing activities need to be broadened to include all taxa, as well as input from the full range of biodiversity stakeholders needing taxonomic information. It is intended that the outputs from each regional workshop will be shared with all future workshops in order to facilitate clear and unambiguous, readily achievable pilot projects.

1.3. Planned activity 3: Global taxonomic needs assessment

(i) Rationale

Given the nature of taxonomic activity, and the lack of knowledge of key groups of organisms with global distributions of importance to humankind and biodiversity concerns, a global dimension is critical. It is widely recognized that generally there is very little data available on global diversity and distribution patterns, and where it does exist it is usually in non-standardised formats that may restrict its usefulness. Agreed global cooperation to finalise taxonomic work on globally important groups should involve both developed and developing countries, and will provide a major input into development of capacity building initiatives. The global taxonomic needs assessment can result from a compilation of the regional taxonomic needs assessments, with activity to provide some agreed priority actions that can be undertaken at the global level.

(ii) Outputs

A concise global plan of action using the outputs from the regional workshops, with the advice and support of international organizations and the GTI Coordination Mechanism.

(iii) Timing

A draft global plan of action on priority groups for study should be finalized by October 2001, as input to discussions at the sixth meeting of the Conference of the Parties.

(iv) Actors

National governments, taxonomic institutions and global, regional and bilateral funding agencies are the main actors in the development of global taxonomic needs assessments and priorities. At the global level organisations such as but not limited to, FAO, IUCN, UNEP-WCMC, UNESCO, the Ecosystem Conservation Group (ECG), and programmes such as BioNET INTERNATIONAL, DIVERSITAS, GBIF, Species 2000, and Systematics Agenda 2000 International among others, will also have key roles to play.

(v) Mechanisms

A workshop focusing on global level taxonomic priorities should be organized, perhaps through the Ecosystem Conservation Group and GBIF. The taxonomic requirements of the Millennium Ecosystem Assessment should be a significant focus of setting global priorities. Such a workshop could be held in a developing country to highlight their special needs.

(vi) Financial, human resources and other capacity requirements

Funding should be sought for this activity from Parties, the GEF and key intergovernmental and non-governmental science based institutions interested in this activity.

(vii) Pilot projects

Some pilot projects already exist that address some elements of this activity, such as ECOPORT, Species 2000, and the developing GBIF projects.

1.4. Planned activity 4: Public awareness and education

(i) Rationale

The need to raise awareness and to educate on the importance of taxonomy to underpin the Convention is critical to the success of the Global Taxonomy Initiative, and within the programme of work it is necessary to identify and target those groups who would benefit from increased awareness and education. In developing a public awareness and education package it will be necessary to balance between the needs for formal education as well as the need for wider public awareness raising. This activity will best be developed in conjunction with the activity underway following decision V/17 on education and public awareness, jointly by the CBD and UNESCO. This joint activity will provide the focus for public awareness and education on taxonomy within the Convention through the development of a specific module on taxonomy. The module would trial techniques to develop regionally appropriate public awareness tools to help remove the taxonomic impediment, which would be refined in the later stages of the education and public awareness activity under the Convention, and should focus on educational materials for training to facilitate implementation of the Convention.

(ii) Outputs

A package of materials and activities aimed at broadening public understanding of the importance of taxonomy in achieving the objectives of the Convention. Examples could include a brochure on GTI, enhancement of Web pages, tutorials for education managers, popular scientific films etc. A special focus on using the Public awareness activity to acquire new levels of taxonomic information, *inter alia* through public involvement in parataxonomic activity, should form part of these initiatives.

(iii) Timing

Activities will be planned in 2000, and executed in 2001.

(iv) Actors

At the global level this activity could be jointly executed by the CBD Secretariat and UNESCO, but with prime carriage for this project by regional networks in conjunction with key taxonomic institutions that already have considerable experience in public awareness programs, and have indicated willingness to participate in GTI activities.

(v) Mechanisms

Toolkits addressing particular taxonomic issues will be developed by the lead agencies for trial in selected regions of developing and developed countries. A key mechanism will involve participatory activity by local communities to strengthen the training and awareness raising for para-taxonomists.

(vi) Financial, human resources and other capacity requirements

This work element will be undertaken by the joint CBD/UNESCO public awareness activity, with resources added from participating taxonomic institutions.

(vii) Pilot projects

Pilot projects should be developed within the joint CBD/UNESCO public awareness activity. The recent activities of Systematics Agenda 2000 International and BioNET INTERNATIONAL in this area could also be expanded into pilot projects under the GTI.

C. Targeted actions

2. Operational objective 2 - Provide focus to help build and maintain the systems and infrastructure needed to collate and curate the biological specimens that are the basis for taxonomic knowledge.

2.1. Planned activity 5: Global and regional capacity building to support access to taxonomic information

(i) Rationale

A significant impediment to a major increase the world's taxonomic base for the implementation of the Convention, and indeed more effectively utilizing the current taxonomic knowledge lies in the limited capacity in many nations, and the decreasing taxonomic capacity world-wide. A key objective of the GTI should thus be to address the global and regional capacity building needs, particularly of developing countries. There are two main areas of concern that need to be addressed simultaneously:

- Human capacity-building
- Infrastructure capacity building.

Human capacity-building requires major increases in training programmes for taxonomists and para-taxonomists throughout the world, for it is now well established that the "taxasphere", the world's global taxonomic expertise is currently shrinking just at the time when we need it to rapidly advance our knowledge base.

Maintaining and improving the existing taxonomic infrastructure can only be achieved through adequate funding, and new strategies are required to make optimal use of our past investments, while minimising the costs and maximizing the benefits of future investments. Decisions IV/1/D and V/9 of the Conference of the Parties have urged countries to establish or consolidate regional and national taxonomic reference centres. There is a need to explore globally how the best possible outcomes for improving taxonomic capacity can be achieved. The GTI should address at the global and regional levels the coordination of collections infrastructure within countries and regions leading to improvements of long-term infrastructure regionally. Furthermore such strategic planning should therefore encourage the creation or strengthening of national and regional taxonomic reference centres.

(ii) Outputs

Increased human and institutional taxonomic capacity directed at meeting the needs of implementing the Convention.

(iii) Timing

Activities need to begin immediately, and be included in all work elements throughout the programme of work, with priority in covering the major upcoming work areas of the Convention in a timely manner, such that increases in capacity are achieved prior to the major element of work being undertaken.

(iv) Actors

All Governments, international and national funding agencies, biosystematic institutions and taxonomic organizations have a role to play. Within planned activities 1 and 2 above, the development of national and regional taxonomic priorities, detailed regional priorities for capacity building, both human and institutional, should be addressed.

(v) Mechanisms

Decision III/ 10 endorsed the recommendation II/2 of the SBSTTA concerning capacity-building for taxonomy, in which the GEF has been requested to provide funds for training programmes, strengthening reference collections, making information housed in collections available to countries of origin, producing and distributing taxonomic guides, strengthening infrastructure, disseminating taxonomic information *inter alia* through the CHM. The GEF will consider financing strategic components of demonstration projects consistent with the GEF's mandate, operational strategy, and operational programmes. Therefore

in GEF projects, capacity-building in taxonomy should be a component of a larger intervention aimed at the conservation and sustainable uses of biodiversity.

(vi) Financial, human resources and other capacity requirements

The financial and human resources requirements of this activity are substantial. However, through national and regional priority setting it will be possible to take a staged approach to undertaking the work required.

(vii) Pilot projects

Consortia of major institutions should participate in the development of pilot projects to identify priority capacity building activities, through facilitating regional conferences to document existing holdings and by designating lead agencies in a collegiate process to maximizing taxonomic effort across all groups.

SABONET and BioNET INTERNATIONAL are two existing examples of projects that could be considered pilots of a regional and global approach, respectively that could be strengthened to provide greater capacity building activities. The Smithsonian Institution has submitted a potential pilot project on neo-tropical moths that could also be considered for regional capacity building.

2.2. Planned activity 6: Strengthening of existing networks for regional cooperation in taxonomy

(i) Rationale

To facilitate the development of cooperative programmes that increase taxonomic capacity in developing countries through fostering North-South and South-South collaboration.

Taxonomic capacity in terms of both human and institutional capacity varies widely between countries and regions. Although many developed countries have relatively comprehensive reference collections and a number of experts, no single country has a complete taxonomic inventory of national biodiversity, nor experts in all relevant taxonomic groups. In many cases, developing countries have very little or no physical reference collections of local biodiversity, nor trained personnel. Much of the existing reference material from developing countries resides in the expert institutions of the developed world, as do the experts in particular taxonomic groups. However, even in developed countries taxonomy has been under-resourced for many years, leading to a general decline in infrastructure, and a dearth of younger professionals.

In order to facilitate taxonomic capacity building to underpin the CBD, cooperative programmes need to be established and/or strengthened between countries with the expertise and reference materials, and those without. A number of regional networks that facilitate cooperation between countries in building taxonomic capacity in certain taxonomic groups currently exist, e.g. SABONET, a cooperative network between 10 countries in southern Africa focussed on flowering plants. The most comprehensive network currently in existence is BioNET-INTERNATIONAL, the Global Network for Taxonomy. This initiative currently has seven extant sub-regional networks covering some 120 countries, with another four under development, and a further five planned. It is envisaged that these sixteen networks will provide a global coverage of collaborative North-South and South-South networks for taxonomic capacity building. The Global Network for Taxonomy is a donor-funded programme and the rate of network establishment is dependent on adequate continued funding. In establishing sub-regional cooperative networks BioNET-INTERNATIONAL works through official governmental endorsement and comprehensive needs assessment activities to establish regional and national priorities.

(ii) Outputs

A global network ideally comprised of increasingly self-sufficient sub-regional networks that covers all taxa. Whilst the actual capacity building initiatives should have a finite project-based life, ideally the networks themselves would remain in perpetuity once established and underpinned by member country governments.

(iii) Timing

Given that the lack of taxonomic capacity is a severe impediment to countries' abilities to meet their obligations under the Convention on Biological Diversity, and that most taxonomic capacity can readily be shared and utilised across institutional and national boundaries, it follows that building of taxonomic capacity can best be facilitated by sub-regional cooperative networks. Therefore the strengthening and/or building of regional networks should be completed by December 2001, particularly ensuring that existing relevant networks become fully operational across the full spectrum of taxonomic groups, and strategies in place to complete the global coverage.

(iv) Actors

Existing regional and sub-regional networks, with assistance from BioNet INTERNATIONAL and UNESCO could be utilized to build a more complete coverage. These networks should play the role of implementing mechanisms, such that the GTI has access to, and interaction with all relevant taxonomic institutions within a sub-region.

To facilitate this development the expert institutions of the developed world which house the relevant sub-regional taxonomic reference materials and information, and the professional staff with expertise in taxonomic groups from these sub-regions, should be actively involved.

(v) Mechanisms

An agreed strategy on strengthening and building networks to ensure global coverage both geographically and by taxon group is a huge undertaking. Different countries and regions have different levels of capacity, and different taxonomic needs and priorities. Existing sub-regional networks can serve as implementing mechanisms for improving taxonomic capacity in developing countries. These existing networks need to be broadened in scope, and the establishment of the remaining networks currently under development or in the planning stages needs to be undertaken as soon as possible. This will require completion of needs assessments and priority setting for each network, where these do not exist or need updating and/or expansion. Regional taxonomic reference centres that house network reference materials and host the network's Information and Communications System provide a useful mechanism to prevent duplication of infrastructure, but they require sound means of communication to enable all countries involved equal access to the information.

(vi) Financial, human resources and other capacity requirements

Funding will be required to support the work programmes of the individual networks, but the countries themselves need to endorse the operations and specifically the human resource and institutional costs of maintaining, operating and developing such collaborative networks. These costs will depend on the status of each country's capacity and the scope of the work programmes. Such collaborative networks can be cost-savings mechanisms in certain taxonomic groups/areas because of the 'economies of scale' produced by the sharing of taxonomic capacity, and reduce the need for each country to individually attempt to build the needed capacity.

Ideally the networks should have a dedicated full-time secretariat, but depending on needs, they can be operated on a part-time basis by staff already employed within relevant institutions.

Capacity-building in taxonomy necessarily includes the infrastructure capacity to house reference material, together with all of the reference material and equipment to enable identifications.

(vii) Pilot projects

Three pilot projects can be proposed. The first pilot project would work with one of the existing BioNET-INTERNATIONAL networks and evaluate the current structure, mechanisms and operations of the network to assess its ability to expand to fully meet the objectives of the GTI in underpinning the CBD. Currently many of the existing BioNET-INTERNATIONAL networks are focussed on micro-organisms and invertebrates often with an agricultural orientation, and as such would need to be expanded to include all taxon groups and relevant institutions. The second pilot project would be undertaken in partnership

with BioNET-INTERNATIONAL in the establishment of new networks designed to meet the requirements of the Convention. The third project is currently under formulation under the name BOZONET, and is an eastern African taxonomic capacity building project for botany and zoology.

3. Operational objective 3 - Within the major thematic work programmes of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

It is recognized that taxonomy is fundamental to the thematic areas of the CBD through discovery, identification, and documentation of biological diversity. Because there are inadequate global taxonomic resources to meet all demands, it is important to indicate taxonomic priorities within each of the thematic areas of the CBD. [Within existing thematic work programmes, workshops should be conducted in appropriate regions, involving taxonomic experts to identify key taxa for inventory and monitoring programmes].

3.1. Planned activity 7: Forest biological diversity

(i) Rationale

In the annex to decision IV/7 on forest biological diversity containing the Work Programme on forest biological diversity, under programme element 3 on criteria and indicators for forest biological diversity, the following activity is identified: *Taxonomic studies and inventories at the national level, which provide for a basic assessment of forest biological diversity.*

(ii) Outputs

An increased knowledge of the species composition of forests, through national taxonomic studies and inventories. Using this increased knowledge base facilitates selection of criteria and indicators for forest biological diversity and may guide in the selection of sites to be protected and in the valuation of resources.

(iii) Timing

As this activity is carried out at the national level there will be variable timetables globally. The 2nd round of national reports for the implementation of the Convention are due in June 2001, and will provide an opportunity for countries to report on taxonomic studies and inventories carried out at the national level which provide for a basic assessment of forest biological diversity.

(iv) Actors

National governments and institutions will have the main responsibility, with possible advice from ITFF member agencies on methodologies for the development of appropriate criteria and indicators. The active involvement of international organizations such as CIFOR, ICRAF, and IFF will provide useful links between existing initiatives.

(v) Mechanisms

In decision IV/7, the Conference of the Parties agreed that countries would review specific indicators of forest biological diversity derived by the major international processes related to sustainable forest management. Depending on the selection of the criteria and indicators chosen then additional taxonomic studies and inventories will be required.

(vi) Financial, human resources and other capacity requirements

This will be country dependent, and resource requirements and sources will vary.

(vii) Pilot projects

To facilitate the implementation of one element of the Forest Biological Diversity Programme of Work, a pilot project is proposed in the selection of Indicators for below ground diversity in forests in each of the three forest biomes: tropical, temperate, boreal. While there is a need to continue developing knowledge in many components of forest ecosystems, the least known, and highest priority, is the belowground

biological diversity. It is understood that it plays a major role in contributing to the development and the health of the above-ground biological diversity by, for instance, processing nutrients or minerals that are then made available to, and assimilated by, plant biodiversity.

3.2. Planned activity 8: Marine and coastal biological diversity

(i) Rationale

Two major elements of taxonomic work within marine and coastal ecosystems can be considered as high priority for achieving the Convention's objectives in marine and coastal systems, namely ballast water organisms, and key organisms for monitoring the health of mangrove systems through their invertebrate fauna. The ballast water organisms sub-element will require, *inter alia*, a focus on pelagic juvenile stages of benthic organisms. The second element focuses on mangroves, which are among the world's most rapidly changing systems. Within the marine and coastal biodiversity programme of work there is a need to develop taxonomic support for baseline monitoring of invertebrate fauna in mangrove systems.

(ii) Outputs

Identification aids for quarantine and other officials to identify and monitor the introduction of novel marine organisms.

Taxonomic guides to key invertebrate organisms in mangrove systems to aid management of the continuum from natural to disturbed mangrove ecosystems. Taxonomic data will also assist in selecting sites for protected areas and for resource valuation.

(iii) Timing

Within the GloBallast programme timeframe produce basic guides for the identification of major organism groups found in ballast water at major sources.

Within the next three years develop taxonomic guides to the identification of mangrove invertebrate fauna that can be used as indicators of habitat change.

(iv) Actors

The International Maritime Organization (IMO) should take the lead role in the taxonomic work in ballast water, under their GloBallast Work Programme, which would then be integrated with the activities foreseen under the invasive alien species work of the Convention on Biological Diversity, and the GTI programme of work.

International conventions, in particular the Ramsar Convention, and taxonomic institutions with expertise in coastal invertebrates should play a key role in conjunction with national institutions from Parties with significant extent of mangrove ecosystems under threat, in the implementation of the necessary taxonomic work.

(v) Mechanisms

The IMO GloBallast work programme could include a taxonomic component for the identification of marine pelagic taxa, including those with adult benthic forms, which will form a key element of the GTI in the marine environment. The International Society for Mangrove Ecology could facilitate the development of the work element on mangrove invertebrate fauna, including training workshops of key personnel from taxonomic institutions in tropical areas. Three workshops, one in Africa, one in the neotropics and one in Asia have been suggested and are in preparation for 2001 with support from UNESCO. ICRI and its network can assist with regard to coral reefs.

(vi) Financial, human resources and other capacity requirements

The IMO GloBallast programme could provide the appropriate resources for a pilot project involving 6 developing countries.

Funding support is required for the three capacity building workshops as well as appropriate infrastructure support for the mangrove invertebrate taxonomy and production of guides and ICRI work.

(vii) Pilot projects

The GloBallast programme is a pilot project underneath the IMO, with direct relevance to the invasive alien species and GTI programmes of work.

A pilot project focused in south east Asia on mangrove invertebrates, particularly involving Malaysia, Indonesia and Philippines could be developed in conjunction with ICLARM and ISME.

3.3. Planned activity 9: Dry and sub-humid lands biodiversity

(i) Rationale

Decision V/23 on consideration of options for conservation and sustainable use of biological diversity in dryland, Mediterranean, arid, semi-arid, grassland and savannah ecosystems, establishes a programme of work, including, *inter alia*, assessment of the status and trends, identification of specific areas within dry and sub-humid lands of particular value for biological diversity and/or under particular threat, and the further development of indicators. Under each of these activities targeted actions on furthering the knowledge base on the organisms that maintain the crucial soil crust should be developed at national and regional levels, as well as the need for greater knowledge of the micro-organisms in nutrient cycling, and increased taxonomic information of pests and diseases.

Correct identification of crust forming lichens often requires special identification aids and techniques, and the development of such tools are required for increasing the capacity of rangeland managers to understand their function in maintaining dry-land ecosystems. Increasing taxonomic capacity to identify the lichens, and to then develop identification tools is required in many parts of the world. Importantly such identification tools must be designed so that they are capable of being used by rangeland managers to help in identification of key organisms.

(ii) Outputs

Enhanced understanding among agricultural and rangeland managers of lichens as key indicators warning of the advance of soil degradation. This will usually be in the form of loss of particular species from the system. Taxonomic work will need to develop easily used identikits for key soil lichens, algae, soil invertebrates and herbivores that will be the harbingers of change.

(iii) Timing

By the sixth meeting of the Conference of the Parties, have developed identification aids in consultation with appropriate national taxonomy and management agencies.

(iv) Actors

The Convention to Combat Desertification (CCD) and other environmental conventions and their relevant collaborators, international agencies (including CGIAR systems), rangeland managers and national governments.

(v) Mechanisms

Cooperation with CCD and other key players among international organizations

(vi) Financial, human resources and other capacity requirements

To facilitate global and regional cooperation and synergy in this work, a project which could attract funding from the CGIAR system, in conjunction with FAO, can be proposed.

(vii) Pilot projects

A pilot project could be developed between CCD, FAO and UNEP to assess different biological and biochemical indicators of land degradation. This project would require input from a range of taxonomic experts, including algologists and lichenologists. Input would also be required from soil scientists, who can link abiotic information with the taxonomic information obtained. Results can be distilled to a simple

identikit system that will allow local managers to identify key species and determine the health of their arid/semi-arid system.

3.4. Planned activity 10: Inland waters biological diversity

(i) Rationale

As in all other major ecosystems the current status of taxonomic knowledge in inland waters is varied both geographically, and according to the major taxon groups. For the purposes of the GTI targeted activities in rapidly increasing worldwide knowledge of freshwater fish and invertebrates are proposed as high priority.

(ii) Outputs

A series of regional guides to freshwater fish and invertebrates (including adult terrestrial forms where appropriate) as an input to ecosystem monitoring for river and lake health.

(iii) Timing

Produce field-useable regional guides within two years for both professional and public use.

(iv) Actors

National agencies and taxonomic institutions, especially museums should play a principal role in the implementation of this activity. International support and coordination could be provided through UNESCO's key science activity 'Water and Ecosystems'. Parataxonomists, in the form of interested public and school students in a number of countries have been using the technique to monitor aquatic health. This is an area that could be built upon, and maybe also linked through to planned activity 3.4.

(v) Mechanisms

Changes in the species compositions and abundance of macro invertebrates in freshwater systems are now being studied worldwide as part of approaches to monitoring of ecosystem health. A number of key potential partners are possible for this activity, including from developed and developing country perspectives. The Scientific and Technical Review Panel of the Ramsar Convention should also be involved in this project to provide specialist expertise, and a focus on the concept of using taxonomy to help understand ecological change.

(vi) Financial, human resources and other capacity requirements

There is opportunity to build on existing projects here, or assist regional collaboration between existing projects, which would contribute to the implementation of the GTI while simultaneously improving monitoring of ecosystem health.

3.5. Planned activity 11: Agricultural biological diversity

(i) Rationale

Within the programme of work on agricultural biological diversity several areas require taxonomic capacity in order to fully deliver on their objectives. The need for taxonomy ranges from classical taxonomy of the species living in agricultural ecosystems, to the taxonomy of agriculturally important species' wild relatives, to access to existing taxonomic information including basic knowledge on the functional relationships between organisms often recorded by taxonomists.

The need for increasing the world's para-taxonomy base through the training of farmers and on-the-ground ecosystem managers in identification and collection of all aspects of agro-ecosystems is also a highly important component of Integrated Pest Management.

Within the agricultural biodiversity work programme specific taxonomy related activities are envisaged in the following subject areas: pollinators (decision V/5), soil biodiversity (decision V/5), and Integrated Pest Management (IPM) (decision V/5).

As the agricultural biological diversity work programme develops significant taxonomic activities will need to be integrated within the proposals for work.

(ii) Outputs

Outputs would include: easy to use keys to families, genera and species of pollinators; automated identification systems for pollinators; development of standard methods for identification of soil biodiversity to different taxonomic levels; increased knowledge of soil biodiversity to aid in the identification of indicators of below ground biological diversity 'health'; and taxonomic training for farmers and ecosystem managers.

(iii) Timing

Within the agricultural biodiversity work programme the taxonomy related activities are part of the timeframe for the development of the overall activity. Current timeframes are as follows:

- *Pollinators* – A planning meeting is expected to take place in late 2000, with the aim of developing a full project proposal in 2001, including the taxonomic elements, which will be submitted to SBSTTA at its seventh meeting,;
- *Soil biota* – to be developed within the timeframe of the GEF project.

Functional guides and parataxonomy for IPM – A proposal for activities will be developed, as part of the package of work for the seventh meeting of SBSTTA.

(iv) Actors

The FAO has been invited by the Conference of the Parties in decision V/5 to lead the International Pollinators Initiative (IPI), and will prepare a proposal for the development of the IPI for the seventh meeting of SBSTTA.

The Tropical Soil Biology and Fertility (TSBF) Programme hosted by UNESCO in Nairobi are the proposed executing agency for a full-sized GEF project, which includes major taxonomic components for assessing below ground biodiversity.

A possible lead agency for the Functional guides and parataxonomy for IPM is the Global IPM Facility, which is a programme co-sponsored by FAO, UNEP, UNDP and the World Bank, based in Rome.

(v) Mechanisms

The International Pollinators Initiative (IPI) will contain a major taxonomic component, and the project is currently under development.

A major taxonomic element needs to be built into all current and proposed projects dealing with the sustainable use or conservation of agricultural and non-agricultural lands, if we are to advance our knowledge base on the functional aspects of maintaining ecosystem processes.

Within the IPM component of the agricultural biodiversity work programme a scoping exercise should be undertaken to determine where the limitations exist in terms of taxonomic information, from basic alpha-taxonomy of pests and natural enemies, to how the information is presented and distributed. This work can be coordinated through the Farmer Fields Schools, in consultation with the International Agriculture Research Centres (IARC), perhaps through the CGIAR system wide programme on IPM.

(vi) Financial, human resources and other capacity requirements

All three elements require resources to be identified within existing and new projects, as well as additional resources to be made available to increase technical capacity in most countries of the world.

(vii) Pilot projects

A major UNEP project entitled "Conservation and sustainable management of below-ground biodiversity" in seven countries is currently under assessment by UNEP. A pilot project on termites submitted by the Smithsonian Institution could also be considered.

3.6. Planned activity: mountain biological diversity

Development of this activity will be undertaken following discussion of this thematic work area at the seventh meeting of the Conference of the Parties. The GTI Coordination Mechanism could play an important role in proactively defining taxonomic needs related to this planned thematic activity.

4. Operational objective 4 - Within the work on cross-cutting issues of the Convention include key taxonomic objectives to generate information needed for decision-making in conservation and sustainable use of biological diversity and its components.

4.1. Planned activity 12: Access and benefit-sharing

(i) Rationale

The Conference of the Parties, in its decision V/26, identified " Assessment and inventory of biological resources as well as information management" as key capacity building needs with respect to access and benefit sharing arrangements. Indeed, the inventory of biological resources could provide useful information in view of the elaboration of measures regarding access to genetic resources and the equitable sharing of benefits arising from their exploitation. In order to carry out this inventory, increased capacity is often needed at the country level. The primary goal of the GTI is to assist countries in carrying out this inventory in a timely and efficient manner. A major element in increasing capacity to properly inventory and access biological resource information is effective information management. Therefore a key element of the Global Taxonomy Initiative must be the development of appropriate IT tools to allow access to existing data, as well as to provide efficient entry of new information generated from any increased knowledge.

Further each country can develop its capacity to properly inventory, collect, classify, and then commercialize its biological resources, the greater will be the return of benefits to that country. These four elements (inventory, collection, classification, commercialisation) can be seen as a hierarchy of increasing capacity. The Global Taxonomy Initiative will concentrate on developing capacity in the collection and classification of biodiversity. The Global Taxonomy Initiative should include projects designed to develop capacity in collecting and maintaining biological collections, as well as the proper classification and knowledge of the biological resources. This will then provide the foundation for the commercialisation of specific elements of the biodiversity. By increasing in-country capacity in collection and classification, the Global Taxonomy Initiative may provide new market opportunities in the commercialisation of biological resources based on equitable benefit sharing arrangements. In addition, taxonomic information including specifically at the genetic level will be critical in tracing the origin of resources and living modified organisms (LMOs).

Increasing access to existing information on biological resources outside of the country of origin has also been highlighted as a major element of the Global Taxonomy Initiative. In decision V/26 the COP urges countries to adopt measures that are supportive of efforts to facilitate access to genetic resources for scientific, commercial and other uses, and associated knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant to the conservation and sustainable use of biological diversity.

The first step in facilitating access is provision of information, and the parties have agreed in decision IV/1 D to a series of actions that would increase access to information world-wide. Operational objective 5 of this work plan sets out a plan to begin to address this issue.

(ii) Outputs

Interactive catalogues of material available, linked to taxonomic collections in herbaria and museums. Taxonomic support, including at the molecular level, to provide clear identification of specimens in the *ex-situ* collections, especially in developing countries is needed.

A series of country driven projects could be carried out, combining the development of basic taxonomic capacity and an improved information base on biological resources.

These would assist in developing better linkages between existing initiatives that provide information electronically on genetic resources, as well as new projects to improve the access to, and range of, publicly available taxonomic information. In turn, a basis for the commercialization of components of that biological diversity would be provided.

(iii) Timing

Progress in global networking between countries and taxonomic institutions holding significant *ex-situ* collections should be accelerated within a 5 year timeframe.

Development of pilot projects should occur as soon as possible in 2001.

(iv) Actors

National (and international) culture collections, including microbial collections. The CGIAR system should be involved to select priorities for needed taxonomic effort.

Taxonomic institutions in many countries contain significant holdings of *ex-situ* materials from other countries, and in particular from developing countries. Botanic Gardens hold both dead and live material, that may be of considerable interest to the country of origin of that material, and may also develop new or improved conservation techniques that could aid countries of origin in their conservation and sustainable use efforts.

The Commission on Plant Genetic Resources could play a key partnership role.

(v) Mechanisms

One of the first most important measures any country can take to encourage the sustainable use of its resources and ensure proper sharing of benefits derived from their exploitation is through developing knowledge regarding their own biodiversity, and in particular full cataloguing of their diversity. Through acknowledging the importance of developing taxonomic capacity and adopting a series of suggested actions and priority activities (COP decision IV/1 D and decision V/9), the COP has clearly indicated to Parties, Governments, relevant organizations, the major work that needs to be undertaken to build taxonomic capacity within countries.

The basic mechanism for undertaking these actions and activities is through country driven projects at the national, regional and subregional levels, which are to be implemented with the assistance of developed and developing country institutions that house *ex situ* collections (i.e., herbaria, botanic gardens, museums and zoos), and the financial mechanism. These country driven projects need to be developed to clearly show how the development of basic taxonomic capacity leads to an improved knowledge base and understanding of the biological resources held by the country, which can then be used to attract the necessary investment in the full range of commercial uses of components of that biological diversity.

To achieve tangible results in the short term will require the promotion of a series of projects that have existing support from within both developing and developed world institutions, that clearly lead to a conservation or sustainable use outcome. A major action plan should be developed with FAO, CGIAR system and BioNET INTERNATIONAL as the key IGOs and NGO.

(vi) Financial, human resources and other capacity requirements

Capacity building of taxonomic institutions is a costly and ongoing matter, and strategic input to significantly help conservation and sustainable use efforts must be based on those areas where useful outcomes can be demonstrated in the short to medium term. Hopefully by demonstrating benefit this may then lead to further investment in infrastructure support and development.

New resources are needed to initiate activities, although existing resources within key organizations may be able to be mobilized for the development of an action plan.

4.2. Planned activity 13: Invasive alien species

Development of this activity will be undertaken based on priorities identified through GISP phase I and the review of the status of invasive alien species and of ongoing measures addressing invasive alien species under way within the Convention on Biological Diversity .

4.3. Planned activity 14: Support in implementation of Article 8(j)

(i) Rationale

The COP has acknowledged that traditional biodiversity related knowledge (TBRK) has the potential to inform the activities of the CBD. Before this can happen indigenous and local communities require protection of their intellectual property in any collaborative efforts aimed at meshing traditional knowledge and science. Given that the GTI has the potential to make TBRK more accessible to a wide range of users due regard must be given to the concerns raised by indigenous and local communities regarding the right to preserve, protect and manage TBRK particularly traditional taxonomic knowledge.

In its decision V/16, the Conference of the Parties endorsed a programme of work to implement Article 8(j) based on a number of principles including; full and effective participation of indigenous and local communities, the valuing of traditional knowledge, acknowledgment of spiritual and cultural values and the requirement for prior informed consent from traditional knowledge holders.

Paragraph 17 requests the Parties to support the development of registers of traditional knowledge, innovations and practices of indigenous and local communities through participatory programs and consultations with indigenous and local communities, taking into account strengthening legislation, customary practices and traditional systems of resources management, such as the protection of traditional knowledge against unauthorised use.

A number of tasks in the programme of work for the implementation of Article 8(j) and related provisions have a direct bearing on the proposed activities of the GTI in particular tasks 1, 2 and 7 in phase 1 and tasks 6, 10, 13, and 16 in phase 2 (decision V/16).

Traditional knowledge systems include taxonomic information which if used in combination with Linnaean taxonomies could support the GTI. Access to and use of traditional knowledge must have the prior informed consent of the holders of that knowledge and be based on mutually agreed terms. When this has occurred then comparison of indigenous taxonomies and Linnaean taxonomies in different regions could be made to provide general principles to assist in the conservation and sustainable use of elements of biodiversity in different ecosystems.

(ii) Outputs

Regional and subregional guides based on ethical research practices and developed with full and effective participation of indigenous and local communities. These guides could highlight the similarities and differences between the two taxonomies and may be in the form of catalogues and species lists, or be more targeted resource material that provide interpretation material for a wide variety of environmental managers, and in particular protected area and conservation managers.

(iii) Timing

Preparation of guides to be completed as part of implementation activities under Article 8 (j).

(iv) Actors

National and sub-national governments, indigenous and local groups, indigenous research centres and indigenous NGOs should take the lead in this work element. Potentially the GBIF could play a lead role in providing a global role in information distribution. Some international and national institutions already hold significant information and have active programs in compiling indigenous and local taxonomies. These institutions, with the full and effective participation of indigenous and local communities, should be encouraged through additional “catalytic” funding to ensure that their research practices are based on agreement between parties and the principle of prior informed assent.

(v) Mechanisms

UNCBD, UNESCO, ISSC and ICSU offer the appropriate platform to develop with the full and effective participation of indigenous and local communities suitable plans of work leading to project development. The Ad Hoc Open Ended Working Group on Article 8(j) should play a key role in advising on the development of projects.

(vi) Financial, human resources and other capacity requirements

New resources are required to initiate this activity.

4.4. Planned activity 15: Support for ecosystem approach and CBD work on assessment including impact assessments, monitoring and indicators

(i) Rationale

Under the ecosystem approach, a key activity will be the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment). The Millennium Ecosystem Assessment will require considerable scientific effort for the characterization of ecosystems, including better data on key species that comprise ecosystems and their role in maintaining ecosystem processes. In many regions taxonomic knowledge needed to fulfil these efforts are not available, and therefore will require specific activities to be undertaken (created under the GTI). The Millennium Ecosystem Assessment seeks policy-relevant information; the GTI is a policy response to a recognized impediment, or knowledge block, in our system of biodiversity understanding. The GTI seeks to facilitate gathering of the pertinent species information that would be used to characterize ecosystems, including those that help to illustrate the value of goods and services flowing from ecosystems.

The Millennium Ecosystem Assessment will be required to report on issues such as patterns of species and ecosystem diversity – the activities of the GTI in facilitating better knowledge of the species and their distribution will help provide this information. All information fed into the Millennium Ecosystem Assessment will need appropriate geo-referencing – which is a key plank for all activities envisaged under the GTI. The GTI will also be focusing on taxonomic activity in areas of relevance to the Convention, especially the key ecosystem themes. Thus the products of the GTI can complement the Millennium Ecosystem Assessment activity in thematic ecosystems, which in turn may illustrate the extent of removal of the taxonomic impediment – providing a positive feedback process.

The GTI also has relevance to the suite of associated environmental conventions to the CBD (eg CMS, CITES, CCD), and to the CSD all of which have a direct interest in the outcomes of the Millennium Ecosystem Assessment. There is scope for linking envisaged work programmes under the Millennium Ecosystem Assessment with the key action areas under the GTI.

(ii) Outputs

Production of taxonomic overviews to help guide the Millennium Ecosystem Assessment to focus on key areas and issues of importance. These overviews can be compiled from work under the other operational objectives, but may need special focus for the global ecosystem context of the Millennium Ecosystem Assessment.

(iii) Timing

To be linked with the Millennium Ecosystem Assessment development and program

(iv) Actors

The Millennium Ecosystem Assessment advisory mechanisms, and UNEP-WCMC and UNESCO as key synthesisers.

(v) Mechanisms

The CBD cross cutting issue of Assessments and the programme of work on Indicators of Biological Diversity include a number of programme elements where input from the GTI would be required,

including the development of a menu of indicators in thematic areas and development of methodology sheets, guidelines and training for supporting the development of national monitoring and indicator programmes. Specific input required from the GTI would be in the identification, development and testing of suitable indicators, and priority taxonomic information required as input to scientific assessments.

(vi) Financial, human resources and other capacity requirements

The development of financial and human resource requirements will need to be undertaken within the development of specific Millennium Ecosystem Assessment project proposals, as well as through agreed activities in Indicator development.

5. Operational objective 5 -- Facilitate an improved and effective infrastructure/system for access to taxonomic information; with priority on ensuring countries of origin gain access to information concerning elements of their biodiversity

5.1. Planned activity 16: Develop a coordinated global taxonomy information system

(i) Rationale

Existing taxonomic information is widely scattered and not centrally available. This activity will firstly identify the current status of major taxonomic information systems in particular their major foci, and plan a coordinated approach to the development of a global taxonomic information infrastructure, as the major element of the GTI under the Convention's clearing-house mechanism.

(ii) Outputs

An agreed strategy to develop information services that optimizes access to taxonomic information systems world-wide. This strategy would also include common standards for exchange of data and consideration of intellectual property rights.

(iii) Timing

To be developed by October 2001 as an input to discussions by the sixth meeting of the Conference of the Parties.

(iv) Actors

Including clearing-house mechanism of the Convention, ECOPORT, GBIF, Species 2000, Tree of Life, NABIN (ITIS etc), ISIS, BIN21, BCIS, BioNET INTERNATIONAL, as well as large-scale biosystematics research institutions and other stakeholders of taxonomic information.

(v) Mechanisms

Assessment of the objectives of each system, and their prospective target audience, as a means to evaluate the fulfilment of the needs of Parties in accessing taxonomic information required under the the Convention on Biological Diversity. The existing International Plant Names Index (IPNI) and the Global Plant Checklist (IOPI) among others could provide useful models for developing a global strategy.

(vi) Financial, human resources and other capacity requirements

Sources of funding need to be identified.

(vii) Pilot projects

As a precursor to developing pilot projects it is proposed to hold a workshop that brings together stakeholders of all the existing global and major regional biodiversity information systems to identify overlaps, synergies, and gaps in order to develop a coordinated global strategy for harmonizing the existing systems.

Several pilot projects are already underway including SABONET and Species Analyst, and several potential projects have been put forward in recent international taxonomic meetings, including GLOBIS, a butterfly information system for the world, and the World Termite Database.

D. Monitoring and assessment of the GTI

The GTI Coordination Mechanism has been tasked to assist the Executive Secretary to facilitate international cooperation and to coordinate activities on matters pertaining to the implementation and development of the GTI, and in this role will provide overall monitoring and assessment of the activities undertaken as part of the GTI.

The Parties will provide regular updates on activities under the GTI through the national reporting process of t Convention on Biological Diversity.

Appendix

WHAT IS TAXONOMY IN THE GTI?

Three conceptual levels can be used to describe the complexity inherent in biodiversity:

(a) *Genetic level.* The inherent variability present within species is often understood at various sub-levels including sub-species, races, populations. Genetic variability within each species ensures species survival. Genetic resources are a major focus of biodiversity use by people. The science of molecular systematics (a modern branch of taxonomy) uses information at the genetic level to help inform how we describe species, as well as the variability within the species. The increasing importance of genetic technologies in many areas of scientific and commercial endeavour is expected to continue to push the frontiers of taxonomy well beyond our current level of knowledge;

(b) *Species level*. Species descriptions and classification provide the base unit by which science distinguishes biological diversity, and the science of taxonomy has been describing species based on the Linnean binomial system for the past 250 years. However to date it is currently estimated that less than 15% of all species on Earth have been discovered and classified. Of those species described over 90% are the large visible species of fauna and flora, and it is generally recognised that the greatest need for new taxonomy and taxonomists lie in the realms of invertebrates, microorganisms and fungi;

(c) *Ecosystem or landscape level*. The ecological variability in the temporal and spatial distribution of any species is a significant component in the description of any species, particularly in relation to the conservation and sustainable use of biodiversity. Temporal and spatial variability in the distribution of species is an expression of genetic variability, but may also be simply a response to abiotic factors influencing each species, which in turn may lead to speciation, through genetic variability. An understanding of the expression of ecological variability across the landscape is the key linkage between understanding species and understanding the agglomeration of species that together form ecosystems/landscapes. The importance of documenting ecological variability, that is assemblage differences within an ecosystem, is crucial, for instance in representing dynamic changes in habitat.

The documentation of ecosystems is a form of classification, but is generally held to be outside the scope of the scientific field of taxonomy. Within the Convention this area of endeavour is developed under the thematic ecosystem studies and especially through the “ecosystem approach”, another cross-cutting area of work of the Convention.

Item 5.3 of the provisional agenda: Biological diversity and climate change, including cooperation with the United Nations Framework Convention on Climate Change (UNEP/CBD/SBSTTA/6/11)

The Subsidiary Body on Scientific, Technical and Technological Advice

1. *Takes note* of the discussion of the interlinkages between biological diversity and climate change, contained in the discussion note by the Executive Secretary submitted to the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) at its sixth session and the UNFCCC Subsidiary Body on Scientific and Technological Advice at the second part of its thirteenth session, held in The Hague, from 13 to 24 November 2000 (UNEP/CBD/SBSTTA/6/11, annex I);

2. *Welcomes* the agreement of the Subsidiary Body on Scientific and Technological Advice to consider this matter at its fourteenth session, scheduled for May/June 2001, and its invitation to Parties to the Convention on Climate Change to submit their views on the issues identified;

3. *Decides* to offer, as an additional input to the fourteenth session of the Subsidiary Body on Scientific and Technological Advice under the Convention on Climate Change, the preliminary assessment of the interlinkages between biological diversity and climate change, contained in the annex to the present recommendation;*

4. *Decides to p*romote a wider assessment of the interlinkages between biological diversity and climate change, in order to develop more comprehensive scientific advice to integrate biodiversity considerations into the implementation of the United Nations Framework Convention on Climate Change and its Kyoto Protocol, including:

(a) The impacts of climate change on biological diversity;

(b) The potential impact on biological diversity of mitigation measures that may be carried out under the United Nations Framework Convention on Climate Change and its Kyoto Protocol, and identification of potential mitigation measures that also contribute to the conservation and sustainable use of biological diversity;

(c) The potential for the conservation and sustainable use of biological diversity to contribute to adaptation measures taken under the United Nations Framework Convention on Climate Change and its Kyoto Protocol;

5. *Decides* to initiate, as a first step in the wider assessment referred to in paragraph 4 above, a pilot assessment to prepare scientific advice to integrate biodiversity considerations into the implementation of the United Nations Framework Convention on Climate Change and its Kyoto Protocol, and, for this purpose, establish an expert group in accordance with the *modus operandi* of the Subsidiary Body on Scientific, Technical and Technological Advice and the terms of reference provided in annex III to the note by the Executive Secretary, to report to it on progress at its seventh meeting;

6. *Invites* the Intergovernmental Panel on Climate Change to participate in this pilot assessment, and also invite IUCN and other relevant international organizations to contribute to this work (see also UNEP/CBD/SBSTTA/6/9);

7. *Invites* the Millennium Ecosystem Assessment to incorporate the issues identified in paragraph 4 above, and to report on this matter to it at its seventh meeting;

8. *Requests* the Executive Secretary to inform the secretariats of the United Nations Framework Convention on Climate Change, the Intergovernmental Panel on Climate Change and the Millennium Ecosystem Assessment of these steps taken by the Subsidiary Body on Scientific, Technical and Technological Advice, and to invite their continued collaboration, with a view to facilitating the

* For ease of reference, annex II to the present draft recommendation on page 45 below contains possible elements for such a preliminary assessment, drawn from sections III C and D of annex I, and annex II, to the note by the Executive Secretary on biological diversity and climate change, including cooperation with the United Nations Framework Convention on Climate Change (UNEP/CBD/SBSTTA/6/11).

integration of biodiversity considerations in the implementation of United Nations Framework Convention on Climate Change and its Kyoto Protocol.

Annex

ELEMENTS FOR A PRELIMINARY ASSESSMENT OF THE INTERLINKAGES BETWEEN BIOLOGICAL DIVERSITY AND CLIMATE CHANGE

I. POTENTIAL IMPACTS ON BIOLOGICAL DIVERSITY OF ACTIVITIES PROPOSED TO ADDRESS CLIMATE CHANGE

1. Whether or not a proposed activity has positive effects on biological diversity may depend on the specific characteristics of the case concerned. In some cases, a proposed activity may have positive impacts on some components of biological diversity, or at certain levels, but negative impacts on others. Further, they may be other non-carbon impacts on sustainable development, besides impacts on biodiversity, that may need to be taken into account. Impact assessments may be necessary to determine likely impacts in some cases.

2. However some general points can be made. For example, converting non-forest land to forest would typically increase the diversity of flora and fauna, except in situations where biologically diverse non-forest ecosystems, such as native grasslands, are replaced by forests consisting of single or a few species. Table 1 below provides an indication of whether potential LULUCF activities (both "ARD" and "additional" activities) are likely, overall, to have negative, positive, or uncertain effects on biological diversity.

3. The definitions for "afforestation", "reforestation" and "deforestation", as well as "direct" and "human-induced", combined with accounting rules and procedures related to certain time periods will determine the incentive structure for such forestry activities and thus impact on forest biological diversity. Under certain definitional scenarios, deforestation followed by replanting could be promoted, and in cases where the original forest was natural there would be significant negative effects on biological diversity. These matters are discussed at length in the IPCC special report. 1/ Of particular interest from a biodiversity perspective will be whether avoided deforestation is included since conservation of natural forests has very positive impacts on biological diversity.

Table 1

Likely impact on biodiversity	***"Afforestation, reforestation and deforestation (ARD)" activities (Art 3.3)***	***"Additional" activities (Art 3.4)***
Strongly positive	• Avoiding deforestation of natural forests	
Positive	• Reforestation with native trees • Afforestation with native trees on degraded land	• Forest management (reduced-impact logging, extended rotation) • Revegetation (establishment of native vegetation, natural regeneration, agroforestry) • Reduced tillage agriculture • Reduced grazing (reductions in overgrazing)
Net neutral or uncertain	• Reforestation (other) • Afforestation (other)	• Forest management (other) • Crop management • Revegetation (other)
Negative	• Afforestation on other native ecosystems (eg: natural grassland or savannah) • Conversion of natural forests to plantations	• Drainage of wetlands • Fertilization of nutrient limited natural ecosystems • Irrigation of water limited natural ecosystems

4. Inclusion of additional activities such as reduced grazing, forest management practices such as reduced-impact logging and increased rotation time, and agroforestry could provide incentives for the conservation and sustainable use of biological diversity. However, unless screened out, certain other

1/ IPCC (2000). Op cit chapters 2 (sections 2.2, 2.5.1.1)

additional LULUCF activities, such as fertilization of natural ecosystems defined by their low-nutrient status or irrigation of water-limited natural ecosystems, could lead to negative impacts on biological diversity.

5. Inclusion of LULUCF activities under the Clean Development Mechansim could provide significant positive incentives for the conservation and sustainable use of biological diversity in developing countries, if appropriate eligibility criteria, screening procedures of impact assessments are applied.

6. Positive non-carbon benefits of LULUCF activities, such as the conservation and sustainable use of biological diversity, could be promoted through the application of screening procedures, including the use of criteria and indicators, impact assessments, or guidelines, as discussed in the IPCC report. 2/ The IPCC suggests that a system of criteria and indicators could be used to assess and compare sustainable development impacts across LULUCF alternatives, and that modified environmental and socio-economic impact assessments could be applied to LULUCF projects. These could be applied on a national or multilateral basis. However, the IPCC warns that if sustainable development criteria vary significantly across countries or regions, there may be incentives to locate activities and projects in areas with less stringent environmental or socio-economic criteria. 3/

7. The IPCC identifies some other critical factors affecting the sustainable development contributions of LULUCF activities and projects to mitigate and adapt to climate change:

(a) Institutional and technical capacity to develop and implement guidelines and procedures;

(b) Extent and effectiveness of local-community participation in development, implementation, and distribution of benefits; and

(c) Transfer and adoption of technology.

II. POSSIBLE TOOLS FOR THE INTEGRATION OF BIODIVERSITY CONSIDERATIONS IN THE IMPLEMENTATION OF THE UNFCCC AND ITS KYOTO PROTOCOL, THE POTENTIAL ROLE OF THE CBD, AND COLLABORATION WITH UNFCCC

8. The Conference of the Parties to the UNFCCC may decide that LULUCF activities, including LULUCF projects, should be screened for their contribution to sustainable development, including the conservation and sustainable use of biological diversity, according to agreed norms. Alternatively, it may decide that this be left to the Parties concerned.

9. There are a number of approaches that Parties may take, for example:

(a) The application of strategic environmental assessments (SEAs) to LULUCF policies and programmes;

(b) The application of environmental impact assessments (EIAs) to project based LULUCF activities; and

(c) `The use of procedures to ensure participation of stakeholder groups, including indigenous and local communities, in the assessment and decision-making processes.

10. For Parties to the Convention on Biological Diversity, a number of provisions of the Convention are relevant, including:

(a) The integration of biodiversity considerations into relevant sectoral or cross—sectoral plans, programmes and policies (art. 6(b));

(b) Use of environmental impact assessments, with public participation, for proposed projects that are likely to have significant adverse effects on biological diversity (art 14.1(a)), and

2/ IPCC (2000). Op cit Summary for policy makers (section 9, paras 86, 89), chapter 2 (sections 2.2, 2.5)

3/ IPCC (2000). Op cit Summary for policy makers (section 9, para 87), chapter 2 (section 2.5)

arrangements to take into account consequences of programmes and policies that are likely to have significant adverse effects on biological diversity (art 14.1(b)).

11. The ecosystem approach has been adopted by the Conference of the Parties to the Convention on Biological Diversity as the primary framework for action under the Convention (decision II/8). As a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (decision V/6), it provides a useful framework for integrating the conservation of biological diversity with the management of ecosystems for other purposes, such as carbon sequestration and modulation of climate change, while enhancing the flow of benefits to stakeholders, in particular the local communities which manage biological diversity in ecosystems. It recognizes that change is inevitable and, therefore, that adaptive management practices need to be used, that management actions need to be carried out at various scales, and that inter-sectoral cooperation must be ensured.

12. As noted above, the Conference of the Parties to the Convention on Biological Diversity has requested SBSTTA to prepare scientific advice to facilitate integration of biodiversity considerations in the implementation of the UNFCCC and its Kyoto Protocol. Such advice may might be drawn upon by UNFCCC Parties. The next meeting of SBSTTA will be held in March 2001.

13. Such scientific advice could include:

(a) Criteria and indicators for the conservation and sustainable use of biological diversity, for example as a component of sustainable forest management, which might be used in the design of activities, or in monitoring and evaluating their implementation;

(b) Positive or negative lists of activities, similar to that in table 1 above. Such lists could be used in determining, for example, which activities should be subject to an SEA or EIA, or even which activities should be eligible; and

(c) Other guidance, such as methodologies to ensure involvement of indigenous and local communities.

14. The Conference of the Parties to the Convention on Biological Diversity has called for the development of advice by SBSTTA to be in collaboration with the appropriate bodies of the UNFCCC and IPCC where appropriate and feasible.

III. OVERVIEW OF THE INTERLINKAGES BETWEEN BIOLOGICAL DIVERSITY AND CLIMATE CHANGE 4/

A. The climate-change phenomenon

15. Climate change is variation in either the mean state of the climate or in its variability, persisting for an extended period, typically decades or longer. 5/ It encompasses temperature increases ("global warming"), sea-level rise, changes in precipitation patterns, and increased frequencies of extreme events.

16. By the end of this century, global mean surface temperatures are expected to increase by between 1.5 ºC and 6 ºC, 6/ a faster change that any seen in the last 10,000 years. Some regions will experience much greater increases. Sea levels are projected to rise by 15 cm to 95 cm. Increases in global mean precipitation and in the frequency of intense rainfall are predicted, but some already dry areas are expected to become drier. Recent trends in the increased frequency and magnitude of the El Niño-

4/ This annex draws upon many sources, including the IPCC Second Assessment Report, the IPPC Special Report on Land Use, Land Use Change and Forestry, and the presentation of the IPPC chair, Dr R Watson, to the UNFCCC COP-6. Further information will become available in 2001 when the working group reports prepared for the Third Assessment Report are accepted by the IPCC.

5/ As defined in the reports of the IPCC. Thus, variations caused by "El Niño" per se are not considered climate change by this definition, but multidecadal trends of change in the frequency of such events are.

6/ These estimates are higher than previous estimates due to lower projected emissions of sulphur dioxide (SO2 aerosols reflect incoming sunlight), resulting less offset of the warming effect of the greenhouse gases.

Southern Oscillation (ENSO) phenomena, which lead to severe floods, droughts and fire outbreaks in regions of the tropics and sub-tropics, are projected to continue.

17. The weight of scientific evidence suggests that the observed changes in climate are caused, at least in part, by human activities, primarily the burning of fossil fuels and changes in land cover, which are modifying the concentration of carbon dioxide and other greenhouse gases that absorb heat radiating from the Earth as well as the properties of the surface which absorbs or scatters radiant energy (the albedo effect).

B. Impacts of climate change on biological diversity

18. Climate change may directly affect species through changes in phenology (e.g., earlier flowering of trees and egg-laying in birds), lengthening of the growing season, and changes in distribution, resulting from migration (e.g. pole-ward and altitudinal shifts in insect ranges). In many cases the observed changes are consistent with well-known biological responses to climate.

19. Changes in such characteristics of organisms may thus serve as indicators or early warnings of climate change.

20. Climate change is an additional stress on ecosystems and species that are, often, already under stress from other pressures such as: habitat change resulting from land-use change; over-harvesting; pollution; and the effects of invasive species. Such pressures thus make biodiversity more vulnerable to climate change. For example:

(a) Habitat fragmentation poses barriers to migration reducing the possibility that species may adapt by moving as the climate changes. (Barriers to migration may also exist naturally in areas such as small islands, mountain tops);

(b) Habitat fragmentation and over-harvesting may result in small isolated populations with low genetic diversity. These are more vulnerable to extinction, especially if genetic diversity is also reduced, and the populations consequently have low genetic adaptability;

(c) Ecosystem degradation, which may result from unsustainable use of ecosystem components, pollution, pest outbreaks, or changes in fire regimes, can decrease the resilience of ecosystems to climate change.

21. Addressing such exacerbating factors may be an important component of adaptation to climate change (see paras. 41-42 below).

22. The expected result of these interactions is that climate change will lead to reduced biological diversity. At the species level, those that are already critically endangered because of existing pressures, are likely to be driven to extinction by the added stress of climate change. Migratory species may be at particular risk since they require separate breeding, wintering and migrating habitats. Under existing climate-change scenarios, migration rates required to keep up with climate change might be ten times greater than those calculated for the last glacial retreat, and thus may exceed the capacity of some species to migrate.

23. Moreover, different capacities for adaptation and migration between species means that biomes are unlikely to move as discrete units. Thus, at the ecosystem level, established natural communities may be broken up as the constituent species shift at different rates in response to climate change. For example, a substantial fraction of the world's forested area is expected to undergo major changes in broad vegetation types with the greatest changes at high latitudes. New assemblages of species and hence new ecosystems may be established. As noted in paragraph 33 below, this may have major implications for the role of forests as carbon stores.

24. Differential responses to climate change by species in ecosystems may lead to disruption of important functional interactions, with potentially highly serious consequences for the provision of ecosystem services such as pest control, pollination, seed dispersal, decomposition and soil nutrient cycling. In

addition to the effects on natural ecosystems, these could have socio-economic consequences for agriculture.

25. Certain ecosystem types will be particularly vulnerable. Ecotones (transition areas between different ecosystems, with high species and genetic diversity), which are important for adapting to climate change (see para. 42 below), are highly threatened by climate change. Examples include semi-arid drylands, which are prone to desertification.

26. Amongst the so-called biodiversity "hotspots" (areas that are high in biodiversity, but are highly threatened), the most vulnerable are the Mediterranean and savanna areas.

27. The impact of climate change on biological diversity is expected to be non-linear. The impact may be particularly severe when certain critical thresholds are crossed. Ecosystem types that are vulnerable to such thresholds include:

(a) Wetlands overlying permafrost. These are likely to be severely affected when the ice melts;

(b) Coral reefs. As already noted by the Conference of the Parties, there is significant evidence that climate change is a primary cause of the recent and severe extensive coral bleaching. Bleaching is reversible when the increases are short-term and of no more than 1-2ºC. However, sustained increases in water temperatures of 3-4 ºC above normal maxima can cause significant coral mortality. Severe bleaching events were triggered, for example, by the El Niño events of 1982/83 and 1997/98;

(c) Mangrove ecosystems. Many mangrove ecosystems are highly vulnerable to sea-level rise. 7/ For example, a 45 cm rise could inundate 75 per cent of the Sundurbans, the world's largest mangrove forest, in Bangladesh.

28. Climate change may also increase threats from invasive alien species:

(a) Firstly, climate change may result in extension or changes in the ranges suitable to certain invasive species. An example may be the increased prevalence of vector-borne infectious diseases transmitted by blood-feeding mosquitoes and ticks;

(b) Secondly, environments may become more favourable to weedy species because of climate change induced ecosystem disruptions.

29. In summary, and as the IPCC second assessment report concluded, ecosystems vital to human development and well-being are vulnerable to climate change. There are likely to be reductions in biological diversity and in the goods and services that ecosystems provide to society, e.g., sources of food, fibre, medicines, recreation and tourism, and ecological services such as controlling nutrient cycling, waste quality, water run-off, soil erosion, pollination services, detoxification and air quality. Additionally there may be an increased provision of ecosystem "bads" such as pests, diseases and other invasive species.

C. The role of biological diversity in measures to mitigate the causes of climate change

Carbon sequestration by terrestrial ecosystems

30. The sustainable management, conservation and enhancement of forests, oceans and other ecosystems, as sinks of greenhouse gases, is promoted by the UNFCCC and its Kyoto Protocol.

31. At present, terrestrial ecosystems are understood to be net sinks. Because of deforestation, tropical forest lands as a whole constitute a net source, while temperate forests are a net sink. In boreal forests, the carbon budgets differ between forest types: some boreal forest regions are net sinks, while others appear to be net sources. Carbon is stored both above and below ground. Below-ground stocks are

7/ However, in cases where vertical accretion can keep pace with sea level rise, some other mangrove systems may be able to adapt.

greater than above ground, particularly in non-forested areas (drylands, grasslands, savannas, tundra, and croplands). Relatively large amounts of carbon are also sequestered in peat lands and other wetlands.

32. There is no unique relationship between the biodiversity and carbon sequestration of an ecosystem. However, as noted above, some forest types are net sinks, while others are sources. Unmanaged forests have more biodiversity and more carbon than managed forests such as plantations, and recent evidence suggests that "old-growth" forests continue to sequester more carbon than managed forests. Nevertheless, newly planted or regenerating forests, in the absence of major disturbances, will continue to uptake carbon for 20 to 50 years or more after establishment.

33. As noted in paragraph 23 above, the species composition of some forests is likely to be altered as a result of climate change — entire forest types may disappear and be replaced by new ones. Large amounts of carbon could be released into the atmosphere during transitions from one forest type to another because the rate at which carbon can be lost during times of high forest mortality is greater than the rate at which it can be gained through new growth.

34. Climate-change-induced changes in the frequency of El Niño and other extreme events and disturbance regimes (fires, pest outbreaks) could also lead to loss of stored carbon or to decreases in the rate of carbon uptake.

35. Increased uptake of carbon is likely to result from carbon dioxide fertilization effects. However ecosystem models suggest that this effect may gradually diminish and be offset by the effects mentioned in the previous two paragraphs. Forest ecosystems could eventually become carbon sources.

36. The management of agricultural lands and rangelands can also play an important role in enhancing carbon sinks and in reducing current emissions of carbon dioxide ,as well as methane and nitrous oxide. 8/ Land-use and management measures include:

(a) Sustaining existing forest cover;

(b) Slowing deforestation;

(c) Regenerating natural forests;

(d) Establishing tree plantations;

(e) Promoting agroforestry;

(f) Improving the management of agricultural soils and rangelands (minimum tillage, mulching etc);

(g) Improving efficiency of fertilizer use;

(h) Restoring degraded agricultural lands and rangelands;

(i) Recovering methane from stored manure;

(j) Improving the quality of the diet of ruminants.

37. Some of these options could have positive or negative impacts on biological diversity as discussed in section I above.

38. Additionally, the use of biomass fuels to displace fossil fuels could contribute to reducing net emissions.

8/ Emissions of methane (CH4) and nitrous oxide (N20) are influenced by land use, land-use change, and forestry activities (e.g., restoration of wetlands, biomass burning, and fertilization of forests). Hence, to assess the greenhouse gas implications of LULUCF activities, changes in CH4 and N2O emissions and removals-the magnitude of which is highly uncertain-would have to be considered explicitly. There are currently no reliable global estimates of these emissions and removals.

Potential impacts on biological diversity of activities proposed to address climate change

39. The potential impacts on biological diversity of activities proposed to address climate change are discussed in section I above.

Possible tools for the integration of biodiversity considerations into the implementation of the UNFCCC and its Kyoto Protocol

40. Possible tools for the integration of biodiversity considerations into the implementation of the UNFCCC and its Kyoto Protocol are discussed in section II above.

D. Adaptation measures

Measures to mitigate the loss of biological diversity

41. A number of measures may be taken to mitigate the negative impacts of climate change on biodiversity. Chief among them is the reduction of other pressures on biodiversity arising from habitat conversion, over-harvesting, pollution, and alien species invasions. Since mitigation of climate change itself is a long-term endeavour, reduction of other pressures may be the most practical options. For example, increasing the health of coral reefs, by reducing the pressures from coastal pollution and practices such as fishing with explosives and poisons, may allow them to be more resilient to increased water temperature and reduce bleaching.

42. A major adaptation measure is to counter habitat fragmentation through the establishment of biological corridors between protected areas particularly in forests. Conservation of ecotones is also an important adaptation measure. Ecotones serve as repositories of genetic diversity that may be drawn upon to rehabilitate adjacent ecoclimatic regions. As an insurance measure such approaches can be completed by *ex situ* conservation. This might include conventional collection and storage in gene banks as well as dynamic management of populations allowing continued adaptation through evolution to changing conditions. Promotion of on-farm conservation of crop diversity may serve a similar function.

Adaptation measures involving the conservation and sustainable use of biological diversity

43. The protection, restoration or establishment of biologically diverse ecosystems that provide important goods and services may constitute important adaptation measures to supplement existing goods and services, in anticipation of increased pressures or demand, or to compensate for likely losses. For example:

(a) The protection or restoration of mangroves can offer increased protection of coastal areas to sea level rise and extreme weather events;

(b) The rehabilitation of upland forests and of wetlands can help regulate flow in watersheds, thereby moderating floods from heavy rain and ameliorating water quality;

(c) Conservation of natural habitats such as primary forests, with high ecosystem resilience, may decrease losses of biodiversity from climate change and compensate for losses in other, less resilient, areas.

44. The ecosystem approach as adopted by the Conference of the Parties to the Convention on Biological Diversity (decision V/6, annex) provides a framework for adaptive management in the face of climate change. Ecosystem processes are often non-linear, and the outcome of such processes often shows time-lags. The result is discontinuities, leading to surprise and uncertainty. Management must be adaptive in order to be able to respond to such uncertainties and contain elements of "learning-by-doing" or research feedback. The ecosystem approach involves a focus on the functional relationships and processes within ecosystems, acknowledgment of the full range of goods and service provided, and attention to benefit sharing among stakeholders. Problems need to be addressed at the appropriate, often multiple, scales, with intersectoral cooperation.

Item 5.4 of the provisional agenda: Migratory species and cooperation with the Convention on the Conservation of Migratory Species of Wild Animals

The Subsidiary Body on Scientific, Technical and Technological Advice

1. *Recommends* that the Conference of the Parties, with a view to enhancing the integration of migratory species in the programmes of work under the Convention:

(a) Invite the secretariat of the Convention on the Conservation of Migratory Species of Wild Animals to compile and disseminate through the clearing-house mechanism of the Convention on Biological Diversity case-studies on migratory species and their habitats, relevant to thematic areas and cross-cutting issues under the Convention on Biological Diversity;

(b) Invite the Executive Secretary to generate, in collaboration with the secretariat of the Convention on Migratory Species and relevant organizations, guidance for the integration of migratory species into the national biodiversity strategies and action plans and ongoing and future programmes of work under the Convention on Biological Diversity;

(c) Consider the need for arrangements to provide financial resources, in accordance with Articles 20 and 21 of the Convention, to mainstream the conservation and sustainable use of migratory species and their habitats into their funding programmes;

(d) Urge Parties to report through their national reports on the extent to which they address migratory species at the national level, and on their cooperation with other range States.

2. *Further recommends* that the Conference of the Parties, with a view to strengthening the role of the Convention on Migratory Species in implementing the Convention on Biological Diversity, recognize the Convention on Migratory Species as the lead partner in conserving and sustainably using migratory species over their entire range and that the Convention on Migratory Species provides an international legal framework through which range States can cooperate on migratory species issues;

3. *Requests* the Executive Secretary to finalize and implement the joint work programme between the secretariats of the two conventions for 2001–2002 (UNEP/CBD/SBSTTA/6/12/Add.1).
