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CONFERENCE OF THE PARTIES TO THE  
CONVENTION ON BIOLOGICAL DIVERSITY  
Sixth meeting  
The Hague, 7-19 April 2002  
Item 18.2 of the provisional agenda\*

**SCIENTIFIC AND TECHNICAL COOPERATION AND THE CLEARING-HOUSE  
MECHANISM**

***Report of the Joint Convention on Biological Diversity/Global Invasive Species Programme Informal Meeting on Formats, Protocols and Standards for Improved Exchange of Biodiversity-related Information***

*Note by the Executive Secretary*

1. The Executive Secretary is circulating herewith, for the information of participants in the sixth meeting of the Conference of the Parties to the Convention on Biological Diversity, the Report of the Joint Convention on Biological Diversity/Global Invasive Species Programme Informal Meeting on Formats, Protocols and Standards for Improved Exchange of Biodiversity-related Information, which was held in Montreal on 19-20 February 2002, in response to decision V/14 of the Conference of the Parties and recommendation VI/4 A of the Subsidiary Body on Scientific, Technical and Technological Advice, on alien species that threaten ecosystems, habitats or species.
2. The report is available in English only.

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\* UNEP/CBD/COP/6/1 and Corr.1/Rev.1.

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**REPORT OF THE JOINT CONVENTION ON BIOLOGICAL DIVERSITY/GLOBAL  
INVASIVE SPECIES PROGRAMME INFORMAL MEETING ON FORMATS,  
PROTOCOLS AND STANDARDS FOR IMPROVED EXCHANGE OF  
BIODIVERSITY-RELATED INFORMATION**

**INTRODUCTION**

**A. *Background***

1. Article 18, paragraph 3, of the Convention on Biological Diversity established the clearing-house mechanism to promote and facilitate technical and scientific cooperation. In its decision V/14, the Conference of the Parties recommended that the Executive Secretary identify possible formats, protocols and standards for the improved exchange of biodiversity-related data, information and knowledge, including national reports, biodiversity assessments and Global Biodiversity Outlook reports and convene an informal meeting on this issue. Furthermore, in decision V/14 the Conference of the Parties also requested the Executive Secretary to develop a pilot initiative to assist work on the thematic issues within the work programme of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). In light of these decisions, the SBSTTA, at its sixth meeting, recommended to the Executive Secretary to continue cooperation with the Global Invasive Species Programme and to explore the development of arrangements for this further cooperation.
2. In response to these decisions and recommendation, the Executive Secretary in collaboration with the Global Invasive Species Programme, and with financial support from the Government of Belgium and the Government of the United States, organized the Joint Convention on Biological Diversity/Global Invasive Species Programme (CBD/GISP) Informal Meeting on Formats, Protocols and Standards for Improved Exchange of Biodiversity-related Information on 19-20 February, Montreal, Canada.
3. The purpose of the meeting was to identify formats, protocols and standards for more effective exchange of biodiversity-related data and information and to recommend the use of these formats in the establishment of the Global Invasive Species Information Network as a pilot initiative.

**B. *Attendance***

4. This meeting was attended by 21 experts qualified in the fields of management of biodiversity-related issues, information sharing systems and database management, establishment of clearing-houses and/or the clearing-house mechanism of the Convention on Biological Diversity. Experts in issues related to invasive alien species were also invited.
5. The full list of participants is contained in annex II to the present report.

**ITEM 1. OPENING OF THE MEETING**

6. The meeting began at 9 a.m. on Tuesday, 19 February 2002. It was addressed by Mr. Arthur Nogueira, Principal Officer, Implementation and Outreach, on behalf of the Executive Secretary of the Convention on Biological Diversity. Mr. Nogueira welcomed the participants and, after introducing the new phase of the clearing-house mechanism, presented a brief summary on new initiatives under the Convention on Biological Diversity to facilitate technical and scientific cooperation, particularly with regard to the identification of new formats, protocols and standards.

7. On behalf of the Global Invasive Species Program (GISP), Dr. Jamie Reaser introduced briefly the goals of the GISP and invited participants to assist in the development of the Global Invasive Species Information Network.

8. In conclusion, Mr. Nogueira and Dr. Reaser thanked the Government of Belgium and the Government of the United States for providing financial support for the meeting.

## **ITEM 2. ORGANIZATIONAL MATTERS**

### ***2.1. Election of officers***

9. At the 1st session of the meeting, on 19 February 2002, Mr. Nick Davidson of the Ramsar Bureau was elected to serve as Chair and Dr. Vishwas Chavan of the National Chemical Laboratory to serve as Rapporteur.

### ***2.2. Adoption of agenda***

10. At the opening session of the meeting, participants adopted the following agenda:

1. Opening of the meeting.
2. Organizational matters:
  - 2.1. Election of a Chair and Rapporteur;
  - 2.2. Adoption of the agenda;
  - 2.2. Organization of work.
3. Technical presentation on formats, protocols, standards, products, databases and applications.
4. Possible formats, protocols and standards for the improved exchange of biodiversity-related data, information and knowledge, including national reports, biodiversity assessments and Global Biodiversity Outlook reports. Presentation of pilot projects:
  - (a) Common format matrix of the second national reports (Second National Reports Analyser);
  - (b) Use of XML, RDF/Dublin Core in the development of the Biosafety Clearing-House;
  - (c) Identification of possible standards and protocols in the implementation of the Global Invasive Species Information Network;
  - (d) Lessons learned and applicability to the development of using common standards among distributed databases (national reports, Global Invasive Species Information Network, etc.);
  - (e) The clearing-house mechanism of the Convention on Biological Diversity and interoperability of national nodes: an option for consideration.
5. Metadata
  - 5.1. Presentation on United Nations metadata standards;
  - 5.2. Presentation on United States Federal Geographic Data Committee (FGDC) metadata standards.

6. Identification of possible standards and protocols in the implementation of the Global Invasive Species Information Network.
7. Identification of possible standards and protocols to improve the exchange of biodiversity data.
8. Recommendations and follow-up action.
9. Adoption of the report.
10. Closure of meeting.

### ***2.3. Organization of work***

11. At its 1st session on 19 February 2002, the Informal Meeting approved the proposed programme of work as contained in annex II to the annotations to the provisional agenda (UNEP/CBD/CHM/IM.FPS/1/1Add.1).

12. At its opening plenary, the Meeting decided to establish two working groups, on the understanding that the results of their deliberations would be brought together in a final report to be agreed in plenary.

13. Working Group I under the chair of Dr. James Quinn of IABIN, was established to consider recommendations pertaining to Agenda Item 6, the identification of possible standards and protocols in the implementation of the Global Invasive Species Information Network; and Working Group II under the chair of Mr. Phil Fox of UNEP-WCMC, was established to consider recommendations pertaining to Agenda Item 7, the identification of possible standards and protocols to improve the exchange of biodiversity data.

14. Other agenda items were considered in plenary.

### **ITEM 3. TECHNICAL PRESENTATION ON FORMATS, PROTOCOLS, STANDARDS, PRODUCTS, DATABASES AND APPLICATIONS**

15. Agenda item 3 was considered during the plenary of the 1st session of the meeting, on 19 February 2002.

16. Mr. Olivier de Munck, of the Secretariat, gave a presentation on formats, protocols and standards.

#### *Discussion*

17. Comments on the presentation were made by Mr. Preston Hardison from the Indigenous Biodiversity Information Network (IBIN), Dr. Chris Lyal (GTI), Mr. Phil Fox from UNEP-WCMC and Mr. Guy Rochon, the co-Chair of the Informal Advisory Committee of the clearing-house mechanism.

18. There was general agreement regarding the need to define the difference between accepted standards such as the Federal Geographic Data Committee (FGDC) metadata standard and standards which have not been accepted such as the Dublin Core. Discussion also emphasized the need to make information systems able to incorporate multi-lingual usage and the need to increase national capacities to ensure full participation by all nations and regions. There was also agreement on the need to define the differences between formats, protocols and standards, particularly when implementing distributed information systems.

**ITEM 4. PRESENTATIONS ON POSSIBLE FORMATS, PROTOCOLS AND STANDARDS FOR THE IMPROVED EXCHANGE OF BIODIVERSITY-RELATED DATA, INFORMATION AND KNOWLEDGE, INCLUDING NATIONAL REPORTS, BIODIVERSITY ASSESSMENTS AND GLOBAL BIODIVERSITY OUTLOOK REPORTS**

19. Agenda item 4 was considered during the plenary of the 1st session of the meeting, on 19 February 2002. Dr. Davidson proposed that discussion under this agenda item cover the following elements:

- (a) Common format matrix of the second national reports (Second National Reports Analyser);
- (b) Use of XML, RDF/Dublin Core in the development of the Biosafety Clearing-House;
- (c) Identification of possible standards and protocols in the implementation of the Global Invasive Species Information Network;
- (d) Lessons learned and applicability to the development of using common standards among distributed databases (national reports, Global Invasive Species Information Network, etc.);
- (e) The United Nations Convention on Biological Diversity Clearing-house Mechanism and interoperability of national nodes: an option for consideration.

20. Mr. Guy Rochon, co-Chair, informal advisory committee of the clearing-house mechanism, gave a presentation on the clearing-house mechanism and issues associated with interoperability of national nodes. In his presentation, he demonstrated a project by the Canadian Government to make environmental information interoperable through the creation and harvesting of metadata.

21. Mr. Olivier de Munck gave a presentation on the Second National Reports Analyser, a Web-based tool to compare responses in second national reports submitted by Parties. He explained that comparisons can be made among countries, regions and economic groups. He also emphasized that, when designing formats, information technology related issues must be taken into account.

22. Mr. Philippe Leblond, consultant with the Secretariat, gave a presentation on the use of eXtensible Markup Language (XML), Resource Description Framework (RDF) and the Dublin Core in the development of the Biosafety Clearing-House. He emphasized the idea of the semantic web, and how information on the Biosafety Clearing-House was organized according to a semantic, structural and syntactic framework.

23. Mr. Marcos Silva, of the Secretariat, gave a presentation on identification of possible standards and protocols in the implementation of the Global Invasive Species Information Network. He outlined the issues associated with the establishment of the Global Invasive Species Information Network, and identified ways to maximize interoperability among distributed databases and information systems that may comprise the network.

*Discussion*

24. Comments on the presentations were made by Dr. David Vieglais (Global Biodiversity Information Facility (GBIF)), Mr. Phil Fox (UNEP-WCMC), Dr. Mervyn Mansell (Plant Protection Institute), Mr. Preston Hardison (IBIN), Dr. Helida Oyieke (National Museums of Kenya), Dr. Vishwas Chavan National Chemical Laboratory and Dr. Jamie Reaser (GISP).

25. There was discussion on the issue of the potential loss of information due to the use of structured formats. There was general agreement that the design of formats for structuring information must allow for flexibility in the reporting of information. Participants also stressed the benefits of designing formats to increase interoperability and the indexing of information. This need is central to efforts in making information produced by the five global biodiversity-related conventions: the Convention on Biological Diversity, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Convention on Wetlands (Ramsar), and the World Heritage Convention (WHC).

26. There was also general agreement regarding the need to involve indigenous communities in the developments of new formats and use of information exchange protocols. Participants stressed the impact of these new technologies on indigenous knowledge, and the need to better involve these communities in the formulation of new formats and use of information exchange protocols.

#### **ITEM 5. PRESENTATIONS ON METADATA**

27. Agenda item 5 was considered during the plenary of the 1st session of the meeting, on 19 February 2002. Dr. Davidson proposed that discussion under this agenda item cover the following elements:

- (a) Presentation on United Nations metadata standards;
- (b) Presentation on United States Federal Geographic Data Committee (FGDC) metadata standards;

28. Mr. Mick Wilson, of the United Nations Environment Programme (UNEP), gave a presentation on United Nations metadata initiatives. He emphasized that the United Nations is still developing metadata standards and that progress has been achieved in the use of metadata to describe geo-spatial data.

29. Mr. Mike Frame, of the United States Geological Survey, gave a brief presentation on metadata standards set by the Federal Geographic Data Committee (FGDC). He described the use of FGDC in the National Biological Information Infrastructure of the United States, and discussed the applicability of FGDC as an accepted standard to geo-spatial data.

30. Mr. Mick Wilson (UNEP) and Mr. Phil Fox (UNEP-WCMC) gave a brief demonstration of a web-based system called Earthviewer. They stressed that the capabilities of these new technologies will most likely become commonplace in the next few years, and that the working groups should use them as a guide for future developments and initiatives.

31. Mr. Fox gave a demonstration of the potential of integrating distributed information resources with visualization software to specific needs and emergency situations.

#### *Discussion*

32. Comments on the presentations were made by Dr. David Vieglais of the GBIF, Dr. Xie Yan of the Institute of Zoology, Chinese Academy of Science, Dr. Chris Lyal (GTI), Ms. Barbara Bauldock (IABIN) and Dr. Jamie Reaser (GISP).

33. There was general agreement that the new technologies demonstrated by UNEP and UNEP-WCMC will influence the development of biodiversity information systems, and that their capabilities should guide future thinking in the development of such systems. There was also discussion concerning the feasibility of integrating specimen level data with UNEP-WCMC mapping systems.

**ITEM 6. IDENTIFICATION OF POSSIBLE STANDARDS AND PROTOCOLS IN THE IMPLEMENTATION OF THE GLOBAL INVASIVE SPECIES INFORMATION NETWORK**

34. Agenda item 6 was considered by Working Group I during the 2nd session of the Informal Meeting, on 19 February 2002.

**ITEM 7. IDENTIFICATION OF POSSIBLE STANDARDS AND PROTOCOLS TO IMPROVE EXCHANGE OF BIODIVERSITY DATA**

35. Agenda item 7 was considered by Working Group II during the 2nd session of the Informal Meeting, on 19 February 2002.

**ITEM 8. RECOMMENDATIONS AND FOLLOW-UP ACTION**

36. The two working groups met once, after which, during the 3rd session of the Informal Meeting on 20 February 2002, the Chairs of Working Group I and Working Group II introduced a report of the discussion which had taken place under this agenda items 6 and 7.

37. At the 3rd session of the Informal Meeting, on February 2002, the recommendations submitted by Working Group I and Working Group II under Items 6 and 7 were adopted and integrated into a single document.

38. The text of the recommendations as adopted is contained in Annex I to the present report.

**ITEM 9. ADOPTION OF THE REPORT**

39. The present report was adopted during the plenary of the 2nd session of the Informal Meeting, on 20 February 2002, on the basis of the draft report prepared and presented by the Rapporteur (UNEP/CBD/CHM/IM.FPS/1/2).

**ITEM 10. CLOSURE OF THE MEETING**

40. The chair declared the Informal Meeting on Formats, Protocols and Standards for Improved Exchange of Biodiversity-related Information closed at 6 p.m. on Wednesday, 20 February 2002.

*Annex I***RECOMMENDATIONS ON THE IDENTIFICATION AND USE OF FORMATS, PROTOCOLS AND STANDARDS FOR THE IMPROVED EXCHANGE OF BIODIVERSITY-RELATED INFORMATION****A. Introduction**

1. As contemplated in decision V/14, annex II, item (h), and in the recommendations made at the sixth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, the meeting elaborated the following recommendations for the identification and use of formats, protocols and standards for the improved exchange of biodiversity-related information and for the development of a global invasive species information network.

2. In the drafting of these recommendations, the Meeting agreed on 9 general observations:

(a) All of the following recommendations are in support of decisions, recommendations and identified actions from the Conference of the Parties and SBSTTA and identified actions from the informal advisory committee (IAC) for the clearing-house mechanism;

(b) In particular, these recognize and support the implementation of decisions under the Convention on Biological Diversity with regard to the pilot initiatives (and their future developments) on invasive alien species, coastal and marine biodiversity, and the ecosystem approach;

(c) It is recognized that the nodes of the clearing-house mechanism are at different stages of implementation with different infrastructures, support and demands;

(d) These recommendations seek to build upon these circumstances and to make greatest use of the excellent initiatives already underway, including the strategic plan for the clearing-house mechanism, whilst providing a road map for members to be able to develop and enhance their participation in the extensive distributed service;

(e) It is further recognized that interoperability is urgently needed to foster scientific and technical co-operation and information dissemination and exchange, within the constraints of the infrastructure currently available;

(f) It is recognized that the evolving interoperable network must allow users to access and retrieve information using local languages, wherever possible;

(g) It is also recognized that many activities offer potential for leveraging their outcomes to strengthen the implementation of the CLEARING-HOUSE MECHANISM, and to achieve maximum benefit whilst ensuring that individual needs are addressed and maintaining and enhancing the synergies of the activities. Many such activities have already been undertaken or are underway within the convention secretariats as well as the contracting parties;

(h) It is also recognised that many standards are currently being developed and that as yet the international standards relating to the exchange of biodiversity information are not currently available and that this is an impediment;

(i) In recognition of the cultural and social diversity of the Contracting Parties, it is necessary to ensure that appropriate transitional resources are provided to support Parties in building capacity.



3. It also agreed on 10 guiding principles for the application of formats, standards and protocols for achieving interoperability:

- (a) Open standards in common and future usage;
- (b) Future extensibility and backward compatibility;
- (c) Phased, incremental development;
- (d) Build on existing services and capabilities;
- (e) Scalability;
- (f) Inclusion (e.g. facilitate local-language queries) in the design of applications;
- (g) Language neutrality in the design of applications;
- (h) Use of interoperability as a tool for fostering cooperation;
- (i) Incorporation of scientific and technical cooperation and capacity development;
- (j) Respect for Intellectual Property Rights and cross boundary issues.

***B. Recommendations on formats, standards and protocols for the facilitation of interoperation at the national and international levels***

4. These recommendations address the identification of possible standards and protocols to improve the exchange of biodiversity-related data, information and knowledge, including national reports, biodiversity assessments and Global Biodiversity Outlook reports.

5. In particular, attention is paid foremost to the interoperability of national CLEARING-HOUSE MECHANISM nodes. With this in mind, the following activities can be carried out in order to facilitate information exchange as a means of promoting scientific and technical cooperation.

6. Recommendations pertaining to the identification and use of international formats, standards and protocols:

- (a) *Recommended formats:*
  - (i) Dublin core
  - (ii) Federal Geographic Data Committee (later ISO 19115)
  - (iii) Federal Geographic Data Committee, Biological Data Profile
  - (iv) BIB-1
  - (v) XML as description language
  - (vi) HTML 3.1 as presentation language
- (b) *Recommended standards*
  - (i) ISO 19115 spatial metadata (pending);

- (ii) ISO 23950 interoperability;
- (iii) ISO 2788 Thesauri;
- (iv) ISO 3166 country codes;
- (v) ISO 635 language codes;
- (vi) IETF RFCs – various;
- (vii) Open GIS Consortium;
- (viii) W3C;
- (ix) GBIF (in development);
- (c) *Recommended protocols*
  - (i) z39.50
  - (ii) http
  - (iii) ftp
  - (iv) TCP/IP

7. The meeting also identified a number of activities in support of the identification and use of formats, protocols and standards. These recommended activities are designed to be implemented, subject to available funding, at the national level with the support and appropriate guidance of the CBD Secretariat in conjunction with other agencies and secretariats.

8. The following table illustrates recommended potential activities: Phase 1 is designed to set the framework for interoperability within the CLEARING-HOUSE MECHANISM. Phases 2 and 3 are pilot activities to demonstrate and develop interoperability.

9. The Meeting agreed that it would be possible to build upon this demonstrated interoperability through: implementation of an updated Toolkit; identification of international standards required for the exchange of biodiversity-related information; development of a searchable database of COP decisions; development of dynamic map of national reports and other information by interoperating with UNEP-WCMC; Identification of commonalities in national report formats amongst MEAs; and promotion of the use of metadata to facilitate retrieval of record-level information in databases.

<b>Phase 1</b>	<b>Phase 2</b>	<b>Phase 3</b>
<p><b><i>Toolkit</i></b></p> <p>Revise and update the CHM Toolkit including existing standards, formats and protocols for creating interoperable national nodes for the exchange of biodiversity information.</p>	<p>Support the implementation of the toolkit in nodes and interoperable links.</p>	<p>Undertake evaluation and future enhancements.</p>
<p><b><i>Standards</i></b></p> <p>Identify the range of standards required for the exchange of biodiversity-related information. Including inter alia metadata, project reporting; laws and legislation; experts databases; thesauri; bibliographic databases</p>	<p>Support implementation of existing standards. Work with appropriate international bodies to establish the necessary standards, where gaps exist.</p>	<p>Support the implementation of newly-developed international standards which allow interoperation.</p>
<p><b><i>Searchable CBD COP decisions</i></b></p> <p>Ensure a fully-versatile CBD COP Decisions search capability building on any existing system</p>	<p>Extend search capability to COP supporting materials</p>	<p>Extend search capability to the decisions and materials of other conventions to facilitate review of overlays of MEA decisions</p>
<p><b><i>Visualization of national reports information</i></b></p> <p>Develop dynamic map of national reports and other information by interoperating with UNEP-WCMC.</p>	<p>Develop systems to Visualize data in CBD National Reports.</p>	<p>Incorporate geo-data to visualize data in MEA National Reports.</p>
<p><b><i>National report formats</i></b></p> <p>Identify commonalities in national report formats amongst MEAs (incorporating outcomes of UNEP pilot projects).</p>	<p>Harmonization of national report format – address commonalities and authorization procedures to allow harmonized reports to be used in place of the current national reporting process.</p>	<p>Assess further opportunities for future collaborative reporting.</p>

<b>Phase 1</b>	<b>Phase 2</b>	<b>Phase 3</b>
Encourage the use of metadata to facilitate retrieval of record-level information in databases.	Establish fully-interoperable nodes to allow data mining.	Allow databases to interoperate with others to ensure consistency of content whilst retaining custodianship.

***C. Recommendations on formats, protocols and standards for the global invasive species information network***

10. The Meeting made the following recommendations in support of objectives identified in the GISP Phase II Implementation Plan with respect to establishment of the Global Invasive Species Information Network. Furthermore, the recommendations are in response to decisions made at COP V/14, and recommendations made by SBSTTA-6 and the IAC Meeting of 11 March 2001. There was agreement that implementation of these recommendations will enable the Global Invasive Species Information Network to provide users with timely and accessible information on invasive alien species to facilitate well informed policy and management decisions at all levels.

11. These recommendations are also based upon a series of GISP workshops held between 2000 and 2002 to develop the concepts for the Global Invasive Species Information Network and define the protocols, formats and standards for establishing an open, distributed, interoperable network of databases and information systems managed through regional information hubs.

12. Below are recommendations pertaining to the identification and use of formats, standards and protocols for the establishment of the Global Invasive Species Information Network:

(a) *Network structure:*

(i) Membership (Informatics Consortium):

- a. Ensure open membership at all levels (international, regional, sub-regional, national), across relevant sectors including environment, agriculture, health, trade, transport and travel, and actors including non-governmental organizations, indigenous and local communities and the private sector;
- b. Make use of the existing national clearing-house mechanism focal point network, as appropriate.

(ii) *Regional hubs:*

- a. Develop invasive species regional hubs building, where appropriate, on existing networks.
- b. Encourage the development of the network and its hubs, including new initiatives and projects, especially through regional and global meetings;
- c. Request BioNET INTERNATIONAL and other existing networks to explore opportunities for using their infrastructure to support development and management of the Global Invasive Species Information Network;
- d. Encourage communication and data sharing among regional hubs especially across shared borders, taxa and/or ecosystems.

- e. Develop mechanisms for reporting the status and the accomplishments of the network and its individual hubs, at least an annual basis, especially through regional and global meetings.
- (b) *Network services:*
  - (i) Develop guidelines for validation and authentication of information that is shared, exchanged or contributed;
  - (ii) Develop interactive tools and information systems to assist in the identification of invasive alien species;
  - (iii) Develop a standardized method for indexing and searching the content of the websites of regional hubs;
  - (iv) Support the urgent development and application of open early warning systems, models and analytical/forecasting tools to predict areas and impacts of invasions, through hub interoperability.
- (c) *Metadata and architecture:* Implement an early and robust application of the proposed formats, protocols and standards, including, particularly, the adoption of:
  - (i) Open systems and open standards;
  - (ii) The philosophy of the semantic web in the development and establishment of the Network, including the use of XML at the syntactic level of the network, and Resource Description Framework at the structural level of the network;
  - (iii) FGDC, Dublin Core and other metadata standards, as appropriate, at the semantic level of the Network.
- (d) *Core content:*
  - (i) Support the establishment and maintenance of invasive species information hubs and be supported to establish and maintain, in standard formats being developed by GISP, information on occurrences of invasive species, experts, datasets, projects, organizations, relevant laws and authorities, and best practices, within their regions;
  - (ii) Use established vocabularies and thesauri, when feasible, for such attributes as taxonomic names, geolocators, subject matter, pathways and vectors, habitat types, organization names, laws and regulations, and control methodologies. Encourage development and use of multi-lingual thesauri;
- (iii) *Taxonomy:*
  - a. Increase the standardization of taxonomic usage within the network, taking into account the following:
    - b. Encourage cooperation among hubs to ensure that all are using the same names for species;
    - c. Recognize and communicate changes in taxonomic concepts of individual invasive species without delay across hubs;
    - d. Encourage adoption by hubs of standard nomenclatures of higher taxonomic groups, where developed and accepted under the appropriate nomenclatural codes;

- e. Use the taxonomic resources of GBIF, ITIS and/or Species 2000 that provide access to baseline taxonomic data to ensure interoperability;
  - f. Enable the inclusion of unidentified or partially identified specimens in the information system;
  - g. Allow species level updates of specimen-associated data, such as distribution and ecological impact, upon their eventual naming or re-identification in the information system;
  - h. Encourage hubs to recommend to affiliated institutions to follow best practices, such as:
    - i. Maintenance of voucher collections of invasive species (including genetic material), whether named or not;
    - ii. Specimen identification tracking systems with the potential of active links to the information network in the case of voucher specimens;
    - iii. Mechanisms for actively linking species-level data and the specimen-level data upon which they are based.
  - i. Allow for multiple taxonomic interpretations by the information system. Where conflicting interpretations create confusion as to the status of a species as invasive, these should be flagged as requiring priority investigation.
- (iv) *Geospatial standards:*
- a. Ensure that occurrence data are geo-referenced to enable management from micro to global scales;
  - b. Fully consider the adoption of guidelines/suggestions developed by geospatial working groups;
- (e) *Capacity-building:*
- (i) Encourage and support capacity development by hubs in the application of standards, formats and protocols to ensure equitable and full participation by and within all regions of the world;
  - (ii) Work through and build upon other capacity building initiatives, including those associated with the clearing-house mechanism, GTI (particularly in the context of its proposed programme of work, planned activities 15, 5 and 6) <sup>1/</sup>and other thematic areas and cross-cutting issues under the Convention on Biological Diversity, those being developed in response to the UNDP Capacity Development Initiative, and those being developed by initiatives and organizations such as GBIF, BioNET INTERNATIONAL, the ALL-Species Foundation;
  - (iii) Encourage countries, institutions and initiatives to include invasive alien species information networking within other capacity development activities, and should harmonize aims with this priority issue;

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<sup>1/</sup> See the report of the sixth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (UNEP/CBD/COP/6/3).

- (iv) Recommend to the above and other relevant international initiatives that they make information exchange on invasive alien species a priority issue;
- (v) Work with the clearing-house mechanism in the future use of formats, standards and protocols to ensure interoperability among hubs;
- (vi) *Training:*
  - a. Undertake training and capacity-building activities, including workshops and projects to ensure harmonized participation in the establishment, implementation and use of the network;
  - b. Develop training activities, when appropriate, and subject to available funding, in cooperation with the Convention on Biological Diversity clearing-house mechanism;
- (vii) *Toolkit:*
  - a. Develop and make available a toolkit of guidelines, procedures and protocols for establishing regional hubs;
  - b. Include templates for the development of data and information resources and services;
- (f) *Funding.* Recognize the urgent need for additional funding to support planning and coordination of regional hubs in the implementation of the application of formats, standards and protocols.

*Annex II***LIST OF PARTICIPANTS**

Ms. Barbara (Bobbie) T. Bauldock  
 Director, International Biological Informatics  
 Program  
 U.S. Geological Survey  
 12201 Sunrise Valley Drive  
 Reston, VA 20192  
 Phone: (703) 648-4295  
 Fax: (703) 648-4224  
 Email: [barbara\\_bauldock@usgs.gov](mailto:barbara_bauldock@usgs.gov)

Dr. Vishwas Chavan  
 SMIS Group  
 National Chemical Laboratory  
 Dr. Homi Bhabha Road  
 Pune - 411 008, India  
 Phone: +91-20-589-3457  
 Fax: +91-20-589-3973  
 Email: [vishwas@ems.ncl.res.in](mailto:vishwas@ems.ncl.res.in) &  
[vishwasc@yahoo.com](mailto:vishwasc@yahoo.com)  
<http://www.ncbi.org.in>

Dr. Nick Davidson  
 Ramsar Convention Bureau  
 Rue Mauverney 28, Ch-1196 Gland, Switzerland  
 Tel: +41 22 999 0170,  
 Fax: +41 22 999 0169,  
 E-Mail : [Davidson@Ramsar.Org](mailto:Davidson@Ramsar.Org)

Mr. Phil Fox  
 UNEP-World Conservation Monitoring Centre  
 (UNEP-WCMC)  
 219 Huntingdon Road  
 Cambridge  
 CB3 0DL  
 Telephone: +44 (0) 1223 277314  
 Fax: + 44 (0) 1223 277136  
 E-Mail: [Phill.Fox@Unep-Wcmc.Org](mailto:Phill.Fox@Unep-Wcmc.Org)

Mr. Mike Frame  
 USGS National Biological Information Infrastructure  
 (NBII)  
 Director, Research and Technology  
 12201 Sunrise Valley Dr.  
 Reston, VA 20192  
 Tel: (703) 648-4164  
 Fax: (703) 648-4224  
 E-mail: [mike\\_frame@usgs.gov](mailto:mike_frame@usgs.gov)

Dr. William Gregg  
 Global Invasive Species Programme (GISP)  
 International Activities Officer &  
 Invasive Species Program Coordinator  
 U.S. Geological Survey  
 12201 Sunrise Valley Drive, MS301  
 Reston, VA 20192 Phone: (703) 648-4067  
 Fax: (703) 648-4238 or 4039  
 Email: [william\\_gregg@usgs.gov](mailto:william_gregg@usgs.gov)

Mr. Preston Hardison  
 Indigenous Peoples Biodiversity Information  
 Network (IBIN) Tulalip Tribes of Washington  
 Tulalip Natural Resources  
 7615 Totem Beach Rd.  
 Marysville, WA 98271  
 Tel: +1 360 651-4480  
 Fax: +1 360 651-4490  
 Email: [prestonh@attbi.com](mailto:prestonh@attbi.com)

Ms. Katharina Krieger  
 Instituto de Investigacion de recursos Biologicos  
 Alexander von Humboldt  
 Calle 37 No. 8-40 Mezanine  
 Bogotá D.C.  
 Colombia  
 Tel.: 571 340-6925  
 Fax: 571 288-9564  
 Email: [katinka@humboldt.org.co](mailto:katinka@humboldt.org.co)

Dr. Chris Lyal  
 Global Taxonomy Initiative (GTI)  
 Secretariat of the Convention on Biological  
 Diversity  
 United Nations Environment Programme  
 393 Saint-Jacques Street, Suite 300  
 Montreal, Quebec, Canada  
 H2Y 1N9  
 Tel: +44 (0) 207 942-5113  
 Fax: +44 (0) 207 942-5229  
 E-mail: [chris.lyal@biodiv.org](mailto:chris.lyal@biodiv.org)



Dr. Mervyn Mansell  
 ARC-Plant Protection Research Institute  
 Private Bag X134  
 Pretoria, 0001, South Africa  
 Phone: +27 (12) 323-8540/8/9  
 Fax: +27 (12) 325-6998  
 E-Mail: [vrehmwm@plant5.agric.za](mailto:vrehmwm@plant5.agric.za)

Dr. Helida Oyieke  
 Centre for Biodiversity  
 National Museums of Kenya  
 P.O. Box 40658  
 Nairobi, Kenya  
 Phone: (+254) 2-742445  
 Fax: (+254) 2-741424  
 E-mail: [mbegu@wananchi.com](mailto:mbegu@wananchi.com) or  
[nmk@museums.or.ke](mailto:nmk@museums.or.ke)

Dr. Vadim Panov  
 Senior Research Scientist  
 Regional Biological Invasions Center  
 Zoological Institute of the Russian Academy of  
 Sciences  
 1 Universitetskaya Nab.  
 199034 St. Petersburg,  
 Russia  
 Phone: 7 (812) 323-3140  
 Fax: 7 (812) 328-2941  
 E-mail: [gaas@zin.ru](mailto:gaas@zin.ru)  
<http://www.zin.ru/projects/invasions/>

Dr. Zbyszko Pisarski  
 CHM Focal Point  
 Institute of Environmental Protection  
 5/11 Krucza St.  
 Warsaw PL-00-548  
 Poland  
 Tel.: +4822-629-5264  
 Fax: +4822-629-5263  
[zbyszko.pisarski@ios.edu.pl](mailto:zbyszko.pisarski@ios.edu.pl)

Ms. Annie Simpson  
 Integrated Taxonomic Information System (ITIS)  
 Invasive Species Theme Coordinator  
 National Biological Information Infrastructure  
 12201 Sunrise Valley Dr. MS 302  
 Reston, VA 20192  
 Tel: (703) 648-4281  
 Fax: (703) 648-4224  
 E-mail: [asimpson@usgs.gov](mailto:asimpson@usgs.gov)

Mr. William Ulate  
 Instituto Nacional de Biodiversidad, INBIO  
 Information Technology Dept.

Dr. James Quinn  
 Inter-American Biodiversity Information  
 Network (IABIN)  
 University of California  
 Department of Environmental Science and  
 Policy  
 One Shields Avenue  
 Davis, California  
 95616  
 Tel: (530) 752-8027  
 Fax: (530) 752-9515  
 E-mail: [jfquinn@ucdavis.edu](mailto:jfquinn@ucdavis.edu)

Dr. Jamie K. Reaser  
 Global Invasive Species Programme (GISP)  
 Assistant Director for International Policy,  
 Science and Cooperation  
 National Invasive Species Council  
 SIB, Suite 320  
 1951 Constitution Avenue, NW  
 Washington, DC 20240  
 Phone: (202) 208-2834  
 Fax: (202) 208-1526  
 Email: [Sprgpeeper@aol.com](mailto:Sprgpeeper@aol.com)

Mr. Guy Rochon  
 Co-Chair  
 Informal Advisory Committee (IAC)  
 CHM Focal Point  
 Senior International Biodiversity Coordinator  
 Biodiversity Convention Office  
 Environment Canada  
 351 St. Joseph Blvd. 9th Floor  
 Hull, Quebec  
 K1A 0H3 Canada  
 Tel.: 1-819-953-7626  
 Fax: 1-819-953-7626  
 Email: [guy.rochon@ec.gc.ca](mailto:guy.rochon@ec.gc.ca)

Apdo 22-3100  
 Sto. Domingo, Heredia,  
 Costa Rica  
 Tel: (506) 244-0690  
 Fax: (506) 244-2816  
 E-mail: [wulate@inbio.ac.cr](mailto:wulate@inbio.ac.cr)

Dr. Carlos Valdés-Casillas  
Program Manager  
Environmental Informatics - NABIN  
Commission for Environmental Cooperation  
393 St. Jacques Ouest, Bureau 200  
Montreal (Quebec) Canada  
H2Y 1N9  
Tel : (514) 350 4348  
Fax : (514) 350 4314  
cvaldes@cceintl.org

Dr. David Vieglais  
Global Biodiversity Information Facility (GBIF)  
c/o Zoological Museum  
University of Copenhagen  
Universitetsparken 15  
DK-2100 Copenhagen Ø, Denmark  
phone: +45 35 32 14 70  
e-mail: vieglais@ukans.edu

Mr. Mick Wilson  
United Nations Environment Programme  
United Nations Avenue, Gigiri  
Po Box 30552,  
Nairobi, Kenya  
Tel: (254-2) 621-3436  
Fax: (254-2) 624-4315  
E-Mail: Mick.Wilson@unep.org

Dr. XIE, Yan (Coordinator, BWG/CCICED)  
Institute of Zoology, CAS  
19 Zhongguancun Lu, Haidian Dist.  
Beijing, China, 100080  
Tel/Fax: (8610) 6264 7675  
Email: [xieyan@public3.bta.net.cn](mailto:xieyan@public3.bta.net.cn)  
<http://www.chinabiodiversity.com>

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