

DISCUSSION PAPER

**DATA MANAGEMENT
AND COMMUNICATION
FOR THE CIRCUMPOLAR BIODIVERSITY
MONITORING PROGRAM**

**A COOPERATION STRATEGY
BETWEEN CAFF AND UNEP-WCMC**

SUPPORTING PUBLICATION TO THE
CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM
FRAMEWORK DOCUMENT



CAFF Designated Agencies:

Canadian Wildlife Service, Yellowknife, Canada
Finnish Ministry of the Environment, Helsinki, Finland
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Icelandic Institute of Natural History, Reykjavik, Iceland
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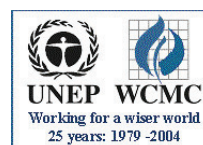
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Supporting publication to the
Circumpolar Biodiversity Monitoring Program
Framework Document

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on behalf of UNEP-WCMC

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Introduction

The circumpolar Arctic region, as defined for the purpose of CAFF, covers some 14.8 million km² of land and 13 million km² of ocean (see Figure 1). It plays a key role in the physical, chemical and biological balance of the globe. The Arctic region encompasses relatively pristine environments, compared to the rest of the globe. Seven of the ten largest wilderness areas are located in the Arctic region, and these are crucial for the preservation of the Arctic's unique biological diversity and provide a unique opportunity to monitor global climate and other global changes in the natural context of a comparatively little disturbed Arctic environment. Together with the Antarctic, the Arctic contains the largest freshwater resources on earth. Arctic seas hold major global fish stocks and Arctic fish, marine mammals and birds connect with almost every corner on the globe through migration routes.

Figure 1: CAFF region



According to the Arctic Climate Impact Assessment report (ACIA, 2004), the Arctic region is warming more rapidly than other parts of the globe, with Arctic biodiversity consequently experiencing both greater and earlier impacts. The characteristic biological diversity of the region, its vulnerability and the threats to it are documented in *Arctic Flora and Fauna: Status and Conservation* (CAFF, 2001).

Circumpolar Biodiversity Monitoring Program

In 2002, the Arctic Ministers endorsed the CAFF Working Group to develop a *Circumpolar Biodiversity Monitoring Program* (CBMP). Furthermore, the Arctic Ministers instructed CAFF, as the biodiversity arm of the *Arctic Council* and its contaminants counterpart AMAP, to cooperate in the development of concepts for coordinating the two respective monitoring programmes.

The ultimate purpose of the CBMP is to provide the necessary information that allows for the development and adoption of policies and strategies for Indigenous Peoples and other local residents of the Arctic, as well as all stakeholders in the utilisation of the Arctic's natural resources, to adapt to the changes occurring in the Arctic; mitigate the negative impacts being brought about by global climate change, and other anthropogenic forces; and work towards stabilisation of biodiversity, and the sustainable use of the Arctic's living and non-living resources.

To be effective, the CBMP must facilitate more effective transfer of information to the various stakeholders; enable wider access to monitoring results and the associated research; and facilitate joint activities such as combining logistical and financial resources, common analyses, and assessments of data over the entire circumpolar region.

Global dimension

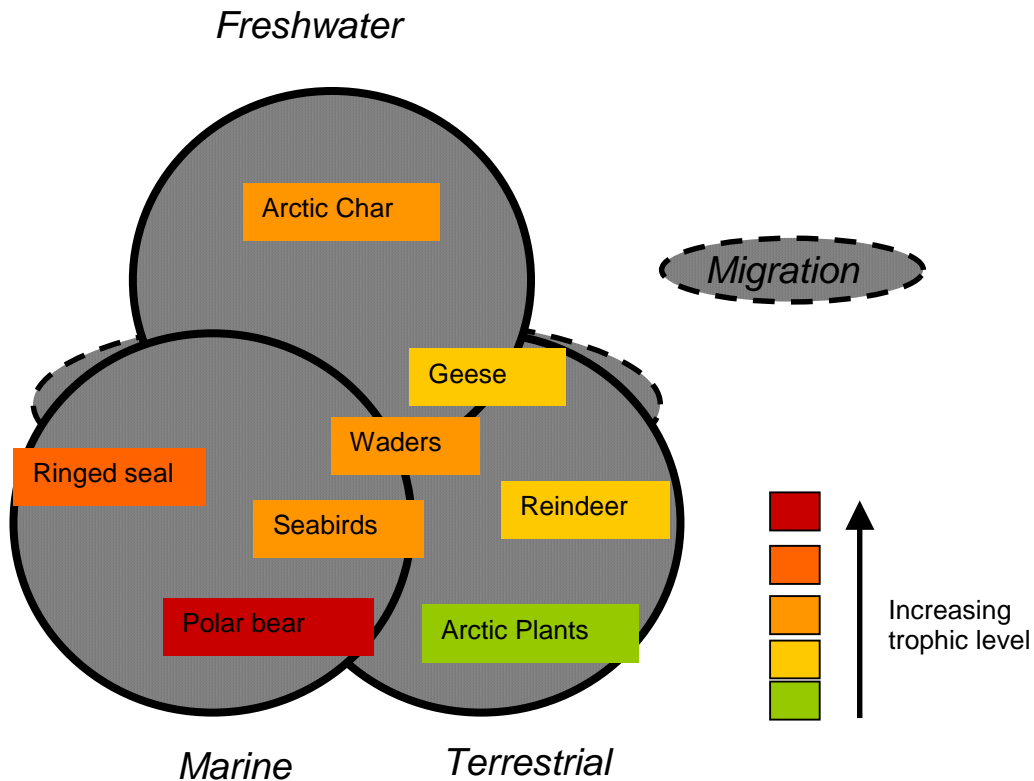
In 2002, both the Convention on Biological Diversity (CBD) and the World Summit on Sustainable Development (WSSD) agreed to a target of significantly reducing the rate of biodiversity loss by the year 2010. In the European region, an even stronger target was agreed to by Environment Ministers in 2003 of *halting* the current rate of biodiversity loss by 2010. Processes are now underway for identifying and developing appropriate indicators for assessing the extent to which this target is being achieved. This will require coordinated use of data from existing monitoring programmes, and the CBD Global Indicators to assess progress towards the 2010 target will be particularly relevant to Arctic conservation and consistent with the CBMP.

Other international conventions and programmes, including both the Convention on Wetlands (Ramsar Convention) and the Convention on Migratory Species (Bonn Convention), are also considering indicators that they might use in assessing success in implementing those agreements. If and when these are implemented, they will also require coordinated use of data from existing monitoring programmes, and will be consistent with the CBMP.

Current monitoring programmes in the Arctic

Among the many global monitoring initiatives, only a few programmes are set up to monitor biodiversity. Frequently, these cover only one taxon, and most are inconsistent in coverage, both spatially and temporally. At present, there are four species networks that will be cooperating with the CBMP, (ITEX, shorebirds, seabirds and Arctic Char), and four additional networks in process of being formed, which represent marine, terrestrial and freshwater species, migratory water birds and sedentary flora and different trophic levels (see Figure 2).

Figure 2: Relationship of eight recognised Arctic biodiversity monitoring networks to ecosystem and trophic levels - where appropriate the migratory status is shown



Monitoring in general is based on various different technologies, and monitoring of biodiversity is usually based on three pillars: remote sensing; *in situ* measuring of population structure and fluxes within ecosystems; and community-based monitoring. Methods include ground mapping; repeat photography; biological data collection at the community (flora) and population (fauna) levels; and phenological observations. All four methods have been applied globally and for the Arctic, and if a Circumpolar Biodiversity Monitoring Program is to be developed, this must include means for bringing together data from a wide variety of sources, collected using a range of different methods.

Proposed approach

This discussion paper outlines ideas for bringing all efforts at monitoring biodiversity in the Arctic together, allowing for better coordination in implementing the programmes, and for more coordinated analysis of the results. The creation of a decentralised and distributed database is recommended, disseminated via a web portal with established links to other monitoring data, such as climate or data on pollution (as collected by AMAP).

It is proposed that a web-based tool be developed which enables full integration of biodiversity monitoring data from different networks, custodians and methodologies, including remote sensing data as well as species network data and community-based information. The common dominator will be spatial geo-referencing, with conversion of the data into GIS databases. Spatial resolution will enable a wide range of complex levels of geographical and thematic overlay and integration for trend analyses and the research of the root causes of the loss in biodiversity.

There are plenty of potential users of the proposed CBMP. The need for monitoring in face of the severe climate change impacts on Arctic biodiversity is of major concern for the Arctic Council as the prime decision and policy makers. In addition, the monitoring data are of key value for assessing progress in achieving the 2010 target on a regional basis. Furthermore, the CBMP will serve other Conventions, such as Ramsar and CMS, and enable a wide range of researcher access to vital data.

In addition, the Arctic has many features of an ideal test case for developing information systems that help assess progress in achieving the 2010 target:

- relatively simple species systems
- global connectivity through international migration routes
- comparatively little direct human impact
- existing circumpolar species networks under the CAFF programme
- huge global implication through high impact of climate change

UNEP-WCMC as a potential partner in implementing CBMP

The main role of the UNEP World Conservation Monitoring Centre is to organise and disseminate knowledge on the status, conservation and sustainable use of biodiversity and ecosystems worldwide. In doing this, UNEP-WCMC:

- analyses the state of global biodiversity, assesses trends and provides early warning of emerging threats in support of international cooperation and action
- supports the development and implementation of international agreements and programmes that promote biodiversity conservation and sustainable management
- supports international action by providing expertise, tools, techniques and information for public awareness, education, capacity-building and cross-sectoral cooperation

The Centre works with a network of partners, and aims to increase the capacity of all stakeholders, while generating outputs for various uses, users and purposes. Figure 3 demonstrates the roles, linkages and relationships with its partners in the management of biodiversity data.

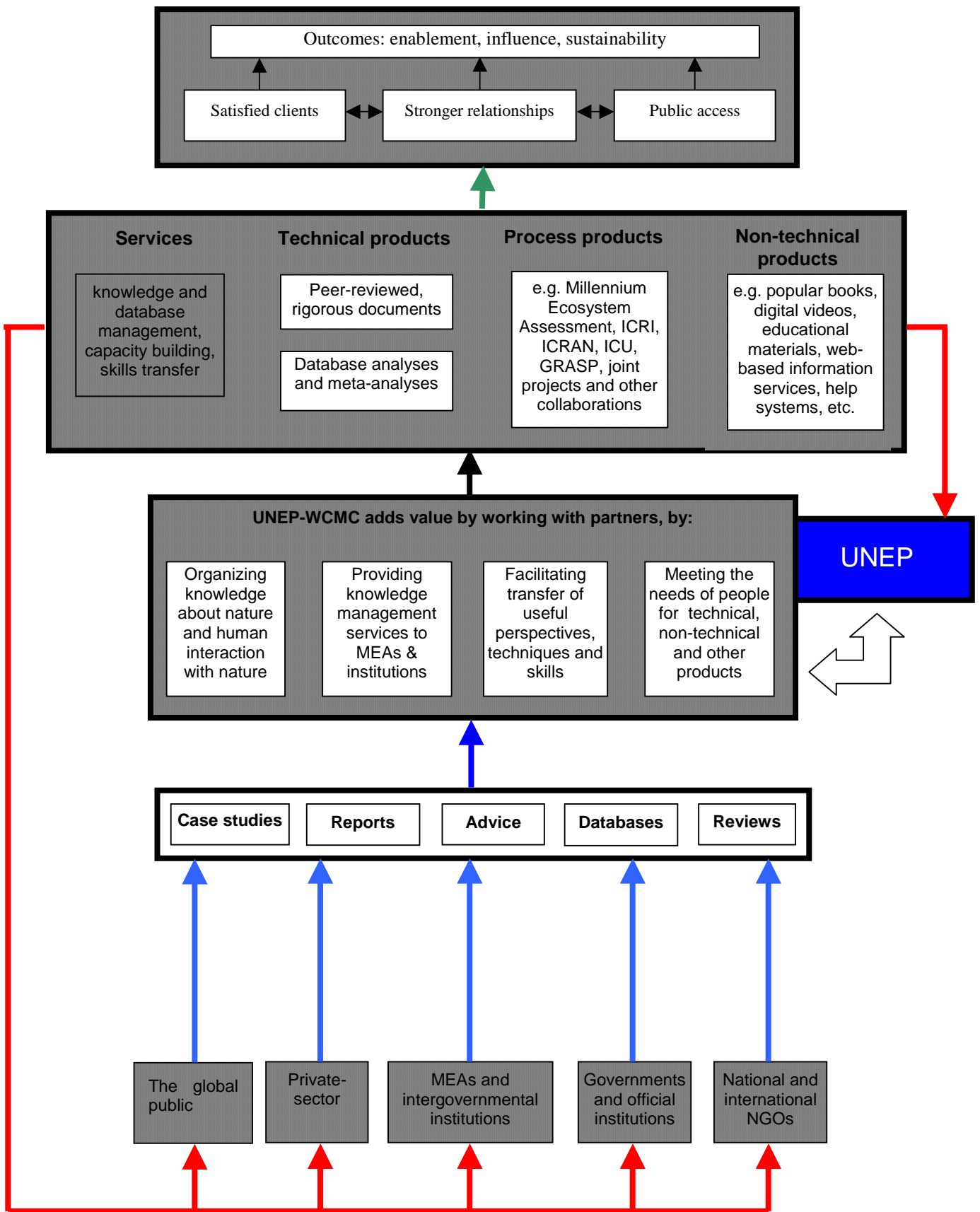


Figure 3: Roles, relationships, inputs and outputs of UNEP-WCMC's data management with its partners

UNEP-WCMC also has extensive experience in the use of GIS and in the development of Internet-based information services both for its own programmes and those of other organizations. UNEP-WCMC works closely with the CBD Secretariat, the EEA and others on 2010 indicators, and is helping other conventions both to manage information and to explore development of indicators. This currently includes work with CITES, CMS, Ramsar and World Heritage Conventions, and with the African-Eurasian Migratory Water Bird Agreement (AEWA).

Database structure for the CBMP

In order to accomplish the integration and management of biodiversity data, different in format and complex in its origin and resolution, it is proposed to develop a web-based portal serving several purposes. It will provide geo-referenced access to data from within the networks, as well as facilitating the integration between the networks. It will also provide a common platform for data access, integration and harmonisation with the potential for a wide range of user groups to use it for trend analyses and reporting.

Figure 4 outlines the concept. The common web-based portal will act as a joint entry point for CAFF and AMAP, for policy and decision makers, scientists and the interested public. The portal will allow limited and controlled access to many decentralised and distributed databases. It is important to emphasise that each organisation or data custodian maintains their own specialist data in their own database.

Development of this distributed system will necessitate the adoption and use of standard storage and query protocols, good metadata and web servers (spatial and tabular). UNEP-WCMC can build a meta database with a web application which makes it 'appear' as if all the data is in one place, even though the data remains on webservers of data custodians.

It is considered that the multi-entry web-based gateway should be designed in such a way that it can be transferred and be applicable for other regions and biomes, so that the Arctic region can act as a pilot for an approach that could also be used elsewhere.

Development of the prototype CBMP

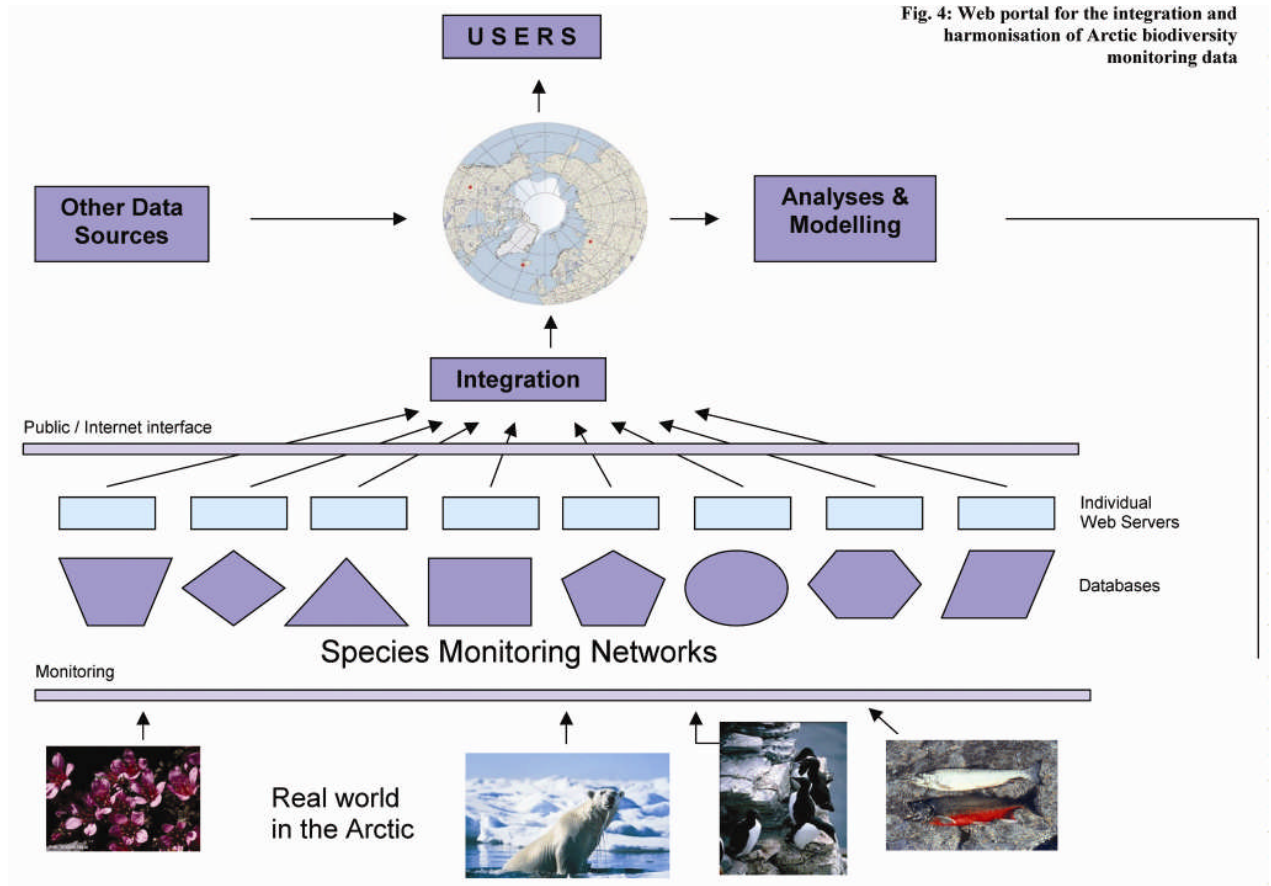
The Arctic region has the great advantage of having very little direct impact from human activity. Furthermore, the Arctic is also based on comparatively simple systems with only few species involved. Many effects, impacts, developments, observations and trends can be interpreted and considered as a baseline, distinguished from natural fluctuations, compared with biomes outside the Arctic region and addressing human impacts and disturbances. For these reasons, the Arctic region is an ideal test case. A prototype for monitoring biodiversity could provide baseline information and be a reference for other regions and biomes.

Problems with currently existing monitoring programmes are that they are not based on all relevant taxa, are biased towards generally rare and well-monitored species, are inconsistent in geographical coverage and have gaps in time series. Most of the existing programmes have been developed without a holistic vision. Today, increasing circumpolar perspectives enable more and more networks to participate in an integrated monitoring initiative.

Existing monitoring networks operate at different levels of structure and organisation. Species networks collect data specifically for the purpose of monitoring status and trends in populations (e.g. Polar Bear, Geese, Arctic Char). Site-based networks often establish a multi-purpose programme, not necessarily including species monitoring as such (e.g. SCANET). Some will

require substantial financial and logistical support in order to join the CBMP. Several of the data holder are organised in big global organisations (e.g. IUCN, Wetlands International). Close collaboration with these partners is anticipated and already in place with respect to other initiatives.

Figure 4: Web portal for the integration and harmonization of Arctic biodiversity monitoring data



For further promoting the CBMP concept, a prototype should be developed and tested. For this it is necessary to choose species, site and community-based networks to trial; to identify how the remote sensing community can contribute; and to consider the development of standards for data collection and maintenance. In order to progress this, two workshops are proposed in early 2005 and 2006.

The prototype should be developed into the following steps.

1. Review existing database structure, based on existing sample databases, such as Arctic Char, reindeer, marine fish, seabird colonies, geese, selected wader species, indigenous peoples observations, flora and climate variables.
2. Develop guidelines on monitoring approaches and database structures based on the largest and best-established databases for the Arctic region. These would guide the development of new monitoring programmes and databases.
3. Develop data holding requirements for interoperability between different databases.
4. Harmonise metadata standards for relevant data to be used by those institutions that make their own data available over the internet, so that access can be fully interoperable (e.g. also with the metadatabase of AMAP).
5. Develop and test the web portal and web-based tools for accessing data on other web sites.
6. Establish a central data hosting facility for data from institutions that can't or don't want to provide data on the Internet themselves and for data that have no current custodians (e.g. from the literature currently used for the *Living Planet Index* database).
7. Consult and harmonise with other global (IUCN, Wetlands International) and regional ongoing monitoring initiatives (e.g. CEON, EEA, GTOS, COML and others).
8. Populate a pilot database, develop some CAFF relevant questions, run a pilot phase and test the value, recognise gaps and insufficiencies.
9. Test the pilot phase in the context of its wider application for other regions to contribute to the 2010 target.
10. Review the prototype database and web portal with potential users both within and outside the region, and develop a programme and business plan for future development of CBMP.

Potential Outputs

The potential outputs of the CBMP using the web-based portal application can be manifold. Some examples of more relevant application are listed below. The value of these need to be considered with stakeholders as the programme develops.

Population Status and Trends: Outputs can be status and trend reports. They can be comprehensive, covering most available aspects of biodiversity information. The Global Biodiversity Outlook of the CBD could be an important process on reporting on Arctic biodiversity as part of the global picture. The next report is scheduled for 2006 which coincides with the next

Arctic Council meeting, and provides an ideal opportunity for a comprehensive report on the status and trends of Arctic biodiversity. These reports can also be based on indicators, developed for the Arctic, such as an Arctic Living Planet Index in accordance to the initiative currently undertaken by WWF and UNEP-WCMC and as proposed for the monitoring of the 2010 target, but based on a much broader data basis. Depending on the variety of taxa included in the monitoring programme regional subsets can be developed. A marine and terrestrial index can illustrate differences, and regional subsets can highlight differences in various regional sea or terrestrial areas. Furthermore, the database can be set up to allow habitat or ecosystem related indices. Another possible distinction in the database can refer to migratory species, including whales, sea birds, reindeer, geese and waders. For most of the species in mind, sufficient knowledge about their migration route and stop over and wintering sites is available on a population level, which can be analysed to distinguish between factors, intrinsic to or outside of the Arctic. Comparing trends of migratory species with those not migrating would allow additional conclusions on the origin of the trends monitored.

Research into the root causes of change: Another major output refers to the potential for correlating the trend data with natural fluctuation, such as the small rodent cycles, mostly in the Arctic lemmings, but also with unnatural ones, such as pollution (AMAP data), climate change variables and others. The potential for research purposes is great. After consideration of natural fluctuations, a correlation with climatic factors is possible, and made even more profound on the basis of different taxa, from different trophic levels, migratory and non-migratory species and from different regions.

Early warning: The recent dramatic sea bird breeding failure and decline of fish in the North Sea illustrates the potential value of monitoring indicators of biodiversity, alerting all stakeholders to major ecosystem malfunctions. Other examples in the less well-monitored Arctic region can indicate major changes, which require further investigation (e.g. strong decline in geese in Eastern Siberia, or Eider population decline in the Western Atlantic among many others).

Provision of background data for various national and regional reporting: All the compiled data and analyses contribute to the requirements of Arctic and other nations to report on the progress towards the 2010 target, and other reporting commitments for the CBD, for Ramsar and CMS for those countries which joined the convention.