INTOSAI
Working Group
on Environmental
Auditing

Auditing Biodiversity: Guidance for Supreme Audit Institutions

This publication was prepared by the INTOSAI Working Group on Environmental Auditing (WGEA). The WGEA aims to encourage the use of audit mandates and audit methods in the field of environmental protection and sustainable development by Supreme Audit Institutions (SAIs). The WGEA has the mandate to

- help SAIs gain a better understanding of the specific environmental auditing issues,
- facilitate exchange of information and experiences among SAIs, and
- publish guidelines and other informative material.

This publication may be downloaded free of charge from the INTOSAI WGEA website

http://www.wgea.org.

Acknowledgements

As the authors of this paper, we would like to thank all Supreme Audit Institutions (SAIs) that answered the biodiversity survey and provided case studies on audits of biodiversity. We would also like to thank the Working Group on Environmental Auditing and steering committee members who provided comments at different stages of the evolution of this paper. Without them, this paper would not have been possible.

A special acknowledgement for colleagues from Secretariat of Convention on Biological Diversity (CBD), Mr. Robert Höft, Mr. Maroun Abi-Chahine, and Mr. David Cooper, who have helped in providing recent studies and sharing recent developments on the issue of biodiversity.

Writing this paper was a collaborative effort among several SAIs. We would like to thank our colleagues who helped, especially colleagues from Audit Board of the Republic of Indonesia, Office of Auditor General of Lesotho, Tribunal de Contas da União of Brazil, National Audit Office of Estonia, Office of the Auditor General of Canada

July 2019

Prof. Dr. Moermahadi Soerja Djanegara, CA., CPA.
Chairman of the Audit Board of the Republic of Indonesia
Chair of INTOSAI WGEA

Lucy L. Liphafa
Auditor General of Lesotho
Project Leader

INTOSAI
Goal Chairs Collaboration
PSC – CBC – KSC

Quality Assurance Certificate of the

Chair of INTOSAI Working Group on Environmental Auditing (WGEA)

This is to certify that ***Auditing Biodiversity: Guidance for Supreme Audit Institutions*** which is placed at level three of Quality Assurance as defined in the paper on "Quality Assurance on Public Goods developed outside Due Process" approved by INTOSAI Governing Board in November 2017 has been developed by following the Quality Assurance processes as detailed below:

i. The project proposal was developed by the team with consultation of INTOSAI WGEA Steering Committee Members and Convention on Biological Diversity (CBD)
ii. The project was discussed during the 15th INTOSAI WGEA Steering Committee Meeting at Washington D.C- USA. in 2017 and further discussed during parallel session of 18th INTOSAI WGEA Assembly Meeting in Bandung-Indonesia.
iii. The project output draft was circulated among team members, steering committee members, Convention on Biological Diversity (CBD) and has gone through more than 30-day exposure (from 22 March to 10 May 2019) for comments at INTOSAI WGEA website and circulated among WGEA members.

The product developed is consistent with relevant INTOSAI Principles and Standards. The structure of the product is in line with the drafting convention of non-IFPP documents.

The product is valid until 30 September 2029 and if it is not reviewed and updated by 30 September 2029, it will cease to be a public good of INTOSAI developed outside the Due Process.

Jakarta, July 2019

Prof. Dr. Moermahadi Soerja Djanegara, CA.CPA
Chair of the Audit Board of the Republic of Indonesia
Chair of INTOSAI WGEA

INTOSAI

Knowledge Sharing & Knowledge Services Committee

Quality Assurance Certificate
Chair of the Goal 3: Knowledge Sharing and Knowledge Services Committee

Based on the assurance provided by the Chair of the ***Working Group on Environmental Auditing*** and the assessment by the Goal Chair, it is certified that the ***Auditing Biodiversity: Guidance for Supreme Audit Institutions*** *which* is placed at level ***3(three)*** of Quality Assurance as defined in the paper on "Quality Assurance on Public goods developed outside Due Process" approved by the INTOSAI Governing Board in November 2017, has been developed by following the Quality Assurance process as detailed in the Quality Assurance Certificate given by the Working Group Chair.

The product is valid till ***30th September 2029*** and, if not reviewed and updated by ***30th September 2029*** it will cease to be a public good of INTOSAI developed outside the Due Process.

Rajiv Mehrishi
Chair of INTOSAI Knowledge Sharing and Knowledge Services Committee

Table of Contents

List of Exhibits

Acronyms and Abbreviations

CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
EI	Ecological Integrity
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
GAO	Government Accountability Office – United States
GE	Genetically Engineered
GEF	Global Environment Facility
GMO	Genetically Modified Organisms (see also LMO)
IBA	Important Bird Areas
IBAMA	Brazilian Institute for the Environment and Renewable Natural Resources—Brazil

IEA	International Environmental Agreement
INTOSAI	International Organization of Supreme Audit Institutions
IPPC	International Plant Protection Convention
ISSAI	INTOSAI Standards of Supreme Audit Institutions
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature and Natural Resources (also named the World Conservation Union)
LMO	Living Modified Organism
MDG	Millennium Development Goal
MA	Millennium Ecosystem Assessment
MMA	Ministry of Environment—Brazil
MPA	Marine Protected Area
NAO	National Audit Office
NBSAP	National Biodiversity Strategy and Action Plan (prescribed in the Convention on Biological Diversity)
NGO	Non-governmental Organization
OAG	Office of Auditor General
OLACEFS	Organización Latino Americana y del Caribe de Entidades Fiscalizadoras Superiores (The Latin American and Caribbean Organization of Supreme Audit Institutions)
SADC	Southern African Development Community
SAI	Supreme Audit Institution
SDGs	Sustainable Development Goals
SEAM	Environmental Secretariat—Paraguay
UNCCD	United Nations Convention to Combat Desertification
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	United States Department of Agriculture
WHC	World Heritage Convention
WGEA	Working Group on Environmental Auditing

Foreword

Biodiversity has been a familiar subject for the International Organization of Supreme Audit Institutions (INTOSAI) Working Group on Environmental Auditing (WGEA). Even, Biodiversity has become the central theme for the 2005-2007 Work Plan period where this original document of *Auditing Biodiversity: Guidance for Supreme Audit Institutions (SAIs)* was first written and published. Since 2013, INTOSAI WGEA has been allocating a specific time on Biodiversity topic within the Environmental Audit training at Global Training Facility in India.

Along this past 10 years, the Guidance has been a good reference for Supreme Audit Institutions (SAIs) in auditing Biodiversity topic. Based on the WGEA Database, there have been approximately 133 audit reports performed by SAIs in the field of Biodiversity since 2007 until 2015. The audits were performed by SAIs worldwide and showed how significant the topic is to the National Governments.

Recent developments in the Biodiversity issue, the ratification of Nagoya Protocols 2014, the Paris Agreement, and 2030 Agenda for Sustainable Development in 2015, require changes made in the current Guidance Material. Thus, it will be relevant with current situation faced by SAIs. In 2010 CBD together with 196 countries have agreed to 20 ambitious Biodiversity Targets for 2020. It was developed into a Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets. It has five strategic goals which demand every National Government to take effective and urgent action by developing a National Biodiversity Strategies and Action Plans (NBSAPs). Those plans are expected to help the government in implementing the Convention and bring positive impact on Biodiversity. The updated document of *Auditing Biodiversity: Guidance for Supreme Audit Institutions* was developed to add the original document the issues and knowledge upon the aforementioned issues.

This project was co-led by the Audit Board of the Republic of Indonesia and Office of Auditor General of Lesotho with the consultation of the Secretariat of Convention Biological Diversity (CBD). I would like also to thank Tribunal de Contas da União (TCU) of Brazil and the Office of the Auditor General of Canada as the previous co-leaders of the original document published by WGEA in 2007. For they have made the work much easier for us in updating the document.

My thanks also goes to subcommittee members – National Audit Office of Estonia, China National Audit Office, Office of Auditor General of Nigeria, European Court of Auditors, Contrôle Supérieur de l'État Cameroon and of course the Tribunal de Contas da União (TCU) of Brazil and the Office of the Auditor General of Canada for their inputs and suggestions. Greatest appreciation also goes to the Supreme Audit Institutions (SAIs) who have contributed in our mini survey and have contributed their audit case studies to our guidance.

Updating the *Auditing Biodiversity: Guidance for Supreme Audit Institutions* document is one of projects within Work Plan 2017-2019. This updated document is expected to fulfill the auditors' need of knowledge in auditing biodiversity. Readers are encouraged to consult about this document or other WGEA products through our website at www.wgea.org or contact us at wgea@bpk.go.id

Prof. Dr. Moermahadi Soerja Djanegara, CA, CPA.

INTOSAI WGEA Chair

Executive Summary

Environmental degradation and habitat loss are growing concerns within the international community; the loss of different species of animals, plants, and micro-organisms is accelerating. Life on Earth depends on nature and humans need the diversity of nature for important services such as food and water resources. Nature is also a source of economic opportunities. Protecting biodiversity is in everybody's interest and concern because its loss could eventually lead to:

- the extinction of species;
- loss of genetic diversity;
- the global spread of common plants and animals, and
- major changes in the way the ecosystems which are essential to humans (for example, through provision of pharmaceutical products, food, timber and purification of air and water) function.

The Strategic Plan for Biodiversity 2011-2020, adopted under the Convention on Biological Diversity, recognizes five major direct threats to biodiversity:

- habitat change: loss and fragmentation;
- invasive alien species (bio-invasion);
- overexploitation;
- pollution and nutrient loading; and
- climate change and global warming.

Other known threats include biotechnology, unsustainable agricultural methods, desertification, and biopiracy. The lack of mainstreaming biodiversity into broader policy frameworks and its implementation has been identified as the indirect threat for biodiversity. When a country has not yet recognized the biodiversity values within their national planning and development, it will put the ecosystem in risk. Economic growth will put more pressure into the ecosystem if the society is lacking the awareness of biodiversity.

In the 2005 *Millennium Ecosystem Assessment*, over 1,300 scientists from around the world issued this sober warning:

> *The ability of the planet's ecosystems to sustain future generations can no longer be taken for granted. The loss of biodiversity, caused by habitat destruction, pollution, invasive species, illegal hunting, overexploitation, and more, is occurring at rates unprecedented in human history—at the global, regional, and local levels. Humanity is, in essence, impairing the very foundation of our health and prosperity. Governments have a key role to play in reversing these trends and in protecting our natural heritage. So do environmental auditors.*

Human activities are the main cause of biodiversity loss as stated in the Millennium Ecosystem Assessment (MA) released in 2005, "Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted." Habitat fragmentation caused by urbanization and agriculture and the overexploitation of resources lead to depletion of species.

There are several ways to protect biodiversity from these threats. Protected areas, such as national parks and conservation areas can be created. Individual endangered and rare species can be protected in biodiversity "hotspots"—areas with a high concentration of those species. The conservation of biological diversity components outside their natural habitats (for example, zoos for living animals and related species, botanical gardens for plants, and gene banks for the preservation of species) can be used and may protect species from extinction.

These activities are regulated by National Governments and they have put legislations, policies, and programs in place to deal with biodiversity issues. Supreme Audit Institutions (SAIs) can therefore, play a major role in protecting biodiversity by auditing their governments' actions.

Because biodiversity is a broad and diverse subject area, selecting audits of biodiversity to conduct can be challenging for SAIs. Once the topic has been selected, it can be difficult to know where to start, because there are many possible:

- scopes (for example, genetics, species, and ecosystems);
- threats (for example, habitat loss, pollution, and urbanization);and
- government's responses (for example, international conventions, national parks, and environmental impact assessments).

The updated document has been developed to help auditors audit biodiversity; educate auditors on the nature of biodiversity and the reason it has to be audited; describe the major role that SAIs can play, by auditing their government's actions and reminding them of their commitments; and present case studies to SAIs to help them learn how others have approached this audit topic, which involves large amounts of public funds.

The document has four main sections, three chapters and an introduction section at the beginning of the document. An introduction chapter is written to give a highlight on what

is happening worldwide regarding biodiversity and what have been done to protect it. In Chapter 1, the topic of biodiversity is introduced and auditors are given useful information on why they should audit biodiversity and how to go about it. In Chapter 2, the best way to choose and begin audits of biodiversity was looked at, and it is described in detail in the following four basic steps:

- **Step 1.** Identify the country's biodiversity and threats to it
- **Step 2.** Understand the government's responses to these threats and the relevant players.
- **Step 3.** Choose audit topics and priorities.
- **Step 4.** Decide on audit approaches: audit objectives and lines of enquiry.

Finally, in Chapter 3, readers will find 10 major biodiversity audit topics that have been conducted by SAIs in different countries around the world. For each topic, readers will find the following:

- Sources of potential audit criteria from international conventions, legislation, policies, and programs including the latest adopted 2030 Agenda for Sustainable Development;
- The players involved;
- Potential researchable questions; and
- SAIs' audit experiences on biodiversity.

The chapter also includes the challenges faced by SAIs and how to cope with these challenges in auditing biodiversity. These audits demonstrate that each SAI can play a major role in auditing their government's commitment to protect biodiversity. .

Introduction

According to the Convention on Biological Diversity, biodiversity (or biological diversity) is the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes diversity within species, between species, and in ecosystems.

Biodiversity is an area of growing concerns—no longer simply a topic for biologists. More and more, the media is bringing biodiversity to the public's attention.

Biodiversity is being lost at rates that are unprecedented in human history. The loss of biodiversity (the number of species of animals, plants, and micro-organisms) is accelerating rapidly, and it directly affects the structure of our ecosystems, natural world, and lives. One of the challenges of maintaining biodiversity is the increasing demand for biological resources caused by population growth and increased consumption. People all over the world must understand the importance of ecosystems and the advantages of biodiversity.

In 2017, at the 17th Meeting of the Working Group on Environmental Auditing (WG17), members agreed to update the 2007 INTOSAI WGEA publication on Auditing Biodiversity: Guidance for Supreme Audit Institutions as one of the project in Working Group on Environmental Auditing's (WGEA) 2017-2019 work plan.

These guidelines have been developed to help SAIs audit biodiversity by:

- educating auditors on the nature of biodiversity and why it has to be audited,
- describing the major role SAIs can play in auditing the actions of their governments and reminding them of their commitments, and
- presenting case studies that will help SAIs learn how others have approached this audit topic, which involves large amounts of public funds.

INTERNATIONAL AWARENESS OF BIODIVERSITY

International awareness of the importance of protecting nature has existed since the 1950s. In 1972 in Stockholm, the world's leaders gathered for the first time to discuss environmental issues at the United Nations Conference on the Human Environment. This conference focused on environmental matters and on the steps humans could take to stop environmental degradation.

Since then, various international agreements that protect the environment have been developed, some of them dealing with specific biodiversity issues. The first global agreement, the Convention on Biological Diversity, dealing specifically with the conservation and sustainable use of biodiversity was signed at the 1992 Earth Summit, in Rio de Janeiro. The Conference of the Parties to the Convention on Biological Diversity (CBD) recognized that biodiversity remains the living foundation for sustainable development.

The CBD is complemented by two Protocols: the Cartagena Protocol on Biosafety, adopted in 2000, which governs the international movement of Living Modified Organisms (LMOs) and its Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress, as well as the Nagoya Protocol on Access and Benefit Sharing, adopted in 2010.

Apart of the CBD, several other international conventions also focus on biodiversity issues: the Convention on Conservation of Migratory Species, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975), the International Treaty on Plant Genetic Resources for Food and Agriculture (2004), the Ramsar Convention on Wetlands (1971), the World Heritage Convention (1972) and the International Plant Protection Convention (1952), the International Whaling Commission (1946). These agreements and their associated commitments are described further in next chapters.

Biodiversity-related conventions work to implement actions at the national, regional and international level in order to reach shared goals of conservation and sustainable use. In meeting their objectives, the conventions have developed a number of complementary approaches (site, species, genetic resources and/or ecosystem-based) and operational tools (e.g., programmes of work, trade permits and certificates, multilateral system for access and benefit-sharing, regional agreements, site listings, funds).

With the adoption of the Agenda 2030 for Sustainable Development in 2015, biodiversity is getting more attention than earlier years. Goal 14 – Conserve and sustainably use the oceans, seas and marine resources for sustainable development- and Goal 15 – Protect, restore and promote sustainable use of terrestrial ecosystem, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss – clearly state the importance of maintaining the biodiversity for sustainable development. INTOSAI WGEA recognizes the importance of auditing SDGs through environmental audit thus it develops another publication titled "Environmental Auditing and Sustainable Development Goals: A Discussion Paper (2019)"

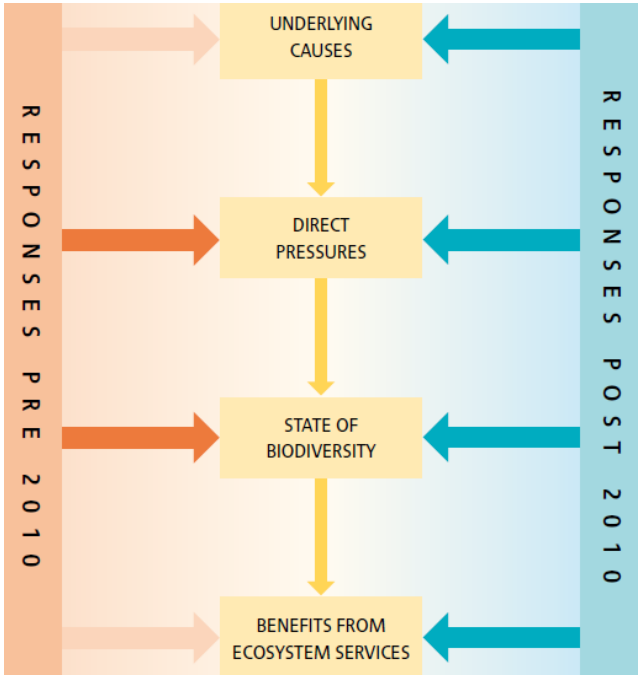
Audits of the implementation of these conventions are considered to important as they are legally binding for countries that have agreed to become parties through ratification, acceptance, approval or accession. Supreme Audit Institutions (SAIs) could play crucial role in evaluating whether the tools that their governments use have produced the intended results.

More information on the audit of International Accords or Multilateral Environmental Agreements (MEAs), see INTOSAI WGEA publication on "Auditing the Implementation of Multilateral Agreements: Primer for Auditors (2010)" at https://wgea.org/media/2921/2010_wgea-unep_primer-for-auditing-implmementation-of-meas.pdf.

The Millennium Ecosystem Assessment (MA) released in 2005 evaluates the relationship between human well-being and ecosystems. The MA is made up of many reports and is the most comprehens ive analysis of existing data on the state of ecosystems and biodiversity. Over 1,300 experts from 95 countries contributed to this report, which highlights the main services and essential goods provided by ecosystems. This report reached troubling conclusions:

> *At the heart of this assessment is a stark warning. Human activity is putting such strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted. The provision of food, fresh water, energy, and materials to a growing population has come at considerable cost to the complex systems of plants, animals, and biological processes that make the planet habitable. . . . Nearly two thirds of the services provided by nature to humankind are found to be in decline worldwide. In effect, the benefits reaped from our engineering of the planet have been achieved by running down natural capital assets. . . . The degradation of ecosystems is already a significant barrier to achieving the Millennium Development Goals (MDGs) agreed to by the international community in September 2000.*

In 2010, the CBD adopted the Strategic Plan for Biodiversity 2011-2020 including the Aichi Biodiversity Targets. This was to respond the failure to achieve the 2010 target of significantly reducing the current rate of biodiversity loss. Secretariat of CBD stated in their Global Biodiversity Outlook 3[1] report that one of the main reasons why the 2010 targets failed to be achieved at the global level was the actions tended to focus more on measures taken in responding the changes in the state of biodiversity or direct pressures of biodiversity loss. (see picture below)



1 Secretariat of the Convention on Biological Diversity. 2010. *Global Biodiversity Outlook 3*. Montréal, 94 pages.

The underlying causes of the biodiversity loss have not been addressed in a meaningful manner for most part of the actions. These causes include demographic change, economic activity, levels of international trade, per capita consumption patterns, cultural and religious factors, also the scientific and technological change. In addition to that, the actions have rarely suited the scale or the magnitude of the challenges addressed. Further, direct pressures on biodiversity must continue to be addressed in order to ensure that biodiversity is effectively conserved, restored, and wisely used. Also, actions must be developed to address the underlying causes of biodiversity loss and to ensure that biodiversity continues providing benefits for human wellbeing.

In the Global Biodiversity Outlook 4[2], published in 2014, Secretariat of CBD reported there has been a significant progress towards meeting some components of the majority of Aichi Biodiversity Targets. For example, the area-based component of Aichi Biodiversity Target 11 aiming to conserve at least 17 per cent of terrestrial and inland water as protected areas and other area-based conservation measures, was considered to be on track to be met in 2020. However, in most targets, this progress was not sufficient to achieve the targets set for 2020. As some of the targets are strongly dependent on others, each of the Aichi Biodiversity Targets cannot be tackled in isolation. Thus, the coherence between the national – regional – and international policies regarding biodiversity is important in achieving the targets by 2020.

IMPORTANCE OF PROTECTING BIODIVERSITY

Life on Earth depends on nature. Humans need the diversity of nature for important services, such as food and water resources. Nature is also a source of economic opportunities. Protecting biodiversity is in everybody's interest and concern.

Until recently, humans have not appreciated that ecosystems are fundamental to supporting life. For example, deforestation has made it clear what a critical role forests play in regulating water cycles. Biodiversity guarantees the stability of ecosystems. Removing one species can affect the entire food chain and ecosystem.

Many ecosystem services and their underlying biodiversity are neither widely recognized nor adequately valued in economic terms, despite their significant economic value. For instance, according to recent estimates:

- wild pollinators, along with managed populations, enhance global crop production by $235 billion to $577 billion annually;
- the value of biodiversity in maintaining commercial forest productivity is estimated at US$166 – 490 billion per year, which is more than twice the cost of implementing effective global conservation measures (estimated at below US$80 billion annually);
- by investing money into protecting watersheds that act as sources for drinking water, one in six cities globally (approximately 690 cities serving over 433 million people globally) has the potential to fully offset conservation costs through water treatment savings alone.

Recently, natural disasters have shown that human lives could have been saved and damage reduced if ecosystems had been better managed. According to recent estimates, protecting coastal wetlands could save the insurance industry $52 billion annually through reducing global flood damage loss. For flood damages by hurricane Sandy in the United States, a 2017 study estimates that temperate coastal wetlands reduced flood heights

2 Secretariat of the Convention on Biological Diversity. 2014. *Global Biodiversity Outlook 4*. Montréal, 155 pages.

and thus avoided over US$625 million in flood damages across 12 affected coastal States, from Maine to North Carolina. Wetlands reduced flood damages by 11% on average across the 12 States included in the study.

Ecosystem services could be assessed using several tools developed by experts. Neugarten et al (2018)[3] mentioned several tools that commonly used to assess ecosystem services as follow:

a. Written step-by-step tools

    1. Ecosystem Services Toolkit (EST);
    2. Protected Areas Benefits Assessment Tool (PA-BAT);
    3. Toolkit for Ecosystem Service Site-based Assessment v.2.0 (TESSA)

b. Computer-based modeling tools

    1. Artificial Intellegence for Ecosystem Services (ARIES);
    2. Co$ting Nature v.3 (C$N);
    3. Integrated Valuation of Ecosystem Services and Tradeoffs 3.4.2 (InVEST);
    4. Multiscale Integrated Models of Ecosystem Services (MIMES);
    5. Social Values for Ecosystem Services (SolVES);
    6. WaterWorld v.2 (WW).

Full description and case studies of each tools could be found in IUCN report on"Tools for measuring, modeling, and valuing ecosystem services". The document is available for accessed at https://portals.iucn.org/library/sites/library/files/documents/PAG-028-En.pdf

AUDITS OF BIODIVERSITY

Along this past 10 years, the Guidance has been a good reference for Supreme Audit Institutions (SAIs) in auditing Biodiversity topic. Based on the WGEA Database, there have been approximately 133 audit reports performed by SAIs in the field of Biodiversity since 2007 until 2015. The audits were performed by SAIs worldwide and showed how significant the topic is to the National Governments. Any audit that touches on ecosystems, watersheds, forests, agricultural practices, marine environments, and other such topics, could be considered an audit of biodiversity. These audit reports have helped the national governments in evaluating their strategies and actions with regard to biodiversity. Recent audit performed by SAI of China on the implementation status of major policies of biodiversity conservation and sustainable natural resources use has helped the Government of China to achieve one component of the Aichi Biodiversity targets. China government has completed the target of 17 per cent land area as protected areas before the year of 2020. More case studies about the variety of audits of biodiversity will be illustrated in Chapter 3.

3 Neugarten, R.A., Langhammer, P.F., Osipova, E., Bagstad, K.J., Bhagabati, N., Butchart, S.H.M., Dudley, N., Elliott, V., Gerber, L.R., Gutierrez Arrellano, C., Ivanić, K.-Z., Kettunen, M., Mandle, L., Merriman, J.C., Mulligan, M., Peh, K.S.-H., Raudsepp-Hearne, C., Semmens, D.J., Stolton, S., Willcock, S. 2018. *Tools for measuring, modelling, and valuing ecosystem services: Guidance for Key Biodiversity Areas, natural World Heritage Sites, and protected areas*. Gland, Switzerland: IUCN. x + 70pp.

CONTENT AND STRUCTURE OF THE DOCUMENT

This paper is a guidance document for SAIs, and it is divided into three chapters. The first chapter:

- provides background on biodiversity and will be particularly useful for readers who are new to the subject,
- defines the scope of biodiversity,
- describes the main concerns related to biodiversity and the main threats to biodiversity and their causes, and
- explains why it is important to protect biodiversity and how it can be done.

The second chapter describes an approach for choosing and designing audits of biodiversity. The four steps in this chapter will help auditors choose and prioritize biodiversity audit topics for their countries.

Finally, the third chapter contains case studies conducted by SAIs around the world. It is divided into 10 sections, covering the most common biodiversity topics that SAIs audit. Each section contains background information on the issue and describes international conventions and potential audit approaches that are supported by actual case studies from around the world.

Chapter 1

Background on Biodiversity

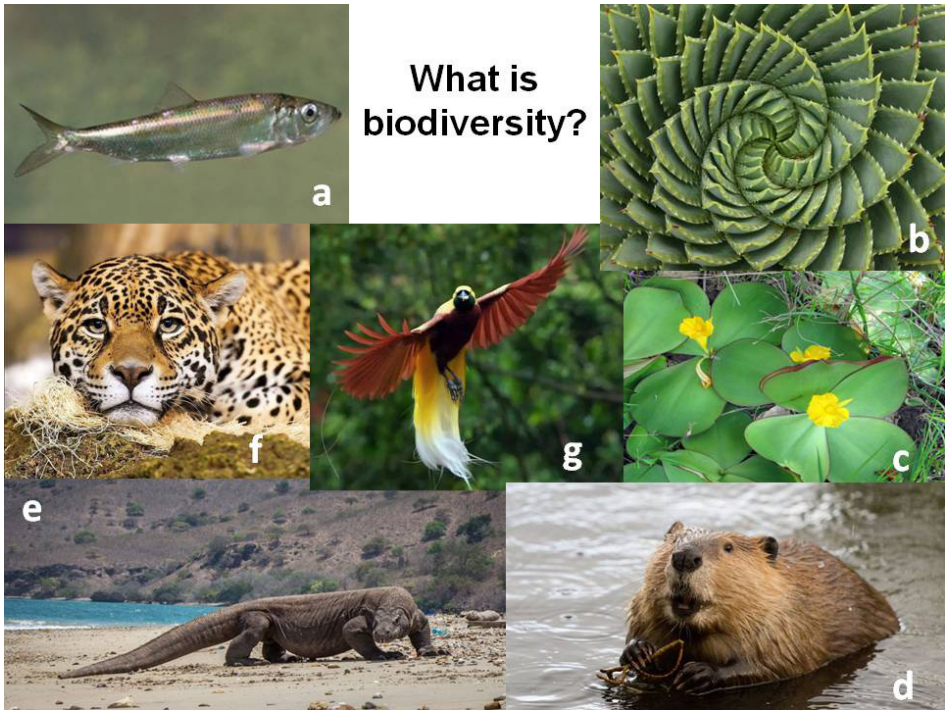
Protecting nature means protecting the environment and biodiversity. The environment is a system that is connected and interdependent. Anything that has an impact on one part of the environment can affect the whole environmental system and its biodiversity.

WHAT IS THE SCOPE OF BIODIVERSITY AND WHAT ARE THE MAIN CONCERNS?

The accelerating loss of biodiversity is a key concern for many reasons. Losses could eventually lead to the extinction of species, reduced genetic diversity, and global spread of common plants and animals—all of which could lead to major changes in the way the ecosystems function.

Biodiversity is a complex subject. It has many facets and can be described in many ways.

Exhibit 1. What is biodiversity?



Note: a. Baltic Herring (Source: https://news.err.ee/104001/new-research-bodes-well-for-baltic-herring-population); b. Aloe polyphylla (Source: http://ls.geoview.info/lesothos_national_flower,31901235p); c.Yellow Trumpet (*Costus spectabilis* (Fenzl) K.Schum.) (Source: https://worldoffloweringplants.com/costus-spectabilis-yellow-trumpet/); d. Beaver (*Castor*) (Source: http://helonational.com/national-animal-of-canada/); e. Komodo (*Varanus komodoensis*) (Source: https://www.goodnewsfromindonesia.id/2018/04/20/8-fakta-menarik-komodo); f. Jaguar (Panthera onca) (Source: http://helonational.com/national-animal-of-brazil/); g. Cendrawasih Kuning Besar *(Paradisaea apoda)* (Source: https://pacebro.com/2018/07/ini-7-jenis-burung-cendrawasih/).

Genetics

Genetics refers to the chromosomes, genes, and deoxyribonucleic acid (DNA) that determine the uniqueness of each individual and species. Colour, size, and resistance to disease are all manifestations of genetic diversity. Genetic variation is important for maintaining fitness and adaptability of species to environmental change.

Concerns about the loss of genetic diversity. The loss of genetic diversity, therefore, could lead to the extinction of species. For example, only two species of rice are cultivated worldwide despite the existence of 120,000 genetically distinct varieties. It is important to conserve those distinct varieties because interbreeding of varieties can increase productivity by reducing the loss from pests and pathogens. A reduced population and an impoverished gene pool leave the remaining species more susceptible to disease. For example, some African cheetahs are at risk because the size of their populations has reduced, and they are likely to inbreed.

Currently, a third of the 6,500 breeds of domestic animals are threatened with extinction, due in part to modern farming practices and varieties. Genetic resources have been lost, because modern farmers often farm a small number of crop and animal varieties instead of locally adapted ones. The failure of one variety can have direct consequences on food security.

Species

Species are organisms that are capable of breeding and producing viable offspring. They are grouped into kingdoms of living organisms. Scientists have identified about 1.74 million of the world's species. According to the scientists, up to 100 million species may be still unknown, many of which are likely to come and go without being catalogued.

Exhibit 2: Kingdoms and their species (2018)[4]

Kingdoms	Number of species
Animals	1,205,336
Archaea	337
Bacteria	9,982
Chromista	23,428
Fungi	135,110
Plants	364,099
Protozoa	2,686
Viruses	3,186
Total	1,744,204

Source: Catalogue of Life (2018)

Concerns about species extinction. Even though extinction (such as that of the dinosaurs) is a natural process, human activities have dramatically accelerated the current rate of decline. According to some estimates, the current rate of extinction is 1,000 times the natural rate. Human activities over the last 50 years are responsible for the sixth largest extinction event in the history of the Earth—the greatest since the dinosaurs disappeared 65 million years ago. These activities include

4 Source: Catalogue of Life – available at: http://www.catalogueoflife.org/annual-checklist/2018/info/totals

- destruction of natural habitats,
- illegal hunting,
- and
- overexploitation of resources.

Extinction raises specific concerns because it is irreversible. Habitat destruction is the main reason that most species become extinct.

Invasive alien species can have a devastating impact on native animals and plants, as they cause other species to become extinct and affect natural and cultivated ecosystems. They can transform the structure and composition of species in ecosystems, by repressing or excluding the native ones. For example, invasive alien species are endangering 80 percent of the threatened species in the Fynbos biome of South Africa.

Climate change also plays an important role in affecting the species composition which leads to local extirpation. For example, sea turtle which is an excellent example of species that has a distinct sensitivity to climatic condition. Higher incubation temperatures yielding more females while lower temperatures yielding more males. Warmer temperature in the Pacific regions (Great Barrier Reef) could reduce the number of male sea turtle offspring and threatens turtle populations[5].

Every year, the International Union for Conservation of Nature and Natural Resources (IUCN) assesses the status of threatened species and publishes the *Red List of Threatened Species*. The number and percentage of threatened species in the 2018 Red List are listed in Exhibit 3— more than 26,000 species of animals and plants are threatened.

Exhibit 3. The 2018 IUCN Red List of Threatened Species

Organisms (by Group)	Estimated Number of Described Species	Number of Species Evaluated in 2018	Number of Threatened Species in 2018
Vertebrates	**69,537**	**47,470**	**8,442**
Mammals	5,692	5,692	1,219
Birds	11,126	11,126	1,492
Reptiles	10,793	7,127	1,307
Amphibians	7,926	6,722	2,092
Fishes	34,000	16,803	2,332
Invertebrates (including Insects, Molluscs etc)	1,305,250	21,886	5,040
Plants (Mosses, Green and Red Algaes)	310,442	27,514	13,299
Fungi and Protist (Mushroom, Lichens)	52,280	81	59
Total	1,737,509	96,951	26,840

Source: https://newredlist.iucnredlist.org/

The percentage of threatened species is high for mammals because there is more information about them than about other groups. The percentage of threatened invertebrates may,in fact, be much higher. The Red List also classifies the species that are at higher risk of global extinction (critically endangered, endangered, and vulnerable).

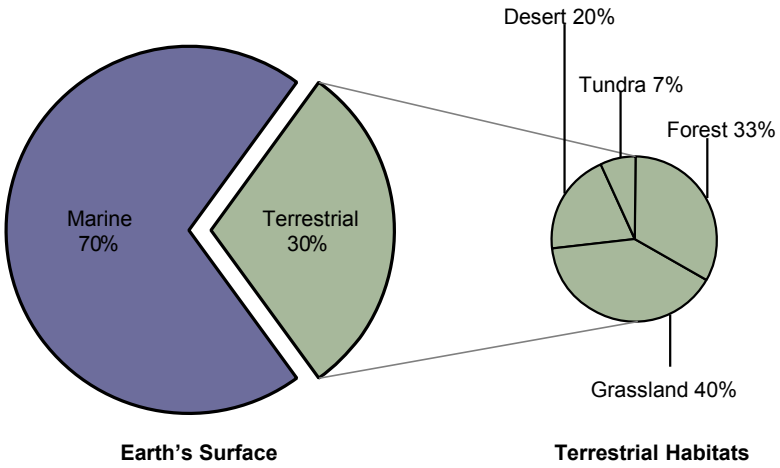
5 Michael P. Jensen, Camryn D. Allen, Tomoharu Eguchi, Ian P. Bell, Erin L. LaCasella, William A. Hilton, Christine A.M. Hof, Peter H. Dutton. Environmental Warming and Feminization of One of the Largest Sea Turtle Populations in the World. *Current Biology*, 2018; 28 (1): 154 DOI: 10.1016/j.cub.2017.11.057

The annual trade in international wildlife is estimated to be worth billions of dollars and to include hundreds of millions of plant and animal specimens. The trade is diverse and includes live animals and plants and a vast array of products derived from them, including food, leather goods, wooden musical instruments, timber, souvenirs, and medicines. Some animal and plant species are heavily harvested to satisfy this trade. Together with other factors, such as habitat loss, this trade may deplete populations and even lead some species to extinction.

Habitat

Habitat refers to the complex of environmental conditions, necessary for one organism to pass its life cyce. Habitats are usually classified as terrestrial, freshwater, or marine (Exhibit 4).

Exhibit 4. Terrestrial habitats make up a small proportion of the planet



(Freshwater represents about one percent of the Earth's surface. It is not represented on this graphic.)

NOTE: Data for terrestrial habitats may vary, depending on the information source (for example, some researchers classify the savannah as forest while others classify it as grassland).

Terrestrial habitats include:

- **Forest.** According to FAO[6], in 2015, an estimated 3,999 million hectares—approximately 30.6 percent of the world's land mass—was forested: 93 percent was natural forest and 7 percent was planted. Estimated to contain half the world's total biodiversity, natural forests have the highest diversity and endemism (species restricted to a certain area) of all ecosystems.
- **Grasslands.** Grasslands once occupied 40 percent of the world's land mass. Today, many are being cultivated, including the prairies of North America, the pampas of South America, the steppes of Europe, and the savannah of East Africa.

6 Food and Agriculture Organization of the United Nations (FAO). 2016. *Global Forest Resources Assessment 2015: How are the world's forests changing? Second edition.* Available at: http://www.fao.org/forest-resources-assessment

- **Deserts.** Deserts are defined as land where evaporation exceeds rainfall (for example, the Sahara and Namib in Africa and the Gobi in India).They may range from being extremely arid (dry) to having sufficient moisture to support life. Species that can survive the intense heat and arid conditions have adapted through natural processes.

- **Tundra.** Tundra is the coldest of all habitats. There are two types of tundra: arctic and alpine. The arctic tundra is around the North Pole and extends south to the coniferous forests in the boreal forest. Tundra is also present around Antarctica and on some islands in the southern Ocean (for example, South Orkneys). The alpine tundra is at high altitudes on mountains, above the tree line.

Freshwater habitats. These include diverse communities found in lakes, rivers, and wetlands— and cover only about one percent of the Earth's surface. Nonetheless, they are highly diverse and contain a large number of the world's species. The majority of the world's human population lives near and depends on freshwater environments for water, food, and employment.

Marine habitats. The marine (ocean) environment covers 70 percent of the Earth's surface thus it is considered as the largest habitat on earth. In some places, it is nearly 11,000 metres deep[7]; although the average depth is about 4,000 metres.

All of the Earth's seas (salt water) are connected through currents, dominated by waves, and influenced by tides. Plant life (phytoplankton) is considerably less dense in the water than on the Earth's land surface, because it can only survive in water that is lit by the sun (a depth of 100 metres)—which is a small portion of the total volume.

Coastal and marine habitats are among the most productive in the world. They include terrestrial areas (for example, sand dunes), areas of brackish water, near-shore coastal areas, and open ocean areas. There are more than 1.6 million kilometres of coastline worldwide.

Concerns about biotic uniformity. Across the globe, animals and plants that can tolerate human activities are replacing distinct, regional species. Changes in land use can break up habitats and create uniformity in the landscape, which leads to less variety in types of animals and plants. This uniformity, also called homogenization, is partly the result of global transport and trade that leads to the introduction of invasive species.

Ecosystems

An ecosystem

- is defined as a system of interrelationships, interactions, and processes between plants and animals (including humans) and their physical environment;

- is a more comprehensive concept than a simple habitat; and includes the habitat, its organisms, their interactions, and other factors—for example, nutrients, energy, and water cycles.

Humans derive many essential goods from ecosystems including seafood, animals, fodder (food for animals), firewood, timber, and pharmaceutical products. Millenium Ecosystem Assessment report (2005)[8] mentioned four major categories of ecosystem services as follow:

7 Hadal/Hadopelagic zone is the deepest region of the ocean lying within oceanic trenches. It could range from 6,000 to 11,000 metres (20,000-36,000 ft).

8 Ecosystems and Human Well-Being Synthesis report (2005) available at http://www.millenniumassessment.org/documents/document.356.aspx.pdf .

Provisioning Services. These are the products obtained from ecosystems, including:

- *Food.* This includes the vast range of food products derived from plants, animals, and microbes.
- *Fiber.* Materials such as wood, jute, cotton, hemp, silk, and wool.
- *Fuel.* Wood, dung, and other biological materials serve as sources of energy.
- *Genetic resources.* This includes the genes and genetic information used for animal and plant breeding and biotechnology.
- *Biochemicals, natural medicines, and pharmaceuticals.* Many medicines, biocides, food additives such as alginates, and biological materials are derived from ecosystems.
- *Ornamental resources.* Animal and plant products, such as skins, shells and flowers are used as ornaments and whole plants are used for landscaping and ornaments.
- *Freshwater.* People obtain freshwater from ecosystems and thus the supply of freshwater can be considered a provisioning service. Freshwater in rivers is also a source of energy. Because water is required for other life to exist, however, it could also be considered a supporting service.

Regulating Services. These are the benefits obtained from the regulation of ecosystem processes, including:

- *Air quality regulation.* Ecosystems both contribute chemicals to and extract chemicals from the atmosphere, influencing many aspects of air quality;
- *Climate regulation.* Ecosystems influence climate both locally and globally. For example, at a local scale, changes in *land cover* can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting greenhouse gases.
- *Water regulation.* The timing and magnitude of runoff, flooding, and aquifer recharge can be strongly influenced by changes in *land cover*, including, in particular, alterations that change the water storage potential of the system, such as the conversion of wetlands or the replacement of forests with croplands or croplands with urban areas.
- *Erosion regulation.* Vegetative cover plays an important role in soil retention and the prevention of landslides.
- *Water purification and waste treatment.* Ecosystems can be a source of impurities (e.g., in fresh water) but also can help to filter out and decompose organic wastes introduced into inland waters and coastal and marine ecosystems and assimilate and detoxify compounds through soil and sub-soil processes.
- *Disease regulation.* Changes in ecosystems can directly change the abundance of human pathogens, such as cholera, and can alter the abundance of disease vectors, such as mosquitoes.
- *Pest regulation.* Ecosystem changes affect the prevalence of crop and livestock pests and diseases.
- *Pollination.* Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators.
- *Natural hazard regulation.* The presence of coastal ecosystems such as *mangroves* and coral reefs can reduce the damage caused by hurricanes or large waves.

Cultural Services. These are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including:

- *Cultural diversity.* The diversity of ecosystems is one factor influencing the diversity of cultures.
- *Spiritual and religious values.* Many religions attach spiritual and religious values to ecosystems or their components.
- *Knowledge systems (traditional and formal).* Ecosystems influence the types of knowledge systems developed by different cultures.
- *Educational values.* Ecosystems and their components and processes provide the basis for both formal and informal education in many societies.
- *Inspiration..* Ecosystems provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising.
- *Aesthetic values.* Many people find beauty or aesthetic value in various aspects of ecosystems, as reflected in the support for parks, scenic drives, and the selection of housing locations.
- *Social relations.* Ecosystems influence the types of social relations that are established in particular cultures. Fishing societies, for example, differ in many respects in their social relations from nomadic herding or agricultural societies.
- *Sense of place.* Many people value the «sense of place» that is associated with recognized features of their environment, including aspects of the ecosystem.
- *Cultural heritage values.* Many societies place high value on the maintenance of either historically important landscapes («cultural landscapes») or culturally significant species.
- *Recreation and ecotourism.* People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.

Supporting Services. Supporting services are those that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. (Some services, like erosion regulation, can be categorized as both a supporting and a regulating service, depending on the time scale and immediacy of their impact on people).

- *Soil Formation.* Because many provisioning services depend on soil fertility, the rate of soil formation influences human well-being in many ways.
- *Photosynthesis.* Photosynthesis produces oxygen necessary for most living organisms.
- *Primary Production.* The assimilation or accumulation of energy and nutrients by organisms.
- *Nutrient cycling.* Approximately 20 nutrients essential for life, including nitrogen and phosphorus, cycle through ecosystems and are maintained at different concentrations in different parts of ecosystems.
- *Water cycling.* Water cycles through ecosystems and is essential for living organisms."

Destroying ecosystems has a significant impact on biodiversity that, in turn, affects how the ecosystem functions. The process is complicated and varies with each type of ecosystem. Certain key species are fundamental to maintaining certain ecosystems. For example, the beaver is considered a key species in the Boreal forest; it plays a major role in creating new habitats, by cutting down trees and creating ponds.

Recently, ecosystems such as wetlands, forests and coast could provide cost-effective natural buffers against disasters and the impacts of climate change. This is known as the ecosystem-based approach disaster risk reduction (DRR). The protection of the ecosystem could also increase the resilience of the vulnerable people of natural hazards such as droughts, hurricanes, and earthquakes (IUCN,2017[9]). For example, a mangrove forest in the coastal areas could function as the habitat of fishes while in the same time it protects the people living in the coastal area from high-tide waves or even tsunami.

Concerns about changes in ecological functions. The loss of biodiversity can disrupt the way ecosystems function, making them more vulnerable to shocks and disturbances, which makes them less resilient and less able to supply humans with necessary resources.

When populations are reduced, there may be an important impact on the functioning of their ecosystem. For example, reducing the wolf population in the United States increased the number of deer grazing in sensitive areas. Park managers are now reintroducing wolves to try to regain an ecological balance.

Invasive species are one in a chain of factors that affect ecosystems by competing with, and often winning against, native species for food and resources. However, it is not easy to determine their overall impact. Recently, the rate and risk associated with the introduction of an invasive species have increased significantly because

- human population growth and environment-altering activities have escalated rapidly; and
- increasing travel, trade, and tourism have raised the likelihood of species being spread.

Food chains

Food chain is described as an arrangement of the organisms of an ecological community according to the order of predation in which each uses the next usually lower member as a food source[10]. The usual order of a food chain is sunlight, plants, herbivore, omnivore and/or carnivore. There are millions of food-chains exist around the world. Food chains that are related within an ecosystem form a food web. A closed food-chain cycle creates a sustainable balance in the nature. Any interference that occurs in one of the links might break the food-chain cycle. Despite these interferences may come from several sources, most of them come from humans and their activities.

For example, within a forest ecosystem, there are many types of carnivores which are considered wild animals. Thus, sometimes when their habitats are destroyed, there is a high possibility that they will look for their food in the surrounding areas like villages. Reports how the villagers in India, Eastern Africa, and Western Canada have to deal with wild animals carnivores that attack their livestocks[11]. This shows that carnivores are an important part of biodiversity as they regulate herbivore populations. Thus, the herbivores do not eat any specific plants to extinction.

9 International Union for Conservation of Nature. 2017. Annual Report 2016. Full report is available at: https://www.iucn.org/about/programme-work-and-reporting/annual-reports

10 Merriam-Webster Dictionary definition on food chain available at https://www.merriam-webster.com/dictionary/food%20chain

11 More on food chains can be seen at https://www.cbd.int/ibd/2008/youth/3.shtml.

WHAT ARE THE MAIN THREATS TO BIODIVERSITY?

The Millennium Ecosystem Assessment recognizes five major threats to biodiversity:

- habitat change: loss and fragmentation;
- invasive alien species (bio-invasion);
- overexploitation;
- pollution and nutrient loading; and
- climate change and global warming.

Other threats include biotechnology, agricultural methods, desertification, biopiracy, and illegal trade of species. These threats and their causes are summarized in Exhibit 5. Human activities are the main cause of biodiversity loss. Habitat fragmentation, caused by urbanization and agriculture and the overexploitation of resources, leads to depletion of species. Because these activities are regulated by government, Supreme Audit Institutions (SAIs) can play a major role in auditing government's actions.

Exhibit 5. Main threats to biodiversity and their causes and consequences

Threats to biodiversity	Causes	Consequences
Habitat loss and fragmentation	Change in land-use and transformation caused by • agriculture, • urbanization, • forestry, • physical modification of river courses or water withdrawal from rivers, • damage to sea beds due to trawling, and • Construction of big infrastructure.	• Decline in distribution, size, and genetic diversity of species • Possible conflict with humans – i.e. carnivores who lost their home will attack human and the animal livestocks. • Some habitats such forests and wetlands play crucial roles in disaster risk reduction. Removing these means higher disaster risks for human and other species well-being.
Invasive alien species: Bio-invasion	• Introduction of (non-native) alien species (intentional and accidental dispersal by human activities). Especially increased mobility and globalization of trade and tourism. • Climate change – global warming • Marine transport (ballast water)	• Native species threatened or extinct through predation, competition, parasitism and hybridization • Some alien species that are vectors for infectious disease can also directly affect human health • Indirect effects on ecosystems as they may change the hydrology system, fire regimes, nutrient cycling, and migration patterns for migratory species • In most cases, invasive species come with high monetary cost for causing environmental damage and crops losses.
Overexploitation (especially overfishing)	• Increased demand and harvesting above or near maximum sustainable levels • Unsustainable management of ecosystems • Illegal practices (logging, fishing, and poaching)	• Collapse of fisheries and other resources • A dysfunction in the food chain – uncontrollable number of species in the lower trophic level of the food chain • In the case of forest, overexploited wood resources reduces the forest cover which in the end affecting global temperature and human well-being.
Pollution and nutrient loading	• Discharge and runoff (from agriculture and industry), • Lack of proper wastewater treatment (for towns and industry), • Over-consumption or misuse of agricultural fertilizers and pesticides, • Light pollution from from artificial lighting in the biosphere.	• Pollutants: disease or death of aquatic populations and affected the human well-being • Nutrient loading: algae blooms and dense flora leading to oxygen depletion and mass mortality of fish and bottom-dwelling organisms • Light pollution has a great impact on light-sensitive species and genotypes also the nocturnal pollinators such as moths and bats
Climate change and global warming	Changes in human population, lifestyle and consumption patterns	• Changes in the distribution of species, population size, and reproduction timing or migration events and an increase in the frequency of pest and disease outbreaks • Major episodes of coral reefs being bleached due to higher water temperatures at surface level • Some species that already vulnerable are likely to become extinct

Threats to biodiversity	Causes	Consequences
Illegal trade of species	Trade of some species for economic benefits	• Many species are threatened to extinction • A dysfunction in the food chain – uncontrollable number of species in the lower trophic level of the food chain
Biotechnology	Genetically modified organisms (GMO): • accidental release • cross-border trade	• Potential adverse effects of GMOs on wild species • Potential adverse effects on biodiversity if GMOs are released into the environment (for example, GMOs commingling with native species) • In the case of biotechnology for agricultural crops, there is potential decrease in overall genetic diversity because the breeding programs will focus on the high value cultivar
Unsustainable Agricultural and aquaculture practices	Human may use agricultural and aquaculture practices that do not respect biological diversity	• Some species can be threatened and deforestation - due to habitat loss from forests into agricultural field • Unsustainable practice of agriculture may reduce the ecosystem's ability to serve its function such water quality maintenance, nutrient cycling, erosion control, and carbon sequestration
Desertification	Overgrazing, deforestation, and climate change	• Decreased ecosystem's ability to support biodiversity • Possible extinction of some vulnerable species.
Biopiracy	Foreign entities using indigenous biomedical knowledge without offering compensation	Lack of incentive for the conservation and sustainable use of biodiversity resources

Habitat loss and fragmentation

The most effective way to conserve biodiversity is to prevent the degradation of habitats. According to International Union for Conservation Union (IUCN), habitat loss is the main threat to 85 percent of the species on the IUCN Red List.

Studies reveal that urbanization (clearing land for development), deforestation and agricultural expansion have dramatically accelerated habitat loss. Marine and coastal ecosystems have been degraded or altered by changes in land use and habitat destruction (development, tourism, fisheries, deforestation, mining and aquaculture).

Fragmentation refers to the division (from natural causes, road construction or other human activities) of large areas of habitat into smaller patches. Fragmentation makes it difficult for isolated species to maintain large enough breeding populations to ensure their survival. It also diminishes the quality of the remaining habitats.

Inland water ecosystems can be physically altered and destroyed by dams and reservoirs, and by introducing water, drainage, canal and flood-control systems.

For audit case studies on this topic, see Chapter 3.

Invasive alien species

Introduced, alien, or exotic species are plants, animals, or micro-organisms that have been introduced outside their natural distribution (past or present) intentionally or accidentally through human activities. Not all alien species are harmful, and many have been introduced intentionally for the benefits they offer. However, invasive alien species can

- cause disease in or prey upon native plants and animals;
- change local habitat, making it inhospitable to native species; or

- reproduce faster than native species and crowd them out by inhabiting their space and eating their food.
- some alien species that are vectors for infectious disease can also directly affect human health
- Indirect effects on the of change migration patterns for migratory species
- In most cases, invasive species come with high monetary cost for causing environmental damage and crops losses.

Experts have concluded that invasive species are the second greatest cause of biodiversity loss and that they could lead to local extinction of species.

The World Conservation Union's list of the 100 worst invasive alien species includes purple loosestrife, leafy spurge, Japanese knotweed, green crab, spiny water flea, common carp, rainbow trout, and rats. Since the 17th century, invasive species have contributed to nearly 40 percent of animal extinctions, for which the cause is known. Annual environmental losses caused by pests introduced to the United States, the United Kingdom, Australia, South Africa, India, and Brazil have been calculated at over US$100 billion.

The most common way species are introduced is through ballast water from ships that transports an estimated 3,000 species of animals and plants every day. An example is the zebra mussel, which threatens the ecosystem of the Great Lakes in Canada and the United States by consuming the plankton that is the main food for many fish.

For audit case studies on this topic, see Invasive species, in Chapter 3.

Overexploitation of resources

With the world population currently at more than six billion people, there is an increasing need for living space and food.

Traditional methods of harvesting natural resources are being replaced by intensive technologies, often without controls to prevent overexploitation. Forestry is a major source of income for some countries, but it can cause the extinction of many species if it is not managed properly.

Although seafood is the primary source of protein for many coastal peoples, (especially the poor), they have not been the main factor in the demise of the global fishery. Much of the global catch is for luxury foods or is processed into livestock feed. As the top predators are depleted, progressively smaller or alternative species are being taken. Some fishing equipment (for example, equipment used for bottom trawling) and destructive fishing practices (for example, blast fishing) can be threats to marine species. The threats include entanglement and drowning in fishing nets (for example, of dolphins and sea turtles).

With regard to preventing overexploitation of fishery resources, a sustainable fisheries management has been encouraged to be performed by countries. Goverments have been encouraged to govern its fishery sector with more sustainable perspective and relevant with the international agreements. More on the information of sustainable fisheries management audit see INTOSAI WGEA publication of "Auditing Sustainable Fisheries Management: Guidance for Supreme Audit Institutions" (2010) at link as follow https://wgea.org/media/2923/2010_wgea_fisheries_management_a4_web.pdf.

In addition, illegal exploitation of resources (illegal logging, fishing, poaching) can add an additional burden on the environment and its biodiversity.

For audit case studies on this topic, see Freshwater habitats and their resources, and Forest resources, in Chapter 3.

Pollution and nutrient loading

Pollutants affect the health of species directly (for example, when they breathe) or indirectly (for example, when they eat). Pollutants drift with prevailing water and air currents and are often deposited far from their original source or across geopolitical borders. Pollutants such as pesticides or chemicals directly affect the food chain.

Fertilizers such as nitrogen, sulphur, and phosphorus that increase agricultural productivity run off into natural ecosystems and cause nutrient loading. Excessive nutrients negatively affect the ecosystems' nutrient cycles, their functioning, and, ultimately, the species they contain. Species that need low levels of nitrogen, such as temperate grasslands, are particularly vulnerable.

Eutrophication (the depletion of oxygen from an environment due to over-dense flora), nutrient pollution, and sewage are threats to freshwater and marine ecosystems, as they threaten the survival of many aquatic organisms.

Pollution (including eutrophication and oil spills) in water and on land significantly threatens the health of species and contributes to the destruction of biodiversity. These threats must be handled through international co-operation.

Recently in 2015, a report made by the US Department of Agriculture (USDA) state that some pollutants under high concentrations can damage leaves (e.g. SO_2, NO_2, O_3), particularly on sensitive tree species. Further, it also stated that particulate trace metals can be toxic to plant leaves. The accumulation of particles on leaves also can reduce photosynthesis by reducing the amount of light reaching the leaf.

For audit case studies on this topic, see Marine habitats and their resources, in Chapter 3.

Climate change and global warming

Many animals, plants, and their communities survive and prosper in areas where they are best adapted to the climate. They are affected by even small changes in the climate.

The Earth is warming faster than at any time in the past 10,000 years. In its fourth assessment report (2007), the Intergovernmental Panel on Climate Change (IPCC) determined that

- the Earth's mean surface temperature increased by 0.74 degrees Celsius over the last century,
- the 1990s were warmest on record so far,
- some precipitation patterns have changed, and
- the global sea level has risen by an estimated 17 centimetres during the 20th century.

Studies show that climate change has a significant impact on biodiversity—leading to the extinction of species and the destruction of habitats. According to UN report on Sustainable Development Goals (2017), corals, amphibians and cycads are in serious decline due to climate change. Corals bleaching, driven by climate change, has affected the health of coral reefs worldwide and it could disappear completely by 2050.

Recently ratified Paris Agreement has strengthened the countries' commitment to decrease the negative impacts of climate change especially to biodiversity. Paris agreement (2015) noted the importance of ensuring the integrity of all ecosystems including oceans, and the protection of biodiversity when taking action to address climate change.

Global warming can result in a rise in the sea level, which may threaten vulnerable habitats, including mangroves, coral reefs, and coastal wetlands. Recent empirical evidence and predictive modelling studies show that climate change will speed up the decline of certain populations. Changing wind patterns, ocean currents, pH levels, and temperatures affect oceanographic processes and affect marine biology in ways that have not been quantified in models. To study more on how SAIs could perform an audit on climate change efforts, see INTOSAI WGEA publication on "Auditing the government efforts to adapt to climate change and ocean acidification in the marine environment"12. Another publication, INTOSAI WGEA Guidance on "Research Paper on Potential Criteria for Auditing Climate Change Adaptation – Strengthening Resilience and Adaptive Capacity to Climate-related Hazards (2019)" could also be a good reference on how SAIs could audit its governments' in strengthening resilience and adaptive capacity to climate-related hazards and natural disasters and implement the Sendai Framework13 Chart for Disaster Risk Reduction 2015-2030.

Illegal trade of species

Another threat to biodiversity is the illegal trade of animal and plant species. Species are exported for a variety of reasons. For example:

- some plants and animals are exported for medical purposes,
- other plants and animals are exported for collections (for example, orchids),
- fish are exported for aquarium markets, and
- birds are exported as pets (for example, parrots).

Exporting these species is only considered illegal under certain circumstances. However, the export of some species—often those that are believed to cure diseases or enhance health (for example, some people believe that the horn of a rhinoceros can be used to improve one's health)—is always illegal.

In many countries, the trade of species can boost the economy. However, exporting some species could threaten their survival.

To address this issue, many countries signed an international agreement in 1975: the Convention on International Trade in Endangered Species of Wild Fauna and Flora. For more information on this convention and for audit case studies on this topic, see Endangered species, in Chapter 3.

Biotechnology

Advances in biotechnology have made it possible to transfer genes from one species to another. Genetic modification could help provide more food for the growing population. However, this technology is still relatively new and many scientists are concerned about its potential side effects on human health (for example, food allergies) and on the environment (for example, biodiversity risks). In particular, genetically modified organisms (GMOs) that are accidentally released into the natural environment could affect biodiversity by reproducing (mating) with native species and causing a reduction in genetic diversity. For example, if the modified genes made them stronger than native species, individual species with the introduced genes could successfully compete for resources with native species and may eliminate the natural genetic diversity.

12 Link to the publication: https://wgea.org/media/5372/wgea_marine_isbn-ok.pdf.

13 More information on Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030 is available at: https://www.preventionweb.net/sendai-framework/sendai-framework-for-drr

The Cartagena Protocol on Biosafety adopted in 2000 is an international agreement which aims to ensure the safe handling, transport, and use of living modified organism (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity and human health. Link to the protocol as follow: https://www.cbd.int/doc/legal/cartagena-protocol-en.pdf.

Unsustainable Agricultural and aquaculture practice

Overgrazing can deteriorate a grasslands system until the ground becomes barren and the original water cycle is disrupted. Rainwater washed away the soil because of scarcity of vegetation. In desert grasslands, overgrazing also affects the natural vegetation.

Natural grasslands have been drastically altered by general agricultural practices. The expansion of agriculture, since the 1970s, has involved cultivating marginal areas and clearing important natural habitats, such as forests and wetlands.

In some countries, deforestation and irrigation may cause the water tables to rise, leading to an accumulation of salts at the surface, which is a major problem for agriculture and the local population. This phenomenon can eventually lead to desertification.

The rapid growth of aquaculture has caused the loss of many coastal ecosystems. Effluents from aquaculture facilities can be pollutant-heavy and can degrade the surrounding habitats and species. Diseases and parasites can be transmitted to wild stocks when farmed fish escape.

Desertification

Desertification refers to the degradation of land in arid, semi-arid, and "dry sub-humid" areas brought about climatic variations, human activities and other factors. According to the United Nations Convention to Combat Desertification (UNCCD), about 3,600 million hectares, 70 percent of the world's drylands (excluding hyper-arid deserts), are degraded. Human activities have contributed to desertification through deforestation, over-cultivation, overgrazing. Deforestation is especially problematic in the margins of the sub-Saharan Africa because of the need of fuelwood.

INTOSAI WGEA recognized this issue and have developed several publications. They are Land Use and Land Management (2013) and Auditing Guidelines for SAIs on Land Use and Soil Quality Management for Combating Desertification (2019) available in the INTOSAI WGEA website.

Biopiracy

Biopiracy is an unfair exploitation of a country's biological resources. The global market value of pharmaceuticals derived from genetic resources is estimated at between US$ 75,000 and US$ 150,000 million annually. Biopiracy takes advantage of knowledge—often the traditional knowledge of native peoples—that is not protected by the system of intellectual property.

The most controversial aspect of biopiracy is access to genetic resources and the distribution of derived benefits. Fair and equitable sharing of the benefits from genetic resources can encourage conservation and the sustainable use of biodiversity. Around the world, networks are being created to counteract the unauthorized use of genetic resources in pharmacy and medicine. It has been proposed that biopiracy should be regulated by an international regime, within the framework of the Convention on Biological Diversity. The regime would include mechanisms to ensure that holders of traditional knowledge receive a fair share of the benefits.

Traditional knowledge is the sum of what is known about innovations and practices of indigenous and local communities around the world. Today, there is a growing appreciation of the value of such knowledge. It is not only valuable to those who depend on it in their daily lives; it is also valuable to modern industry and agriculture. Many widely used products, such as plant-based medicines and cosmetics, are derived from traditional knowledge. It can make a significant contribution to sustainable development. Most indigenous and local communities are in the same areas as the vast majority of the world's plant genetic resources; their members have used biodiversity in a sustainable way for thousands of years.

In 2009, an International Treaty on Plant Genetic Resources for Food and Agriculture was adopted. The objective of this treaty are the conservation and sustainable use of all plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising ut of their use, in harmony with CBD, for sustainable agriculture and food security. Further, in 2010, the Nagoya Protocol was adopted to prevent such exploitation or disputes happen due to the access of genetic resources. This protocol is aimed at sharing benefits arising from the utilization of genetic resources in a fair and equitable way. This include an appropriate access to genetic resources and transfer of relevant technologies through a set of core obligations for its parties to access the genetic resources, benefit-sharing, and compliance.

For audit case studies on this topic, see Genetic resources, in Chapter 3.

HOW CAN BIODIVERSITY BE PROTECTED?

Human activity is the main cause of biodiversity loss. Therefore, the solution to the problem is in the management of resources and human development, in which the government plays a central role. It uses public policy tools (see Step 2. Understanding the government's responses to these threats and the relevant players, in Chapter 2) to regulate human activities, such as urbanization, resource extraction, and agriculture, which will help to protect the environment and biodiversity.

There are several ways to protect biodiversity. One is to create protected areas, such as national parks and conservation areas. Properly managed, protected areas provide a refuge for species and their ecosystems. This is known as *in-situ* conservation or "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings."

In particular, conservation efforts are important in areas called biodiversity "hotspots." These areas are Earth's richest and most endangered habitats. Hotspots are regions that harbour a great diversity of endemic species and, at the same time, have been significantly affected and altered by human activities. To be declared a hotspot, the region has to have lost 70 percent or more of its original habitat. To date, Conservation International has identified 34 biodiversity hotspots where 75 percent of the planet's most threatened mammals, birds, and amphibians survive within habitats that cover just 2.3 percent of the Earth's surface. Such areas must be protected against illegal activities such as burning, cultivating, hunting, and poaching. Conservation should focus on critical, unique, and representative habitats that may then be considered protected areas.

Where *in-situ* conservation is not possible, *ex-situ* conservation can be used. *Ex-situ* conservation is "the conservation of components of biological diversity outside their natural habitats," such as zoos for living animals and related species, botanical gardens for plants, and gene banks to preserve species. These measures may provide insurance

against extinction. Re-integrating animals and plants in nature is not always successful, because they are no longer accustomed to living in their natural ecosystems.

Measures must be taken to prevent the introduction of invasive alien species through trade routes.

Countries will have to reassess the way they are managing their resources. They will have to revise their river management, forestry, fisheries, and agricultural practices. Governments must consider biodiversity when making decisions that affect land use and exploitation of resources.

Governments use a variety of public policy tools to support protective measures. Chief among these tools are international and regional environmental agreements, legislation, and funded programs, which will be covered in more detail in chapters 2 and 3.

Another way to protect and conserve biodiversity is to increase public awareness of biodiversity and ecosystem issues. Public education is often a requirement under international agreements.

Research and monitoring is essential in protecting biodiversity. There is a need to increase the knowledge and understanding of biodiversity, its value, and the threats to it. Assessing the status of biodiversity (genes, species, and ecosystems) is a major challenge. More information must be available on the gain and loss of crop varieties and the change in status of species, threatened or not, to preserve the biological balance. The status of habitats, ecosystems and threats must be covered in the main agenda for ecological meetings today, so that recovery and restoration efforts will show results tomorrow.

Exhibit 6 summarizes actions that can be taken by countries according to the Secretariat of the Convention of Biological Diversity.

Exhibit 6. Ways to slow the loss of biodiversity

1. **Sustainable and efficient agriculture. Improve** the efficiency of land use, water, nutrients, and chemicals in agriculture, aquaculture, and plantations.
2. **Landscape-level planning.** Protect **areas** that are rich in biodiversity and produce essential ecosystem services. Use lands that are already converted, including degraded lands, to expand agriculture, aquaculture, and plantations.
3. **Sustainable consumption.** Limit **over**-consumption of energy, timber, and food (especially meat) by affluent sectors of society.
4. **Over-exploitation of wild resources. Stop** over-fishing and destructive fishing practices. Expand protected marine areas. Stop harvesting endangered species and populations.
5. **Critical ecosystems.** Protect and restore those ecosystems that provide resources for the poor, allow adaptation to climate change, and provide critical ecosystem goods and services.

Exhibit 7. Best practices done by Government of Costa Rica on Biodiversity

Costa Rica is perhaps the good example of a biodiversity-rich country making a commitment to protecting its natural endowments. While it is a small country, about the size of West Virginia, it is home to about 500,000 plant and animal species. Though Costa Rica experienced very serious deforestation driven by cattle ranching during the 1960s and 1970s, it has worked for the last 30 years to protect about 25% of its land in national parks and other forms of reserves. The protected areas are designed to ensure the survival of at least 80% of Costa Rica's remaining biodiversity. Efforts have been made to facilitate connectivity between reserves and to ensure that they are as representative as possible. Beyond the reserves, the Costa Rican government has also halted subsidies that encourage forest clearing and has encouraged investment in ecotourism. Today, tourism is the largest industry in Costa Rica, and is very substantially focused on activities within and surrounding these reserves. Tourism has become so popular that the Costa Rican government and conservation biologists are now concerned about the impacts that so many visitors are having on the country's biodiversity. Nevertheless, Costa Rica remains an example of the benefits that protected areas can have for biodiversity and local economies.

But connectivity between reserves is often necessary on a larger than national scale, and that was the goal of advocates for the "Paseo Pantera" (Panther Path) in Central America. Now known as the "MesoAmerican Biological Corridor," this system of protected areas and corridors stretches from Mexico to Panama.

The Rewilding Institute advocates for the creation of even large-scale connectivity between important ecosystems in North and Central America, focusing on the necessity for large carnivores like wolves, mountain lions, and grizzly bears to travel the long distances they require.

The primary goal of all of these corridor-based projects is to ensure landscape permeability, which means that even if a particular place is not designated as a protected area, wildlife is able to use the habitat and to travel freely through it. Elements that ensure landscape permeability include laws that regulate or restrict wildlife hunting or trapping, designing roads and railroads so that animals can cross safely, and establishing relationships between government wildlife agencies and local communities so that everyone feels that they benefit from protecting the biological integrity of the region.

Source: https://www.e-education.psu.edu/geog30/node/396.

Chapter 2

Choosing and Designing Audits of Biodiversity

The purpose of this chapter is to guide Supreme Audit Institutions (SAIs) and auditors, as they choose and design audits of biodiversity. Selecting and determining the scope of audits of biodiversity can be challenging for SAIs. There are so many ways of describing the scope (from genetics to species to ecosystems), the threats (from habitat loss to pollution to urbanization), and the responses of governments (from international conventions to national parks to environmental impact assessments). Even deciding where to start can be difficult.

This chapter is designed to help SAIs and auditors make sense of it all. It includes the following four basic steps that are described in more detail in Exhibit 10:

- **Step 1**. Identify the country's biodiversity and threats to it.
- **Step 2**. Understand the government's responses to these threats and the relevant players.
- **Step 3**. Choose audit topics and priorities.
- **Step 4.** Decide on audit approaches: audit objectives and lines of enquiry.

These steps are only suggestions, and they can be adapted to the situation and needs of a particular SAI. They can be used to define the objectives, scope, and criteria of a single audit of biodiversity or to develop a long-term, risk-based plan for a series of audits. Even though the steps are presented in a linear way, they are, in fact, highly inter-related and iterative. The early steps can be omitted if the SAI has already chosen the audit topic. Once a topic has been chosen, the auditor can go to Chapter 3 for information on specific topics.

SAIs do not need special mandates to conduct audits of biodiversity. Like all environmental audits, an audit of biodiversity could examine financial and compliance issues as well as performance issues, depending on the SAI's mandate. Since biodiversity issues can be complex and difficult to understand, many SAIs hire experts to help them understand particular issues or to clarify some points. For more information about the SAI's mandate and advice on using experts, see the WGEA paper, *Evolution and Trends in Environmental Auditing* (2007).

STEP 1. IDENTIFY THE COUNTRY'S BIODIVERSITY AND THREATS TO IT

Chapter 1 gives a general background on biodiversity and describes the biological resources that exist around the world and some of the common global threats and concerns. The degree of relevance and urgency of certain issues is unique to each country and, therefore, raises unique concerns about biodiversity. To develop domestic approaches for auditing biodiversity issues, SAIs must understand the situation in their country and the main threats to biodiversity.

Key Question: What are the biological resources in the country?

Auditors could consider the following:

- **Economic sectors and activities that depend on biological resources.** For example, is the economy based on fisheries, forests, or agriculture? In a country with a large fishing industry, sustaining the fish population is crucial and should be managed in a way that maintains integrity of the ecosystem. Sustainable fish management is crucial. European Commission used the Maximum Sustainable Yield[14] concept to maintain the population size at the point of maximum growth rate by harvesting the individuals that would normally be added to the population which allows the population to be productive continuously. Over-fishing can be very destructive for biodiversity and fisheries sector too. Unsustainable and illegal fisheries cause the decline of big economic sector.

- **The nature and sensitivity of various types of ecosystem in the country.** For example, are the ecosystems mainly marine, freshwater, or terrestrial, or are they combinations? Ecosystems of coral reefs, wetlands, mangroves, and mountains are more fragile and often need specific protection. An ecosystem that makes up a small percentage of a country could be considered a priority topic.

- **The contribution that the country's ecosystem goods and services make to the national economy and well-being.** For example, are wetlands and mangroves important to protect against flooding?

- **The nature and status of species in the country.** For example, are any species endemic or endangered? Is there any existing relevant information on the species status in the country? Does the proper indicators in the biodiversity status monitoring and evaluation system properly elaborated? Does the biodiversity status monitoring system offer sufficiently long-time period data sets? What are the trends of the presented data and what are the reasons for the trend?

Key Question: What are the key threats to these resources and its diversity?

The next set of questions focuses on the threats (and their causes) to the resources, such as described in the section, What are the main threats to biodiversity, in Chapter 1. The auditor must now understand the specific threats that exist in the country and the risks that these threats pose to economic development, social prosperity, and the quality of the environment.

In general, it is not the SAI's role to assess the main threats—it is the government's role. To identify local threats, the SAI can seek information from the government agencies that are charged with controlling and overseeing biodiversity in the country. Other sources of information include universities, non-governmental and international organizations, local and state councils, laws, and the media.

14 For further information on Maximum Sustainable Yield used by European Commission: https://ec.europa.eu/dgs/maritimeaffairs_fisheries/magazine/en/tags/maximum-sustainable-yield

When identifying threats to biodiversity, auditors should remember that behind the direct drivers are indirect drivers, such as demographic, economic, socio-political, cultural, religious, scientific, and technological factors that cause changes to biodiversity.

In some cases, governments may not have adequately assessed the threats to biodiversity. As a result, auditors may have to consult NGOs, universities, or any organizations that have done this kind of assessment, or SAIs may hire consultants to help them. Depending on what their mandate is, SAIs can give advice to the government. However, most of the time, they will simply report that the government has not yet assessed the threats to biodiversity and their consequences.

Finally, SAIs need to understand the causes behind these threats (see Exhibit 4). Changes in land use, urbanization, agricultural practices, and many other factors can drive or aggravate the threats discussed in the section, What are the main threats to biodiversity, in Chapter 1. In addition, economic development policy, such as the increasing tourism in the world's biodiversity hotspots, should not be overlooked. In these hotspots, governments have the challenge of promoting economic activity without compromising the integrity of the natural resources. Poorly planned tourism can have a variety of negative effects, such as the logging of original growth forests to build infrastructure, pollution, the introduction of invasive species, water shortages, and degrading water supplies.

Additional information on the impact of tourism on biodiversity can be found in TOURISM AND BIODIVERSITY—Mapping Tourism's Global Footprint (UNEP, 2003) at http://www.unep.org/PDF/Tourism-and-biodiversity.pdf

STEP 2. UNDERSTAND THE GOVERNMENT'S RESPONSES TO THESE THREATS AND THE RELEVANT PLAYERS

Governments play a crucial role in protecting biodiversity. SAIs do not audit the environment. They audit government. Therefore, once a SAI has understood the main biological resources in the country and the threats to those resources, it needs to understand what the government is doing to mitigate or prevent them (what programs exist and which policy tools are used) and who is responsible. Armed with this information, SAIs can then consider the traditional questions, such as audit mandate, risk, auditability, and materiality, to select and prioritize audit topics.

Exhibit 8. National Governments' Responsibilities based on Strategic Plan for Biodiversity 2011-2020

According to the Strategic Plan for Biodiversity 2011-2020[15], national governments have the responsibility to:

a. **Enable participation at all levels** to foster the full and effective contributions of women, indigenous and local communities, civil-society organizations, the private sector and stakeholders from all other sectors in the full implementation of the objectives of the Convention and the Strategic Plan;
b. **Develop national and regional targets,** using the Strategic Plan and its Aichi Targets, as a flexible framework, in accordance with national priorities and capacities and taking into account both the global targets and the status and trends of biological diversity in the country, and the resources provided through the strategy for resource mobilization, with a view to contributing to collective global efforts to reach the global targets, and report thereon to the Conference of the Parties at its eleventh meeting;

15 Link to the Strategic Plan 2011-2020: https://www.cbd.int/doc/decisions/cop-10/cop-10-dec-02-en.pdf.

c. **Review, and as appropriate update and revise, their national biodiversity strategies and action plans,** in line with the Strategic Plan and the guidance adopted in decision IX/9, including by integrating their national targets into their national biodiversity strategies and action plans, adopted as a policy instrument, and report thereon to the Conference of the Parties at its eleventh or twelfth meeting;
d. **Use the revised and updated national biodiversity strategies and action plans as effective instruments** for the integration of biodiversity targets into national development and poverty reduction policies and strategies, national accounting, as appropriate, economic sectors and spatial planning processes, by Government and the private sector at all levels;
e. **Monitor and review the implementation of their national biodiversity strategies and action plans** in accordance with the Strategic Plan and their national targets making use of the set of indicators developed for the Strategic Plan as a flexible framework and to report to the Conference of the Parties through their fifth and sixth national reports and any other means to be decided by the Conference of the Parties;
f. **Support the updating of national biodiversity strategies and action plans** as effective instruments to promote the implementation of the Strategic Plan and mainstreaming of biodiversity at the national level, taking into account synergies among the biodiversity-related conventions in a manner consistent with their respective mandates;
g. **Promote the generation and use of scientific information, develop methodologies and initiatives** to monitor status and trends of biodiversity and ecosystem services, share data, develop indicators and measures, and undertake regular and timely assessments, to underpin the proposed new intergovernmental science-policy platform on biodiversity and ecosystem services (IPBES) and an effective Subsidiary Body on Scientific, Technical and Technological Advice in order to strengthen the science policy interface, thereby enhancing the implementation of the Strategic Plan for Biodiversity 2011-2020;

Source : Decision X/2 on the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets (CBD, 2010)

Key Question: What is the government doing about these threats?

As noted in the section, How can biodiversity be protected, in Chapter 1, governments can and do take action to protect and conserve biological resources. They establish national parks and other protected areas; they regulate hunting, fishing, and exploitation of resources (for example, forests); and they control pollution and land-use. They can and do use a variety of public policy tools to authorize, finance, and implement these actions. Public policy tools include international agreements, laws, programs, and public education. The following are descriptions of most common environmental policy tools and questions for auditors.

International conventions and treaties. Since many environmental issues affect the entire planet, they require the concerted action of national governments. Various bilateral, regional, and international environmental agreements (IEAs) or multilateral environmental agreements (MEAs) have been signed by national governments to conserve natural heritage. SAIs can play a major role in auditing how these agreements are carried out and in reminding the government of its obligations under them. The principal IEAs related to biodiversity and its main features are listed briefly in the Appendix 1.

To learn more about international conventions and treaties, see the WGEA publication, *The Audit of International Environmental Accords* (2001), at:

https://wgea.org/media/2887/eng01pu_studyaudinterenvaccord.pdf

Auditors should find out from the agency responsible for international relations if the country has signed any regional agreements related to biodiversity. These agreements are numerous, and it is not the objective of this paper to describe them. However, Appendix 2 contains a list of regional agreements, by continent.

Legislation and regulations. Governments have a variety of legal powers and tools that they can use to address environmental problems and activities. Legal powers include legislation (acts of Parliament or Congress), regulations, permits, licences, bylaws, and ordinances. Governments have varying roles and responsibilities.

Usually, national laws are required to give effect to international agreements. For example, if a country has ratified an agreement, the auditor should find out whether corresponding national legislation has been introduced, and whether it is being enforced. In some cases, countries enact specific laws to implement specific agreements. More often, a single piece of legislation (such as an environmental protection act) can be used to address a number of agreements. For the sake of sustainability, governments set quotas or total allowable catches (e.g. hunting quota, fishing quota) which are based on scientifically argued data and to manage the species' population.

In other cases, national laws are unrelated to international agreements and are simply intended to respond to national needs. Legal powers are used broadly to establish national parks, protect species, limiting pollution, and control invasive species.

For many SAIs, the existence of national laws (and the supporting legal tools) is a prerequisite for conducting compliance audits.

Policies and programs. Governments can also formulate national policies on biodiversity. In some countries, biodiversity has became one of the development focuses in their National Development Planning along with reducing poverty and human development. Policies tend to set direction, but are usually not prescriptive or enforceable. A policy might be a statement of intent or of a desired outcome. In some cases, policies can be supported by specific procedures (action plans) and (funded) programs. For example, it might be the policy of a government to establish a series of national parks. In order for these parks to be established a well funded program is needed to carry forward their implementation and their maintenance.

Success implementation of programs requires that they have sufficient monetary resources, skilled people, goals and authorities. Government should set performance measurements regarding the implementation of their policies or programs. Some countries have developed their National Biodiversity Strategy and Action Plan Document to provide step-by-step guidance on what they should do in preserving biodiversity.

Governments also establish and support research programs on biodiversity. These research programs are often linked to monitoring and evaluation databases to evaluate whether the measures taken made positive changes or not.

Market Based Instruments (MBIs) or Economic Instruments. Market Based Instruments are tools for governments to implement environmental policy. These tools are grants, loans, subsidies, taxes, user charges, and service fees. Several governments have used MBIs in order the protect biodiversity. For example: a) the use *resource tax for forestry and hunting* in Brazil and Colombia; b) the use of *watershed protection charges/taxes* in USA, Philippines, India, and Jamaica to improve water quality; and c) the use of *tradable development permits* in Canada, Cyprus, and India to prevent developers destroying valuable habitat in the land the wish to develop. In some cases, using these types of tool is grounded in financial or environmental legislation.

For further information on how Governments used MBIs in different environmental areas and SAIs experiences in auditing MBIs, see INTOSAI WGEA Publication on Market Based Instruments for Environmental Protection and Management (2016) at https://wgea.org/media/5370/wgea-instrument-protection-and-management_isbn-ok.pdf.

Environmental Impact Assessments and Strategic environmental assessment. Environmental Impact Assessments (EIAs) are used to examine projects, programs, policies, or activities to ensure that potential impact on the environment, including on biodiversity, is carefully considered before legislation is enacted. EIAs are critical

planning tools, given the serious and irreversible damage that humans can cause to the environment. Failure to consider such damage and set appropriate mitigation measures before a policy, program, or project is launched can lead to significant environmental degradation, damage to human health, and economic costs. In some governments, such EIAs are legislated. In others, they are part of the policy tools.

More information on performing EIAs on Environmental Auditing could be learned in INTOSAI WGEA publication on Environmental Impact Assessment (2016). The document could be accessed at https://wgea.org/media/5371/wgea_impact-assassement_isbn-ok.pdf.

Meanwhile, Strategic Environmental Assessment (SEA) is used to ensure that environment and other sustainability aspects are considered effectively in the process of strategy/plan/program development. Most of the time, SEA is conducted before an EIA is undertaken to provide high level protection of the environment and to promote sustainable development in the strategic level.

Voluntary partnerships. Voluntary partnerships are agreements between governments, non-profit organizations, or corporations that come together for a common purpose without legislation. Some governments and conservation organizations encourage private landowners to protect ecologically sensitive lands and natural areas through voluntary agreements. The most well known voluntary partnership is the European Union Forest Law Enforcement Governance and Trade (EU FLEGT). The voluntary partnership agreement is made between EU and individual timber-producing countries to eliminate illegally-produced timber from a country and domestic trade. In 2016, Indonesia became the first country to enforce this licensing scheme on legally produced tropical timber. This scheme is believed to end the scourge of illegal logging and prevent the destruction of unique ecosystem while in the same time exacerbate poverty.

Clearing-House Mechanism (CHM) is a mechanism established by Convention on Biological Diversity (CBD) to ensure that all governments have access to the information and technologies they need for their efforts regarding biodiversity. This mechanism serves to promote and facilitate technical and scientific cooperation with and between countries, develop a global mechanism for exchanging and integrating information on biodiversity, and develop a human and technological network.

Convention's Communication Education and Public Awareness (CEPA) is an important instrument to raise the public awareness and to contribute to the relatively low political priority given to biodiversity issues. The secretariat of CBD allocates a specific page where people could access reports submitted by countries on their CEPA efforts[16].

Key Question: Who are the players and what are their roles and responsibilities?

The auditor needs to identify the major players involved. Players can be numerous and can have both converging and diverging interests. The auditor must define each player's role, activities, and scope of influence. Auditor may perform a stakeholder mapping based on stakeholders' interests and impacts to identify the key players.

Players may include government departments and agencies at the national (federal), provincial, state, or, local (municipal) level. Government control and preservation frameworks for biodiversity vary from country to country. In many countries, a government authority is in charge of the major environmental policies at the national level, including the preservation and conservation of biodiversity. Among other activities, this authority is responsible for

16 National Action on CEPA could be accessed through https://www.cbd.int/cepa/action.shtml.

- ensuring that environmental laws are being enforced by public and private entities
- preparing environmental standards,
- defining environmental policies,
- issuing licences to limit the volume or concentration of pollutants discharged into the environment,
- monitoring to identify potential environmental damage, and
- applying fines when laws are violated.

In some countries, national (federal) agencies are responsible for these activities. In others, responsibilities may be delegated to lower administrative levels. National (federal), state, provincial, and local (municipal) governments have different powers, and their specific roles and responsibilities can vary widely. For example, national governments tend to develop and formulate policies, and lower levels of government often implement those policies. National governments enact national legislation and regulations, and local levels of government use tools, such as permits and licences. These are not fixed rules, however, so it is important for auditors to understand where an issue fits into the hierarchy, which level of government is involved, and how that level is involved.

Non-government organizations, such as civil institutions, members of social movements, professional associations, local communities, non-governmental organizations, business sectors, academic institutions, and scientific institutes, may have a role to play. In some countries, it is also important to highlight the key role played by indigenous communities. Many countries have established knowledge resource centres, databases, and networks to preserve and disseminate traditional ecological knowledge.

In addition to their roles as policy-makers and regulators, some governments may be "operational enterprises" in their societies. Government actions and projects, including the building of roads, the generation and distribution of electricity, and agriculture can have a negative impact on biodiversity. Auditors may wish to identify the state-run agencies and enterprises that affect biodiversity.

STEP 3. CHOOSE AUDIT TOPICS AND PRIORITIES

The auditor is now ready to identify possible audit topics. As noted throughout this paper, there are many ways of framing and defining audit topics related to biodiversity. SAIs may select an overall threat to biodiversity (for example, invasive species) or select a topic as it affects a specific habitat (for example, invasive species in marine habitats). The important thing is to define the focus of the investigation. Chapter 3 includes detailed information (including possible audit criteria, players, and researchable questions) on the following possible audit topics:

- a national strategy for biodiversity,
- protected areas (parks, conservation areas, and bird sanctuaries),
- endangered species,
- invasive species,
- freshwater habitats and their resources,
- wetlands,

- marine habitats and their resources,
- genetic resources,
- forest resources,
- mainstreaming biodiversity into economic sectors and development planning,
- impact of climate change on biodiversity, and
- desertification and biodiversity.

It is up to the SAI to choose audit topic and set priorities, which involves answering the following questions:

Key Question: What are the highest risks to the environment and the use of public funds?

The SAI will need to do a risk analysis to define where its actions will be most relevant and useful. When assessing threats to biodiversity, the auditor should consider the magnitude of the actual and potential impact on the environment, society, and the economy. When determining the damage to the environment, the auditor should question how reversible that damage is— irreversible damage is especially risky. In addition, the auditor must consider how intense the damage is, since it is a priority to address and prevent acute threats. Usually, auditors rely on their government's assessments. However, if necessary, they may request help from experts in the field.

In the case of specific ecosystems, auditors need to consider existing threats, the level of habitat degradation, and the effects of the damage on the local communities that benefit from the goods and services. For example, a SAI may decide to audit the government's actions to protect mangroves, because they are a very important spawning area or because they play an important role in protecting shores against tsunami. Since fisheries are important for the survival of coastal communities, a SAI may audit how the government is assessing the role of mangroves in assuring sustainable fisheries.

For some SAIs, the level of expenditure by the government is a critical factor; some monies can be earmarked for specific legislation and directives. Some national governments included their budget for biodiversity within their National Biodiversty Strategy and Action Plan. Sources of fund for biodiversity protection could also come from outside national budget especially with the adoption of Agenda 2030 for Sustainable Development. United Nations has endorsed the Addis Ababa Action Agenda[17] in 2015 as a proof of financial commitment to support the Agenda 2030. This action agenda has acknowledged the importance of protecting biodiversity and the sustainable use of its components as a part of the implementation of Agenda 2030. In part of the article 63 of the Action Agenda stated that:

> *"……We encourage the mobilization of financial resources from all sources and at all levels to conserve and sustainably use biodiversity and ecosystems, including promoting sustainable land management, combating desertification, drought, dust storms and floods, restoring degraded land and soil, and promoting sustainable forest management….."*

The CBD also has its own financial mechanism of the convention. The implementation of the convention has several funding resources such as Global Environment Facility (GEF), Global Taxonomy Initiative special fund, and European Funding Sources.

17 Full document of the UN Resolution on the Addis Ababa Action Agenda see link as follow: https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf .

Key Question: Does the SAI have the mandate and authority?

After identifying the players, the SAI should determine which ones it has jurisdiction over. Even in the government sphere, it may be able to act only at the national (federal), state, provincial or local (municipal) level. Private players (for example, the private sector, state-run enterprises, or non-government organizations) that are financed by public resources may also fall under the SAI's jurisdiction. Despite the lack of jurisdiction over some players, the auditor must know who they are and what role they play, since the government can regulate or influence their behaviour through public policy tools and instruments. If the most influential players are not subject to the SAI's jurisdiction, auditing the issue may have little value.

Key Question: Is the topic auditable?

First and foremost, the auditor should decide whether there are suitable sources of criteria against which to conduct the audit.

- Has the government signed international biodiversity-related agreements?
- Has the government enacted laws and regulations?
- Has the government made policy statements clear?
- Are biodiversity-related topics included in state budgets?
- Does the government receive external funding from international organizations (for example, the Global Environmental Fund or the European Union) to fulfill its biodiversity obligations related to international agreements?
- Are there any sufficient data and information available related to the chosen topic?

Key Question: Can an audit make a difference?

A SAI will also have to assess where it will be most effective in improving the way the government protects and conserves biodiversity. The auditor may consider the following questions:

- What are the interests of the users of the audit report, particularly the primary users (e.g., Parliament)?
- What is the relative significance of the topic to overall governmental activities?
- What is the impact of the audit likely to be? Is the audit likely to make a significant difference?
- Has the topic been audited before?
- What is the relevance of this topic to protect basic human needs?

The SAI may then decide that it is not worthwhile to audit a biodiversity issue at this stage. On the other hand, the SAI may include a line of enquiry related to biodiversity in an environmental audit, even though biodiversity is not the main issue. For example, in an audit of climate change, a SAI may include a line of enquiry on the effect of climate change on biodiversity.

STEP 4. DECIDE ON AUDIT APPROACHES: AUDIT OBJECTIVES AND LINES OF ENQUIRY

For this last step, the auditor needs to select an audit approach and choose audit objectives and lines of enquiry.

Key Question: What are the most relevant objectives and lines of enquiry for this audit?

The following are some possible lines of enquiry and associated researchable questions. See Exhibit 11 for more information on how auditors can combine various topics and approaches.

Financial management and regularity. Using traditional financial audit techniques, auditors can investigate the use of public funds in projects and programs that focus on conservation and biodiversity.

- Are the funds spent on biodiversity programs correctly administered, according to spending authorities and regulations?
- Are adequate financial resources allocated to biodiversity protection programs?
- Is the disbursement of funds monitored?
- Against what criteria is the disbursement of funds measured?
- Do official trade-offs exist in policies? If so, how do the estimated benefits balance against the losses in biodiversity?

Compliance with agreements, laws, and policies. An audit of biodiversity can address the consistency of government strategies, actions, and programs with laws and regulations, or with the international conventions, to which the country is a signatory. It may answer the question: Is the government meeting commitments it made in treaties, laws, policies, and programs? The following are some of the lines of enquiry:

- Are there international agreements that protect biodiversity within the country's geopolitical borders or shared protected areas?
- Is the country following the rules and agreements determined by the international conventions that it is a signatory to?
- Has the government enacted laws and regulations to implement its international commitments and domestic policies?
- Are there any conflicts or gaps between national policies on biodiversity and the country's environmental laws?
- Are environmental laws and regulations being adequately enforced?
- Is there any conflict between national policies and the international conventions that the country is a signatory to?

Policy Integration and Policy Coherence. Auditing policies and programs on domestic biodiversity can be valuable. Policy on biodiversity usually provides a macro vision. As biodiversity is a very crosscutting issue, the policies related to it often permeate other government's actuation fields. Interesting lines of enquiry include the following:

- Are government policies being complied with?
- Has the government developed policies that address the protection and conservation of biological resources in the country? Do the policies deal with the most important threats?
- Have general policies on biodiversity been addressed, specified, and executed in laws and other legal instruments such as plans and budgets?
- What protective measures, with the support of bordering countries, can be taken to protect ecosystems that straddle geopolitical borders?
- What kinds of changes can be suggested that would make national policies achieve better results?

To ensure the integration and the coherence, the auditor could ask below questions:

- What are the policies involved in achieving a certain goal of SDGs – both with positive and negative impacts?
- How the policies are coordinated?
- Are there is any mechanism for identifying synergies or conflicts?
- Are there any fragmentation, overlapping, duplication, and gaps among the policies?
- Is the whole set of policies being efficient or is there any opportunity for improving its efficiency?

Performance measurement and results. Audits of biodiversity can assess the performance of government programs' actions to deal with threats to biodiversity and ensure the conservation of habitats or ecosystems. SAIs may wish to evaluate the traditional three E's—effectiveness, efficiency, and economy—of the programs. They may also wish to assess the processes used to define and measure success and the results of these processes.

- Have the relevant agencies defined expected results for their programs?
- Have they developed indicators and measures for these results and are they being monitored and tracked?
- Is the data used to measure performance reliable?
- Are policies and programs on biodiversity achieving their objectives and intended results?
- Why are policies and programs not achieving their objectives and intended results, and how can the causes be countered?

Performance audits on biodiversity project could also be performed using an biodiversity impact assessment approach. Biodiversity impact assessment allowed the auditor to determine the types and significance of a project effects on the biodiversity (Hardner et al, 2015). The process generally takes four major steps as follow:

1. Definition of project alternatives
2. Impact identification

3. Impact characterization

4. Assessment of consequence and risk

By the end of this process, auditors/project managers could analyze the risks of the projects using the predetermined consequences and likelihood of the impact will occur using the example risk matrix below:

Exhibit 9. Example risk matrix for biodiversity impact assessment

Likelihood	Consequence				
	Minor impact	Moderate impact	Serious impact	Extreme impact	Catastrophic impact
Almost certain: expected to occur in project plan	Moderate	High	Critical	Critical	Critical
Likely: probably will occur in project plan	Moderate	High	High	Critical	Critical
Possible: might occur in some circumstances	Low	Moderate	High	Critical	Critical
Unlikely: may occur at some time	Low	Low	Moderate	High	Critical
Rare: only in exceptional circumstances	Low	Low	Moderate	High	High

Source: Hardner et al, 2015[18]

SAI of Iraq performed an audit on the programs of state policy for preserving biological diversity throughout Iraq. The deterioration and decline of biodiversity throughout the country were the main reason of the audit. Using sub risk matrix to prioritize risks during the audit engagement, SAI of Iraq decided to audit the government policies on protecting the biodiversity.

Accountability, coordination, and capacity. Because biodiversity topics frequently involve many government entities and other players, SAIs could assess how departments and agencies have demonstrated good governance, for example, whether they can meet their responsibilities for environmental programs and actions, and whether they have the mechanisms to coordinate those actions.

- Are the roles, responsibilities, and accountability of relevant entities (for example, ministries and departments) clearly defined?
- Are any necessary mechanisms to coordinate action in place?
- Do the entities have adequate financial and human resources to carry out their roles and responsibilities?
- Has the staff received adequate training?
- Have the entities developed robust internal management systems?

Scientific research and monitoring. The government's capacity to undertake research and monitor ecosystems can directly affect how biodiversity is protected. In many countries, this responsibility is legally defined. The following are suggested lines of enquiry:

- Does the government have the scientific knowledge (in-house or consultant-based) to prioritize its actions on biodiversity?
- Are there adequate systems in place to monitor the status of biodiversity?

18 Hardner, J., R.E. Gullison, S. Anstee, M. Meyer. 2015. *Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning.* Prepared for the Multilateral Financing Institutions Biodiversity Working Group

- Is the government developing and maintaining databases on biodiversity either in-house or with research institutions?
- Is information being shared between the national and international monitoring systems?
- Does the public have access to information on monitoring activities?

Public education. National and international, environmental protection programs often have a public education component. Large sums of money can be spent even though the success of these programs has not been measured. SAIs may include, among others, the following lines of enquiry:

- Is the government allocating appropriate funds for public outreach and education at each phase (formulation, planning, implementation, and evaluation) of a policy?
- Is the government encouraging the public and private sectors to protect biodiversity?
- Has the government integrated biodiversity concerns into its public outreach strategies?
- Is the government measuring its public outreach results?

Reporting to clients and the public. The reporting requirements of public policies can be an important source of audit evidence. For example, many international environmental agreements require that national governments report to United Nations agencies or other international agencies (e.g., donor organizations). In addition, regulated entities within a country may be required to report to regulatory agencies that, in turn, may report to their Parliament or equivalent.

Proper monitoring, reporting, and accountability processes—which include collecting data, performing analyses, and reporting on findings—should be in place. SAIs can ensure that such reports and performance comply with appropriate standards, rules, and regulations. SAIs may consider:

- What are the required contents of the reports?
- How are departments and agencies reporting their results?
- What are the timelines in rendition of reports?
- Are departments and agencies meeting international and national reporting obligations?

Summary of audit approaches

Exhibit 12 summarizes the many possible ways auditors can combine biodiversity topics and audit approaches. An audit of biodiversity may cover more than one of the listed topics, and more than one audit approach can be used for each biodiversity audit topic. However, as with any audit, auditors need to be careful when they decide what the scope will be. In particular, those who are new to auditing biodiversity need to try and choose an audit scope that will be manageable.

For example, one SAI decided to audit a government program that was implementing the international Convention for the Control and Management of Ships' Ballast Water and Sediments. The audit will cover two biodiversity topics: invasive species and marine habitats and their resources, and the audit team decided to evaluate the program to determine whether

- funds allocated to the program are being managed according to national financial law (financial management and regularity);

- the management plan for ballast water, adopted by the responsible authority, respects the international convention (performance measurement and results);
- the authority has been measuring the results of its program (performance measurement and results);
- the program is bringing expected results (performance measurement and results);
- the authority responsible for the program is reporting to the Secretariat of the convention, as requested, and to the relevant players involved with invasive species and marine transport (reporting results and compliance and agreements, laws, and policies); and
- the authority is using the information from its reports to improve its program (reporting results).

Exhibit 10.Table on Audit Steps in Auditing Biodiversity

Step One : What are main threats to biodiversity in the country?

- Habitat Loss and Fragmentation
- Invasive Alien Species
- Pollution/nutrient loading
- Climate Change and Global Warming
- Over exploitation of resources
- Unsustainable agriculture/aquaculture practices
- Desertification
- Biotechnology
- Biopiracy

Step Two: What are the government's responses and who are the players

What?
- Create protected areas
- Establish and implement recovery plan for endangered species
- Control and eradicated invasive species
- Establish land-use planning

Whot?
- National, state, provincial and local (municipal) governments
- Government owned agencies and enterprises
- Non-government organizations: civil institusions, professional association, local communities, scientific institutes

How?
- Sign international conventins
- Enact legislation
- Establish policies
- Set programs
- Use economic tools and incentives
- Promote voluntary partnerships
- Conduct environtal impact assessment
- Fund research
- Promote public education

Step Three: What audit topics to prioritize?

- National strategy on biodiversity
- Protected areas
- Endangered species
- Invasive species
- Freshwater habits and their resources
- Wetlands
- Marine habitats
- Genetic resources
- Forest resources
- Mainstreaming biodiversity into National Development Planning and Practices with sustainable development perspective

Step Four: What audit approach to adopt?

- Financial management and regularity
- Compliance with agreements, laws and policies
- Policy coherence
- Performance measurement
- Accountability, coordination and capacity
- Scientific research and monitoring
- Public education
- Reporting to clients and the public

Exhibit 11. Audit Approaches for Biodiversity Audits

Biodiversity topics	Audit Approaches (lines of enquiry							
	Financial management and regularity	Compliance: Agreements, laws and policies	Policy	Performance measurements and results	Accountability, Coordination, and Capacity	Science, Research, and Monitoring	Public Education	Reporting Results
National Strategy on Biodiversity								
Protected Areas (Conservation areas, Parks, and Bird Sanctuaries								
Endangered Species								
Invasive Species								
Freshwater habitats and their resources								
Wetlands								
Marine habitats and their resources								
Genetic resources								
Forest resources								
Mainstreaming biodiversity in the National Development Planning and Practices with Sustainable perspective								
Impact of climate change on biodiversity								
Desertification and biodiversity								

Chapter 3
Audits of Biodiversity

The main objective of this chapter is to give Supreme Audit Institutions (SAIs) information about audits of biodiversity from around the world. Whenever possible, the examples include information on the audit objectives, scope, findings, and recommendations.

The chapter is divided into the following 10 sections that cover the main biodiversity topics described in Chapter 2:

- a national strategy for biodiversity,
- protected areas (parks, conservation areas, and bird sanctuaries),
- endangered species,
- invasive species,
- freshwater habitats and their resources,
- wetlands,
- marine habitats and their resources,
- genetic resources,
- forest resources,
- mainstreaming biodiversity into national development planning with sustainable development perspective

Each section contains a general audit approach that includes

- a short background;
- audit criteria from international conventions, legislation, policies, and programs;
- potential researchable questions, which may help auditors define audit objectives and lines of enquiry; and
- case studies from SAIs.

"Desertification and biodiversity" while potentially important, it will only a brief within this document because it has separately discussed in other INTOSAI WGEA Publication on Auditing Guidelines for SAIs on Land Use and Soil Quality Management for Combating Desertification (2019).

The audit information was mainly collected from

- a questionnaire on biodiversity that was sent to SAIs;
- environmental auditing surveys; and
- the WGEA website, under Environmental Audits Worldwide at: http://www.wgea.org.

Where possible, case studies from around the world were used. However, only a few were available for some regions.

THE BIG PICTURE: A NATIONAL STRATEGY ON BIODIVERSITY

Background

Biodiversity is a vast, global issue the effects of which are felt differently in different countries. Individual governments, therefore, must define how they will tackle this topic. The adoption of 2030 Agenda for Sustainable Development or known as Sustainable Development Goals (SDGs) has brought biodiversity countries' priority list. The agenda explicitly adopt and mentioned some of the targets mentioned in Strategic Plan for Biodiversity 2011-2020 (Aichi Biodiversity Targets) set in 2010. Biodiversity and ecosystems feature prominently in most SDGs and its related targets. Both Aichi Biodiversity Targets and SDGs targets are mutually supportive and reinforcing. Thus, the implementation of one contributes to the achievement of the other.

Many SAIs decide to audit their government's progress in developing a national biodiversity strategy and associated action plans. Often, they start by comparing the obligations under the main convention on biodiversity, the Convention on Biological Diversity (CBD), with the government's actions.

When the Strategic Plan for Biodiversity 2011-2020, including its 2050 Vision on Biodiversity, and the Aichi Biodivesrity Targets were agreed, Parties to the Convention committed to review, and as appropriate update and revise, their national biodiversity strategies and action plans (NBSAPs), to adopt the NBSAPs as a policy instrument, and to use them as effective instruments for the integration of biodiversity targets into national development and poverty reduction policies and strategies, national accounting, economic sectors and spatial planning processes, by Government and the private sector at all levels.

Audit criteria

Most of the audit criteria come from the obligations set out in the CBD and the way those obligations are reflected in the legislation and policies in each country.

Exhibit 12: Potential lines of enquiry using CBD

Under the CBD, governments undertake to conserve and use biodiversity in a sustainable way. They are required to develop **national biodiversity strategies and action plans (NBSAPs),** to integrate them into broader national plans addressing the environment and development (policies and programs) and to set clear priorities (see article 6). This is particularly important for sectors such as forestry, agriculture, fisheries, energy, transportation and urban planning. Other treaty commitments include the following:

- Having adequate capacity to implement NBSAPs;
- **Identifying and monitoring** the important components of biodiversity that need to be conserved and used in a sustainable way (see article 7);
- **Establishing protected areas** to conserve biodiversity while promoting environmentally sound development around these areas (see article 8);
- Rehabilitating and restoring degraded ecosystems and promoting the recovery of threatened species in collaboration with local residents.(see article 8);
- Respecting, preserving and maintaining **traditional knowledge** of the sustainable use of biodiversity with the involvement of indigenous peoples and local communities(see article 8);
- Preventing the introduction of, controlling, and eradicating **alien species** that could threaten ecosystems, habitats or species (see article 8);
- **Controlling the risks** posed by genetically modified organisms see article 8);
- Promoting **public participation**, particularly when assessing the environmental impacts of development projects that threaten biodiversity (see article 14);
- **Educating** people and raising awareness about the importance of biodiversity and the need to conserve it (see article 13); and
- **Reporting** on how each country is meeting its goals relating to biodiversity. (see article 26**).**

NBSAP peer review framework can be used by auditors as a reference or guidance for their audits. The framework was developed under the NBSAP Forum too review the implementation status of existing NBSAPs and map out key challenges and gaps with the provision of clear means to address these. Further information on the framework, see https://nbsapforum.net/knowledge-base/resource/nbsap-peer-review-framework.

The Global Environment Facility (GEF) provides financial support to developing countries, so they can fulfill their obligations under the CBD. Since 1991, the GEF has made nearly US$ 4.2 billion in grants and co-financing available to developing countries. SAIs may audit how these funds are spent.

In 2010, the tenth meeting of the Conference of Parties to the CBD, held a meeting in Nagoya-Japan, adopted the Strategic Plan 2011-2020[19]. It was developed based on the need for a balanced and enhanced implementation of the Convention's three objectives and the limitations in financial, human, and technical resources to fully implement the Convention especially for developing countries, in particular the least developed countries and small island developing states, as well as countries with economies in transition. The plan provides an overarching framework on biodiversity, not only for biodiversity related conventios, but for the entire United Nations system and other partners working on biodiversity management and policy development. Exhibit 13 showed 20 Aichi Biodiversity Targets that could be used as criteria for the auditors. The full thext of Aichi Biodiversity Targets are presented in the Appendix 4.

Exhibit 13. Aichi Biodiversity Targets

19 Further information on Strategic Plan 2011-2020 could be accessed at https://www.cbd.int/sp/ .

Legislation, regulations, and policies. Few countries have established dedicated and comprehensive legislation that covers all aspects of biodiversity, because existing legislation may already cover many aspects. However, many countries have developed national biodiversity strategies and action plans to meet the requirements under the CBD.

Programs. Specific programs related to biodiversity may exist, especially if government has enacted legislation. However, auditors should look for any programs that aim to protect nature and habitats, national biodiversity strategies and action plans (NBSAPs), which are required under the CBD, as well as any documents that provide direction to protect biodiversity.

Mechanisms for implementation. National Biodiversity Strategies and Action Plans (NBSAPs)[20] are the principal instruments for implementing the Convention at the national level (Article 6). The Convention requires countries to prepare a national biodiversity strategy (or equivalent instrument) and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities can have an impact (positive and negative) on biodiversity. Other mechanisms such National Reports, Cooperation and Partnerships, Clearing House Mechanism, Biosafety Clearing-House, and LifeWeb for Financing Protected Areas could be further learned at https://www.cbd.int/mechanisms/

Players

While many departments and ministries have biodiversity responsibilities, developing a national strategy is often delegated to one department or a coordinating unit. Some countries, often as a result of being signatories to the CBD, have biodiversity offices, which are good starting points for finding information.

Researchable questions

When they define their audit approach, auditors may ask whether the government

- developed a national strategy on biodiversity as required under the CBD;
- developed national biodiversity strategies and actions plans (NBSAP), as required under the CBD;
- implemented its biodiversity strategy and action plans;
- implemented the CBD commitments through legislation;
- measured the results of their actions in protecting biodiversity;
- set priorities to achieve the 2010 targets, established under the CBD;
- reported its progress in protecting biodiversity to the CBD; and
- developed programs to educate the public on the importance of protecting biodiversity.

Audit case studies

The following audit case studies relate to the way countries have met their commitments under the CBD.

20 Further information on NBSAP Framework could be accessed at https://www.cbd.int/nbsap/.

SAI Costa Rica (2011): Report of the performance audit on the effectiveness of the Government in meassuring and reporting on the state of biodiversity

Audit Objective
The objective of the study was to evaluate the effectiveness of the management of the System National Conservation Areas (SINAC) and the Ministry of Environment, Energy and Telecommunications (MINAET), in relation to the administration and protection of resources located in the Las Baulas National Marine Park (PNMB), in accordance with the legal and technical regulations applicable to this particular case.

Scope
The audit covered the regulations, mechanisms and practices designed and implemented by government authorities to determine the category to be assigned to biodiversity or an object of conservation such as ecosystems, species and genetic resources; this for the purposes of protection and sustainable management. In addition, the processes to manage information, communication and accountability in this area were analyzed.
The observation focused mainly on the Protected Wild Areas of the country, whose management by the Government supposes a greater knowledge of the state of conservation of the biodiversity under its protection. The period between 2009 and 2011 was covered, expanding when necessary.

Audit Criteria
- Convention on Biological Diversity.
- Biodiversity Law.
- The National Biodiversity Strategy.
- Indicators (for example: Red list index for resident birds)

Findings
The biodiversity audit was intended to verify the effectiveness of Government efforts to institute mechanisms to measure and report on the state of biodiversity. It was found that applicable regulations were unclear in setting out how biodiversity is to be identified and monitored, and that the National Biodiversity Strategy has not been updated.
Monitoring efforts have been made at several Protected Areas but only in isolation, showing weaknesses in frequency and diffusion of information. The audit also observed that there are no parameters to classify the state of relevant ecosystems and to associate measures of mitigation and restoration; nor a methodology to review and update lists of vulnerable species. In addition, there are no updated priorities for biodiversity research, nor is there a system to organize and present information about this resource.

Recommendation
The report's recommendations are oriented toward ensuring accountability on the state of biodiversity to ensure its conservation and sustainable use.
Follow-up in process.

SAI Fiji (2014): Management of Multilateral Environment Agreements

Audit Objective
The overall objective of the audit was to assess the efficiency and effectiveness of focal and implementing agencies in implementing multilateral environmental agreements by examining:
- implementation arrangements in place for honouring requirements of MEA; and
- accountability and reporting relationships including the effectiveness in monitoring implementation.

Scope
The audit focused on the management of multilateral agreements administered by the Department of Environments over the 3 years 2012 to 2014.

Audit Criteria
States should enact laws and regulations to enable implementation of multilateral environmental agreements where such measures are necessary for compliance. Laws and regulations should be regularly reviewed in the context of the relevant international obligations and the national situations.

Findings
Only 4 out of the 10 MAs implemented by the Department of Environment were supported by enabling legislations Three out of the remaining 6 MAs were implemented vide the provisions of other legislations. Absence of national laws has hindered the effectiveness of implementing Conventions, and in another instance has led to deterioration of Fiji's only wetland site. Principal legislations also lacked defining key elements of managing MEAs.

Recommendation
The Department of Environment to ensure that a gap analysis be conducted of all existing legislations supporting the implementation of respective agreements. Due considerations should be made for the development of specific legislations or, the review of existing mandates to incorporate provisions relevant to the effective achievement of obligations under each of the Agreements.

SAI of Canada (2013): Meeting of goals of CBD

Audit Objective

This audit sought to determine whether Environment Canada has

- fulfilled selected responsibilities as National Focal Point for the Convention on Biological Diversity (specifically with respect to monitoring, promoting, and facilitating implementation of the Convention), and
- developed and applied models for the economic valuation of biodiversity and ecosystem services.

Scope

The audit is divided into two lines of inquiry, reflecting the two audit objectives:

- **Convention on Biological Diversity.** This line of inquiry examined how Environment Canada is planning for and managing its role as National Focal Point for the Convention on Biological Diversity.
- **Valuation of biodiversity and ecosystem services.** This line of inquiry examined Environment Canada's efforts to develop and apply models for estimating the economic value of biodiversity and ecosystems.

In carrying out the audit, we interviewed Environment Canada officials and relevant stakeholders, and reviewed the Department's files, reports, and other supporting documentation.

Audit Criteria

Criteria	Sources
To determine whether Environment Canada has fulfilled selected responsibilities as the National Focal Point for the Convention on Biological Diversity in Canada, we used the following criteria.	
• Environment Canada has defined what results it wants to achieve as the National Focal Point. • Environment Canada has identified the actions and resources necessary to achieve these results. • Environment Canada has tracked the implementation of these actions and achievement of results.	• Department of the Environment Act • A Biodiversity Outcomes Framework for Canada • Convention on Biological Diversity Terms of Reference for National Focal Points, Conference of the Parties, Decision VIII/10
To determine whether Environment Canada has developed and applied models for the economic valuation of biodiversity and ecosystem services, we used the following criteria.	
• Environment Canada has developed models for economic valuation of biodiversity and ecosystem services in support of sustainable development decision making. • Environment Canada has applied models for economic valuation of biodiversity and ecosystem services in support of sustainable development decision making.	• Federal Sustainable Development Strategy, 2010 • Canadian Biodiversity Strategy • 2012–13 Report on Plans and Priorities, Environment Canada

Source: www.oag-bvg.gc.ca/internet/English/parl_cesd_201311_02_e_38672.html#hd3e

Findings

- Environment Canada has been leading the development of Canada's 2020 goals and targets under the Convention, resulting in four draft goals and 19 related draft targets covering a range of important topics, from creating protected areas to sustainably using biodiversity. However, most of the 19 draft targets are not sufficiently specific and key actions for achieving the targets have not been developed. Without details on key actions that need to be taken, it is not clear how Canada will meet its biodiversity targets by 2020.
- The first ecosystem status and trends report for Canada, released in 2010, was a positive step in addressing the lack of comprehensive biodiversity reporting in Canada, an issue we have raised in past audits. Environment Canada will no longer lead this initiative. As a result, the ability to comprehensively report on biodiversity status and trends may be in jeopardy.
- The Department has not set out what it plans to continue doing in connection with monitoring, promoting, and facilitating national implementation of the Convention on Biological Diversity. Without a specific plan setting out its future role as Canada's National Focal Point, it is difficult to determine what the Department plans to achieve as well as the resources it will require.
- Environment Canada has developed and applied models for the economic valuation of biodiversity and ecosystem services. Although gaps in methodology and data exist, the Department has applied these models to assist in decision making in selected areas. For example, Canadians' willingness to pay to ensure the continued existence of the polar bear in Canada was considered in analyzing the costs and benefits before listing the species as a species at risk.

Recommendation

As National Focal Point, Environment Canada, in collaboration with all relevant partners, should add more specificity to the targets and define the key actions and initiatives required to achieve Canada's 2020 biodiversity goals and targets and its milestones for assessing progress.

Environment Canada should identify its priorities as Canada's National Focal Point for the Convention on Biological Diversity. It should develop a concrete plan setting out what it wants to achieve, and should indicate the resources it requires for that purpose.

Environment Canada should develop an overall strategic approach for further advancing the valuation of ecosystem goods and services, and identify what priorities need to be addressed, with consideration given to economic and non-economic (for example, ecological and socio-cultural) values.

SAI of Iceland: The Convention on Biological Diversity—an environmental audit

In 2006, the Iceland National Audit Office audited the efforts of its government, under the Convention on Biological Diversity (CBD)

Audit objectives
Examine how the national government applied its commitments under the CBD

Scope
Activities of the Ministry of Environment, along with its institutions for the execution and implementation of CBD in Iceland.
Criteria

Convention on Biological Biodiversity
Icelandic legislation and public policy in the field of biological biodiversity

Findings
- Signing the CBD had a very limited effect on Icelandic legislation and public policy related to biodiversity.
- Nationwide plans for protecting and monitoring biological diversity had not been made.
- The government had conducted little research regarding the status of Icelandic biodiversity, contrary to the requirements of the CBD.
- It was not clear which government department of agency had the principal responsibility for carrying out commitments under the CBD.
- Implementation of the CBD was random and unsystematic.

SAI of Poland: Implementing provisions of the Rio Convention on Biological Diversity

In 2004, The SAI of Poland conducted an audit titled "Implementing Provisions of the Rio Convention on Biological Diversity."

Audit objective
Examine the extent to which the government had harmonized its commitments under the CBD with its legislation and national strategic documents.

Scope
- Audited period: January 2001 to June 2003
- Sixteen units were selected, from four different levels, and were involved in
- decision-making, coordinating and funding (3);
- research activities and problem papers development (4);
- performance of administrative tasks at the local level (7); and
- *in situ* protection (2).

Criteria
- Rio de Janeiro Convention on Biological Diversity
- National laws and regulations

Findings
- Regulations protecting biodiversity in agriculture were insufficient and ineffective.
- Scientific research aimed at identification, protection and sustainable use of biodiversity was limited because of financial constraints.
- Data on the status of nature in Poland needed to be updated.
- Databases (System for Information Exchange on Biological Diversity) were not up-to-date and not well supervised by the Ministry of Environment.
- Due to amendments to regulations and funding constraints, some tasks regarding *in situ* protection were never carried out.
- Many irregularities were found in the process of selecting and establishing protected areas for the European protection network—Natura 2000.

SAI of Norway: Surveying and monitoring biodiversity and managing protected areas

In 2006, the Office of the Auditor General (OAG) of Norway conducted an audit of government activities regarding the country's commitments, under the CBD. The OAG Norway looked at the inadequate knowledge of the country's biological diversity and, consequently, a risk of insufficient precautionary actions.

Audit objective
Examine the efforts authorities had made to survey and monitor the country's biodiversity (CBD, Article 7) and manage protected areas (Article 8).

Scope
- Audited period: 1997 to 2006
- The efforts of five ministries to survey and monitor biological diversity: Ministry of the Environment, the Ministry of the Agriculture and Food, the Ministry of the Fisheries and Coastal Affairs, the Ministry of the Education and Research and the Ministry of the Petroleum and Energy.
- Two main programs that are important contributors to a new knowledge-based management system for biodiversity—the main element in the Norwegian strategy to apply the CBD: a nationwide municipal mapping and monitoring program, and a national surveying and monitoring program.
- The management of national parks, landscape conservation areas, and nature reserves.

Criteria
- The CBD, articles 7 and 8
- Appropriations Regulations
- National Strategy for conservation and sustainable use of biological diversity
- Guidance on government budgeting
- Reports to the Norwegian Parliament related to biodiversity and sustainable development, including Parliamentary Committee recommendations

Findings
- In the nationwide, municipal mapping program, weaknesses in planning meant that critical factors, such as survey methodology, databases, and cost estimates, had not been sufficiently established before the surveying started.
- Up to 30 percent of protected areas were threatened. Their management contained verified deficiencies. For example, priority was given to protecting certain areas, even though the related cost estimates were not updated.
- The goals for the new, knowledge-based management system were not well defined, making it difficult to assess its achievements and those of the national mapping and monitoring program.
- Weaknesses were revealed in the decision-making process of the national mapping and monitoring program. The OAG Norway emphasized the need for good planning in subsequent work.
- The OAG Norway concluded that, to date, the authorities had been unable to convert high environmental ambitions into specific action.

PROTECTED AREAS

Background

Protected areas, such as national parks and conservation areas, are key to counter the continuing loss of ecosystems and species. They currently cover about 12 percent of the Earth's land surface.

The IUCN defines protected areas as:

> *Areas of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.*

Protected areas do not only include those on land; more and more countries are setting aside protected areas in oceans to protect marine resources. Conservation planners divide land and sea into management areas. These protected area systems are often a highly protected core surrounded by a buffer zone. The core, such as a strict reserve or no-take area, protects critical habitat and species. The buffer zone may have a larger variety of uses; it is intended to insulate the core from threats to its conservation status.

IUCN (2008)[21] categorize protected areas into different types as follow:

***I.a. Strict nature reserve*:** Strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values

***I.b. Wilderness area*:** Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition

***II. National park*:** Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities

***III. Natural monument or feature*:** Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove

***IV. Habitat/species management area*:** Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category

***V. Protected landscape or seascape*:** Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values

***VI. Protected areas with sustainable use of natural resources*:** Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims

Protected areas are vital to the conservation of the world's natural and cultural resources. They protect natural habitats and flora and fauna, and they help to maintain the environmental stability of the surrounding regions. Protected areas can be used to provide developing rural areas with opportunities to use marginal lands rationally, generate income, create jobs, do research and monitoring, and educate people about conservation, recreation, and tourism. As a result, most countries have developed systems of protected areas and it is a common audit topic for SAIs. However, the growth in the number and area of protected areas is a fairly crude indicator, and information on the level of protection these areas afford and how well they are managed is still needed.

Sometimes, parks are not properly established or regulated. Major threats to the integrity of the parks include

- human settlement,
- agricultural conversion,
- fire,
- large-scale drainage and roads that improve access to the area,
- hunting and fishing,

21 Dudley, N. (Editor). 2008. *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. x + 86pp. With Stolton, S., P. Shadie and N. Dudley. 2013. *IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21*, Gland, Switzerland: IUCN. Xxpp.
Link to the document: https://portals.iucn.org/library/sites/library/files/documents/PAG-021.pdf.

- trade in wildlife,
- collection of fuel wood,
- logging and mining, and
- oil and gas operations.

More information about protected areas can be found in the UNEP publication: *Protected Areas and Biodiversity Report—An Overview of Key Issues (2004)* available at https://portals.iucn.org/library/sites/library/files/documents/2004-011.pdf.

Criteria

Convention on Biological Diversity (CBD). Establishing and managing protected areas, conservation, sustainable use, and restoration projects in the adjacent land and seascape are central to Article 8, "*In-situ* Conservation," of the CBD.

The Conference of the Parties has emphasized that developing and maintaining national protected area systems is a central element of their strategy to apply the CBD.

Sustainable Development Goals. Protection to the natural habitats and its resources also the conserving the natural and cultural heritage have become parts of the 2030 Agenda for Sustainable Development. There are several targets that clearly mentioned the importance of protecting and reducing the habitat loss. Below are several examples of the SDGs targets that could be used as criteria.

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Target 11.4 mentioned that "Strengthen efforts to protect and safeguard the world's cultural and natural heritage"

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Target 14.5 mentioned that "By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information"

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Target 15.4 mentioned that "By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance thasheir capacity to provide benefits that are essential for sustainable development"

Aichi Biodiversity Target

Target 11
Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.
Target:
11. By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape.

Exhibit 14. Instrument to evaluate Protected Areas in Latin America

INDIMAPA

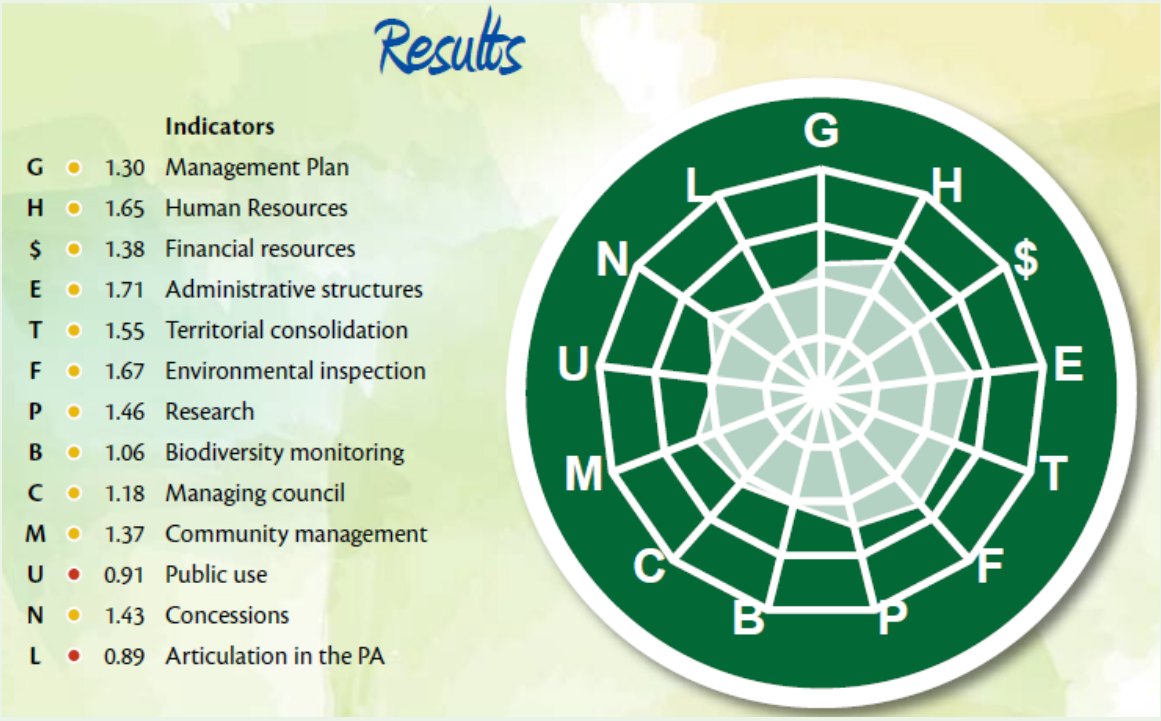
INDIMAPA is an instrument for the evaluation of the Protected Areas (PAs) on the Latin American continent. This tool uses indexes and indicators to assess the implementation and the management of the protected areas. The instrument was based on two internationally recognized tools: Rapid Assessment and Prioritization of Protected Areas Management (RAPPAM) and Management Effectiveness Tracking Tool (METT).

INDIMAPA utilizes radar charts to provide a multidimensional view of the results of the evaluation. This way considering up to 13 indicators for each PA, the method provides individualized data that aids in the identification of strengths and weaknesses in the management of these territories,

For each aspect of management, there is an indicator to demonstrate the achievement level of the corresponding goal. Every indicator uses the same scale, ranging from 0 to 3 points. Zero corresponds to a null level of achievement for the objective, while three corresponds to the full achievement of the analyzed objective.

In order to communicate the results in a consolidated way, in addition to the indicators, an implementation index was created for each protected area. The results from all the indexes allows for the classification of the PAs in three ranges: red, yellow, and green, corresponding to the low, medium, and high levels of implementation and management, respectively.

As such, INDIMAPA serves as an individualized diagnostic tool for each PA and acts as a more accessible communication mechanism of the audit results, which allows the various involved actors to monitor the evolution of management in these territories. Therefore, the application of INDIMAPA in the coordinated audit allowed for the systematization of the information generated by the 12 SAI in a single document. This provides a panorama of the public biodiversity conservation policy in Latin America, serving as a subsidy for decision-making and helping to improve environmental governance. Below is the example of how Latin American SAIs used the instrument in their audit:



Taken from: "Protected Areas Latin America – Coordinated Audit Executive Summary (2015)"

World Heritage Convention (WHC). The mission of the World Heritage Convention (WHC) is to identify and conserve the world's cultural and natural heritage by listing sites of outstanding value and ensuring their protection.

Exhibit 15. World Heritage Convention— Potential lines of enquiry

- State parties agree to identify and nominate sites within their national territory to be considered for inclusion on the World Heritage List.
- When a State Party nominates a site, it gives details of how it is protected and provides a management plan for its upkeep.
- State parties are also expected to protect the World Heritage values of the listed sites and are encouraged to report periodically on their condition.

Other conventions. See the section on wetlands in Chapter 3 which describes the Ramsar Convention in this chapter.

Legislation, regulations, and policies. Generally, legislation includes provisions to control activities such as hunting, fishing, and logging in the parks. Auditors can expect to find national legislation and regulations concerning the management of protected areas. In general, each protected area has a management plan and is a good source of criteria.

Some countries allow the private sector to manage protected areas, especially parks that have tourism potential. In these cases, the private sector usually has to respect some requirements.

Auditors can develop lines of enquiry to investigate the compliance with these requirements.

In some protected areas, government allows the sustainable extraction of resources, such as seeds or the use of protected areas for scientific research. These activities are usually regulated and can be a source of criteria for auditors.

Programs. Beyond legislation, some governments establish funded programs to identify and monitor protected areas. Inside protected areas, a wide variety of programs may exist that promote the

- restoration of habitats,
- preservation of threatened species,
- mitigation of invasive species, and
- creation of biological corridors—to ensure connectivity between protected areas.

Monitoring and evaluating program performance provides evidence of success and failure, which helps identify necessary management changes and give an early warning of serious problems.

In Europe, nature conservation became one of their concerns thus they develop a program called Natura 2000 to protect the wildlife and ecosystem

Natura 2000[22] is a network core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right.It stretches across all 28 European Union countries, both land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under both the Birds Directive and the Habitats Directive.

This network enables partnership between people and wildlife. Local stakeholders should be fully involved in the network as it requires full support from public and full transparency. With regard to financial support for this scheme, the main funding for the site management is available for all EU member states through structural funds and the rural development fund. In 2007, the budget for LIFE+ (2007-2013) financed projects worth EUR 187 million, with 50% of the funds earmarked for nature and biodiversity.

22 Source: European Commission website and Natura 2000 published by European Commission (2009) – or visit http://ec.europa.eu/environment/nature/natura2000/index_en.htm

Exhibit 16. European Court of Auditors (ECA) special report on Natura 2000 Network

Biodiversity loss is one of the main environmental challenges facing the EU. A key element of the EU's 2020 strategy to halt biodiversity loss and improve the status of habitats and species is the Natura 2000 network established under the Birds and Habitats Directives. These directives provide a common framework for nature protection across the Member States. Covering more than 18 % of the EU's land area and around 6 % of the EU's sea area, the Natura 2000 network has over 27 000 sites all over Europe, protecting diverse habitats and species. Socioeconomic activities are not prohibited on Natura 2000 sites, but Member States must ensure no deterioration of the sites and take the conservation measures needed in order to maintain or restore protected species and habitats at a favourable conservation status.

The objective of ECA audit was to answer the question 'Has the Natura 2000 network been appropriately implemented?' This involved examining whether the network was appropriately managed, financed and monitored. ECA carried out the audit work in the Commission and in five Member States, covering most of the biogeographical regions in Europe. ECA also visited 24 Natura 2000 sites, surveyed Member States and consulted with various stakeholder groups.

While recognising the major role played by Natura 2000 in protecting biodiversity, it is concluded that the Natura 2000 network had not been implemented to its full potential. Significant progress is needed from the Member States, and more efforts from the Commission, in order to better contribute to the ambitious goals of the EU 2020 biodiversity strategy.

Member States were not managing the Natura 2000 network sufficiently well. Coordination between relevant authorities, stakeholders and neighbouring Member States was not sufficiently developed. The necessary conservation measures were too often delayed or inappropriately defined. The Member States visited did not adequately assess projects impacting on Natura 2000 sites. While the Commission was actively supervising Member States' implementation of Natura 2000, there was scope to improve the dissemination of its guidance to Member States. The Commission dealt with a high number of complaints concerning Natura 2000, generally finding solutions with the Member States but also starting infringement procedures where necessary.

EU funds were not well mobilised to support the management of the Natura 2000 network. The EU's approach to financing the implementation of the Natura 2000 network has been to use existing EU funds. The use of these funds for the network is the competence of the Member States. ECA found a lack of reliable information on the costs of the network and on its financing needs from the EU budget. The prioritised action frameworks gave an incomplete picture of actual EU funding up to 2013 and of the planned allocation of funds for 2014-2020. At site level, management plans rarely gave complete cost assessments. The 2014-2020 programming documents of the various EU funds used to finance the network (notably the European Agricultural Fund for Rural Development (EAFRD) and the European Regional Development Fund (ERDF)) did not fully reflect funding needs and the Commission did not address these shortcomings in a structured manner. EU funding schemes were insufficiently tailored to the objectives of the Natura 2000 sites.

Monitoring and reporting systems for Natura 2000 were not adequate to provide comprehensive information on the effectiveness of the network. There was no specific performance indicator system for the use of EU funds for the network. Indicators did exist at funding programme level (e.g. the EAFRD), but they related to general biodiversity objectives and focused on outputs rather than on the conservation results of the Natura 2000 network. At site level, monitoring plans were often not included in the site management documents; or when they were included, they were either not sufficiently detailed or not time-bound. Standard data forms, which contain basic data on the characteristics of the site, were generally not updated following monitoring activities. The data reported by the Member States for the Commission's periodic 'State of Nature' report indicated trends in conservation status, but was too often incomplete, and comparability remained a challenge.

A number of recommendations have been made by ECA to the Commission and Member States aimed at helping to achieve full implementation of the Nature Directives, clarifying the financing and accounting framework of Natura 2000 and better measuring the results achieved by Natura 2000.

Full report could be accessed at: https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=40768

Players

Departments and ministries, for the environment or natural resources, are usually charged with managing protected areas. However, specific agencies are sometimes set up for that purpose.

Aboriginal peoples, people who live off the land, and residents who live around protected areas are important players, because they may no longer be able to carry out their traditional activities in these areas.

Another important player in the management of protected areas is the private sector—particularly in the mineral industries, which often has an interest in the areas around protected areas and sometimes in the protected areas themselves. In some cases, where minerals have been extracted, the replacement or expansion of protected areas is supported by the industry—to compensate for damages caused to the environment.

Researchable questions

Auditors may ask the following:

- Is the government establishing a network of protected areas that considers the needs of the different species and ecosystems?
- How does the government plan the establishment of new protected areas?
- Has the government assessed whether protected areas are large enough to protect species at risk and whether a corridor is needed between these areas to protect targeted species?
- Is the government establishing policies to ensure that national ecological networks and protected areas are effectively conserving biodiversity?
- Is the government implementing its policies regarding protected areas?
- Are government actions having the desired conservation benefits?
- Is the government periodically reviewing and adapting the management plans of protected areas?
- Is the government providing the necessary infrastructure to maintain and conserve protected areas?
- Are the measures taken by the government to counter illegal activities and overexploitation of natural resources inside protected areas effective?
- Is the government assessing activities outside protected areas that may influence wildlife in the parks?
- Has the government decided what resources (including costs) are necessary to manage protected areas, and has it allocated them appropriately? How are these resources managed?

Audit case studies

The following case studies relate to managing protected areas.

SAI of Ecuador (2015): Audit of Environmental Aspects in coordination with the Latin American and Caribbean Organization of Supreme Audit Institutions (OLACEFS), to the management of biodiversity, with a focus on national protected areas, under the responsibility of the Ministry of Environment and other related industries

Audit Objective

General Objectives

- To examine the management of the Institutions responsible for the implementation of national biodiversity conservation policies related to protected areas.
- To assess whether regulatory, institutional and operational conditions allow national protected areas to achieve the objectives for which they were created.

Specific Objectives

- To evaluate the administrative conditions of the Ministry of Environment for the implementation and consolidation of protected areas.
- To evaluate the articulation between the actors involved in the governance of national protected areas to achieve the objectives set for the areas.

Scope

The Internal Audit of the Ministry of Environment made the special examination to the management and administration of the protected areas, for the period from January 2nd, 2009 to December 31st, 2012. This audit analyzed aspects related to investment programs and projects, expenses currents, valued species, long-lived goods, deficiencies in the contracting of infrastructure works and in their reception.

In the period between January 1st, 2009 and May 30th, 2014, the audit of environmental aspects evaluated 44 protected areas (48 administrations) of the subsystem Patrimony of Natural Areas of the State (PANE).

Audit Criteria

Laws of Environmental Management and Biodiversity, Unified Text of Secondary Legislation of the Ministry of Environment, Functional Organization Structure of the Ministry of Environment, Agreement of Biodiversity, Plans of Management of the protected areas.

Findings

- No technical, financial and/or administrative management strategies were implemented to make possible the generation of management plans.
- The updating of some management plans and programs for protected areas was not carried out in accordance with biodiversity conservation policies.
- There was no management of the areas based on a study that evaluated the maximum levels of visitor use and corresponding infrastructure, which protected areas can support.
- There was no periodic and constant biodiversity research and monitoring program, generated based on the interests and needs of the protected areas.
- There was no information system that records, integrates and processes the results obtained from scientific research, biological, ecological, social and economic monitoring carried out in the territories, which should allow to measure of the gradual progress of programs, projects and activities aimed at conservation and/or sustainable use of the natural heritage.

Recommendation

- Identify mechanisms to obtain different sources of income and/or economic instruments that transfer, depending on the value of use of the protected areas, certain costs to those who generate profit, negative impacts or make indirect use of their assets.
- Implement a Biodiversity Information System.
- Design and implement an investment project to develop and update management plans for protected areas, and their respective execution schedule.
- Implement the mechanism so that the programs and projects, inherent in the protected areas, are managed under the same information system, independently of the fact that the management strategies and action plans for certain categories are executed in isolation from the management plans.
- Strengthen strategies and mechanisms to encourage participation and effective involvement in the management of protected areas of the various levels of government, of traditional and/or local communities that inhabit the territories and in their damping zones; and of non-governmental actors.
- Promote the use of methodologies that evaluate the maximum levels of visitor use and corresponding infrastructure that protected areas can withstand without causing severe negative effects on resources.
- Prepare and implement guidelines or mechanisms that guide research work towards the needs, interests and priorities of protected areas.

With regard to follow-up of this audit, there are no other control actions have been carried out.

SAI of Brazil (2015): Protected Areas Management International Audit

Audit Objective
Assess the management of protected areas in Brazil as well in Latin America

Scope
1120 Latin America protected areas

Audit Criteria
Aichi Target

Findings
It was verified that the protection goal for terrestrial areas has already been reached by eight countries, while the percentage of protection in coastal areas is still far from being achieved.
Nonetheless, the need to implement and effectively manage these areas is as important as their creation, so that they can reach the objectives for which they were created.
As a consequence, the consolidated results of the evaluation by the SAIs demonstrates that more than half of the protected areas posses a medium level in implementation and management. In turn, the highest degree of implementation is found in 19% of the territories.
Almost 30% of PAs are on the lowest range of evaluation, which indicates the existence of structural weaknesses in the governance of the Latin American PAs, for example:

- Absence of management plan in 47% of the evaluated areas;
- Absence of a manager in 13% of the territories;
- Non-execution of the monitoring of biodiversity in 44% of the evaluated PAs;
- Difficulty in consolidating territory, in regulating land, for example, in 54% of the areas.

Additionally, problems in the articulation among the actors involved in Management contributed to the current degree of implementation of PAs in Latin America.

Recommendation
SAIs recommended that, in the process of creation and consolidation, mechanisms should be established aiming to ensure essential resources to the effective implementation and proper management of these territories. The definition of a strategy for the territorial consolidation of the protected areas that takes the technical, juridical, social and environmental aspects involved in this process was also recommended to the national entities.
Finally, it was recommended that national governments promote actions of local, institutional and non-government articulation, considering the crossover aspects of the protected areas theme and the need for environmental governance improvement.
A follow-up audit was planned in 2018.

SAI of Russian Federation (2015): Auditing the use of federal budget funds and federal property in 2013-2014 and in 2015 to date

The audit was intended to ensure the operation of specially protected natural areas of federal significance and exercise control and supervisory functions in the field of their activities.

Audit Objective
a. Verify the legality, reasonability, and timeliness of financial support for the operation of specially protected natural areas of federal significance.
b. Assess how effective the tasks and functions in the established field of activity are completed by the audited entities.

Scope
The audited entities were the Ministry of Natural Resources of Russia, subordinated budgetary institutions, and the Department of the Federal Supervisory Natural Resources Management Service (Rosprirodnadzor) in the Arkhangelsk region.
Audit period: 2013 – 2014 and the expired period of 2015.
The use of federal budget funds intended to ensure the operation of specially protected natural areas of federal significance was inspected.

Audit Criteria
The audit was carried out in accordance with the authority of the Accounts Chamber of the Russian Federation, established by Federal Law No. 41-FZ dd. April 5, 2013, "On the Accounts Chamber of the Russian Federation".

Findings
a. Financing of budget institutions for activities aimed at preserving natural complexes and facilities located in Special Protected Nature Reservation (SPNR) in their natural condition was provided within the subprogram "Biodiversity of Russia" of the state program of the Russian Federation "Environmental Protection" for 2012-2020.
b. The objective of this subprogram is to conserve and restore biodiversity in Russia, which is achieved by completing four tasks aimed at improving regulatory framework and methodological support in biodiversity conservation, preserving and developing SPNR and creating conditions for fauna protection.
c. This objective is achieved through ten major activities and is characterized by eleven indicators.
d. All major activities have been completed. The target was met for nine out of eleven indicators. The failure to achieve two target indicators is associated with the fact that the rate of creation of locally and regionally significant SPNR was slower than planned.
e. Federal Law "On Environmental Protection" does not fully regulate matters of compensation for harm to the environment and elimination of accumulated harm to the environment in the territory of SPNR.
f. There is no procedure for calculating the extent of harm caused to natural complexes of SPNR resulting from fires.
g. Violations related to the use of federal budget funds were found.

Recommendations
The Ministry of Natural Resources of Russia proposed to develop a procedure for calculating the amount of harm caused to natural complexes of SPNR resulting from fires and to prepare amendments to Federal Law "On Environmental Protection".
Take measures to eliminate the violations committed using budget funds.

Follow-ups
- The Ministry of Natural Resources of Russia has drafted the above regulatory acts.
- The audited entities have taken measures to eliminate the identified violations.

SAI of Bulgaria (2014): Performance audit Management of national parks

Audit Objective
a. To provide the legislative and executive authorities, the management of the audited organization and other users with an independent and objective assessment of:
   - the effectiveness of the management of the national parks in Bulgaria and the degree of achievement of the objectives and priorities in the planning and programming documents in the area
   - the reliability of systems to monitor and control the implementation of planned measures and activities in the national parks.

b. To assist the legislative and executive authorities and the management of the audited organization to improve effectiveness in the management of national parks.

Scope
The scope of the audit includes the analysis and evaluation of:
- the long-term planning of the management of national parks as a prerequisite for a clear vision, effective management and ensuring continuity;
- short-term planning of the management of national parks as a tool for meeting long-term objectives and priorities;
- the effectiveness in the implementation of the planned measures and activities for the period 2010 - 2012 and the achievement of the objectives set in the planning and programming documents;
- legality and effectiveness of the activities for monitoring and control on the implementation of the planned measures at the level of the national parks and Ministry of Environment level.

Audit Criteria
a. Adopted national objectives and priorities in environmental policy, in the field of protected areas and biodiversity conservation.
b. Compliance between the objectives and priorities set in the national policies in the field of protected areas and biodiversity and Bulgaria's commitments to international agreements in the field.
c. Sufficiency of the information from the National Biodiversity Monitoring System for purposes of developing policies and programs in the field of biodiversity conservation

Findings
a. In Bulgaria, general conditions for the protection of biodiversity have been created by developing a national regulatory framework in the area and ensuring its harmonization with EU law.
b. The Government does not underestimate the loss of biodiversity as one of the major environmental risks and sets goals and priorities aimed at protecting biodiversity in its planning and programming documents, national and sectoral policies.
c. The analysis on the implementation of the activities carried out by the National Parks Directorates as the competent authority in the protected areas during the period 01.01.2010 to 31.12.2012 shows that the management of the national parks is not effective.

Recommendation
Development and approval of an amendment to the Rules of Organization of the Ministry of Environment and Water in order to extend the competences of the specialized administration at the Ministry with the functions of coordination and control over the activities of the National Parks Directorates as regional authorities.

SAI of Costa Rica (2014): Performance audit on the effectiveness in the conservation and sustainable use of biodiversity within the continental protected wild areas

Audit Objective
The purpose of this Audit was to determine whether the State has the necessary resources for the operation and consolidation of the Protected Wild Areas, and the articulation between the actors involved in its management, to ensure the expected results in conservation and sustainable use of biodiversity.

Scope
The analysis covered a total of 128 continental protected areas, in the management categories of National Park, Biological Reserve, Wildlife Refuge, Forest Reserve, Protective Area and Wetland.

Audit Criteria
Area 1: Inputs
Hypothesis regarding whether the State provides the necessary resources for the operation and consolidation of the continental protected areas was analyzed.
Area 2: Articulation
Hypothesis to whether the articulation between the actors involved in the management of the continental Protected Wild Areas contributes to the conservation and sustainable use of biodiversity.
Area 3: Results
Hypothesis to whether the results of the management in the continental Protected Wild Areas, show the achievement of relevant objectives for the conservation and sustainable use of biodiversity.

Findings
Moderate management by SINAC, regarding the allocation of resources was determined necessary for the operation and consolidation of the Protected Wild Areas, which puts at risk the achievement of the objectives of conservation and sustainable use of biodiversity. These difficulties in control and protection, joined with emergency situations, have affected groups of mammals in the top food chain such as the jaguar and the puma, as well as the ecosystems (for example the tropical dry forest and wetlands). The main threats identified relate to wood extraction, agricultural practices, anthropogenic fires, mineral extraction, hunting, fishing, construction of infrastructure, irregular human occupation, and organized crime activities.Others Findings: A total of 70 Wild Protected Areas do not have a General Management Plan and the SINAC does not know the legal status of the lands included in the Wild Areas Protected.

Recommendation
To establish and implement mechanisms to recover the security of the Protected Wild Areas, the criteria for assigning personnel in these territories, a plan for the development and maintenance of priority administrative head office, mechanisms for preparing, updating and monitoring the implementation of general management plans.
To determine the legal status of the lands within the limits of the Protected Wildlife Areas and perform diagnostics to determine the uses that are carried out in these territories and their effects on biodiversity and to define the areas of management in which cooperation with other relevant actors should be encouraged.

SAI of Peru (2014): Performance Audit to the participatory management services and control and monitoring services on protected natural areas administered nationally

Audit Objective
Determine the main factors that affect the achievement of the goals for conservation of biological diversity and sustainable exploitation of the natural resources in the nationally administered protected natural areas, in order to identify opportunities for improvement.

Scope
January 1st to December 31st of 2013

Audit Criteria
National Regulations

Findings
a. Participatory management of the protected natural areas
b. Routine patrolling for control inside the protected natural areas
c. Monitoring of the biological diversity
d. Territorial consolidation to protect biological diversity
e. Research on biological diversity

Recommendation
a. Define the participatory management approach in the System, through a normative framework that defines its concept, structure, components, activities, tools and implementation and monitoring strategies. Also, the defining of the technical assistance strategies and any other that the SERNANP deems necessary to insure the implementation of said approach in the nationally administered protected natural areas.
b. Update and approve the methodology for the application of the tools "stakeholders map" and "participation radar". Likewise, establish procedures for training, technical assistance and supervision, to insure their correct implementation.
c. Strengthening the management committees, granting the necessary budget to the Headships of the protected natural areas so that they support in attaining the minimum number of meetings established in the guidelines. Set training courses that encourage the participation and involvement of its members.
d. Establish the guidelines for the formulation of plans for patrolling and processing the information obtained from routine patrols. These guidelines should define, among other things, the methodology to calculate the coverage area of routine patrols (controlled surface area), in order to insure a proper setting of objectives and goals.
e. Set supervision goals that insure a correspondence between the goal indicators in the strategic management documents and the goals set in the operational documents.
f. Add to the Control and Vigilance Service's budget programing prioritization criteria that take into account the particular characteristics of each protected natural area (size, accessibility and physiography, among others).
g. Define the guidelines to create a biological diversity monitoring protocol and establish procedures that allow for the processing and systematization of the data resulting from the monitoring. Also, identify the operational requirements necessary to obtain useful information on the protected areas.

h. Appoint an area within the organizational structure of SERNANP to be responsible of monitoring biological diversity, making sure that it has the technical staff required to coordinate, systematize, and evaluate the data obtained from the Headships of the protected natural areas.
i. When implementing the training for the staff of the protected natural areas, prioritize monitoring activities, in order to improve the biological diversity registry and obtain valid data for the systematization.
j. Strengthen the institutional relationship between SUNARP and SERNANP, in order to achieve the registration and recording of the protected national areas in the Registry of Protected Natural Areas.
k. Finish the physical demarcation diagnosis in the 64 protected natural areas definitively. With these results, allocate the necessary budget to complete the physical demarcation process in the protected natural areas.
l. Set guidelines that can help finish the territorial consolidation process of the protected natural areas.
m. Incorporate actions in the budgeting process that favor the promotion of priority research that are articulated with the strategies and guidelines of the master plans, the Directing Plan of Protected Natural Areas and the SERNANP's institutional strategic plan.
n. Elaborate the System's Research Strategy, which must gather and articulate the proposals of the Directing Plan, the National Strategy for Biological Diversity, as well as the proposals established in the Environmental Research Agenda 2013-2021 (Thematic axis: conservation and sustainable exploitation of natural resources and biological diversity.). Likewise, it must be articulated with the annual operational plan.
o. Set guideline for the elaboration, evaluation and approval of tools for the management of research in the protected natural areas.
p. Identify in the organizational structure of the SERNANP, the department responsible for research management. Those areas will implement lines of action set in the Master Plans and will propose norms, tools and operational procedures for developing basic research and applying them within protected natural areas.
q. Implement incentive mechanisms geared towards natural or legal persons, in order to promote agreements or collaborations to develop research on sustainable business opportunities in the protected natural areas.
r. Set effectiveness indicators to evaluate the management of research, within the framework of the Directing Plan of the protected natural areas and the SERNANP's institutional strategic plan.
s. Write documents that guide the promotion of research and strengthen the capacities for research management.
t. Evaluate the establishment of alternative mechanisms to generate infrastructure and conduct research projects.

SAI of India (2017): Performance Audit on Protection of Forests and Biodiversity through Protected Area Network in the State of West Bengal

Audit Objective
To identify whether:
a. adequate measures were undertaken for setting up, strengthening and enhancing the Protected Area networks for conservation of forests and biodiversity of the State
b. PA Network was managed in a manner to enhance conservation of wildlife and their habitats.
c. Necessary infrastructure and institutional mechanisms were provided for in an effective manner for protection of forests and biodiversity in PAs.

Scope
Performance Audit was carried out between February and June 2016 on the basis of standard audit guidelines, joint site inspections with departmental officials, taking photographs and holding discussions with departmental officials, apart from the examination of records of divisions of all 21 Protected Areas.

Audit Criteria
a. Indian Wildlife Protection Act (WPA), 1972 and Rules thereunder,
b. National Wildlife Action Plan (NWAP), 2002-16,
c. Management Plans (MPs) of Protected Areas/ Tiger conservation Plans (TCP) of Tiger Reserves formulated by the PAs in the State,
d. Guidelines issued by National Tiger Conservation Authority (NTCA),
e. Orders of the Hon□ble Supreme Court of India, guidelines/ orders issued by the GoI/ GoWB/ Wildlife Institute of India (WII), International Union for Conservation of Nature(IUCN) etc.

Findings
a. Steps taken for creation and expansion of Protected Areas network to achieve the target of covering 10 per cent of geographical area under the Protected Area network were not adequate.
b. Requisite inviolate spaces, which impacted conservation/ protection of biodiversity, were not available.
c. Management of Protected Areas preparation and implementation were not efficient.
d. Steps taken to reduce biotic pressure on wildlife were inadequate as the Department had failed to relocate forest villages from the Protected Areas, create Eco-Sensitive Zones around Protected Areas and regulate eco-tourism in and around Protected Areas.

Recommendation
a. Expansion of the Protected Area network to all bio-geographic regions, marine areas and setting up the Ganga Dolphin reserve.
b. Notification of identified elephant corridors to minimise man-animal conflict.
c. Demarcation of requisite inviolate spaces.
d. Finalisation of State Eco-tourism Strategy to regulate eco-tourism.
e. Enhancement of patrolling activities through modern methods.
f. Restriction of extreme ingress of eco-tourists in and around Protected Areas.

SAI of Czech Republic (2016): Funds Provided for the Improvement of Nature and Landscape

Audit Objective
To scrutinise the provision, drawdown, and spending of funds earmarked for the nature and landscape protection

Scope
Audited period: **2013 – 2015**

Audit Criteria
Follows up the audit - Funds provided for the improvement of nature and landscape (from 2011)
The following criteria were used to select the sample of audited projects:
- allocated amount,
- focus of the project,
- an objective and a purpose of the project,
- and the project completion date.

Moreover, we examined whether the funds for the nature and landscape protection brought the expected results, and whether the respective ministry observed and assessed the effectiveness of the programmes in relation to the desired change.

Findings
- Setting quantifiable and measurable objectives for the subsidy programmes is essential for assessing the success of the programmes in relation to the desired change of the state of nature and the landscape. These objectives must be clearly defined and supported by measurable indicators, with an indication of initial and realistic expected values and a link to a verifiable assessment of the benefits of the programmes.

Quantifiable and measurable **objectives** for the subsidy programmes **were not set**.
- Monitoring the attained results regularly and assessing them against the indicators that were set, are indispensable for ensuring proper management of subsidy programmes. Such monitoring and assessment provide the programme administrator assurance that the programme is progressing towards fulfilling its purpose and that the target values will be achieved.

The audit examined whether the results attained through the subsidy awarded under the audited subsidy programmes corresponded to the stipulated expected target values of the indicators. The respective ministry's efforts to monitor and assess progress under the programme were also examined.
Achievement of the subsidy programmes **indicators was not** sufficiently **assessed**.
- Precise specification of the benefits of the individual subsidy programmes, in conjunction with an estimate of the amount of awarded funding required to stop the negative development of nature and the landscape or reverse it, is essential for assessing the development of the state of nature and the landscape.

The medium-term assessment of the State Environmental Policy suggests that, in most cases, **a positive trend was not seen** in the implementation of the stipulated nature and landscape protection objectives that are linked to the desired change of the state of nature and the landscape. This fact is documented by the development of selected measurable State Environmental Policy indicators, such as following:
- The total area of agricultural land in the Czech Republic is decreasing. The reason for this decrease is the expansion of built-up areas and other areas at the expense of arable land.
- At this time, 63 % of agricultural land remains potentially threatened by water erosion and 18 % by wind erosion. No systematic protection is carried out on most land with erosion-threatened soil to prevent soil loss.
- Regarding the objective of restoration of the landscape water regime, the adverse state of water courses persists (e.g. disruption of their natural morphology, high intensity of use of stagnant water and related eutrophication, restriction of the biological diversity of aquatic and water-dependent organisms), and
- The area of the landscape not fragmented by roads decreased from 54 thousand km² in 2000 to 50 thousand km² in 2010, with a further reduction expected in subsequent years.
- The **state of nature** and the landscape did **not show positive development.**
- Imposing basic, and in practice usual, conditions for awarding subsidy is one of the requirements for the proper, transparent, and effective use of such subsidy and the criterion for verifying the eligibility of expended funds. There was no obligation to document the selection of the contractor and the obligation to submit the works contract.

The usual conditions on beneficiaries for awarding subsidy to them were not imposed.
Findings in relation to the subsidy beneficiaries: **individual projects did not contain specifically quantified benefits** in relation to the desired change of the state of nature and landscape.

Recommendation
The SAI of Czech Republic recommended that the respective ministry focuses on the following:
- Setting quantified and measurable programme objectives to allow for the programme benefits to be clearly quantified in respect of the state of nature and the landscape,
- Setting verifiable indicators to allow quantification of the achieved benefit and the impact of the awarded subsidy in relation to the desired change of the state of nature and the landscape,
- Setting such project parameters for the implemented projects that will allow determination of at least the local benefit with respect to the change of the state of nature and the landscape,
- Monitoring and assessing continually the achievement of target indicators and, should deviations from expected outputs and benefits arise, carrying out an analysis of such developments and taking steps to adjust the programme rules to ensure that the objectives are met, and
- Assessing the subsidy awarded under the subsidy programmes based on the current state of nature and the landscape to determine the funding required to attain the desired change.

The SAI of Czech Republic also proposed updating the conditions for awarding the subsidy under the national programmes to be the same as the conditions of programmes financed from EU resources.

SAI of Slovak Republic (2017): Audit of the International Carpathian Biosphere Reserve

Audit Objective
Find out the real status and evaluate whether the main goal of biosphere reservation has been achieved, namely biodiversity protection and ecological change tracking through three basic functions

Scope
- Analysis of Poloniny national park territory in accordance with UNESCO requirements and generally binding legal regulations
- Strategic documents for the development of Poloniny National Park (NP)
- Analysis of funds spent on Poloniny NP
- Drawing of EU funds
- Compliance with generally binding legislation when spending funds
- International cooperation of Poloniny NP administration with partner parks managements
- The effectiveness of Poloniny NP management system in meeting the objectives and functions of the international biosphere reserve.

Audit Criteria
- Specified as the optimal state (what should be)
- The territory is defined and divided in terms of national and international standards, commitments
- The territory is marked physically and also in map data, without any deviations in the area so marked
- The principles of land protection are in line with UNESCO strategies
- Inconsistency with legislation, UNESCO recommendations are identified, and mitigation, removal, non-compliance
- The land management plan is agreed and harmonized by the parties forming an international biosphere reserve in the sense of UNESCO recommendations
- Actions to promote sustainable development are identified and managed in line with UNESCO recommendations
- Cooperation with bodies involved in the international biosphere reserve at national and international level is ensured in the sense of UNESCO recommendations
- Education is part of the management plan
- The management plan includes educational and training activities for the local population
- The territory is the subject of research by national and international authorities
- Regular monitoring and evaluation of activities within an international biosphere reserve is ensured
- The territory has a promotional and communication strategy developed and conducts promotional activities

Findings
- Inconsistency between the declared zoning of the biosphere reserve according to UNESCO requirements and between the real status and the classification of the territory in accordance with the Nature and Landscape Protection Act.
- In the concept of nature and landscape conservation, the issue of biosphere reserves has not been elaborated in terms of strategic objectives and measures to ensure their functioning. The concept also did not include the vision and mission of biosphere reserves, their content, functions and operating principles.
- The objectives set out in the Strategy for the Development of State Nature Conservation of the Slovak Republic with a view to 2013 were not evaluated or updated until the period of audit.
- The territory of Poloniny NP in the period 2012-2016 did not have a care document in accordance with the Nature and Landscape Protection Act.
- Care documents have not been prepared either for small-scale protected areas or for the UNESCO World Heritage Site
- The activities outlined in the master task plan were in several cases the nature of the generally formulated tasks, without specifying any measures to meet them
- Not all tasks have been evaluated by the audited subject. Some tasks could not be clearly identified
- The process and rate of implementation of UNESCO's international recommendations for biosphere reserves was not evaluated for the territory of NP Poloniny between 2012 and 2015
- Within the framework of the State Nature Conservation budget, funds were not allocated separately for fulfilling the tasks of biosphere reserve
- The measures and tasks set out in the main tasks plan, as well as the objectives and measures set out in the Poloniny NP care program for the years 2017-2026, were not consulted and harmonized
- The tasks created and agreed by the Coordination Council of the International Biosphere Reserve in the Joint Framework of Activity Activities were not part of the planning documents of the State Nature Protection of the Slovak Republic
- Classification of the territory declared in international commitments in some cases did not correspond to the actual state of protection under national legislation
- International research activities with the involvement of the partner territories of the international biosphere reserve were not implemented in the period 2012-2016.

Recommendation
The Recommendations at government level and responsible ministries:
The Government of the Slovak Republic
- To Review the possibility of joint action of the Ministry of Agriculture and Rural Development of the Slovak Republic, the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Ministry of the Environment of the Slovak Republic in the fulfillment of the Government Resolution no. 338/1994, point 5, for the following period
- Instigate the legislation - to strengthen the status of biosphere reserves under the existing Nature and Landscape Protection Act, or to consider the creation of a separate legislative modification of biosphere reserves
- To Assess the possibility of contracting selected parts of the territory of Poloniny NP owned by the state into the State Nature Conservation Administration of the Slovak Republic
- To Assess the conclusion of an agreement on managing the operation of the International Biosphere Reserve and the International Biosphere Reserve Coordination Council at intergovernmental level

The Ministry of the Environment of the Slovak Republic
- Implement the biosphere reserve issue in the forthcoming Nature and Landscape Protection Concept
- To ensure the evaluation and updating of the Strategy for the Development of the State Nature Conservation of the Slovak Republic with an emphasis on the management of areas of international importance

The Ministry of Foreign Affairs and European Affairs of the Slovak Republic
Coordinate the process of updating the map of the international biosphere reserve on the territory of the Poloniny NP in accordance with the current legal regulations and according to the current status in the sense of the proposal of the State Nature Protection of the Slovak Republic.

SAI of Mongolia: Effective management of protected areas network

In 2004, the Mongolian National Audit Office conducted an audit entitled "Special Protected Area Network and Effectiveness of its Management" to assess the risk of the unsustainable use of resources and the decline of biological species in protected areas.

Audit objectives
Investigate whether the natural environment in protected areas was adequately protected.

Scope
- The Protected Area Management Division (PAMD) of the Ministry of Nature and Environment
- Fifteen protected area administrations (PAAs)
- Some related entities

Criteria
- Law on Special Protected Areas (1994)
- Law on Buffer Zones of Special Protected Areas

Findings
- Mining activities had been carried out in protected areas in violation of the *Law on Special Protected Areas*.
- Due to a lack of coordination and environment impact assessments by the Ministry of Nature and Environment and other related organizations, too many tourist camps and resorts had been built in the protected areas, causing an ecological imbalance.
- Mongolia's biodiversity had not been systematically assessed or monitored. Common difficulties, such as the lack of a biological resource database and other necessary information, underdeveloped monitoring methodology, and a lack of human resources, exist throughout the system of protected areas in Mongolia.
- Actions against illegal hunting and the improper use of natural resources were inadequate.
- The operating budget of the PAMD was insufficient to carry out its duties effectively. Moreover, no budget had been allocated for enforcement activities.
- The PAAs and their staff were not fully supplied with weapons, communication equipment, vehicles, and horses as per their own standards.

Investigate whether protected areas were adequately managed and organized.

Recommendations
To the Ministry of Nature and Environment:
- Establish an information database on the biodiversity of protected areas and improve regular monitoring.
- Take step-by-step measures to provide the PAAs with qualified staff and the necessary equipment and resources.
- Improve public awareness and promotional activities for protecting nature and ecology.
- Inspect the licences, certificates, and payment of land-use fees of all legal entities operating in protected areas.
- Evaluate general and detailed environment impact assessments and take necessary actions against violations.

SAI of China: Auditing management of two natural reserves

In 2004, the National Audit Office of China audited Xishuang Banna National Nature Reserve and Jiangsu Yancheng National Wild Bird Reserve. Nature reserves play a leading role in protecting China's great biodiversity.

Audit objectives
Analyze and better understand how the nature reserves were being managed.

Scope
- The State Environmental Protection Administration (SEPA)
- The State Forestry Administration (SFA)
- Two National Nature Reserves

Criteria
- Laws and regulations
- Environmental standards
- Other standards (for example, The 10th Five-Year (2001-2005) Plan for Environmental Protection)
- Expert opinions

Findings
- Management of nature reserves led to some good results. For example, local governments enacted related laws and regulations, such as Xishuang Banna Forestry Resources Protection Regulations and Xishuang Banna Nature Reserve Administration Rules to support the management of nature reserves.
- Both reserves were invaded by foreign species but no effective counteraction was taken.
- This issue should be addressed in the future.

Recommendations
- Improve control over the core, buffer, and experimental areas of nature reserves.
- Conduct more research to effectively counter invasions by foreign species and balance sustainable development.

SAI of Canada: Ecological integrity in national parks

In 2004, the Office of the Auditor General (OAG) of Canada conducted a performance audit of Parks Canada Agency and its management of ecological integrity in national parks. Ecological integrity means that the native components, processes, biodiversity, and abiotic components of an ecosystem are intact. The OAG Canada examined how the Agency monitors and restores ecological integrity and reported on the condition of the 12 national parks.

Audit objectives
Determine whether
- reporting on ecological integrity (EI) was fair;
- the monitoring and research on EI addressed significant issues, were managed to achieve results, used to maintain or restore ecological integrity and used to enhance public education; and
- active management and restoration reflected significant issues, were managed according to generally accepted practices, used to maintain and restore ecological integrity and enhance public education.

Scope
Parks Canada Agency's monitoring, research, active management, and restoration activities in
12 parks
Criteria
The Agency's ecological integrity management guidelines and its commitments to improve ecological integrity in national parks

Findings
- The Agency's monitoring and restoration activities addressed significant issues, including some related to biodiversity, ecosystem functions, and stress factors.
- Gaps existed in the coverage of what issues to monitor, such as wildlife disease and human activity in sensitive habitat, and in how to plan and manage these issues.
- Monitoring and restoration activities were not used to their maximum effect to enhance public understanding of ecological integrity issues.
- Reporting on the condition of the parks was relatively good but inconsistent.
- Use All national parks are working to have scientifically credible monitoring programs in place that address their ecological integrity goals.
- Guidelines were being developed to improve the consistency of monitoring activities.

Recommendations
- Improve reporting on the condition of national parks by using baselines and benchmarks more consistently and include more information on results, financial information, and concrete examples of the contributions of other parties. the up-to-date management plans the Agency has at its disposal to remedy the gaps in managing restoration activities.
- Improve the Agency's monitoring and restoration programs by applying its data management system and guidelines to monitoring and restoration activities,
- establishing objectives and actions for integrating public education with monitoring and restoration activities,
- publicly reporting on an annual basis on the measures being taken to improve monitoring and restoration.

SAI of the Slovak Republic: National parks in Slovakia

In 2005, the Supreme Audit Office of the Slovak Republic conducted a performance audit of national parks and the Slovak Nature Conservancy.

Audit objectives
Evaluate
- how well the management of national parks and the Slovak Nature Conservancy were carrying out their duties to protect national parks;
- management of environmental protection activities in national parks for their economy, efficiency, and effectiveness;
- compliance with international environmental agreements and national legislation; and
- the economy, efficiency, and effectiveness of funds spent to protect nature in national parks.

Scope
- Activities from 2003 to 2004
- Management of National Parks
- Slovak Nature Conservancy

Criteria
- Laws and regulations
- International agreements to co-operate on protecting national parks

Findings
- The budget for monitoring and environmental maintenance had been underestimated.
- There was a limited number of expert employees.
- Insufficient research and scientific activities had been conducted.

Recommendation
Reassess the funding of national parks and develop environmental projects for them that would be financed by European Union structural funds.

ENDANGERED SPECIES

Background

Threatened species exist in all kingdom groups, all over the world. In the past few hundred years, it is estimated that humans have accelerated the rate of species extinction by as much as 1,000 times over the typical rate in the Earth's history.

The annual trade in international wildlife is estimated as billions of dollars and includes hundreds of millions of plant and animal specimens. The level of exploitation of some animal and plant species is so high that such trade, combined with factors such as habitat loss, could bring some species close to extinction.

Many governments are developing and supporting recovery plans for endangered and threatened species. Countries may have different classifications of threatened species and different levels of protection for each of them. More and more, the audit topic of endangered species is becoming an area of interest for SAIs. Because an international convention on the illegal trade of endangered species has existed since 1975, this topic has been audited for a long time.

For more information on the issue, see the section on species extinction of the section, What is the scope of biodiversity and what are the main concerns, in Chapter 1.

Audit criteria

Convention on Biological Diversity (CBD). Each Contracting Party of the CBD is to rehabilitate and restore degraded ecosystems and promote the recovery of threatened species. The Parties can do this by developing and implementing plans or other management strategies, developing or maintaining legislation and/or other regulatory provisions to protect threatened species and populations. (see Article 8 in Appendix 4.)

Sustainable Development Goals (SDGs). Endangered Species or threatened species has become one of the lists within the 2030 Agenda for Sustainable Development. Goal 15 clearly identify the need to protecting the endangered species and halt the wildlife trafficking. Here are examples of the targets:

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.5 mentioned "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species"

Target 15.7 mentioned "Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products"

Target 15.c mentioned "Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities"

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments to ensure that the international trade of wild animals and plants does not threaten their survival. Currently, the public is aware of the endangered status of many prominent species, such as the tiger and elephant. However, when the need for CITES was first recognized in the 1960s, international discussion on regulating the wildlife trade for conservation was a relatively new concept.

Because the trade of wild animals and plants crosses geopolitical borders, efforts to regulate it require international cooperation. CITES was conceived in the spirit of such cooperation. Today, CITES protects, in varying degrees, more than 30,000 species of animals and plants, whether they are traded as live specimens, fur or dried herbs. Since CITES came into force, not one species that is protected by CITES has become extinct as a result of trade.

Aichi Biodiversity Target

Target 12
Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

Target:
12. By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline has been improved and sustained.

Exhibit 17. CITES— Potential lines of enquiry

CITES is limited to controlling international trade in endangered species. It defines international trade as (with very few exceptions) all situations in which a specimen or part of a specimen of an endangered species is taken or sent across international boundaries.
Countries are required to control trade in species in the same manner that they control other trade—through customs and inspection processes at borders and other ports of entry.

Convention on the Conservation of Migratory Species of Wild Animals. The Convention on Migratory Species (CMS) is also known as the Bonn Convention. Signed in 1979, it aims to conserve terrestrial, marine, and avian migratory species throughout their range and habitats. Parties work to provide strict protection for the most endangered migratory species, to establish a regional multilateral agreement for specific species and undertake cooperative research and conservation activities. Fourteen regional agreements have been adopted under this Convention to protect cetaceans (whales and dolphins), bats, water birds, seals, turtles, deer, elephants, and individual species of birds. The largest such agreement, the Conservation of African–Eurasian Migratory Water birds, covers 235 species of birds.

To reduce the rate at which species are becoming extinct, governments must deal with the main factors: the unsustainable use of resources, loss of habitat, and predatory activities—such as hunting and the illegal trade in wild animals.

Exhibit 18. The Convention of Migratory Species (CMS)—Potential lines of enquiry

More than 100 endangered migratory species are listed in Appendix I of the Convention.

Parties must endeavour to:
- conserve and, where feasible and appropriate, restore habitats that are necessary to remove the threat of extinction;
- prevent, remove, compensate for, or minimize the adverse effects of activities or obstacles that impede or prevent migration; and
- prevent, reduce, and control factors that endanger or are likely to further endanger the species.

The CMS prohibits the harvesting of the species listed in Appendix I, with exemptions for:
- scientific purposes,
- improvement of propagation or survival of the species,
- traditional subsistence use, and
- extraordinary circumstances.

Legislation/regulations/policies. Laws, international conventions, and policies are essential to prevent the loss of species. In many countries, governments have introduced specific legislation to protect endangered species. These laws usually include mechanisms to identify endangered species and recovery plans. If specific legislation on endangered species does not exist, provisions are likely to exist in other environmental legislation. Auditors should look for policies that deal with protection of endangered species, directly or indirectly.

Regarding the trade of endangered species, specific legislation and regulations may exist that meet commitments under CITES.

Programs. If specific legislation exists to protect endangered species or regulate their trade, there is likely to be a specific program on this subject.

There are some programs that help reverse the decline of an endangered or threatened species. To ensure the effectiveness or the recovery plans, threats must be reduced or removed, which will ensure the long-term survival of species in the wild.

Governments may also implement programs to reintroduce threatened plant and animal species to their natural habitats. This is often necessary to have enough individual members of a certain species in the wilderness to sustain its recovery and ensure its viability.

Players

Departments of environment, or their equivalents, usually have lead roles in protecting endangered and threaten species. In some countries, other departments, such as the departments of fisheries and parks could also have a major role. If the country is a signatory to CITES, the department or ministry charged with border inspections or customs and excise is likely to be involved.

Aboriginal communities that depend on wild animal or plant life are often players in the decisionmaking process regarding endangered species. The scientific community also plays an important role, especially in *ex-situ* conservation of threatened species.

Researchable questions

Auditors may ask whether the government is

- identifying species at risk in the country;
- preventing the extinction of threatened species;

- implementing its legislation and policies on endangered species;
- controlling the trade of threatened species;
- combating the illegal trade of wild animal or plant life (i.e. through increasing local communities' capacity to pursue sustainable livelihood opportunities);
- applying international conventions, such as CITES;
- putting habitat recovery programs with specific action plans in place for threatened species;
- setting aside protected areas for endangered and migratory species; and
- controlling the illegal hunting that can affect endangered species or migratory species.

Audit case studies

The following audit case studies relate to CITES, the trade of species, and the implementation of recovery plans to protect endangered species.

SAI of Australia (2017) – Funding Models for Threatened Species Management

Australia has globally distinct ecosystems comprising diverse flora and fauna derived from the continent's isolation and unique environmental conditions. The Australian Government gives effect to its responsibilities for threatened species through the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). In July 2014, the Australian Government initiated a new national focus for threatened species management, with the appointment of a non-statutory Threatened Species Commissioner (the Commissioner). In February 2017 the Australian Government launched the Threatened Species Prospectus (the Prospectus). The Prospectus is an innovative model for attracting private and philanthropic investment to support the recovery of threatened species in partnership with government, and conservation and community groups.

Audit Objective

The objective of the audit was to assess the effectiveness of the Department of the Environment and Energy's design of the Threatened Species Prospectus as an innovative approach to attract investment from private and philanthropic sources.

Scope

- The audit examined the department's approach to developing and administering the Prospectus, with a focus on the evidence-base used to inform design, the rationale for seeking external investment and the identification and management of risk. The audit also examined the performance measurement and reporting framework for the Prospectus.
- The audit focused on the design phase of the Threatened Species Prospectus, including processes and indicators established to measure and report outcomes. The audit did not assess the extent to which outcomes have been achieved due to the early stage of the Prospectus' implementation.

Audit Criteria

To form a conclusion against the audit objective, the ANAO adopted the following high level audit criteria:

- Was an appropriate design process established to support the achievement of the Government's objectives?
- Was a sound performance and reporting framework established, including fit-for-purpose performance monitoring, reporting and evaluation arrangements?

Findings

- The Department of the Environment and Energy's design of the innovative Threatened Species Prospectus was effective, other than the lack of a fit-for-purpose performance framework.
- Within the broader framework established by the Threatened Species Strategy, the design of the Prospectus was an innovative approach in supporting the Government's intent of promoting projects likely to be attractive to private and philanthropic investors. A total of 51 projects were selected for inclusion in the Prospectus through a largely informal process following stakeholder engagement.
- The department is not well placed to monitor and report on the effectiveness of the Prospectus in attracting additional funding for threatened species recovery from private and philanthropic investors. Limited performance data is collected against the targets of the Threatened Species Strategy. The department has commenced an evaluation of the Prospectus as part of a broader evaluation of the Threatened Species Commissioner model.

Recommendation

The Department of the Environment and Energy develop fit-for-purpose performance measures to better inform itself and stakeholders on the extent to which the Prospectus is achieving its objective.

Full report could be accessed at: https://www.anao.gov.au/sites/default/files/ANAO_Report_2017-2018_32.pdf

SAI of Western Australia (2009 and 2017 (follow up)) – Rich and rare: Conservation of Threatened species

Audit Objective
The focus of this examination was on whether Department of Environment and Conservation (DEC) has effective management and conservation processes and programs to ensure the protection and recovery of Western Australia (WA)'s threatened species.
- Does DEC have clear strategies, plans, policies and procedures in place to support threatened species conservation activities?
- Does DEC undertake threatened species conservation activities in line with relevant legislation, plans, policies and procedures?
- Is DEC effectively protecting and recovering threatened species?

Scope
The scope of the examination included the identification, protection and recovery of threatened species. While we did not examine the Department's Nature Conservation service as a whole, we have reviewed aspects of nature conservation activities to the extent to which they directly affect threatened species.
The scope of the examination included terrestrial threatened species and excluded marine species.
The examination was conducted with regard to the Australian Standard on Assurance Engagements (ASAE 3500 Performance Engagements).

Audit Criteria
- *Wildlife Conservation Act 1950* (the Act)
- Wildlife Conservation Bill (1992)
- Conservation and Land Management Act 1984
- *Environmental Protection Act 1986*.
- Commonwealth's *Environment Protection and Biodiversity*
- Conservation Act 1999

Findings
- 601 species in WA are listed as threatened with extinction and this number is increasing. Only a handful of species are improving.
- Only one in five threatened fauna and less than half of threatened flora have a recovery plan, while full implementation of the plans that are in place often does not occur. Without a recovery plan, the needs of threatened species may not be identified and addressed.
- Multi-species approaches to conservation are an effective response to the growing number of threatened species. DEC has a number of multi-species programs.
- Creating reserves is a key habitat conservation mechanism, but less than half the amount of land agreed under the national target has been reserved in WA. On average, it takes a decade for acquired land to become a reserve.
- DEC cannot demonstrate the effectiveness of its threatened species conservation activities for all threatened species.
- Since 1987 DEC and its predecessor agencies have sought to replace the 1950 Wildlife Conservation Act with new legislation that would provide greater support for conserving biodiversity.

Recommendation
DEC should:
- consider changing how it prioritises species for conservation attention to ensure existing resources are used to maximum long-term effect
- continue to identify and acquire land of conservation value and work with other agencies to achieve reservation more quickly
- implement an evaluation framework and supporting systems to assist in measuring threatened species conservation effectiveness
- continue its efforts to replace the *Wildlife Conservation Act 1950* with a new Biodiversity Conservation Act.

Follow up Audit
In 2017, SAI of Western Australia performed a follow up audit with results as follow:
A Commonwealth Threatened Species Commissioner was appointed in 2014 and leads the national Threatened Species Strategy 2015 to 2020. Department of Parks and Wildlife (DPaW), now the Department of Biodiversity, Conservation and Attractions (DBCA) contributes to this strategy through:
- inclusion of several WA species as key targets for recovery action and for recovery funding
- participation in a joint national and state cooperation program to develop common processes and practices to nominate and recover threatened species.

Key findings of the follow up audit:
- The number of threatened and priority species has increased
- DBCA has less resources for managing threatened species conservation activities
- New legislation has been passed to better support conservation activities
- DBCA delivers broad-scale conservation activity for threatened species, ecological communities and habitats, in line with current practice and the new legislation
- Most threatened species now have recovery plans or interim recovery plans, but these plans are not always resourced, so do not guarantee activity or improved outcomes
- There has been little progress since 2009 in reserving land for conservation
- Nomination and listing processes have improved
- There are still gaps in the evaluation and reporting of outcomes of activity to conserve threatened species
- DBCA does not make the best use of its substantial information about threatened species
- Because DBCA has not documented its prioritisation process, it cannot demonstrate that it is being applied or that resources are directed to highest priorities

SAI of Costa Rica (2013-2014): Report on the controls implemented by the State to ensure compliance with the agreements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Audit Objective
To assess the controls for ensuring compliance with the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES).

Scope
The audit was carried out in the National System of Areas of Conservation (SINAC) of the Ministry of Environment and Energy (MINAE) and included the analysis of CITES permits, the commercial and biological criteria used to the proposed adjustment, to the Appendices of the Convention. Also analyzed the mechanisms used by the Conservation Areas for the control of CITES species within the territory of the Protected Wildlife Areas and the controls implemented for the confiscation of said species.
Other institutions audited were the State Phytosanitary Service (SFE), the National Animal Health Service (SENASA) of the Ministry of Agriculture and Livestock (MAG), the General Directorate of Customs of the Ministry of Finance, National Coast Guard Service, National Operations Directorate of the Ministry of Public Safety and the Foreign Trade Promoter (PROCOMER). In addition, the period of analysis comprised from January 1st, 2011 and until December 31, December 2012, which was extended when estimated necessary

Audit Criteria
Area 1: Existing procedures for the definition, application, monitoring of scientific-technical criteria for the inclusion of species in the Appendices of the CITES Convention
Area 2: Control and monitoring of the species included in the Appendices of the CITES Convention
Area 3: Access and relevance of the strategic information that public actors manage for the control of CITES species
Area 4: Mechanisms for inter-institutional coordination for the monitoring of species included in the Appendices to the CITES Convention

Findings
Lack of national parameters for including or excluding native species in any of the three CITES Appendices according to the species' degree of threat or vulnerability in terms of biological and trade criteria. The weaknesses also included the absence of records documenting the criteria of the Scientific Authority for including, excluding, or keeping species in Appendix III. The absence of records makes it difficult to apply the criteria established in CITES Resolution 9.25.
The Office of the Comptroller General also examined the issuance of CITES permits, and identified several findings. Specifically, the Scientific Authority is required to issue non-detriment findings to allow for trade in CITES species. However, 62 percent (76 of 122) of export and import permits analyzed did not have an opinion of non-detriment findings. In addition, 87 percent (74 of 85) of export permits analyzed did not meet the requirement to state that the specimens were obtained in accordance with legal regulations. Also, there was no evidence that 57 percent (31 out of 54) of export permits regarding the transport and handling conditions of live specimens complied with regulations. Moreover, the monitoring of the population status of CITES species occurs in only 9 percent (15 of 166) of protected areas in the country, and only for Appendix I and II species. Furthermore, the Office of the Comptroller General found a lack of standardized information about government entities and protocols for conducting seizures.

Recommendation
The report's recommendations focused on five topics:
- developing records that document the biological and trade parameters for the seven CITES species of Costa Rica, to support including, excluding, or keeping species in CITES Appendix III;
- developing and implementing a procedure to standardize seizures of species and supervision of local wildlife;
- enforcing CITES requirements that have been omitted from permits;
- establishing mechanisms to allow the tracing of CITES permits; and
- implementing a system to monitor the status of populations of vulnerable species, including CITES species.

SAI of United States of America (USA) (2018): Combating Wildlife Trafficking: Agencies Are Taking Action to Reduce Demand but Could Improve Collaboration in Southeast Asia

Audit Objective
Review United States' (U.S.) agencies efforts to combat wildlife trafficking.

Scope
This report focuses on demand side activities and examines, among other things, (1) what is known about the demand for illegal wildlife and wildlife products in the United States and in Asia and (2) actions agencies are taking to reduce demand for illegal wildlife products in the United States and in Asia.

Audit Criteria
SAI of USA reviewed information from U.S. agencies and international and nongovernmental organizations and interviewed U.S. officials in Washington, D.C., and Miami, Florida, and U.S. and foreign government officials in China, Thailand, and Vietnam.

Findings
Wildlife trafficking undermines conservation efforts, can fuel corruption, and destabilizes communities that depend on wildlife for biodiversity and ecotourism revenues. U.S. agencies are taking actions designed to reduce demand for illegal wildlife, including building law enforcement capacity and raising awareness, but disagreement on roles and responsibilities has hindered some combating wildlife trafficking (CWT) activities in Southeast Asia.

Recommendation
SAI of USA recommends that Interior, State, and USAID work to clarify roles and responsibilities for staff collaborating on combating wildlife trafficking efforts in Southeast Asia.
See full report here: https://www.gao.gov/products/GAO-18-7

SAI of Tanzania (2013): Management of wildlife in game reserves and game controlled areas

Audit Objective
The overall objective of the audit was to determine whether the Ministry of Natural Resources and Tourism (MNRT) appropriately manages and monitors wildlife hunting activities and revenue generated in the Game Reserves and Game Controlled Areas.
Specifically, the audit aimed at examining: 1) the extent to which the wildlife hunting regulation is enforced by responsible authorities; 2) efficiency of the MNRT in monitoring wildlife hunting in game reserves and game-controlled areas; and 3) management of the collected revenue and allocation of the funds to the required LGAs by the MNRT.

Scope
The audit examined management of wildlife hunting in game reserves and game-controlled areas by the Ministry of Natural Resources and Tourism as main audited entity. Game reserves (GRs) with size of at least 5000km2 were studied. Six out of a total of 27 game reserves were selected. These are Selous, Rungwa, Kigosi, Moyowosi Ugalla and Rukwa-Lukwati. Similarly, in a total of 39 game-controlled areas (GCAs), four were selected which are Kilombero, Lake Natron, Loliondo, and Simanjiro for examination.
Because of homogeneity of GRs and GCAs, we were able to select six GRs and four GCAs as representative sample for the audit purpose. Similarly, in a total of 39 gamecontrolled areas (GCAs), four of them of a size ranging between 3000 km2 and 4280 km2 were selected. These are Kilombero, Lake Natron, Loliondo, and Simanjiro for examination. Because of homogeneity of GRs and GCAs, we were able to select six GRs and four GCAs as representative sample for the audit.

Audit Criteria
Management of wildlife hunting by the MNRT was assessed based on various criteria prescribed by the wildlife policy, Wildlife Act of 2009, Wildlife Regulations of 2010, MNRT strategic plans, Ministry of Finance guidelines for medium term plan and budget framework and other best practices.
Wildlife law enforcement was assessed based on the following criteria:
The MNRT is required to protect wildlife against unlawful hunting, capturing, photographing and securing of trophies by enforcing the Wildlife law.
Monitoring of wildlife hunting by wildlife division was assessed based on the following criteria:
- The MNRT have to carry out annual performance assessment and an in-depth analysis of the performance of all hunting companies at the third year of the hunting term,
- The MNRT have to require all hunting companies to record and report relevant details of all animals killed, wounded, or captured by hunters.

Findings
Major findings:
The MNRT had never carried out a formal analysis to identify and map areas which are prone to risk of poaching. Elephant killing for tusks has been the only indicators to point out poaching in game reserves. 721 elephants are reported to have been killed by poachers in five game reserves from 2009 to 2012. However, due to lack of reliable data, total figure of killed elephants is estimated to far exceed the figures presented above.
Patrols are not regularly conducted during the rainy season, despite consistent poaching events. Surveillance coverage was 37% and 47% in 2010/11 and 2011/12 respectively. This is far below the set target of 60% coverage.
There was shortage of staff and equipment in all visited game reserves and game controlled areas which impair performance efficiency. 2 out of 11 identified stakeholders are not actively involved by the ministry in control of poaching at the ports of exists. Processing informers' payments from the head office takes longtime. 60 % of culprits in Moyowosi-Kigosi were fined up to USD $40 which is far below the prescribed amount in the wildlife law.
Annual assessment of hunting companies was based on 40% utilization of quota and omitted other 4 performance measures. There were incidences of non compliance with the trophy criteria set.
There were no actions taken to noncompliance or substandard trophies. 49% of the 108 hunting permit forms were not filled at all to indicate the habitat or ecology where the animals were hunted. A total of 366 wild animals in 2009 and 2011 were killed without quota allocation.
There was no in depth analysis done at the third year of the hunting term based on criteria set. None of the hunting companies submitted annual contribution of 5000 USD during the interim period. During 2009-2011 hunting season there was neither data related to problem animals nor elephant tusks.
Revenues estimation was based on previous performance. There was no scientific assessment done to be used as a basis for estimation. 36 companies did not pay the government bills for photographic tourism on time. Consequently the ministry lost a total amount of USD 1.7 million which is equivalent to TZS. 2.7 billion as at 11/12/2012.
There were no LGA which presented reports to the MNRT about expenditure of the use of 40% of the 25% funds received. Three districts namely Longido, Simanjiro and Loliondo were allocated less than 27% of the funds instead of 40%.

Recommendation

The Ministry of Natural Resources and Tourism should ensure that:

- risk analysis is carried out to enable realistic setting of target and allocation of resources
- appropriate strategies are set to eradicate poaching during rainy seasons
- necessary equipment is available in game reserves and in anti-poaching zones, and maintenance is done
- it carries out analysis of key stakeholders and actively involve them in combating poaching and fighting export of illegal trophies
- rates of fines and penalties charged help to reach the intended deterrent effect.
- game scouts posts in areas of high animal concentrations to facilitate vigilance and action when necessary.
- trophy and habitat quality assessment is carried out
- the review of payment of 5,000 USD annually by hunting companies is done to see if it saves the intended purpose, and if not change accordingly
- hunting safari data and data from ant poaching are properly collected, documented and analyzed and used in planning and decision making.
- datasheet/form filled by game warden/officers and village scouts, who accompany hunting clients is developed and used
- tourist hunting database on hunting companies, contribution to community development by hunting companies, or support to improve infrastructure, protection of the environment and contribution towards ant-poaching is developed
- game officers/wardens/scouts are trained to properly fill the permit
- assessment on revenues from wildlife is done to benchmark the basis for revenue estimation.
- there is established system for collecting timely revenue from photographic tourism.

SAI of India (2017): Performance Audit on Administration of National Parks and Wildlife Sanctuaries in the state of Karnataka

Audit Objective

To identify whether:

1. Protection and Conservation of Wildlife, including their habitats, were adequately planned for and implemented in the administration of the Protected Areas, by examination of:
   - Consolidation of boundaries, status of encroachments and rehabilitation of persons living inside Protected Areas
   - Research and implementation of research findings done by the Department and other agencies
   - Management of Resources (Manpower and Financial)
2. Adequate measures were taken to address issues relating to biotic interference like
   - Human Wildlife Conflict and Corridors, and anthropogenic threats in the Protected Areas with reference to Forest fire, unnatural deaths and road-kills, Patrolling, anti-poaching camps and poaching, Tourism, resorts and other commercial activities.

Audit Criteria

- Wildlife (Protection) Act, 1972,
- Forest (Conservation) Act, 1980,
- Environment (Protection) Act, 1986.
- National Wildlife Strategy, 2002.
- National Wildlife Action Plan 2002-2016.
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
- Supreme Court, National Green Tribunal and High Court orders and other directions,
- Codes and Manuals of Karnataka Forest Department.
- Guidelines issued by Wildlife Institute of India, National Tiger Conservation Authority for preparation of Management Plan / Tiger Conservation Plans.
- Scheme guidelines and other orders, instructions, action plans, strategies issued by Government of India, Government of Karnataka, Karnataka Forest Department.

Findings

- Delay in preparation of Management Plans, Tiger Conservation Plans and deficient fire management plans. Research outputs were not utilized and any mechanism to monitor submission of these reports was not available.
- Persistent vacancies in front line staff.
- Frequent illegal encroachments and flash points for Human Wildlife Conflicts. Lack of possible long-term mitigation measures to curb this.
- Focused programme in respect of nearly extinct and endangered endemic species was absent.
- Exemption of Mini Hydel Projects, from conducting environmental impact assessment causing the natural water course to be altered.

Recommendation

- Need to maintain an updated database of wildlife movement.
- Incentivising farmers to grow non-cash crops around the Protected Areas and providing of crop insurance may be taken up.
- Speedy action to be initiated to work on strengthening of corridors by purchasing private land within a time frame.
- Any new commissioning of Mini Hydel Projects should be subjected to appropriate environment assessment.
- Tourist flow to be strictly controlled based on the carrying capacity.
- Survey and demarcation along with Global Positioning System (GPS) and satellite imageries of all the Protected Areas be done on priority basis.
- Satellite based analysis be linked to ground truthing to assess the exact extent of forest fires.
- Department needs to strengthen its research activities to control weeds.

SAI of Russian Federation (2017): Auditing the use in 2015 - 2016 of federal budget funds and federal property intended to ensure biodiversity and to eliminate the effects of pollution and other negative impacts on the environment resulting from economic and other activities

Audit Objective

1. Analysis of the activities of the Ministry of Natural Resources of Russia to implement the main measures under the state program of the Russian Federation "Environmental Protection" for 2012-2020 to ensure the biodiversity in Russia.
2. Establishment of the legality, reasonability, and timeliness of financial support for the operation of audit entities.
3. Analysis of the use of federal budget funds directed by the Ministry of Natural Resources of Russia to implement measures to ensure the biodiversity in Russia.

Scope

The audited entities were the Ministry of Natural Resources of Russia and subordinated budgetary institution.
The use of federal budget funds intended to implement measures ensuring the biodiversity was inspected.
Audit period: 2015 – 2016..

Audit Criteria

The audit was carried out in accordance with the authority of the Accounts Chamber of the Russian Federation, established by Federal Law No. 41-FZ dd. April 5, 2013, On the Accounts Chamber of the Russian Federation"of the Russian Federation".

Findings

1. The Ministry of Natural Resources of Russia and budgetary institutions subordinated to it implemented the aims of conserving and restoring natural systems defined by the National security strategy of the Russian Federation and the Strategy for conservation of rare and endangered animals, plants and fungi in the Russian Federation for the period up to 2030 within the subprogram 2 "Biodiversity of Russia" of the state program of the Russian Federation "Environmental protection" for 2012 - 2020".
2. The subordinated budgetary institutions carry out works aimed to preserve natural complexes, unique and reference natural sites and objects; to protect natural areas in order to conserve the biodiversity and maintain protected natural complexes and facilities in their natural condition.
3. Fourteen federal budgetary institutions additionally carry out works on conservation and breeding of rare and endangered animals, water biological objects, and plants.
4. Strategies for conservation of selected rare and endangered animals - the Amur tiger, the Far Eastern leopard, the snow leopard, the polar bear, the bison, and the Sakhalin musk deer - have been developed and are implemented by the Ministry of Natural Resources of Russia
5. During the implementation of the program for the restoration (reintroduction) of the Persian leopard in the Caucasus, the leopard population reached fourteen individuals.
6. At the meeting of the Presidium of the Council of the President of the Russian Federation for strategic development and priority projects in 2017, the passport of the priority project "Wild Nature of Russia: Preserve and See" was approved, which aims to conserve the biodiversity and protect rare and endangered animals, and provides for the restoration and increase in the number of populations of rare animals such as the Persian and Far Eastern leopards, the Przewalski's horse, the bison, the argali, the zeren, the saiga.
7. Minor violations related to use of federal budget funds were found

Recommendations

The Ministry of Natural Resources of Russia is recommended to take measures to eliminate the identified violations.
The Ministry of Natural Resources of Russia has taken measures to eliminate the identified violations.

SAI of Paraguay: Trading species of wild fauna and establishing seasons for hunting and for collecting live animals

In 2003, SAI of Paraguay (Contraloría General de la República) audited whether the country's Environmental Secretariat (SEAM) was complying with the law when it authorized the preserving, carrying, transporting, and trading of wild fauna, and when it established the hunting season and the season for collecting live animals.

Audit objectives

- Evaluate the management of the wildlife law enforcement agency.
- Analyze resolutions through which hunting quotas or quotas for preserving live animals and the use of leather, meat, and other items are being granted.

Scope

Activities carried out by the Environmental Secretariat in 2002 and 2003.

Criteria

- National Constitution
- Laws and regulations

Findings

- The Environmental Secretariat had no institutional environmental policy for protecting, conserving, and using, or ensuring the sustainable use, of wild fauna.
- The Wildlife Law and the Biological Diversity Law were not being fully complied with. For example:
- Population studies or censuses were being used to replace the scientific studies that are required by law to authorize the exploitation of natural resources.
- Neither an environmental impact assessment, nor an environmental licence is required to exploit wild fauna.
- Authorization was given to extract samples of wild fauna from a reserve, which affected the balance of legally protected ecosystems.
- There was no plan to manage exploitable species that included conservation actions, biological knowledge and was based on scientific studies, on which "sustainable use" programs could be based.

Recommendations

- Grant no new authorizations to exploit species until the SEAM defines clear procedures— through equitable, specific, and sustainable regulations that ensure the survival and reasonable use of the species.
- Consider more appropriate systems for protecting wild fauna species, such as captive reproduction and release into their habitat.
- With social organizations, academia, municipalities, and governmental organizations, design and apply domestic environmental policies to manage wildlife and habitat, paying special attention to natural resources and wildlife, as the public heritage of Paraguay.
- Emphasize supervising and overseeing field activities, monitoring, and carrying out censuses.
- Prepare formal lists of endangered or threatened species that will help establish rules and regulations to preserve the habitat of the listed species.

SAI of USA: Audits on protection of endangered species and their recovery plans

Between 2002 and 2005, the Government Accountability Office (GAO) of the United States conducted five audits related to the protection of endangered species. The audits examined recovery programs, the use of science, consultation processes, and spending.

The following is a summary of two of these audits:

A. Research strategy and long-term monitoring needed for the Mojave Desert tortoise recovery program.
Audit objective for A.
Evaluate the scientific basis for key decisions related to the tortoise—assess the effectiveness of actions taken to conserve tortoises, determine the status of the population, and identify costs and benefits associated with recovery actions.

B. Fish and Wildlife Service generally focuses recovery funding on high-priority species but needs to periodically assess its funding decisions.
Audit objective for B.
Evaluate how the Fish and Wildlife Service's allocation of recovery funds compares with its guidelines on recovery priorities and the factors that influence its decisions to allocate funds towards recovery.

Scope for A. and B.

- Federal agencies with obligations under the *Endangered Species Act*
- Non-federal scientific research

Criteria for A. and B.

- Federal laws and regulations
- Federal financial management controls
- Expert opinion
- Findings for A. and B.
- In most cases, federal agencies followed federal laws and regulations to carry out the *Endangered Species Act*.
- There were concerns about the efficiency and effectiveness of some programs.
- There was a lack of clarity in how some programs were to be executed.

Recommendation for A.
Develop and implement a coordinated research strategy to link land management decisions with research results and periodically reassess Mojave desert tortoise recovery plan. The Secretary of the Interior should identify and assess options to fund long-term monitoring of the population.

Recommendation for B.
Periodically assess whether higher priority species receive recovery funds and report this information publicly to ensure that the Fish and Wildlife Service is making the best use of available recovery resources.

SAI of Poland: National obligations under CITES agreement

In 1999, the Supreme Chamber of Control of Poland audited the application of national obligations under CITES.

Audit objective
Verify the activities of Polish public administration bodies and other organizations (such as businesses and NGOs) aimed at protecting animals, especially those that house and transport animals. A follow-up audit was performed in 2002.

Scope
Eighty-nine entities, including the National Veterinary Inspectorate, border veterinary inspectorates, and customs offices.

Criteria
- CITES
- National laws and regulations

Findings
- The Ministry of the Environment did not issue regulations to execute the *Animal Protection Act (1997)* that enforces the obligations under CITES.
- In 1998 and in the first half of 1999, the Ministry issued 488 permissions to import wild animals under CITES. It refused to issue several permissions, citing that the animals were wild-caught or that the importer was not able to prove their origin.
- During that period, under the power granted by the veterinary law, the Chief Veterinarian also issued permissions, independently from CITES, to import over 10,000 wild animals— 309 of which were issued in the first half of 1999. Most of them were incomplete, making it impossible to determine whether CITES should be applied.
- Customs offices registered 62 cases of animals being imported in violation of CITES provisions (12 of them concerned 360 living animals that represented 6 species).
- Pet wholesalers and shops selling exotic animals did not always have certificates stating the origin and health of their animals, and the animals were not always covered by a veterinary inspection.
- The Ministry did not report annually to the CITES Secretariat on how well it met its obligations under CITES.

Impact of the audit reflected in the follow-up
- In 2002, a regulation of the *Animal Protection Act (1997)* came into force that incorporated provisions of CITES and was geared towards restricting and regulating international trade in the animal species listed under CITES.
- The Ministry launched a media campaign informing citizens of regulations that resulted from obligations under CITES.
- Customs Services and Border Veterinary Inspection reached an agreement to restrict trade in wild animals, through which customs officers were trained to enforce the provisions of CITES.
- Recommendations from the 1999 audit resulted in veterinary inspection rules being extended to pet wholesalers and shops.
- During the audit period, only isolated shipments containing animals covered under CITES into Poland were reported.
- Veterinary permissions to import wild animals continued to be issued independently from CITES permissions (as had been disclosed in the 1999 audit). Because they still did not contain the full species names, it was still impossible to identify whether the imported animals should have been protected under CITES.

INVASIVE SPECIES

Background

Alien species that become invasive are considered to be a main cause of loss of biodiversity around the world. Increased levels of transport, tourism, and trade introduce more invasive alien species, which pose a significant threat to terrestrial and aquatic ecosystems.

Most invasive alien species arrive in their new territory through the accumulation and release of ballast water from ships. However, aquaculture and aquarium releases are equally important sources of invasive alien species and are not as well-regulated as ballast water release.

The problem of invasive alien species is a global one that requires action at all levels. Many countries have established systems to prevent and control the problem and use risk assessments to predict the likelihood of invasion and the potential ecological and economic cost. Although such systems consider the impact of invasive alien species once they are introduced, more work needs to be done to prevent their introduction. Because these invasive species can have a direct and costly impact on the economy, this is becoming an important audit topic for SAIs.

For more information on the issue, see the following topics in Chapter 1:

- species extinction;
- biotic uniformity;
- changes in ecological functions; and
- invasive alien species.

Audit criteria

Convention on Biological Diversity (CBD). Each contracting party is to prevent the introduction of, control, or eradicate invasive alien species that threaten its ecosystems, habitats, or native species. Parties are also responsible for ensuring that activities within their jurisdiction or control do not damage the environment of other countries.

Sustainable Development Goals (SDGs). Goal 15 of the SDGs take the topic on invasive alien species as one of the concerns. Target 15.8 clearly stated that '*by 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species*'.

Aichi Biodiversity Target

Goal B: Reduce the direct pressures on biodiversity and promote sustainable use
Target:
9. By 2020, invansive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Governments must develop effective strategies to minimize the spread and impact of invasive alien species. Each country faces unique challenges, so their solutions will also be unique. The document, *Guiding Principles for the Prevention, Introduction and Mitigation Of Impacts of Alien Species That Threaten Ecosystems, Habitats or Species* (Secretariat of Convention on Biological Diversity, 2002), lists some principles that give governments clear direction and a set of goals. SAIs can use these principles for their audits, and auditors can address lines of enquiry related to compliance, finance, effectiveness, and others for each one.

International Convention for the Control and Management of Ships' Ballast Water and Sediments. At a conference in February 2004, the International Convention for the Control and Management of Ships' Ballast Water and Sediments was adopted. The Convention could prevent the potentially devastating effects of the introduction, by maritime trade, of invasive species that compete with native wildlife. However, it has not yet come into force. Nevertheless, its principles could serve as good practices for managing invasive species coming from ballast water and sediments, and its guidelines could serve as source of audit criteria.

Exhibit 19: International Convention for the Control and Management of Ships' Ballast Water and Sediments— Potential lines of enquiry

The Convention requires that all ships have a ballast water and sediments management plan. All ships must carry a ballast water record book and manage their ballast water procedures to a given standard.

International Plant Protection Convention. The International Plant Protection Convention (IPPC) was adopted in 1951 by the Food and Agriculture Organization of the United Nations. Under its obligations, countries must act to prevent the introduction and spread of pests of plants and plant products, and to promote appropriate control measures. A revised text of the Convention was adopted in 1997.

Legislation, regulations, and policies. Some countries may have developed comprehensive frameworks for national legislation and international cooperation to regulate the introduction of invasive species as well as to eradicate and control them. This legislation may involve different sectors of activity (for example, trade, agriculture and food, and transport (ballast water).

Auditors need to look for

- any policies or strategies that can be used to control invasive alien species,
- any legislation that addresses the intentional and unintentional introduction of invasive species, and
- agreements between and actions of regional trade organizations that may help minimize or prevent the unintentional introduction of invasive species.

Programs. Auditors may find programs that address invasive species in a number of departments and ministries. Usually, the ministry in charge of environmental issues develops programs to prevent the introduction of alien invasive species or to eradicate and control the alien invasive species that have already been introduced in the country.

Often, education programs and campaigns are implemented to minimize and prevent the unintentional introduction of invasive species. These programs may suggest methods to reduce the risk of invasive species being introduced through traded goods, packaging material, ballast water, personal luggage, aircraft, and ships.

Governments also implement research and development programs to address the problem. These programs may identify the major invasive pathways in the countries (for example, international ports and airports) so the pathways can be monitored, and the invasive species can be eradicated.

Players

In addition to the usual players (departments and ministries of the environment and fisheries), departments and ministries of agriculture, food, transport, coast guard, trade, and customs may be involved in managing invasive alien species. Because invasive species are introduced in different ways in each country, the players will be different.

Researchable questions

Auditors may ask whether the government is:

- implementing its legislation and policies related to invasive species;
- identifying the key invasive species in the country;
- providing available information on the invasive behaviour of a species to other countries;
- taking appropriate individual and cooperative action to minimize the risk posed by invasive alien species;
- undertaking research and monitoring;
- promoting education and public awareness and performing outreach activities;
- implementing border controls and quarantine measures, where warranted;
- assessing and controlling illegal activities that introduce invasive species;

- signing specific agreements with neighbouring countries;
- implementing measures to reduce the number of invasive alien species through mechanical, chemical, and biological controls, or through habitat management; and
- implementing detection programs to eradicate species in the early stages of invasion and mitigation measures to limit the spread.

Because auditing government actions to control invasive alien species could be a huge topic, it may be advisable to audit only one specific pathway or sector of activity (for example, agriculture, forestry, or shipping).

Audit case studies

The following case studies relate to the management of invasive species and the prevention of pests and diseases.

SAI of Canada (2008) – Aquatic invasive species

Audit Objective

The main objective of our follow-up audit was to assess the progress that Fisheries and Oceans Canada and Transport Canada had made in responding to the recommendations in our 2002 audit on invasive species.

SAI of Canada examined whether:

- Fisheries and Oceans Canada had made satisfactory progress in implementing selected recommendations made with respect to managing the risks posed by aquatic invasive species, and
- Transport Canada had made satisfactory progress with respect to managing ballast water.

Scope

The audit covered the measures taken following the recommendations on aquatic invasive species made in 2002 audit, *Invasive Species*. They looked at how Fisheries and Oceans Canada is managing risks posed by aquatic invasive species and how Transport Canada is controlling the introduction of aquatic invasive species into Canadian waters from ship ballast water. These issues were selected as being of continued interest to Parliament and Canadians and still posing a significant risk.

The approach included reviewing documents from the headquarters and regional offices of both departments, interviewing management and employees (including visits to two Fisheries and Oceans Canada research labs, and one regional Transport Canada office), examining databases, analyzing procedures, and observing operations.

The examination did not include recommendations made to Environment Canada, since this work would have involved terrestrial invasive species and the overall coordination of the federal government's response to invasive species. These areas were beyond the scope of our current audit. The audit also did not include Fisheries and Oceans Canada's programs for dealing with introductions of alien or genetically modified species from domestic fish-stocking programs or from aquaculture operations. These areas were not within the scope of the 2002 audit and so were not followed up here.

Audit Criteria

The criteria for the audit were derived from our 2002 audit recommendations.

- SAI of Canada expected Fisheries and Oceans Canada to have developed and implemented a means to identify and assess the risks of aquatic invasive species and use it as a tool for setting departmental priorities and objectives for the prevention, control, or eradication of those risks.
- SAI of Canada expected Fisheries and Oceans Canada to have put in place a monitoring and reporting system that tracks the effectiveness of measures taken toward its invasive species objectives and to report on progress annually.
- SAI of Canada expected Transport Canada to have defined best management practices for ship ballast and established regulations requiring application of those practices on all ships entering Canadian waters.
- SAI of Canada expected Transport Canada to have developed and implemented a means to monitor, maintain records, and report on compliance with Canadian ballast water regulations.

Findings

- Fisheries and Oceans Canada has made unsatisfactory progress in assessing the risks posed by aquatic invasive.
- Transport Canada has implemented one of the two recommendations we made in 2002. Regulations that reflect current best practices for managing ballast water came into force through the *Canada Shipping Act* in 2006.

Recommendation

- Fisheries and Oceans Canada should apply a systematic risk-based approach to early detection and develop the ability to respond rapidly when new invasive species are detected in order to prevent them from becoming established or to control them.
- Transport Canada should ensure that ships entering Canadian waters from high-risk locations are appropriately and systematically monitored and that ballast water management practices applied by these ships comply with Canadian regulations.

Follow up

- Fisheries and Oceans Canada acknowledges the need for a systematic, risk-based approach to early detection and rapid response and therefore accepts this recommendation.
- Transport Canada's agreed that they are acting on this by launching a database of ecosystem data of the world's ports.

SAI of USA (2016): Information on Federal Agencies' Expenditures and Coordination Related to Harmful Algae

Harmful algae blooms are an environmental problem in all 50 states, according to EPA. While algae are essential to the ecosystem, providing food for all types of animals, these blooms can produce toxins that hurt the environment and local economies. Specifically, they can cause human illness or death from the consumption of seafood or water contaminated by toxic algae; harm aquatic and other animal species through neurological or liver damage or severe oxygen depletion; and hurt the seafood industry, recreation, and tourism. Harmful algal blooms occur naturally, but their prevalence, frequency, and severity are increasing—and this increase is influenced by climate, pollution, and human activities such as agriculture and wastewater, according to an interagency working group report.

Audit Objective
This report examines:
1. how much federal agencies expended on these activities from fiscal years 2013 through 2015; and
2. how federal agencies coordinate their activities with each other and with nonfederal stakeholders

Scope
To identify how much federal agencies expended on activities related to marine and freshwater HABs, and the types of activities funded, for fiscal years 2013, 2014, and 2015, we conducted interviews with and requested data from officials from the 17 relevant agencies on their HAB-related expenditures for this period, and we found that 12 agencies'expenditure data were relevant and sufficiently reliable for the purpose of producing a rough estimate of federal HAB-related expenditures

Audit Criteria
- The Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA)
- The Drinking Water Protection Act

Findings
- Twelve federal agencies reported expending an estimated total of roughly $101 million from fiscal years 2013 through 2015 to fund various research, monitoring, and other activities related to harmful algae—overgrowths of algae that can create toxic "blooms" in marine or freshwater environments.
- Based on the data, the 5 agencies with the largest expenditures related to harmful algal blooms funded efforts to research and analyze harmful algal blooms; forecast, monitor, and respond to their occurrence; and investigate human and ecological health effects. In addition, other agencies expended millions of dollars funding activities to address harmful algae.
- Federal officials reported that their agencies coordinate in a variety of ways with each other and with nonfederal stakeholders to share information, expertise, and opportunities for collaboration on activities to address harmful algae.
- Furthermore, federal officials reported a number of interagency partnerships directly related to their harmful algae work

SAI of Canada: Invasive species in Canada

In 2004, the Office of the Auditor General (OAG) of Canada audited Environment Canada, Fisheries and Oceans, and Transport Canada to determine whether the federal government had adequately carried out its obligations under the international Convention on Biological Diversity and the Canadian Biodiversity Strategy regarding invasive species.

Audit objectives
a. Determine whether the federal government adequately responded to the problem of invasive species, since it signed the Convention on Biological Diversity and, more specifically, since it finalized the Canadian Biodiversity Strategy.
b. Investigate whether Environment Canada had information or the tools needed to acquire information on:
   - which species pose the greatest threats,
   - which major pathways they are likely to arrive by,
   - who took what action to respond to major risks, and
   - how effective those actions were.
c. examine how the federal government managed invasive species arriving via ballast water. The focus was on whether Fisheries and Oceans Canada acquired the basic information it needed to manage invaders and whether Transport Canada ensured that there is adequate legislation and enforcement to control their introduction into Canadian waters.

Scope
- Environment Canada
- Fisheries and Oceans Canada
- Transport Canada
- Convention on Biological Diversity
- Canadian Biodiversity Strategy

Criteria
- Departmental mandates (including legislative mandates) with respect to invasive species
- Convention on Biological Diversity
- Canadian Biodiversity Strategy

Findings

- Despite its commitments, the Canadian government had not launched an effective response to the problem. Ten years after making commitments under the Convention and the Strategy, the number of invasive species in Canada continues to grow.
- No federal department saw the "big picture" because none of them had the overall authority to make sure that action was taken. Clear roles and responsibilities had not been assigned to specific federal departments.
- The federal government had not identified the species that posed a threat, it had not identified the pathways by which they arrive nor was it able to assess progress against its commitments.

Recommendations

To Environment Canada

- Put a national action plan in place as well as a monitoring and reporting system to track the effectiveness of measures taken against invasive species.
- Secure the commitment of relevant federal departments to act on their contribution to the plan.

To Transport Canada

- Formalize information-sharing on ballast water with the U.S. Coast Guard.
- Enforce future Canadian regulations on discharging ballast water.

To Fisheries and Oceans Canada

- Develop and implement measures to identify and assess the risks associated with aquatic invasive species, and assess priorities and objectives to these risks.
- Track the effectiveness of these measures and report annually to Parliament.

SAI of UK: Protecting UK from plant pests and diseases

In 2003, the National Audit Office of the United Kingdom carried out a value-for-money (performance) audit on preventing the introduction of invasive species.

Audit objective

To examine the way the Department for Environment, Food and Rural Affairs protects England and Wales from the risks of plant pests and diseases.

Scope

- Key risks posed by plant pests and diseases
- Department's record in dealing with outbreaks
- Department's work to detect pests and diseases and prevent them from spreading

Criteria

- National legislation
- Requirements of the World Trade Organization
- European Union Directive 2000/29/EC
- The UN Food and Agriculture Organization's International Plant Protection Convention (IPPC)

Findings

The Department

- played a key part in the country's good record in preventing major outbreaks of pests and diseases;
- needs to focus more on key risks and results;
- must better coordinate its work, particularly with industry and foreign counterparts;
- had insufficient means to assure the quality of work of its inspectors; and
- must focus on acquiring the necessary scientific capacity in coming years.

Recommendations

- Focus on key risks and outcomes.
- Coordinate with industry and foreign counterparts.
- Assure the quality of work of inspectors.
- Acquire the necessary scientific capacity.

FRESHWATER HABITATS AND THEIR RESOURCES

Background

Freshwater habitats (including lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, bogs, marshes, and swamps) are an important source of food, income, and livelihood—particularly in rural areas of developing countries. These ecosystems also provide water, energy, transport, recreation and tourism, hydrological balance, retention of sediments and nutrients, and habitats for fauna and flora.

Globally, freshwaters are experiencing declines in biodiversity at rates greater than those in terrestrial systems (Vaughn, 2010[23]). Freshwater ecosystems, which humans often change dramatically, are among the most threatened ecosystems of all, through

- physical alteration,
- loss and degradation of habitat,
- drainage,
- overexploitation,
- pollution, and
- the introduction of invasive alien species.

Forty-one percent of the world's populations live in river basins that are experiencing stress. More than twenty percent of the world's 10,000 freshwater fish species have become extinct, threatened, or endangered in recent decades.

Industrialization, rapid economic development, and population growth have transformed freshwater ecosystems and have increased the loss of biodiversity to unprecedented level. There is increasing concern about what can be done to maintain the rich biodiversity of inland waters and reduce the risks faced by many species, so that the goods and services they provide will not perish with them. There is an ever-increasing need and urgency to improve the management of inland water ecosystems to meet the equally ever-increasing demand for fresh water.

The most important threat in freshwater ecosystems in the past 50 years have been the physical alteration of habitat, modification of the flow of water (dams and water reservoirs), and reduced water quality (pollution by the agriculture, industry and municipal (sewage) sectors, sedimentation, and eutrophication). Pollution of freshwater is frequently audited by SAIs.

Audit criteria

International Agreements. There are no international agreements specifically for freshwater protection. However there are numerous regional agreements on rivers or lakes; SAIs should look at those agreements as a source of audit criteria.

The CBD makes reference to the protection of freshwater and the Conference of Parties has established a specific program for inland water biodiversity.

Sustainable Development Goals (SDGs). Protecting the natural habitats like freshwater habitats is essential for the achievement of the SDGs by 2030. Below are the examples of targets related to the freshwater habitats protection:

23 Vaughn, Caryn C. 2010. *Biodiversity Losses and Ecosystem Function in Freshwaters: Emerging Conclusions and Research Directions.* BioScience Volume 60, Issue 1, 1 January 2010, Pages 25-35. https://doi.org/10.1525/bio.2010.60.1.7. Accessed at: http://carynvaughn.com/wp-content/uploads/2014/11/Vaughn.BioScience.2010.pdf

Goal 12. Ensure sustainable consumption and production patterns
Target 12.2 mentioned "By 2030, achieve the sustainable management and efficient use of natural resources"

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Target 14.4 mentioned "By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics"

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Target 15.1 mentioned "By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements"

Aichi Biodiversity Targets

Goal B: Reduce the direct pressures on biodiversity and promote sustainable use.

Targets:

6. By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species, and ecosystems are within safe ecological limit.

Legislation, regulations, and policies. Specific freshwater legislation and policies usually exist and include provisions for dealing with quality and quantity of water. They may also include specific provisions for drinking water and the protection of groundwater. Because there is a wide range of users (for example, agriculture, industry, and municipalities), governments often use integrated watershed management as a tool to balance needs and protect the water supply. However, the laws may not directly refer to biodiversity (for example, legislation surrounding production of electric energy resulting from dam construction).

Auditors can examine any legislation on preventing pollution or protecting species. For example, if a SAI is auditing inland fisheries, legislation on fisheries may be an important source of criteria.

Policies on water are usually developed at the national level and include some clauses on the protection of species. Often, such policies are based on the principle, "the polluter pays."

Programs. Since legislation and policies on water undoubtedly exist, auditors could expect to find specific programs related to water. Some aspects of these programs may relate to biodiversity.

Players

The departments of the environment or of natural resources, or their equivalents, generally have lead role in the management of freshwater. The department of fisheries, or its equivalent, may also have an important role. SAIs should also look at departments and ministries that use water resources, such as those for agriculture and energy. In addition, local government may implement policies that are developed at the national level. Organizations such as water boards or water authorities may also be involved.

Researchable questions

Auditors may ask whether the government is

- enforcing its legislation and policies related to freshwater,
- integrating biodiversity into the management of water resources and river-basins, and into relevant sectoral plans and policies,

- establishing and maintaining protected freshwater ecosystems,
- regulating pollution of water from different sectors,
- monitoring water quality and water quantity,
- regulating sewage discharge,
- halving the proportion of untreated wastewater,
- preventing invasions of alien species,
- encouraging the use of low-cost technology and innovative approaches to manage water resources,
- providing incentives to conserve and use in a sustainable way the biodiversity in inland waters,
- supervising inland fisheries and protecting resources through sustainable fisheries management;
- improving understanding of the biodiversity in inland waters and of the threats to their ecosystems;
- conducting thorough impact assessments; and
- monitoring inland water biodiversity.

For more information, see the INTOSAI WGEA document, *Auditing Water Issues: Experiences of Supreme Audit Institutions*[24], published in 2004, which includes audit case studies on nature and biodiversity, rivers and lakes, and water quality.

Wetlands could have been included in this section. However, because auditors often audit how their government is protecting wetlands under the Ramsar convention, it has been left as a separate topic (see the section on Wetlands, in Chapter 3).

Audit case studies

The following case studies relate to river restoration and freshwater fisheries management.

SAI of India (2015): Performance audit on Conservation and Ecological restoration of Lakes under the jurisdiction of Lake Development Authority and Urban Local Bodies in Karnataka State

Audit Objective

To identify whether:

1. the existing institutional mechanism and legal framework ensure effective and efficient long term environmental sustainability of lakes;
2. the survey and demarcation of lakes were effectively carried out and action to prevent encroachments and diversions were effective.
3. the agencies undertook effective sustainable initiatives to restore water quality and **maintain ecological health of the lakes**.

Scope

The performance audit was for the period 2009-14 covered the activities relating to conservation and restoration of lakes in Revenue Department, Forest Department, Urban Development Department (UDD), and Fisheries Department. The performance audit covered 56 lakes.

24 Link to the document: https://wgea.org/media/2901/eng04pu_guidewater.pdf.

Audit Criteria

a. Guidelines of National Lake Conservation Programme and National Wetland Conservation Programme.
b. Shri Lakshman Rau Committee Report and Hon'ble Justice N.K. Patil Committee Report.
c. Water (Prevention & Control of Pollution) Act, 1974
d. Reports on monitoring of level of pollution in lakes by KSPCB
e. National Water Policy, 2002
f. Environment (Protection) Act, 1986
g. Memorandum of Association and Bye-Laws of Lake Development Authority

Findings

a. Deficiencies were noticed in restoration works carried out by the implementing agencies.
b. Instead of priortising core works for lake rejuvenation, non-core works were given undue significance. The agencies had not assessed the impact of pollution in lakes and related risks to human health, biodiversity and ground water.
c. Preservation of biodiversity in the test-checked lakes was badly affected due to destruction of gentle slopes on shorelines and formation of ringed elevated bunds. This caused irreparable damage to the fragile wetland ecosystem and resulted in loss of habitat of aquatic weeds and birds.
d. A buffer zone within 30 metres of the periphery of the lake was absent.

Recommendation

a. Steps to introduce a dedicated cell for overseeing all the development and restoration works related to lakes with more Forest Department officials who are conversant with lake restoration works.
b. Capacity building of the officials involved in lake restoration activities
c. Engaging scientific research institutions and reputed educational institutions.
d. Review cases of grant of lake land post 1988 and take steps to reclaim the land.
e. The provisioning of funds for both core and non-core as per norms in the interest of the ecological health of the lakes.
f. Construction of STPs and their optimal to ensure that untreated sewage is not let into the lakes.
g. Emphasis on creation and preservation of natural wetlands instead of constructed wetlands.
h. Ensuring adequate inlets and outlets in all lakes in coordination with concerned agencies.
i. Acquisition of land or prescribing norms for regulating activities in buffer area and the buffer limits.

SAI of Philippines (2015): Adopt-an-Estero/Water Body Program

Audit Objective

To determine whether the Adopt-an-Estero program reduced the water pollution and improved the water quality of esteros.

Scope

Implementation of the program in six regions (NCR, CAR, 3,6, 9 and 11)

Audit Criteria

Philippine Development Plan (PDP) 2011- 2016 – the goal is to improve environmental quality for a cleaner and healthier environment and to provide communities with a healthier environment by improving the quality of the air, land and water.
The objectives of the Adopt-an-Estero program to clean the esteros of wastes, debris and silt starting 2010 until all have been cleaned up and to mobilize estero communities in cleaning the estero and enlist their active participation in the actual clean up, and in implementing and preparing plans to sustain a clean estero in the future years.

Finding

The goal to achieve cleaner, safer, and healthier environment by reducing the water pollution through the Adopt an Estero/Water Body Program has not yet been attained for the past five years in the NCR Regions 3, 6, and 11 due to: a) non-abatement of the dumping of domestic wastes and that only 10 percent of the total water body in Metro Manila was adopted as of December 31, 2015; b) the terms and conditions of the MOA are not fully observed; c) non-involvement of the residents in the management of the estero; and d) low enforcement of ordinance on solid waste management in the barangay level.

Recommendation

a. SAI of Philippines recommended and Management agreed to:
b. increase the targeted number of estero/water bodies to be adopted per year by exerting more efforts to solicit more donor-partners (EMB-NCR);
c. require the donor-partners to fully comply with all the undertakings, terms and conditions of the MOA (Region 3);
d. include the LGUs among the parties to the MOA to enlist the cooperation/involvement of the concerned residents in the clean-up drive (Regions 3 and 6);
e. conduct intensive periodic IEC seminars especially on livelihood projects that will benefit the concerned residents (Regions 6 and 11); and
f. request the LGU partners to strengthen the implementation of the ordinance on solid waste management (Region 11).

SAI of Zambia (2015): Sustainable Management of Fish Resources in Natural Waters

Audit Objective
The objective of the audit was to assess whether the Ministry of Agriculture and Livestock (MAL) had implemented effective measures to promote sustainable management of fish resources.

Scope
The audit focused on the measures put in place by the MAL through the Department of Fisheries (DoF) to achieve its overall objective of promoting sustainable management of fish resources in natural waters (capture fisheries). The audit covered operations relating to the period 2011 to 2014.

Audit Criteria
The performance of the DoF was assessed against criteria drawn from the;
a. Fisheries Act No. 22 of 2011,
b. The Fisheries Regulations, 2012,
c. Strategic National Development Plan (SNDP) 2011-2016,
d. National Agriculture Policy 2004 - 2015,
e. Strategic Plan 2014-2016
f. Code of Conduct for Responsible Fisheries (CCRF).
g. Best practice from the Food Agricultural Organization (FAO) on management of fish resources.

Findings
a. The Department of Fisheries (DoF) did not have knowledge of the biomass of fish species in natural waters except for kapenta and buka-buka. Consequently, the DoF was unable to institute technical measures to control the harvest of fish from the natural waters for demersal or inshore fish species as there was no determination or estimation of the limit of how much fishers could take out as well as how much was to be left for regeneration.
b. Fisheries Management Plans (FMPs) in fishery areas were not in place. The result of not having the plans in place hindered DoF's intention of managing fish resources on a co-management basis with the community.
c. Control measures in place were not effectively implemented.
d. Fishers continued to fish without licences and were not adhering to the fishing ban. Use of illegal methods such as mosquito nets, potato sacks, weirs, explosives and poisons were reported. These methods impact negatively on the fish as they disturb breeding sites, migration routes and indiscriminately kill fish.
e. Although breeding sites had been identified and gazetted, a review of documents revealed that fishers had settled in some identified breeding areas and were actually undertaking fishing activities in those areas. The DoF was not regulating landing sites. As a result, fishers landed fish anywhere making it difficult for the DoF to collect statistics on fish catches.
f. Monitoring, Control and Surveillance (MCS) was carried out to check whether fishing activities are in accordance with the regulations. However, the DoF was not able to achieve targets set. Factors that were attributed to the DoF not achieving the set targets included low staffing levels, inadequate land and water transport, and untimely and inadequate funding.

Recommendation
a. The DoF should determine the fish biomass which will enable them to estimate how much fish can be harvested and how much can remain for regeneration.
b. DoF should ensure that FMPs are drawn and implemented for all fishery areas in order to improve management of fisheries resources in the country.
c. The DoF should strengthen participation of key stakeholders such as the VMCs, ZMC, FMC and support progressive fisheries management initiatives and programmes that will address issues of overfishing and use of illegal gear and fishing methods. It is important to get communities involved in the management of fisheries as it creates a sense of ownership of the resources.
d. The DoF should improve resource allocation for fisheries management and community level sensitization programmes.

SAI of Czech Republic: River system restoration program

In 2004, the Supreme Audit Office of the Czech Republic (NKÚ) audited the River System Restoration Program, which was intended to return freshwater ecosystems to health by restoring the surrounding landscape. The Program is part of the State Environmental Policy and the State Program of Protection of Nature and the Landscape of the Czech Republic.

Audit objective
Verify the management of state funds set aside to restore river systems.

Scope
- Ministry of Environment
- Organizations run by the ministries of the Environment and Agriculture
- The recipients of funds
- All restoration programs for river systems under the ministries of Agriculture and the
- Environment

Criteria
- Laws and directives regarding the state budget
- Laws on the protection of landscape
- Acts on public procurement
- Ministry directives on the River System Restoration Program
- State Environmental Policy
- Ramsar Convention (indirectly)

Findings
- There were inadequacies in the Ministry of the Environment's conceptual, management and control work. It had not set gradual or individual targets that could be evaluated after five years, as proposed in the Program.
- Most of the Program funds were spent to build and repair new fish ponds and water reservoirs for commercial use. The Ministry did not remedy the disproportion between the individual purposes (subprograms).
- The Ministry did not make full use of the restoration studies that it both financed and used as documentation for decision-making.
- Activities, such as tender procedures for suppliers and procedures for contracting and invoicing suppliers were not always carried out in a way that showed the proper use of funds.

Recommendations
The Ministry should increase the effectiveness of the controls over subsidies and ensure compliance with the conditions of the Program, once the project is complete.

SAI of Botswana: Fisheries in Botswana

In 2005, the Office of Auditor General of Botswana conducted a performance audit of the fishing industry to determine how unregulated fishing activities, the absence of a policy framework, and operational mechanisms have affected the sustainability of fisheries and the environment.

Audit objectives
Determine whether the Fisheries Division of the Department of Wildlife and National Parks (DWNP) had adequate guidance and operational mechanisms to manage and protect the fishing industry by determining the following:
- whether the Division had a policy framework with clear objectives;
- how much information was collected to devise long term management plans and usage strategies for the fisheries to provide protection, regulations, and the sustainable use of resources;
- how much open fishing affected fish stocks;
- whether routine inspections were carried out;
- whether the Division fulfilled its obligations to protect the aquatic environment, as specified in the Southern African Development Community (SADC) Protocol on fisheries (Articles numbers 14 and 15), and
- whether there was appropriate monitoring in place.

Scope
- Audited period: 2001 to 2004
- The Fisheries Division of the DWNP
- Department of Animal Health and Production (DAHP)
- One district in the north of Botswana, where fisheries activities are conducted

Criteria
- *Fish Protection Act* of 1975 and draft Fisheries regulations.
- DWNP's and DAHP's strategic plans.
- Southern African Development Community (SADC) Protocol on fisheries

Findings
- The Division had not developed a policy framework to provide the necessary direction and guidance to the fishing industry.
- The *Fish Protection Act* of 1975 had become obsolete, since it did not provide for all aspects of fishing, such as managing fish stocks.
- There was no data in the database, on the number of fish (the "catch") and the effort needed for traditional (hook, line, and basket) fishing, recreational, and competition fishing, to measure how much of the total catch is the result of these activities.
- There were no formal protection controls or mechanisms in place to protect fish and habitat. DWNP management educated fishers and encouraged them to practise good fishing methods. However, this initiative lacked measurable targets for fishers to meet.
- The scientific capacity in the Division was lacking—70.6 percent of its staff lacked formal fishing training, although many were self-taught.
- The annual reports produced by the Division were work-related; they did not mention that the programs to protect fish and promote the sustainable use of resources were achieving results.

Recommendations

DWNP management should

- Review the *Fish Protection Act*.
- Devise methods to improve the quality of data (for example, increased inspections) needed to obtain independent verification of the information in the Daily Catch and Effort forms and to improve education programs.
- Ensure that data on fish stocks are analyzed and relevant reports are produced quickly to give decision-makers up-to-date access to accurate information.
- Conduct research to determine the impact of fishing methods where gillnets are not used (for example, basket fishing and trapping) and recreational and competition fishing on catch rates, mortalities, types of hook, types of species, and size of fish. This data will help in the assessment of stock levels.
- Develop a comprehensive strategy to protect habitat that includes clean-up action plans for polluted fishing sites or fish markets.
- Ensure that inspection activities are conducted efficiently and effectively, and ensure that they comply with the *Fish Protection Act*.
- Ensure that the Division has enough qualified staff to perform its mandated activities.
- Ensure that DWNP management reports include the Division's achievements in protecting fish and habitat, and ensure that Parliament and the public are informed of the sustainable use of fish resources.

WETLANDS

Background

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land or where it is covered by shallow water. Covering four to six percent of the planet, wetlands are one of the key life support systems on Earth.

Wetlands provide critical habitats for many species of fauna and flora. They play an important role in filtering and providing water, retaining sediments and nutrients, stabilizing shorelines, and mitigating floods. They are among the most productive ecosystems in the world and are important warehouses of plant genetic material, such as that in rice.

The survival of wetlands depends on their preservation and the conservation of their ecological functions. They have historically been threatened by encroachment, drainage, land reclamation, pollution, and competing uses, such as agriculture and urban development.

The Wetlands are a common audit topic for SAIs.

Audit criteria

Ramsar Convention on Wetlands. The Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention on Wetlands) is the main convention on wetlands, and it is the only one that specifically protects a single habitat. Most countries have wetlands, and most of those have signed the Ramsar convention (153 countries) and have designated Ramsar sites (1630 Ramsar sites around the world).

Commitments under this convention could lead to specific programs or policies and be a source of audit objectives and criteria. It is an international agreement that provides a framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. When auditing wetlands, auditors often start with the Ramsar Convention.

Exhibit 20. The Ramsar Convention on Wetlands—Potential lines of enquiry

The Convention includes four main commitments that the Contracting Parties have agreed to.

1. **Listed sites**. The first obligation is to designate at least one wetland to be included on the List of Wetlands of International Importance (the "Ramsar List"), to promote its conservation and, where appropriate, wise use of its resources. The wetland should be chosen based on its significance to ecology, botany, zoology, limnology, or hydrology.
   The contracting parties have adopted specific criteria and guidelines for identifying such sites. (Ramsar Information Paper no. 4.)
   - As of November 2006, there were 1,630 designated Ramsar wetland sites—for a total of 145.6 million hectares—worldwide.
   - The Convention takes a broad approach to its definition of wetlands, which are defined as: areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

In addition, wetlands included in the Ramsar List "may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands."
The Convention recognizes five major types of wetland:

- **marine** (coastal wetlands including lagoons, rocky shores, and coral reefs);
- **estuarine** (including deltas, tidal marshes, and mangrove swamps);
- **lacustrine** (wetlands associated with lakes);
- **riverine** (wetlands along rivers and streams); and
- **palustrine** (marshes, swamps, and bogs).

2. **Wise use.** Under the Convention, the contracting parties are obliged to include considerations for conserving wetlands when planning their national land-use. They have to promote, as far as possible, "the wise use of wetlands in their territory" (Article 3.1 of the Convention).
   The Conference of the Contracting Parties has approved guidelines on how to achieve "wise use," which has been interpreted as being equivalent to "sustainable use" (Ramsar Information Paper no. 7).

3. **Reserves and training.** The contracting parties agreed to establish nature reserves in wetlands, even for those wetlands not included in the Ramsar List, and to promote training in research, management, and stewardship.

4. **International co-operation.** The contracting parties agreed to consult other contracting parties on how to apply the Convention, especially for cross-border wetlands, shared water systems, and shared species (Ramsar Information Paper no. 13).

Over the years, the Conference of the Contracting Parties has interpreted and elaborated on these four major commitments and developed guidelines to help carry them out. These guidelines are published in the Ramsar Handbook series (Ramsar Information Paper no. 16).
Reporting. The contracting parties report the progress they are making on applying their commitments under the Convention by submitting national reports to the Conference of the Contracting Parties every three years. The national reports become part of the public record.

The **Convention on Biological Diversity (CBD)** could also be a source of audit objectives and criteria. As mentioned in the protected areas section of this chapter, countries have to establish and maintain protected areas, including wetlands.

As in the freshwater habitats theme, SDGs could also be used as criteria. Here are examples of targets that could be used as criteria for protection of wetlands audit:

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Target 6.6 mentioned "By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes"

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.1 mentioned "By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements"

Legislation, regulations, and policies. Countries may not have specific legislation on wetlands. However, many do have legislation that protects wildlife and their habitats. Wetlands are usually covered under this type of legislation, which generally contains provisions for creating protected areas for wildlife.

Regulations usually prohibit hunting and fishing and other activities that may modify these habitats. Often, these protected areas are called aquatic bird habitats because wetlands are particularly important for birds, especially migratory birds. Many wetlands are designated as Important Bird Areas (IBA).

Many countries have established a wetland conservation policy, which is a requirement of the Convention.

Programs. Departments and ministries may have developed specific programs to implement policies that protect, restore, and ensure that any exploitation of wetlands is sustainable. Sometimes, the programs are not specific to wetlands but have a much broader scope, such as habitat conservation.

Players

Usually, the department of the environment, or its equivalent, is involved. In some countries, the departments of Natural Resources, Nature Management, Parks, and Agriculture could be involved. However, other departments may also be involved in protecting wetlands. The auditor must clarify which is the lead department and whether there are clear, defined roles.

Some institutes and non-governmental organizations—such as the World Wildlife Fund or BirdLife International, hunting associations, national wildlife or nature associations—may be involved in protecting wetlands. Departments and ministries may collaborate with these organizations. It is important to meet these organizations in the first phase of the audit to understand the wetlands issue in the country.

Researchable questions

Auditors may ask the following:

- Is the government complying with the Ramsar Convention?
- Has the government identified any wetlands that qualify under the Ramsar Convention?
- Does the government have a strategy or a national policy framework for protecting wetlands?
- Does the government have the appropriate scientific knowledge to select the wetlands it should protect?
- Has the government established management and restoration plans for its most important wetlands? Have they been applied?
- What are the conservation objectives for wetlands of importance in the country?
- Does the government measure its progress in conserving wetlands? Does it use any indicators?
- Is the government reporting its progress to its Parliament (or equivalent) or to the Ramsar Secretariat?

Audit case studies

The following case studies are experience by SAIs in auditing Ramsar Convention.

SAI of Costa Rica (2011): Report of the performance audit on the measures of protection and conservation of wetlands of international importance according to the RAMSAR Convention

Audit Objective

The wetlands audit was conducted to verify the Government's progress in meeting the commitments of protection and conservation, as set forth in The Ramsar Convention on Wetlands. Three Costa Rican Wetlands on the Ramsar List were assessed: Palo Verde, Caño Negro and Térraba Sierpe.

Scope

The audit included the analysis of the guidelines, mechanisms and control instruments established by the Ministry of Environment to implement the commitments acquired by the country with the Ramsar Convention. The Ramsar wetlands analyzed are the Térraba Sierpe (Osa Conservation Area), Palo Verde (Tempisque and Arenal Tempisque Conservation Areas, and the Caño Negro Conservation Area (Arenal-Huetar Norte Conservation Area).

The state of conservation of the wetland ecosystems covered the mechanisms of monitoring and registration of the flora and fauna, the geographical delimitation and the quality of the aquatic ecosystem. Microbiological, biological and pesticide tests were conducted during July and August 2011 to measure the water quality of the wetlands.

Audit Criteria

The audit criteria considered indicators for vegetation cover, soil composition and water quality.

Findings

Important findings addressed such key issues as the loss of vegetation cover in Caño Negro (87 ha from 1988 to 2005) and Térraba Sierpe (766 ha from 1984 to 2005), invasive aquatic vegetation in Palo Verde, and Escherichia coli contamination in some areas of the wetlands. Also, unpermitted land uses were identified which were in clear violation of current regulations—a situation due to insufficient protection in surrounding areas.

In addition, weaknesses in Governmental management were found, specifically in monitoring and in the use of Geographic Information Systems. The report recommended that mechanisms be established to strengthen management and surveillance of national wetlands.

Recommendation

- To establish, approve and publish the Térraba-Sierpe, Caño Negro and Palo Verde, Management Plans.
- To determine the extension of terrains with wetland characteristics and protect it accordance with the order legal and the institutions competent.
- To develop and implement a monitoring mechanism that allows timely detect changes or alterations in the vegetation or forest cover of the Ramsar wetlands audited.
- To evaluate the results of the water tests reported in this report, in order to determine if the pollution levels detected require specific mitigation actions; and if it is required to perform water tests periodically.
- To promulgate and disseminate the internal procedure and guidelines of Ramsar Convention and incorporate the different actors according to their role. In addition, establish and implement formal and periodic programs of dissemination and training of resolutions and guidelines of the Ramsar Convention.
- To formulate and implement a contingency plan that contemplates the actions to strengthen the control and protection management of the Térraba National Wetland Sierpe; so as to increase the capacity for surveillance, control and protection of the natural resources that said Ramsar site protects.
- To develop and implement a Geographical Information System integrated at the institutional level, standardized through interconnection protocols and exchange of information, which records the geographic information that is generated in the Areas of Conservation and in the Executive Direction of SINAC.
- To incorporate in the Ramsar Information Sheets the extent and geographical limits of wetlands of international importance, under the CRTM05 cartographic projection system, so that the delimitation is georeferenced to a more stable and reliable demarcation over time with the use of geographic coordinates.

SAI of Portugal (2012): Audit on the Fulfillment of the Convention on Wetlands of International Importance (Ramsar Convention)

Audit Objective

To assess the degree of compliance with the commitments made by Portugal in signing the Ramsar Convention and the management of the resources allocated to the protection and conservation of wetlands designated as Ramsar Sites.

Scope

The implementation of the Wetlands Convention, to which Portugal is a contracting Party.

Audit Criteria

Wetlands Convention and Portuguese legal framework.

Findings
- The ecological conditions of the wetlands listed are satisfactory and only small and localized threats to their sustainability were identified;
- Water quality has improved, particularly in estuary areas, although there are still pollution situations due to domestic and industrial effluents or from excessive fertilizer used in agriculture;
- Threats resulting from biotechnologies or biopiracy have not been detected.

Recommendation
- To continue the preparation, review and implementation of wetland management and monitoring plans;
- To promote studies to assess the vulnerability of wetlands to climate change;
- To promote studies to assess the benefits derived from ecosystem services in wetlands.

SAI of India (2015): Performance Audit of conservation of wetlands in the state of Gujarat

Audit Objective
To identify whether-
1. adequate policy and institutional framework was in place for conservation of important wetlands in the State;
2. planning including preparation of Management Action Plans (MAPs), was made for conservation of all important wetlands;
3. adequate funds were provided for conservation of wetlands;
4. adequate efforts were made for retention of water at wetlands, maintenance of proper water level, removal of weeds, maintenance of ecofriendly environment, generation of baseline data regarding migratory birds, medical facilities for injured at wetlands;
5. there was an effective control mechanism for preventing poaching of Birds;
6. Supervision and monitoring of programme implementation was effective.

Scope
The performance audit (PA) covered the period from April 2009 to March 2015. Audit conducted test check of records of eight wetlands of national importance and four out of 19 other wetlands and one wetland (Porbandar) declared as Bird Sanctuary.

Audit Criteria
1. Indian Forest Act, 1927;
2. Forest (Conservation) Act, 1980;
3. Wild Life (Protection) Act, 1972;
4. Wetlands (Conservation and Management) Rules, 2010; and
5. Guidelines issued by MoEF&CC for National Wetlands Conservation Programme.

Findings
1. "State Wetland Conservation Authority" was not formed.
2. A policy framework by the Department for wetlands other than those identified as having national importance was not formulated.
3. Adequate funds in the budget estimate for conservation activities were not sanctioned.
4. Preparation of Management Action Plans was inconsistent.
5. Baseline data of migratory birds was not maintained.
6. Adequate facilities at wetlands like Birds Rescue Centre (BRC) were lacking.
7. Proper water retention work, maintenance of water level, removal of weeds etc was lacking.

Recommendation
1. Need to establish State Wetland Conservation Authority in a time bound manner and priorities for framing of policy/ guidelines for conservation of wetlands other than those having been identified of national importance.
2. Urgent steps to be taken for declaration of wetlands identified as important wetlands and taking up of conservation activities of these important wetlands.
3. Ensure timely preparation of plan of action for conservation of wetlands by preparing MAPs and Annual Plans of Operations (APOs).
4. Provision for adequate budget provision for conservation of wetlands.

SAI of Mexico (2009): Conservation of Mangrove Ecosystem

Audit Objective
Audit the financial management of federal public resources applied by the Ministry of Environment and Natural Resources (*SEMARNAT*, for its acronym in Spanish) in order to verify the fulfillment of the objectives and goals in terms of preserving, protecting and restoring the mangrove ecosystems for its conservation.

Scope
The policy of conservation of mangrove ecosystems raises four aspects: protection, preservation, restoration and sustainable improvement, whose actions are responsibility of *SEMARNAT*, *CONANP* and the Federal Attorney Office for Environmental Protection (*PROFEPA*, for its acronym in Spanish).

Audit Criteria
The audit was selected based on general and particular criteria stated in the the SAI of Mexico's Institutional Standard Framework for the specific planning used in drafting the Annual Audit Program, considering its importance, pertinence and feasibility.

Findings
51 recommendations on performance.

Recommendation
- Define, in coordination with *CONANP* and *PROFEPA*, a specific strategy for the conservation of the mangrove ecosystems.
- Establish the guides used for the elaboration of Environmental Impact Assessment (MIA, for its acronym in Spanish) as mandatory in order to facilitate its inspection.
- Promote modifications to the General Act on National Assets / *Ley General de Bienes Nacionales* (*LGBN*, for its acronym in Spanish) to define the legal form of mangrove ecosystems.
- Promote that the General Act on Sustainable Forestry Development / *Ley General de Desarrollo Forestal Sustentable* (*LGDFS*, for its acronym in Spanish) and the General Act on Wildlife / *Ley General de Vida Silvestre* (*LGVS*, for its acronym in Spanish) conceptualize mangroves as sensitive ecosystems and species at risk.
- Define a mangrove protection strategy in priority sites identified by *PROFEPA*.
- Define goals for the compliance of the Ramsar Strategic Program 20092015.
- Extend mangrove protection coverage under the scheme of NPA.
- Privilege the monitoring of species that inhabit mangrove ecosystems and fall into a risk category.
- Develop the management plans of the Ramsar sites.
- Establish an inspection and surveillance policy for projects and works with authorized *MIA*.
- Design restoration programs for mangrove ecosystems.
- Develop conservation programs for the 200 priority species.
- Define strategies to promote the sustainable use of NPA and mangrove ecosystems.
- The 51 recommendations on performance were addressed by the audited entities, having a positive effect on mangrove ecosystems conservation.

SAIs of Austria and Hungary: The Ramsar Convention as applied to Lake Neusiedl-Fertő

In 2003, the Austrian Court of Audit and the State Audit Office of Hungary carried out a coordinated performance audit of the use of state funding to protect Lake Neusieldl-Fertö, under the Ramsar Convention. Bordering Austria and Hungary, the region is unique and one of the most remarkable ornithological sites in Europe. It is an example of how protecting nature may conflict with regional development.

Audit objectives
- Audit the efficiency and effectiveness of funding and the success of programs and measures, both planned and already applied.
- Reveal conflicts in the economic use of the region.
- Suggest solutions to conflicts.
- Evaluate cooperation between the two countries.

Scope
- Audited period: 1997 to 2003
- National park Neusiedler
- Eleven local governments located in the environment of Lake Neusiedl-Fertő
- Activities carried out by the Federal Ministry of Agriculture, Forestry, Environment and Water Management
- Co-operation between Austria and Hungary with management of the national park

Criteria
- **International agreements.** The area is protected by obligations under international agreements signed by both countries. Among them are the Ramsar Convention on Wetlands, the Convention on Biological Diversity, and the European Union directives on bird protection and habitat.
- National acts and decrees.

Findings
- International obligations, under the Ramsar Convention, for preserving water habitats were met.
- Cooperation between the Hungarian and Austrian governmental organizations was outstanding.
- Water quality has greatly improved. The habitat of water fauna and flora can be considered secured.
- Using the lake for economic gains disrupted the natural ecological process. An overwhelming invasion of reeds suffocated native plants and devastated the lake. Agriculture, hunting, fishery, and tourism conflict.
- The quality of reed stock on the Hungarian side of the lake has decreased.

Recommendations
- Jointly analyze the practices of the two countries and adopt the one that better serves the ecological interests of the area.
- Define and document the areas precisely and designate individual highly protected areas, zones, and reservations.
- Gain a comprehensive understanding of development in the region.
- Scrutinize the hunting of waterfowl in a Ramsar-protected area.
- Avoid using the lake for economic purposes.

SAI of Switzerland: Applying the Ramsar Convention to the Lake Constance region

In 2004, the SAI of Switzerland examined how obligations under the Convention had been applied in the region around Lake Constance.

Audit objectives
- Examine the application of the Ramsar Convention on Wetlands.
- Determine whether the condition of nature reserves in the Lake Constance region meet the obligations of the Convention.
- Main environmental risks investigated
- Decline and loss of species
- Unsustainable use of resources
- Contamination of ecosystems

Scope
- One region in Switzerland (Lake Constance) bordering Germany and Austria (three cases)
- Coordination between federal and regional authorities
- Coordination between federal departments

Criteria
- Ramsar Convention on Wetlands
- Swiss law and the laws and regulations of the cantons (regions)

Findings
- The Swiss Agency for Environment has integrated Ramsar components in its environmental laws.
- Legislation had not been implemented at all sites. In one canton, the Agency faced many difficulties:
- The canton and commune (local area) were not interested in carrying out the legislation.
- The canton and commune did not enforce the requirements concerning signposts that must indicate the existence of nature reserves.
- The canton had yet to submit an order for the required supervision of the reserve that would be federally subsidized.
- There were relationship difficulties between the federal and the regional levels.
- There were coordination problems within the federal agency and between the federal agency and the regional levels.

Recommendations
- Develop a national strategy for wetlands.
- Establish more and better contacts with neighboring countries (Austria and Germany).
- Include border guards in training sessions for nature reserve wardens.
- Improve coordination within the Swiss Agency of Environment (several divisions are involved with implementing the Convention).
- Promote acceptance of the nature reserve through increased public outreach.
- Work hard to eliminate delays in implementing the Convention.
- Promote cooperation with Baden-Württemberg, to meet the Convention goal of creating cross-border nature reserves where ecological units exist.

MARINE HABITATS AND THEIR RESOURCES

Background

Oceans cover 70 percent of the planet's surface. Marine and coastal environments contain diverse habitats (such as mangroves, coral reefs, sea grasses, algae, pelagic or open-ocean communities, and deep-sea communities) that support an abundance of life. Marine life produces a third of the planet's oxygen, offers a valuable source of protein, and moderates climate change.

The impact of human activities on marine and coastal ecosystems can be grouped into five main categories:

- chemical pollution and eutrophication,
- commercial fisheries,
- global climate change,

- alterations of physical habitat, and
- invasion of exotic species.

Many seas and coastal areas have been degraded beyond rescue. The world's fish stock and, as a result, its fisheries are in danger of disappearing. Other resources, such as mangroves, corals, and species that are subject to bio-prospecting, are also overexploited. Coral reefs worldwide are being degraded and destroyed by human activities and global warming.

Overexploitation has been the most important threat in marine ecosystems in the past 50 years. The global catch peaked in the late 1980s and is now in decline despite larger fishing operations working harder. This pressure is seriously damaging marine biodiversity in many parts of the world, often reducing the availability of fish as a basic staple.

Sewage remains the largest source of contamination by volume of the marine and coastal environment. Coastal sewage discharges have increased dramatically in the past three decades. In addition, nutrient loading resulting from intensive agriculture is becoming a serious concern in the protection of marine habitats. Oil spills and oil discharges at seas are also an important cause of pollution of marine water.

For more information on the important issue of invasive species from and in the marine environment, see Invasive species, in this chapter.

Pollution of marine habitat is frequently audited by SAIs, often in cooperation with other SAIs when assessing respect of international agreements related to marine pollution. In addition, fishery resources are an important issue audited by SAIs.

Audit criteria

Sustainable Development Goals. Marine habitat has a special place within the Agenda 2030. Goal 14 which stated "Conserve and sustainably use the oceans, seas, and marine resources for sustainable development" and its related targets are excellent criteria for the audit on marine habitat-related theme.

Aichi Biodiversity Targets. There are 14 targets of the Aichi Biodiversity Targets that have connections with marine habitat and its resources. They are target 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 17, and 19 (full text of the targets see Appendix 4).

United Nations Convention on the Law of the Sea (UNCLOS). This convention was adopted in 1982. It set up a legal regime for the seas and oceans and regulates all aspects of the resources and uses of the oceans. The convention concerned about the territorial sea and the contiguous zone, the continental shelf, the high seas, fishing and conservation of living resources of the high seas.

International Convention for the Prevention of Pollution from Ships (MARPOL). This is the main international convention on pollution, from operational or accidental causes, of the seas by shipping. It was created through the combination of two treaties that were adopted in 1973 and 1978, and it has been updated through amendments.

Further, parties to the CBD have established a specific program on marine and coastal biodiversity to help countries protect their marine environment and resources.

Legislation, regulations, and policies. Protection of biodiversity in oceans is usually addressed through legislation and regulations of fisheries, shipping and marine protected areas. Many countries have also established specific policies or strategies for oceans.

Auditors may use the legislation for marine areas beyond national jurisdiction and international rules for deep seas as source of criteria.

Some countries have taken measures and enacted legislation to

- stop over-fishing, especially by industrial-scale operations;
- prohibit destructive fishing practices; and
- end illegal, unregulated fishing.

Programs. Auditors can expect to find programs relating to legislation and policies on the marine environment, some of which may directly protect biodiversity. For example, programs that

- establish and maintain marine and coastal protected areas,
- educate to eliminate destructive fishing practices,
- promote the sustainable use of marine and coastal living resources, and
- prevent and mitigate the impact of invasive species on marine habitats.

Players

As well as the Department of Fisheries or Oceans, auditors should look at the activities of the Coast Guard. In addition, if the audit topic warrants it, auditors should consult fisheries associations and the shipping industry at the beginning of the audit.

Researchable questions

Auditors may ask whether the government is

- implementing its policies related to oceans;
- implementing integrated management of marine and coastal areas using appropriate policy instruments and strategies;
- improving the conservation and sustainable use of biological diversity in international waters;
- regulating pollution of water from different sectors;
- regulating sewage discharge;
- establishing and maintaining marine and coastal protected areas that are effectively managed;
- assessing and fining illegal fisheries activities;
- preventing or minimizing the negative effects of exploitation by promoting the use of sustainable aquaculture techniques; and
- putting in place mechanisms to control all pathways, including shipping, trade, and aquaculture that may facilitate the invasion of alien species.

For more information, see WGEA document, *Auditing Water Issues: Experiences of Supreme Audit Institutions*, published in 2004, which contains audit case studies on marine environments.

Audit case studies

The following audit case studies deal with the protection and rehabilitation of seas and with the implementation of a national ocean strategy.

SAI of Canada (2012): Marine protected areas

Audit Objective

The objective of this audit was to determine whether Fisheries and Oceans Canada and Parks Canada have planned, established, and managed a network of marine protected areas in accordance with their legislative mandates and policies and recognized good practices in order to conserve and protect Canada's marine biodiversity and fulfill Canada's international targets under the Convention on Biological Diversity.

Scope

The entities examined for the audit were Fisheries and Oceans Canada and Parks Canada.

We examined the coordinating and planning activities undertaken by Fisheries and Oceans Canada in relation to the development of a national marine protected area (MPA) plan. The scope included an examination of the planning approaches used, the consultations undertaken among departments, the actual plans, and supporting documentation.

We also examined the planning activities undertaken by Fisheries and Oceans Canada and Parks Canada to develop their department plans. The scope included an examination of the planning approaches used, the actual plans, and supporting documentation.

We examined whether Fisheries and Oceans Canada and Parks Canada have developed and followed their approaches for establishing MPAs, including the three key steps in the establishment process: obtaining information for decision making, consulting key stakeholders, and designating the MPA. We focused our examination work on two of the most recently established MPAs, as they would be the most representative of recent management practices and performance.

Finally, we examined the management and monitoring of the MPAs that have been established by Fisheries and Oceans Canada and Parks Canada. We examined whether the two entities have developed management plans that reflect department guidance for the 10 MPAs that have been established for the purpose of marine protection (8 by Fisheries and Oceans Canada and 2 by Parks Canada). For more specific questions on implementation of management plans and the monitoring and reporting of results, we focused our examination on 2 MPAs that have been established for a sufficient period of time to allow the entities to have proceeded with implementation of the plans and monitoring and reporting of the results achieved.

Audit Criteria

- *Oceans Act* (in force in 1997)
- National Framework for Canada's Network of Marine Protected Areas, Fisheries and Oceans Canada, 2011
- Canada's Federal Marine Protected Areas Strategy, Government of Canada, 2005
- Federal Guide for Collaborative Planning of Marine Protected Areas, Fisheries and Oceans Canada, Parks Canada, and Environment Canada, 2009
- Establishing Resilient Marine Protected Area Networks—Making it Happen, International Union for the Conservation of Nature, 2008
- Convention on Biological Diversity, United Nations, 1992
- Oceans Act Marine Protected Areas Policy and Operational Framework—A Practitioner's Guide, Fisheries and Oceans Canada, 2009
- Identification of Ecologically and Biologically Significant Areas, Canadian Science Advisory Secretariat Ecosystem Status Report 2004/006, Fisheries and Oceans Canada
- Identification of Ecologically Significant Species and Community Properties, Canadian Science Advisory Secretariat Science Advisory Report 2006/041, Fisheries and Oceans Canada
- Guidelines for Management Planning of Protected Areas, World Commission on Protected Areas, 2003
- *Canada National Marine Conservation Areas Act*, 2002
- Guiding Principles and Operational Policies—National Marine Conservation Areas Policy, Parks Canada, 1994
- *Parks Canada Agency Act*, 1998
- Parks Canada Guide to Management Planning, Parks Canada, 2008
- Guidelines for Management Planning of Protected Areas, World Commission on Protected Areas, 2003
- *Saguenay–St. Lawrence Marine Park Act*, 1997

Findings

- Fisheries and Oceans Canada has established eight MPAs, led the development of the 2011 National Framework for Canada's Network of Marine Protected Areas, and is now developing technical guidance for implementing the Framework. However, the Department has not coordinated with other authorities and stakeholders to produce a plan for a network of marine protected areas as called for by the *Oceans Act* (in force in 1997). The Department has not identified the specific areas that need to be protected by it and others to create a national network that would conserve and protect Canada's marine habitats, animals, and plants.
- Parks Canada has made substantial progress toward its plan for establishing MPAs that would be representative of Canada's marine environments. The Agency has defined 29 marine regions in Canada, identified representative areas within 28 of those regions, decided on MPA candidate sites within 14 regions, and established two MPAs in legislation. However, significant work remains to be done. Parks Canada needs to select candidate sites for MPAs in 15 of its marine regions, and establish MPAs in the 26 of 29 regions where they have yet to be established. Although it has not set a timeline for doing so, the Agency plans to have MPAs in each of its 29 defined marine regions—these MPAs will be the Agency's contribution to Canada's MPA network.
- Both Fisheries and Oceans Canada and Parks Canada have recognized through their commitments within the Federal Sustainable Development Strategy that concrete actions are needed to complete this work, but they have not met these commitments. It has been 20 years since Canada ratified the United Nations Convention on Biological Diversity and 15 years since it committed to leading and coordinating the development and implementation of a national network of marine protected areas under the *Oceans Act*. Yet there is no national network of marine protected areas. Fisheries and Oceans Canada estimates that marine protected areas currently cover about 1 percent of Canada's marine environment. At the current rate of progress, it will take many decades for Canada to establish a fully functioning MPA network and achieve the target established in 2010 to conserve 10 percent of marine areas under the United Nations Convention on Biological Diversity.

Recommendation

Fisheries and Oceans Canada and Parks Canada should identify specific ecosystem services provided by existing and planned marine protected areas and assess their values so that Canadians and federal policy makers have better information to understand their associated benefits and costs.

Fisheries and Oceans Canada has indicated that marine protected areas (MPAs) will be managed so that sustainable economic opportunities compatible with the conservation objectives of the MPAs will be permitted through different zoning in the MPAs. The Department should develop practical guidance on how department officials are to assess economic opportunities to determine whether they are compatible with the conservation objectives of the MPAs.

Parks Canada should develop practical guidance on how ecologically sustainable use is to be assessed and implemented in relation to its MPAs.

SAI of Malta (2018): Performance Audit: The designation and effective management of protected areas within Maltese waters

Audit Objective

This performance audit sought to evaluate the extent to which Malta is effectively safeguarding its marine biodiversity

Scope

Marine protected areas falling under Maltese jurisdiction

Audit Criteria

- Benchmarking with key concepts included in the legislative framework and with generally accepted practices
- Comparative analysis with other documents published by other countries
- Discussions with partners in joint audits – knowledge sharing

Findings

The European Union has praised Malta's progress in declaring marine protected areas. However, the declaration of marine protected areas was not always expediently complemented with the respective site-specific management plans. These circumstances limit National Authorities from securing budgets and technical resources to enable the implementation of these plans as well as inhibit coordination and cooperation between stakeholders. There are also limited monitoring and enforcement of marine protected areas due to the lack of financial, human and technological resources. National competent authorities do not employ formal risk assessment mechanisms to facilitate the monitoring of protected areas.

Recommendation

National Authorities are to consider establishing Marine Protected Areas in conjunction with neighbouring countries. The Ministry for Environment, Sustainable Development and Climate Change and the Environment Resources Authority are to start up a process to draft and finalise a National Strategy on the Environmental Policy, the scope of which extends beyond 2020. Malta Marittima Agency is encouraged to expedite the process of formally adopting an action plan relating to the operationalisation of the Integrated Maritime Policy. Conflict of interest arising due to Environment Resources Authority's dual role as environmental regulator and implementer of measures is to be minimised. Responsible entities for the maritime sector are to initiate action to ascertain that the appropriate administrative capacity is in place. Consideration is also to be given to compile relevant surveillance compliance monitoring and enforcement plans, which embrace risk analysis principles. The Environment Resources Authority is to consider invoking the legislative provisions related to Conservation Orders as a measure to safeguard marine protected areas until such time that site-specific management measures are formally adopted and implemented. Cooperation and coordination between National Authorities are to be strengthened. Moreover, the compliance surveillance and enforcement functions concerning marine protected areas are to be supported through the use of technology and relevant authorities regulating different activities from different sectors.

SAI of Malta (2013): Performance Audit: Enforcement Action by Malta Environment and Planning Authority (MEPA) within the Outside Development Zone

Audit Objective
This performance audit sought to determine whether the enforcement role within MEPA is appropriately implemented, i.e. the extent to which the Authority is capable of detecting irregularities as well as taking rapid and decisive enforcement action to safeguard the outside development zone.

Scope
Findings and conclusions presented in the Report reflect the information available as at end June 2012

Audit Criteria
International conventions, EU directives and national legislation

Findings
Recent efforts to strengthen the enforcement function demonstrate that this important role is still in the process of evolvement. This was due to the fact that the enforcement function was not fully supported by the appropriate strategic and operational policies. Moreover, the enforcement function lacked the adequate level of resources and administrative capacity. The Directorate still lacks the support of a comprehensive Information Technology infrastructure. MEPA's enforcement function stretches to all planning and environmental irregularities, irrespective of the time of contraventions. In its current set-up the Enforcement Directorate is not appropriately resourced to cater for such a broad mandate.

Recommendation
MEPA's enforcement function is to be supported through the appropriate level of resources. Policy decisions are to be taken regarding the approach to be adopted by the Enforcement Directorate when dealing with outstanding Executable Enforcement Notices. MEPA's Management is to formally approve the Enforcement Charter relating to the critical stages of the enforcement process. The current practice whereby enforcement officers validate planning applications submitted is to be reviewed due to conflict of interest concerns. The Directorate is to implement the Daily Fines mechanism and ensure that all measures related to the polluter pays principle are enforced. Enforcement work is to be prioritised in accordance with formal and documented risk-based approaches. Consideration is to be given to allocate increasing importance to surveillance work carried out by enforcement officers. Moreover, all surveillance work is to be supported with the appropriate level of planning, management control and monitoring. Efforts are to be increased to ascertain that customer care targets related to the acknowledgement of complaints and the provision of interim case feedback to complainants are consistently adhered to. Timeframes are to be established within which enforcement officers inspect sites to validate the irregularities noted in Complaints. Internal control mechanisms are to be strengthened to fully exploit the potential benefits of encouraging contraveners to self-regulate their position within an agreed period rather than issuing an enforcement notice at the outset. Procedures are to be established to ascertain standard case reporting by enforcement officers. Consideration is to be given in investing further funds and efforts to complete the changeover from the existing computerised system (Acolaid) to the new IT system (Artemis) to avoid fragmentation of data. The new IT system (Artemis) is to be upgraded to enhance its report generating facilities. Further improvements to the IT infrastructure would consider the possibility that enforcement officers are able to access site information and report on their enforcement work in real time.

The Environment Resources Authority has been set up as an entity distinct from the Planning Authority.

SAI of Norway (2014-2015): Investigation of the authorities' work on the Arctic Council

There is no singular definition of the Arctic. In Norway, the political definition is the areas north of the Arctic Circle. The Arctic Council's working groups can define the geographical area covered by their work.The Arctic Council was established in 1996 to promote cooperation between the Arctic states and indigenous organisations, particularly within sustainable development and environmental protection. The Arctic is one of the last major areas of unspoiled nature, but it is exposed to environmental impact and deglaciation. Climate change is making the Arctic more accessible and is opening up increased economic activity. At the same time, this is amplifying the environmental challenges. The Arctic Council is therefore going to become an even more important cooperation forum in the years to come.

Audit Objective
The objective of this investigation has been to assess the Norwegian authorities' work with the Arctic Council and to elucidate how the Arctic Council organises and finances its work. The investigation is the Norwegian contribution to a multilateral audit of the member states' work on the Arctic Council.

Scope
Norwegian authorities' work with the Arctic Council and to elucidate how the Arctic Council organises and finances its work.

Audit Criteria
- Overall goals for the High North: protect the environment and sustainable development and promote international cooperation and stability
- The High North policy and Arctic Council

Findings
- The Arctic Council has helped strengthen cooperation in the Arctic and increase knowledge – particularly concerning the environment and climate change.
- The organisation of the Arctic Council is impractical and management of the work is deficient – in terms of priorities, financing and reporting.
- The importance of involving indigenous peoples is clearly expressed in the Arctic Council, but their participation in the Council varies due to lack of resources, both financial and in terms of available expertise and personnel
- There are weaknesses in the coordination and follow-up of the Norwegian work related to the Arctic Council

Recommendation
- While the Council's recommendations are not binding under international law, it is, in the opinion of the Office of the Auditor General (OAG), important that the Arctic states can collectively demonstrate that they take responsibility for ensuring sustainable development in the Arctic.
- The SAI of Norway recommends that the Ministry of Foreign Affairs step up efforts to make the Arctic Council a more efficient body with emphasis on better management, organisation, financing and reporting.
- The SAI of Norway recommends that the Ministry of Foreign Affairs better facilitate coordination and interaction in the work in the Arctic Council with the relevant sector ministries.
- The SAI of Norway recommends that the Ministry of Foreign Affairs initiate measures so that all relevant ministries increasingly find work with the Arctic Council expedient, both to make use of the Arctic Council's work and to contribute relevant expertise in relevant areas.

SAI of Ukraine: Protection and rehabilitation of the Azov and Black seas

In 2003, the Accounting Chamber of Ukraine (ACU) audited the application of the National program on the environmental protection and rehabilitation of the Azov and Black Seas. The current level of contaminants in the Azov and Black Seas far exceeds the ability of ecosystems to assimilate them. The government of Ukraine signed and ratified seven international conventions, on the use and protection of biological resources, to facilitate international rehabilitation and protection activities in the Azov-Black Sea ecosystem.

Audit objective
Analyze the legality, efficiency, and suitability of allocating state funds to carry out obligations under the National Program of the Azov and Black Seas environmental protection and rehabilitation.

Scope
- Audited period: 2001 to 2002
- The actions of government and regional authorities in applying the National Program of
- Environment Protection and Rehabilitation of the Azov and Black Seas

Criteria
- Convention on the Black Sea protection from pollution
- Strategic Action Plan for the Black Sea Rehabilitation and Protection (approved by Bulgaria, Georgia, Romania, the Russian Federation, Turkey, and Ukraine)
- International treaties on biodiversity, the protection of wild flora and fauna, the protection, and use of cross-border waterways and international lakes

Findings
- A delay in adopting laws slowed the development of integrated environment management systems and limited the recreational potential of the coastal area. This caused an unfavorable investment climate for foreign investors.
- Funds were not used to meet the Program's objective and were inefficiently managed.
- Public funds were allocated for non-priority conservation programs, the mandates of which were not authorized by national ecology programs.

Recommendations
- Amend Ukraine's laws and finance the National Program under a separate budget line.
- Establish an interdepartmental commission, on environmental issues that affect the Azov and Black Seas, to coordinate the activities of central and local executive authorities.

SAI of Canada: Implementing a national oceans strategy

In 2005, the Office of the Auditor General (OAG) of Canada conducted a performance audit of how Fisheries and Oceans Canada (the Department) applied the 1996 *Oceans Act*.
The OAG Canada examined

- the Department's role in developing and implementing a national oceans strategy, oceans management plans and marine protected areas; and
- action taken on marine commitments made by the government and the Department.

Audit objective
Determine whether Fisheries and Oceans Canada

- is meeting its responsibilities set out in the *Oceans Act*, Part II, Oceans Management Strategy;
- is meeting its national and Canada's international oceans commitments;
- has carried out the management recommendations of the Standing Committee on Fisheries and Oceans, based on its review of the administration of the Act; and
- has appropriately measured and reported the performance and results of its ocean management activities.

Scope

- Audited period: September 2004 to June 2005
- Actions taken since the *Oceans Act* was passed in 1996 until June 2005
- The Department of Fisheries and Oceans Canada

Criteria

- 1996 *Oceans Act*
- Canada's Oceans Strategy
- Sustainable Development Strategy
- International ocean agreements
- Standing committee recommendations
- Performance reports

Findings

- After eight years, the *Oceans Act* had not resulted in better management of the oceans and their resources.
- Implementing the Act and the oceans strategy was not a government priority.
- No ocean management plans—the main tool of the Act to manage sustainable development of ocean industries and resolve conflicts between ocean users—had been finalized.
- Little progress had been made to establish marine protected areas—another important aspect of the Act and one of the primary means of protecting marine habitat and biodiversity.
- Parliament had not been given the financial and performance information it needs to hold the Department accountable for its responsibilities under the Act.
- The Department had not met its commitment to report periodically on the state of the oceans.

Recommendations

- Recognize and manage the Oceans Action Plan, in collaboration with participating departments, and lead and facilitate the development and implementation of action plans.
- Finalize its operational guidelines for integrated management planning, including marine protected areas.
- Plan and manage its resources so that commitments and targets will be met.
- Finalize and implement an accountability framework for its ocean management activities.
- Provide sufficient relevant and reliable financial and other performance information to Parliament so that it can be held accountable for its ocean management activities.
- Improve communications to the public, including periodic information on the state of the oceans.

GENETIC RESOURCES

Background

It is estimated that 40 percent of the global economy is based on biological products and processes. The effective use of biodiversity at all levels—genes, species and ecosystems—is, therefore, necessary for sustainable development.

Genetic manipulation is not new. For centuries, farmers have relied on selective breeding and cross-fertilization to modify plants and animals and encourage desirable traits that improve food production. However, scientists' ability to alter life-forms has been revolutionized by the modern biotechnology that has emerged in the last few decades.

Because genetic resources are so much a part of agriculture, chemistry, medicine and many other areas, many issues must be addressed to guarantee sustainability and biodiversity conservation. The impact of biotechnology on biodiversity is not yet well known. Thus, governments need to apply the "precautionary principle" to deal with questions about genetic resources.

Bio-safety includes a variety of measures, policies, and procedures that minimize the risks biotechnology may pose to the environment and human health. It is critical to establish credible and effective safeguards for genetically modified organisms (GMOs), to maximize the benefits of biotechnology and minimize the risks. These safeguards must be introduced now, while biotechnology is still in its early days.

Another concern in genetic resources is the fair and equitable sharing of the benefits arising from their use. This includes the appropriate access to genetic resources and the appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies.

Some countries have legislation that controls access to genetic resources and a number of benefit-sharing arrangements. Some countries also maintain seed banks in response to the accelerating loss of genetic diversity in crops.

The audit topic of genetic resources is a new one for SAIs. However, because of their government's commitments in this area, many SAIs are starting to show an interest in auditing this topic. In particular, biopiracy could become an important area to audit for countries where high biodiversity occurs.

For more information on the issue, see the following sections under What is the scope of biodiversity and what are the main concerns, in Chapter 1:

- Genetics
- Species extinction

See also the following sections under What are the main threats to biodiversity, in Chapter 1:

- Biotechnology
- Biopiracy

Audit criteria

Convention on Biological Diversity (CBD). The CBD contains provisions to promote the conservation of genetic diversity and the fair and equitable sharing of benefits from the use of genetic resources. It also contains provisions on biotechnology.

Sustainable Development Goals. Adopted in 2015, 2030 Agenda has put genetic resource topic among its targets. Below are examples of targets that could be used as criteria:

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Target 2.5 mentioned "By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed".

Target 2.a mentioned "Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries".

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.6 mentioned "15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed".

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity was adopted at the tenth meeting of the Conference of the Parties on 29 October 2010, in Nagoya, Japan. The Protocol significantly advances the Convention's third objective by providing a strong basis for greater legal certainty and transparency for both providers and users of genetic resources.

Specific obligations to support compliance with domestic legislation or regulatory requirements of the Party providing genetic resources and contractual obligations reflected in mutually agreed terms are a significant innovation of the Protocol. These compliance provisions as well as provisions establishing more predictable conditions for access to genetic resources will contribute to ensuring the sharing of benefits when genetic resources leave a Party providing genetic resources.

In addition, the Protocol's provisions on access to traditional knowledge held by indigenous and local communities when it is associated with genetic resources will strengthen the ability of these communities to benefit from the use of their knowledge, innovations and practices.

Aichi Biodiversity Target

Goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Target:
16. By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from Their Utilization is in force and operationally consistent with national legislation.

The Cartagena Protocol on Biosafety. The Conference of the Parties to the CBD adopted a supplementary agreement, the Cartagena Protocol on Biosafety, on 29 January 2000 in Montreal, Canada. The Protocol is the first legally binding international agreement governing the international movement of GMOs.

Exhibit 21: The Cartagena Protocol on Biosafety—potential lines of enquiry

Potential lines of enquiry:

- Exporters of GMOs must ensure that appropriate documentation accompanies all shipments.
- Governments must adopt measures to manage any risks identified by risk assessments and to monitor and control any future risks.
- The country considering importing a GMO is responsible for ensuring that a risk assessment is carried out.

More information about biotechnology can be found in *Biosafety and the Environment* (2003) published by the Secretariat of the CBD and the United Nations Environment Programme (UNEP) at https://www.cbd.int/doc/publications/bs-brochure-04-en.pdf.

Legislation, regulations, and policies. Biosafety encompasses a variety of measures, policies, and procedures that minimize the risks biotechnology may pose to the environment and human health. Countries with strong biotechnology industries have already introduced national legislation and risk-assessment systems. However, many developing countries are still drafting regulations.

It is critical to establish credible and effective safeguards for genetically modified organisms (GMOs) so that the benefits of biotechnology can be maximized and the risks can be minimized. International rules that deal with GMOs, as an internationally traded, global industry, have not yet been developed, neither has an international regime to promote and safeguard the fair and equitable sharing of the benefits of using genetic resources.

Programs. Auditors can look for a national biotechnology strategy. In addition, programs may exist on biotechnology and the protection of genetic resources, or more specifically, on the long term effects of GMOs on ecosystems.

Governments may also have programs on transfer of technology, exchange of information, and technical and scientific co-operation for the development of biotechnology.

Players

In some countries, there may be a Biotechnology Secretariat. There are also likely to be national research centres that play an important role in research.

Departments and ministries such as those from food agencies, agriculture, fisheries, foreign affairs, international trade, and customs may be involved.

Benefit-sharing arrangements for genetic resources may involve other players, such as local and indigenous communities, private companies, non-governmental organizations, and scientific research institutes.

Researchable questions

Auditors may ask the following:

- Is the government complying with the Cartagena Protocol?
- Is the government complying with the Nagoya Protocol?
- Does the government have a biotechnology strategy?
- Is the government developing legislation or other mechanisms to ensure that traditional knowledge, and its wider applications, is respected, preserved, and maintained?

- Does the government receive funds from international organizations to maintain genetic resources? If so, how were the funds spent?
- Is the government controlling illegal activities with the import of GMOs?

Audit case studies

The following audit case studies deal with bio-prospecting and the protection of plant genetic resources.

SAI of Canada (2008) – Genetically engineered fish

Research on genetically engineered (GE) fish and other aquatic organisms began in the early 1980s and has increased rapidly around the world. GE fish are being developed for use in medical applications, to detect pollution, and as aquarium pets. The aquaculture industry is developing GE fish that grow faster than wild fish and that better tolerate cold temperatures. There are concerns about the potential ecological impacts of an accidental release of GE fish into natural ecosystems.

Audit Objective
This audit was performed to determine whether Fisheries and Oceans Canada had achieved satisfactory progress in addressing commitments made in response to a recommendation in our 2004 audit of genetically engineered fish.

Scope
Since 2003, the Commissioner of the Environment and Sustainable Development (CESD) has conducted 11 petition response audits on a wide variety of subjects. To identify which of the 11 were suitable for follow-up audit, we examined the information available in our recommendations database, consulted staff involved in the original audits, and conducted research. To rank the audits for potential follow-up audit work, we developed criteria based on internal guidance on performance auditing.
SAI of Canada also considered criteria pertaining to auditability, sensitivity, risk, and availability of resources. On the basis of assessments against these criteria, an advisory committee considered the top-ranked issues and selected four. The results for each of these audits are individually reported in four chapters—11, 12, 13, and 14 (this chapter).
In this follow-up audit, we evaluated the progress that Fisheries and Oceans Canada had made in addressing a recommendation in our 2004 CESD Report, Chapter 6, paragraph 6.80. To do so, we reviewed documentation and interviewed government officials and external experts in the field.

Audit Criteria
The criteria for the audit were derived from the findings and recommendations of our 2004 audit of genetically engineered fish, and in particular, Fisheries and Oceans Canada's response to the above-noted recommendation of that audit (Chapter 6, paragraph 6.80). We expected that by the end of 2005, Fisheries and Oceans Canada would have
- reviewed regulatory options for genetically engineered fish,
- decided on a regulatory strategy,
- developed appropriate timelines for regulatory action, and
- finalized its policy on transgenic aquatic organisms.

Findings
Fisheries and Oceans Canada has not yet finalized its regulatory strategy

Recommendation
Fisheries and Oceans Canada should decide on a regulatory approach for genetically engineered fish and clearly communicate the rationale and timeline for implementation of this approach.

Follow up
Fisheries and Oceans Canada (DFO) accepts the recommendation. DFO has decided that its regulatory approach for genetically engineered fish is to continue to work under the terms of a Memorandum of Understanding (MOU) with Environment Canada and Health Canada to contribute to the regulation of aquatic organism products of biotechnology, including genetically engineered fish, under the *Canadian Environmental Protection Act, 1999* (CEPA, 1999) and the *New Substances Notification Regulations (Organisms)* [NSNR(O)].

SAI of Costa Rica (2017): Audit of a special nature about the reasonableness of the process of conferment access permits to biodiversity resources done by National Commission for the Management of Biodiversity(CONAGEBIO)

Audit Objective
To determine the reasonableness of the process of granting permits for basic research, bioprospecting and commercial economic use of biodiversity resources.

Scope
The audit included the process of granting access permits to genetic and biochemical resources of biodiversity, in the areas of basic research, bioprospecting and commercial economic exploitation.
In addition, it included the permits granted from January 1, 2015 to December 31, August 2017, and was extended to 2004 for the review of historical data.

Audit Criteria

- Agreement of biological diversity, Law n ° 7416 of June 30, 1994
- Biodiversity Law No. 7788 of April 30, 1998
- Law for the Protection of Citizens from Excess Requirements and Procedures Administrative, No. 8220 of March 4, 2002
- General Norms for access to elements and Genetics and Biochemicals Resources of the Biodiversity, Executive Decree No. 31514 of October 3, 2003.
- Regulation for access to the genetic and biochemical elements and resources of biodiversity under ex situ conditions, Executive Decree No. 33697 of February 6, 2007
- Good practices: Nagoya Protocol on access to genetic resources and fair and equitable sharing of benefits arising from their use of the Convention on Biological Diversity. Adopted by the country on October 29, 2010, without ratifying

Findings

Lack requirements of the process of granting access permits to biodiversity resources, Inaccuracies were determined in some requirements stipulated in the regulations on access to genetic and biochemical resources of biodiversity.
Contradiction between legal norms as regards the competent authority (between the Regional Council of Conservation Areas and Director of the Conservation Area) to subscribe an informed prior consent in the case of resources under the administration of the National System of Conservation Areas (SINAC).
The regulation does not establish a deadline for public institutions such as SINAC or National Museum issue the informed consent requested by the interested person, in addition, It do not prescised the minimum elements that must be contained in the reports submitted by concessionaires to CONAGEBIO, this situation causes that the information contained in these reports is of little importance and omit relevant technical elements such as: list of samples with the code, coordinates geographic information of the collection site, description of the organism collected and last location of the Samples with information from the responsible contact. According to expert criteria, this information is necessary to provide traceability to resources and issue criteria on conservation issues, use sustainable, and fair and equitable distribution of the benefits derived from biodiversity.

Recommendation

To the Minister of Environment and Energy and the Plenary Commission of CONAGEBIO, adjust the regulation of access permits, so that it is specified: the requirement for the interested party of a single informed prior consent in access for basic research in ex situ collections, when there is an informed prior consent between the owner of the collection and the original provider of the resources; the competent authority to subscribe the prior informed consent in the SINAC, and the deadline for obtaining it when it is processed before public institutions.
To the Executive Director of the CONAGEBIO, establish the purpose and minimum content of the reports presented by the researchers, as well as establish and implement a systematic process of verification of compliance with the obligations of the permit holders.

SAI of USA (2016): Genetically Engineered (GE) Crops- USDA Needs to Enhance Oversight and Better Understand Impacts of Unintended Mixing with Other Crops

Three agencies have primary responsibility for regulating GE crops and food in the United States: USDA, EPA, and FDA. USDA and industry groups estimate that at least 90 percent of many major commercial crops, such as corn and soybeans, are GE varieties. Proponents say GE crops offer greater pest resistance, use less labor-intensive processes to control weeds, and result in increased productivity to feed growing populations. Opponents cite a lack of consensus on impacts to agriculture, the environment, and human health.

Audit Objective

This report examines:

a. steps EPA, FDA, and USDA have taken to regulate GE crops;
b. the data USDA has on the extent and impact of unintended mixing of GE and non-GE crops, and what steps have been taken to prevent such mixing; and
c. the extent to which USDA, EPA, and FDA provide information to the public on GE crops

Scope

In general, to achieve our objectives, we interviewed officials or obtained documentation from USDA, EPA, and FDA. We also interviewed nonfederal stakeholders, including biotechnology, food industry, consumer, environmental, farm, and commodity group representatives, and those from academia.

Audit Criteria

- *Federal Food, Drug, and Cosmetic Act*
- *Federal Insecticide, Fungicide, and Rodenticide Act*
- *Freedom of Information Act*
- *Plant Protection Act*

Findings
- The Environmental Protection Agency (EPA), Food and Drug Administration (FDA), and U.S. Department of Agriculture (USDA), have taken steps to regulate genetically-engineered (GE) crops (i.e., crops whose genetic makeup has been modified), but USDA has not updated its regulations to oversee GE crops derived from alternative technologies in which the GE crop developed contains no plant pest DNA.
- USDA has limited data on the extent and impact of unintended mixing of GE and non-GE crops, according to USDA officials and stakeholders.
- USDA, EPA, and FDA provide varying degrees of information about their oversight of GE crops to the public.

Recommendation
GAO recommends, among other things, that USDA set a timeline for updating its regulations and include farmers growing identity-preserved crops in its survey efforts to better understand the impacts of unintended mixing.

SAI of Brazil: Intellectual property rights and domestic bio-prospecting

In 2006, the Brazilian Court of Audit carried out a performance audit to assess how the Federal Administration is ensuring intellectual property rights and encouraging domestic bio-prospecting.

Audit objectives
- Evaluate the tools used by the Federal Administration to minimize the illegal trade in specimens of Brazilian fauna and flora and their genetic material across the country's borders.
- Ensure that intellectual property rights were protected and respected.
- Assess the Administration's actions to encourage domestic bio-prospecting.

Scope
- Ministries of the Environment and of Agriculture, Livestock, and Supply
- Brazilian Institute for the Environment and Renewable Resources
- Federal police

Criteria
- National regulations.
- Convention on Biological Diversity.

Findings
- There was not enough equipment and personnel at land borders and airports to inspect the flow of genetic material.
- The procedures for handling and storing foreign cargo that may contain invading species—notably, the Asian beetles found in timber pallets—were inadequate.
- Biopiracy is not considered a crime under Brazil's laws; fines are not defined.
- The law that governs access to genetic material, its shipment, and the identification of its origin when used for commercial research was not enforced.

Recommendations
To the Ministry of Agriculture, Livestock and Supply:
Equip agriculture and livestock surveillance facilities with appropriate equipment to safely destroy seized materials that can host pests and disease-causing agents that pose risks to humans, agriculture, and livestock.

To the Ministry of Agriculture, Livestock and Supply and the Brazilian Airport Infrastructure Company:
Train staff responsible for handling cargo at airports in the correct procedures for handling pallets.

To the Brazilian Institute for the Environment and Renewable Resources:
Consider setting up inspection stations at airports where large exports of Brazilian fauna and flora specimens are known to occur, especially in the Amazon region.

To the Federal Police Department:
Carry out a feasibility study for setting up an automated system to exchange information among its units. The system would be used to combat environmental and other crimes and to train personnel.

To the Ministry of Environment:
- Set up a database on the quantity of genetic resources researched and products derived.
- Control access to genetic heritage and shipments, so public policies in this area can be more effectively enforced.

To the Ministry of Environment and the Ministry of Science and Technology:
Jointly consider releasing research funds only when the Genetic Heritage Management Council has granted its approval.

SAI of India (2004) : Conserving plant genetic resources in India

In 2004, the Office of the Comptroller and Auditor General of India audited the management of genetic resources in the country. The audit focused on conserving plant genetic resources and the bio-survey and agro-biodiversity activities of a premier national research and scientific institute, the National Bureau of Plant Genetic Resources (NBPGR).
The NBPGR was established to collect, introduce, evaluate, conserve, document, and exchange plant genetic resources. It is the scientific institute in India responsible for carrying out *ex-situ* conservation efforts related to plant and agro-biodiversity resources. It is also responsible for carrying out quarantine tests to ensure that imported and exported samples of plant germplasm (genetic material) are disease and pest free

Audit objectives
Assess the effectiveness, efficiency, and adequacy of the NBPGR's efforts to perform its responsibilities. This includes assessing
- research activities from in-house and externally aided projects;
- efforts to conserve germplasm samples of agri-horticultural crops for up to 50 years, to store them for up to 25 years and to document the samples so they can be easily retrieved and used;
- efforts to quarantine and inspect all germplasm samples to detect insect pests, plant parasitic nematodes, and plant pathogens; and
- Germplasm Exchange's efforts to introduce, exchange, and distribute plant genetic resources for research, documentation, and dissemination of information.

Scope
- Audited period: 1997 to 2003
- Issues related to management of plant genetic resources by NBPGR

Criteria
- Administrative rules, regulations, and statutes related to the functioning of the institute
- Expert opinions
- Plants, Fruits and Seed Order (Regulation of import into India)

Findings
The NBPGR made poor progress in conducting explorations to collect samples of germplasm and did an inadequate job of conserving samples of exotic and indigenous germplasm.
In addition, the NBPGR did not
- grow or quarantine samples of germplasm in greenhouses;
- obtain appropriate information from private importers;
- fully observe quarantine regulations for plants, resulting in unauthorized imports of germplasm samples;
- use the National Containment Facility meant for processing transgenic samples of germplasm, conducting quarantine tests, and establishing a molecular biology laboratory; or
- allot National Identity Numbers to germplasm samples conserved in the National Gene Bank.

Responses from the NBPGR
The NBPGR agreed to
- intensify efforts to explore and collect germplasm samples in priority areas, such as crops of national importance, wild relatives of domestic crops, and endangered economic species;
- collect appropriate information from Indian importers (private firms) of germplasms and inspect their premises; and
- issue national identity numbers to germplasm samples after completing a physical verification at the National Gene Bank.

FOREST RESOURCES

Background

Forests may be the richest of all terrestrial systems. Tropical, temperate, and boreal forests offer diverse habitats for plants, animals, and micro-organisms and hold the vast majority of the world's terrestrial species.

Forest biodiversity provides a wide array of goods and services, including timber and non-timber resources, and it helps to mitigate climate change. It also provides a livelihood for hundreds of millions of people worldwide and plays important economic, social, and cultural roles in the lives of many indigenous and local communities.

Forest biodiversity is being lost due to the rapid deforestation, fragmentation, and degradation of all forest types. According to the Food and Agriculture Organization of the United Nations, there has been an annual net loss of 9.4 million hectares since 1990, the majority of which was natural forest in the tropics. As these figures include the rate of reforestation, the reality may be a loss of 14 million hectares a year or more.

Human activity is the most important cause of the decline of forests and their biodiversity, including

- poverty and population growth
- conversion of forests into agricultural land,
- overgrazing,
- unsustainable forest management,
- illegal logging,
- introduction of invasive alien species,
- infrastructure (roads, hydroelectric development, and urban sprawl),
- mining and oil exploitation,
- forest fires,
- pollution, and
- climate change.

Tree planting, landscape restoration, and the natural expansion of forests have significantly offset the loss of primary forest area. Because plantations and secondary forests have a much lower value of biodiversity than natural forests, efforts need to be focused on conserving natural forest areas, rather than replacing them with plantations.

Forestry is an important area for SAIs to audit, because most countries have legislation regarding forests.

Audit criteria

Convention on Biological Diversity (CBD). The CBD addresses forest biodiversity directly, through an expanded program of work that was adopted in 2002 by the Conference of the Parties at its sixth meeting. The program includes a broad set of goals, objectives, and activities aimed at conserving forest biodiversity, the sustainable use of its components, and the fair and equitable distribution of benefits from forest genetic resources. The program consists of three elements:

- biophysical aspects, such as reducing threats through restoration, agro-forestry, managing watersheds, and establishing protected areas;
- an institutional and socio-economic environment that enables conservation and sustainable use of forest biodiversity; and
- assessment and monitoring.

Sustainable Development Goals (SDGs). Similar to the other natural habitats, forest habitats are ones that need to be protected and sustainably managed. 2030 Agenda recognizes the importance of forest resources within its targets in the following examples:

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Target 6.6 mentioned "By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes"

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.1 mentioned "By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements"

Target 15.2 mentioned "By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally"

Target 15.4 mentioned "By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development"

Paris Agreement on Climate Change (2015)

Article 4
Par 1. In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

Article 5
Par 1. Parties should take action to conserve and enhance, as appropriate, sirks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.

Aichi Biodiversity Targets

Goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Targets:
5. By 2020, the role of loss of all natural habitats, including forests, is at least halved and where feasible bought close to zero and degradation and fragmentation is significantly reduced.

7. By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Legislation, regulations, and policies. Legislation and regulations for forest practices are usually a good source of audit criteria. Auditors can look at the ways legislation is enforced and at existing policies on forestry. These policies will often include considerations for the sustainable use of forest resources that relate to biodiversity. In many countries, sustainable forest practices have become a rule to follow for forestry companies who want to sell their products nationally and internationally.

Programs. Governments usually have programs that deal with forest resources. For example, there may be specific programs on

- sustainable exploitation of timber resources,
- reforestation of degraded areas,

- creation and maintenance of protected areas,
- prevention and mitigation of invasive species,
- protection of endangered species in forest habitats, and
- public education on deforestation and burning.

Players

Countries usually have a forestry department or ministry or a natural resources department to deal with forest management. In addition, auditors could consult forestry organizations and pulp and paper companies to obtain views from the economic sector. Traditional communities that use forests resources for their survival are also key players in ensuring the preservation of forests habitats.

Researchable questions

Auditors may ask the following:

Does the government have a forestry policy, does it address biodiversity issues, and isit being implemented?

Does the government's national forest program help to protect biodiversity?

Auditors may also ask whether the government is

- enforcing its laws related to forestry;
- controlling illegal logging;
- reducing the threats to forest biodiversity;
- protecting, recovering, and restoring forest biodiversity;
- promoting the sustainable use of forest biodiversity;
- promoting sustainable forest practices;
- assessing forest biodiversity and increasing the knowledge of ecosystem functions; and
- undertaking assessment and monitoring.

Audit case studies

The following audit case studies relate to forest management.

SAI of India (2014): Compliance Audit of Ministry of Environment and Forests (MoEF)

Audit Objective
Whether the activities of Zoological Survey of India (ZSI) in exploration, identification, monitoring and review of status of threatened and endemic species for the period 2005- 14 as per the target fixed by PAC on the revised mandate.

Scope
Compliance Audit was conducted in 2014.

Audit Criteria
Biological Diversity Act, 2002 and Strategic Plan of ZSI prepared by Programme Advisory Committee (PAC) of MoEF prepared (2001).

Findings

- Revised mandate was not properly executed by ZSI. Adequate actions to inventorise/identify faunal resources as envisaged were not taken by ZSI and targets set for survey and publication of the faunal accounts in the selected States, ecosystems and protected areas were not achieved as envisaged.
- The recommendations of the Programme Advisory Committee were not adhered to for conducting extensive surveys in eight States/ UTs. Standard methodology for carrying out surveys and assessment of the survey reports was lacking.
- ZSI did not initiat works in the area of monitoring of faunal diversity. Species wise and area wise monitoring of faunal diversity was not done and action plan in this regard was not prepared.
- Capacity building in terms of trained manpower for carrying out Taxonomic studies was not done hence, non-discharge of taxonomic studies by ZSI.
- Training programmes for development of scientists specialising in taxonomy studies were not sufficient.
- Work done on the review of status of threatened and endemic species was limited.
- Status surveys in seven out of 10 targeted species were not completed. Thus targets oriented towards fulfilling our commitments under the Convention of Biological Diversity were not met. The pace of work was slow and not commensurate with the volume of the back log involved.

Recommendation

a. ZSI may review its taxonomic needs and capacities at national, sub-regional and regional levels as envisaged in the Conference of the Parties in the CBD and make efforts to create sufficient capacities to overcome constraints and clear the backlog in taxonomic identification of species.
b. ZSI may conduct periodic status survey of threatened and endemic species according to the targets fixed. The status of the threatened species in the Red Data Book may be updated urgently so that conservation efforts can be made more effective.

SAI of Denmark (2016): Report on the Ministry of Environment and Food's management of biodiversity in the Danish state forest

Audit Objective

The purpose of the study is to assess whether biodiversity in the state forests is managed in a satisfactory manner by the Ministry of Environment.

Scope

The Management of State Forests by the Ministry of Environment

Audit Criteria

Are state forests designated for conservation and increase of biodiversity managed cost-effectively by the Ministry of Environment and Food?
Is the Ministry of Environment and Food's management focused on achievement of the objectives defined for biodiversity in near-to-nature forestry?

Findings

Overall, SAI of Denmark's assessment showed that the Ministry of Environment and Food has not managed the state forest biodiversity appropriately.

Recommendation

In relation to the future management of biodiversity forests, SAI of Denmark recommends that:

1. The Ministry of Environment and Food should continue to prioritise its efforts to acquire more knowledge of biodiversity in the state forests. If the government wants to designate more state forest area for conservation and increase of biodiversity, the ministry should apply its update knowledge and estimate the costs associated with such a decision-as the ministry in 2015. This will facilitate cost-effective designation of more state forest areas for conservation and increase of biodiversity.
2. The Ministry of Environment and Food should, based on updated knowledge on biodiversity and calculations of costs, reconsider the cost-effectiveness of the designation of existing biodiversity forests and their designation as such.

SAI of Jordan (2015): Performance Evaluation of the Management of Ajloun Forest Reserve

Audit Objectives

- Verify the efficiency and effectiveness of reserve administrative in biodiversity preservation within the protected boundaries, and its role in achieving sustainable development.
- Analyze the role of the implemented programs in protect endangered species in the reserve.
- Determine the compliance degree of reserve administrative to the environmental legislation and public policies.

Scope

- Directorate of Nature Protection in the Ministry of Environment.
- Management of the Ajloun reserve.
- Royal Society for the Protection of Nature

Audit Criteria

- Environmental Protection Law No. 52 of 2006.
- Memorandum of Understanding between the Ministry of the Environment and the Royal Society for the Protection of Nature

Findings

- The Environmental Protection Law does not contain any material related to the protection of biodiversity.
- Decline numbers of implemented programs relating to the biodiversity preservation for some of endangered species, such as (Canis Aureus, Anomalus Syriacus, Testudo Graeca).
- Lack of comprehensive monitoring programs for some types of rare and migratory birds, such as (Falco Ttinnunculus {worldwide endangered}, Buteo).
- There is no breeding program for Oak trees, which is consider the prevailing pattern in the reserve and one of the endangered species.
- High risk existence on the habitat of the species from the privately-owned land within reserve boundaries.
- Not all of the species existed in the reserve are including in the monitoring program, where some of them are classified as rare or endangered species.
- Continuation of the danger that threaten the oak trees which negatively affect the ecological system of the reserve and cause deterioration for the habitats allocated for animals, reptiles, and birds, that their existence depends on these trees.
- Lack of control towers in all protected areas and their reliance on tours only.

Recommendation

- Emphasize the importance of inclusion all of animals, birds, and reptiles (resident and migratory) in the monitoring program in order to guaranty its sustainability.
- Necessity of unify all the reserve land under reserve management authority.
- Increased the financial allocation related to biodiversity preservation by the Ministry of Environment.

SAI of Morocco (2008): Audit of the High Commissioner for Water, Forests and Combating Desertification

Audit Objective

- Evaluate strategy in reforestation and protecting forest ecosystems.
- Evaluate programs and plans to protect forests and fight desertification.
- Evaluate human and material resources to achieve HCEFLCD missions.
- Evaluate if the management of the office meet the standards of efficiency, economy and efficiency.

Scope

- Performance of Government on specific forest programs/ projects/strategies already formulated and being implemented
- Adequacy or lack of a policy framework governing biodiversity issues
- Adequacy of forest policies / laws /strategies
- Adequacy and utilization of infrastructure and funding

Findings

- The annual cost of forest and ecosystems degradation is estimated at 2.9 billion dirhams, not to mention the loss of biodiversity and other environmental health indicators.
- The objectives of the national reforestation plan were only partially completed. This plan was adopted in 1970, and was intended to reforest 662,000 ha per year. However, the achievement of these objectives has fluctuated. These objectives were reinforced by other reforestation plans (1989-1991), changing the annual rate of reforestation to up to 20,000 ha per year.
- Delay in achieving the objectives. Despite the reforestation of more than 500,000 hectares since 1970, the success rate did not exceed 60%.
- Launch of a second scheme since 1997, extending over 30 years: by adopting a participatory approach, in order to plant 1,500,000 hectares. However, the objective of planting 500,000 hectares during the first 10 years (1998-2009) was only partially completed.
- Morocco does not produce enough wood for its needs; this is because the HCEFLCD is unable to plant 23,000 ha dedicated to industrial exploitation.
- The level of reforestation remains inadequate: this is because the forest area is estimated at 8% of the area of Morocco. This is not enough to achieve ecological and environmental balance (this would require 15-20% of Morocco to be forested).
- The forest management program is a sustainable management plan, designed to identify and to ensure ecological, economic, and social development. In order to achieve these aims, the office has tried to organize the population living near forests into cooperatives and associations. However, this program has not achieved this objective.
- Inadequate procedures for monitoring the health of the forest, which increases the spread of diseases and reduces productivity and biodiversity.
- Some forest species are threatened with extinction, as is the case of the Argan tree and Cedar Tree.
- Non-allocation of part of forest incomes recovered by local government to reforestation.

Recommendation

- Establish a reliable information system for updating the status and the rate of degradation of each forest ecosystem, in order to better target and steer programs.
- Accelerate the progress of forest management plans.
- Integrate into forest management programs the economic and social dimensions of forest areas and populations.
- Give more importance to the regeneration of Cedars and Argan trees
- Give more importance to species diversification, reforestation and regeneration programs, and intensify natural essences;
- Establish an internal system of control covering the whole process of raising plants in nurseries.
- Adopt laws and regulations in order to protect Argan forests and its ecosystems.
- Implement appropriate measures (watering, fencing, etc.) for successful regeneration programs of the Argan trees.
- Establishing a system for evaluating the performance of managers in charge of reforestation programs.
- Achieve an annual census of livestock in forests and suburban forest.
- Enhance quality and quantity of units specialized in monitoring the state of forest health.
- Full report available at: http://www.courdescomptes.ma/index.php?id=52&no_cache=1

SAI of Zambia (2012): Forest Monitoring in Zambia

Audit Objective
To assess whether the Ministry of Mines and Natural Resources was monitoring the protection and harvesting of forests in an effective manner in order to reduce the risk of illegal activities in forests.

Scope
The audit focused on the Forestry Department under the Ministry of Mines and Natural Resources. The area of assessment was on the monitoring of forests covering 178 National and 307 Local forests representing 7,665,000 hectares of land. The five (5) provinces visited were selected based on assessment made from reports from the media and Forestry Department which indicated high levels of forest degradation and deforestation in those areas. The audit covered the period from 2008 to 2010.

Audit Criteria
a. Legal, policy and institutional framework The Dry-Zone Africa Process on Criteria and Indicators for Sustainable Forest Management run by the UN requires existence of a comprehensive legislative, national forest policy and regulatory framework for South African Development Community (SADC) Countries.
b. Forest Monitoring Capacity SADC Protocols require member states to ensure existence of institutional, human and financial capacity for effective implementation of sustainable forest management.
c. Forest Management Plans According to FAO, a key criterion for the sustainable management of tropical forests is the existence and effective implementation of an approved management plan that has been prepared using up-to-date and accurate information.
d. Forest Inventory Assessments SADC protocols require member states to undertake and regularly update the national assessment of forests.
e. Forest Licensing The Forest Act of 1973, requires the existence of a forest licensing system.
f. Forest Boundary Maintenance: The FAO guidelines on forest boundaries require that forest boundaries are defined and that forest monitoring on the maintenance of existing boundaries is carried out at least annually.
g. Forest Protection: The Forest Act requires that monitoring of the forest should be carried out on a timely basis to ensure that felling, cutting, taking, collecting, and removal of any forest product is done with a valid licence or permit.
h. Forest Harvesting: FAO guidelines require comprehensive pre-harvest planning, appropriate monitoring and execution of operations as well as post-harvest evaluation.
i. Agriculture and Community Activities in Forests FAO guidelines on monitoring of forest activities require that forest institutions undertake annual monitoring of rural community developments/agriculture in forest areas.
j. Illegal Activities in Forests SADC protocol requires the Strengthening and implementation of national measures, which control human activities that threaten forests, including land and natural resource-use practices that conflict with the principles of sustainable forest management.

Findings
a. The Ministry of Mines and Natural Resources legislation (Forest Act of 1973) on forest management does not address the monitoring mechanisms, the types of forest licences, climate change, global warming and the role of forests in mitigating negative impacts
b. The Ministry had inadequate staffing and funding in Forestry Department.
c. There were no forest management plans for the period under review.
d. Apart from the Integrated Land Use Assessment conducted in 2008, there were no other updates of forest resources inventories carried out.
e. The licensing system in existence was not in conformity with the Forest Act of 1973.
f. The forests boundary lines had not been maintained for the period under review.
g. There were no monitoring reports that could indicate that any monitoring was done at all.
h. Out of the 487 forest reserves, 253 representing 52% had been encroached on.

Recommendation
a. Initiate the enactment of a new law or strengthen the existing legislation/legal framework on sustainable forest management.
b. Update current forest management plans in order to strengthen the sustainable management of forests.
c. Strengthen the capacity of the Forest Department.
d. Maintain the forest boundaries to distinguish between reserved and non-reserved areas to lessen the conflict that is likely to encourage encroachments and illegal activities in the forests.

SAI of Zambia (2017): Sustainable Management of Forest Resources

Audit Objective
The objective of the audit was to assess whether the Ministry of Lands, Natural Resources and Environmental Protection (MLNREP) is effective in ensuring sustainable exploitation of forest resources and an effective forest management.

Scope
The audit focused on the activities and programmes implemented by the MLNREP through the Forestry Department (FD) to promote sustainable exploitation and management of forest resources. The audit covered activities and programmes in gazetted forests in the ten (10) provinces during the period from 2012 to 2015.

Audit Criteria
The criteria was drawn from the following sources:
a. The Forest Act No 39 of 1973,
b. The National Forestry Policy of 1998,
c. The African Timber Organization and International Tropical Timber Organization (ATO/ITTO) principles,
d. FAO 2010 guidelines on sustainable forest management, dry land forest management and silviculture, and
e. SADC Protocol on Forestry of 2002.

Findings
a. The Forestry Department had not implemented Forest Management Plans for the 483 forest reserves in Zambia. The forest management plans were not in place as the preparation of the management plans was totally dependent on the forest inventory both at the national and local level. Without this knowledge, the FD was not able to come up with the management plans as the national inventory had not yet been finalized as of July 2016.
b. The FD did not supervise and monitor the harvesting operations carried out by the concessionaires regularly during the period under review thus failing to ensure that information about harvest operations and actual cut was accurate in the harvesting compartments and whether other harvesting conditions were adhered to by the concession holders.
c. The FD was not able to effectively monitor the forests due to inadequate funding, inadequate staffing and lack of transport.
d. Boundary maintenance was not undertaken in most of the forest reserves. The failure to maintain boundaries continued to be a major contributing factor to the encroachment of forest reserves.
e. There were inadequate investments in plantation forest. Lack of funding was one of the challenges faced in managing the forest. Due to delayed funding, important activities such as planting and weeding were done at the wrong time or not done at all.
f. There was lack of co-ordination between the FD and traditional leaders on the matters of forestry hence the increase in the conflict involving traditional ownership of land or customary law. Mining activities were also being conducted in some forest reserves by licenced companies.

Recommendation
a. The FD should effectively engage key stakeholders – traditional leaders, communities and joint forest management committee in setting up forest management strategies.
b. The FD should through risk assessment, identify areas that should be prioritised for monitoring, establishment of boundaries and control.
c. For those forest reserves at high risk, the FD should channel its available resources to develop complete inventories.
d. The FD should establish routines for ensuring submission of monthly returns from the concession holders.
e. The FD should establish a regular meeting point between the responsible ministries to handle conflicting interest and goals arising in the forest reserves.

SAI of Ukraine: Management of forests

In 2004, the Accounting Chamber of Ukraine conducted a performance audit of the State Forestry Service, its territorial offices, and its regional administration to determine whether forests were being managed, especially at the deforestation stage, in an ecologically balanced manner.

Audit objectives
Identify
- management systems that provide guidance for an ecologically balanced use of forests in the Carpathian region (Western Ukraine); and
- the greatest effect of deforesting mature stands, and evaluate its ecological impact.

Scope
- Forestry management procedures in Ukraine
- The use of state funds for forestry management
- Legislation, state, and regional programs on forestry management, regulations, and other administrative documents connected with the participants' forest management activities

Criteria
- Forestry Code of Ukraine
- Land Code of Ukraine
- Ukraine's Law on environment protection

Findings
- Management of the Carpathian forest resources was inadequate and needed revision.
- The system lacked an efficient institutional management structure.
- The responsibilities of private landowners regarding reforestation, their care, and protection were not clearly defined.
- There was no national control over the use of forests or forestry activities.
- There was an inadequate charge mechanism for special exploration of the forest resources.
- The pricing of forest products is not nationally regulated, making the market in forest products volatile.

Recommendations
- Apply a comprehensive system of forestry management (planting, care, protection, and deforestation of mature stands).
- Sell timber from the region at state-run auctions.
- Create a state fund-in-trust for forestry management.
- Turn over the ecological control and full responsibility for managing the state forestry to external sources.

SAI of Brazil: Forest policy

In 2004, the Brazilian Court of Audit carried out a performance audit to assess the country's forest policy.

Audit Objective
Identify major problems and make recommendations to improve the management of the 36 federal and state conservation units in the Deforestation Arch area of the Legal Amazon Region.

Main environmental risk investigated
- Destruction and fragmentation of habitats
- Agriculture and the excessive conversion of land into pasture

Scope
The audit evaluated the activities of the Ministry of Environment, and its institutions, in the management of protected areas in the Legal Amazon Region.

Criteria
- National Policy of Environment
- National laws related to protected areas
- Expert opinions
- Standards of quality defined for the Brazilian public service.

Findings
Establishing conservation units did not prevent the overall deforestation of the Legal Amazon Region, because the units did not encourage the sustainable use of natural resources within them or sustainable activities in surrounding areas.

Recommendations
To the Ministry of Environment (MMA):
Draw up a national conservation unit plan that includes guidelines for the integrated management of conservation units and that defines common objectives, strategies, priorities, goals, and performance measurements.

To the Managing Council of the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA):
Set up a research centre to
- consolidate and make available the results of all research carried out in conservation units in a systematically documented, digital format; and
- with universities, map out the forest, fauna, water, and soil resources that are available in conservation units.

To the Secretariats of the MMA (Biodiversity and Forest, Amazon Coordination, and Sustainable Development secretariats):
Draw up a strategic and operational plan with IBAMA that encourages sustainable activities in areas surrounding conservation units and, if possible, in the conservation units themselves.
The plan should include
- developing and providing training and extension courses in sustainable practices to communities in areas surrounding the conservation units on subjects, such as
- sustainable forest management,
- controlled slash-and-burn procedures,
- soil conservation in agricultural practices, and
- sustainable harvesting of natural resources;
- identifying, selecting, and cataloguing the sustainable practices that are being developed, under MMA programs, so they can be shared with the communities in these regions.

MAINSTREAMING BIODIVERSITY INTO NATIONAL DEVELOPMENT PLANNING AND PRACTICES WITH SUSTAINABLE DEVELOPMENT PERSPECTIVE

Background

Slowing the loss of biodiversity can only be achieved by addressing the main drivers of change— by encouraging players in the main economic sectors to make changes that reduce the negative impact on biodiversity. Encouraging the principal players and recruiting allies as advocates make the public more aware of the issues. With this awareness, come the increased political will and the additional resources need for change, both of which will help to integrate biodiversity concerns into various economic sectors.

Integrating biodiversity concerns into key economic sectors, such as food and agriculture, trade, energy, mining, and economic development is particularly important. The amount of energy used in these sectors contributes to the decline of biodiversity, through climate change, and it is becoming an increasingly significant cause of decline. Each sector of the economy has an impact on biodiversity.

In addition, there are important links between biodiversity and poverty reduction. Just as the loss of biodiversity and the degradation of ecosystem services could undermine sustainable development goals, many actions that may be quickly implemented (to promote economic development and reduce poverty) could harm biodiversity, at least in the short term.

It is important to understand that some government's policies or practices could induce unsustainable behavior which harms biodiversity. Harmful subsidies or incentives are given in order to supplement the income or lower the costs of consumers or producers, but in doing so, discriminates against good environmental practices. Potential effect of taking action on harmful incentives or subsidies will lower the need to raise fund for biodiversity from the scarce public resources. Eliminating harmful incentives and subsidies could bring positive effects for biodiversity especially in terms of resource mobilization[25].

Audit criteria

Sustainable Development Goals. Sustainable development strategies could be also a good starting point to see how the environment and, more specifically, biodiversity are considered in the government's main activities. With the adoption of the Agenda 2030 for Sustainable Development in 2015, biodiversity is getting more attention than earlier years. As mentioned earlier, how biodiversity get a special place within the Agenda 2030, below are some the examples of targets that could be used as criteria:

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Target 9.1 mentioned "Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all"

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.9 mentioned "By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts".

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Target 17.14 mentioned "Enhance policy coherence for sustainable development"

25 More on resource mobilization, see Secretariat of CBD Report no. CBD/SBI/21/2//INF/15 dated 10 May 2018 on "Resource Mobilization: Progress in Achieving the Milestones for the Full Implementation of Aichi Biodiversity Target 3"

Aichi Biodiversity Targets. Strategic Plan for Biodiversity 2011-2020 has also mentioned explicitly to promote the biodiversity values into the government and society. Below are targets that could be used as criteria.

Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.
Target:

1. By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
2. By 2020, at the latest biodiversity values have been integrated into national and local development and poverty reduction strategies and planning process and are being incorporated into national accounting, as appropriate, and reporting systems.
3. By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the convention and other relevant international obligations, taking into account national socio economic conditions.
4. By 2020, at the latest, Governments, business, and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Given the interrelation, biodiversity must be considered in policies, plans, and programs for sustainable development and in trade discussions.

Legislation, regulations, and policies. It is unlikely that auditors will find specific legislation on this broad topic, which involves many players. However, countries may have specific legislation to regulate the environmental impact on specific sectors (for example, energy or petroleum exploitation), which may be a source of audit criteria. Policies to promote development and combat poverty as well as trade policies may be another source of criteria. For more information about legislation on environmental impact and strategic environmental assessments and about how they are integrated in different areas, see Step 2. Understanding the government's responses to these threats and the relevant players, in Chapter 2.

Programs. Programs can be numerous, depending on the sectors. Auditors can consult colleagues who deal with a particular entity to find out which programs they should consider. Programs that deal with the use of natural resources, economic and social development, and infrastructure (for example, energy, water supply, and transport) all have a direct impact on biodiversity.

Players

The players are different form those discussed earlier because of the wide variety of economic sectors that a country may be active in. In addition to the common departments and ministries, auditors may consider agriculture, rural development, natural resources, energy, industry, economic development, foreign affairs, infrastructure and public works, municipal affairs, land use planning and urban development, and tourism. Because the private sector can mitigate the negative impact of its economic activities, it is also a key player.

Researchable questions

Auditors may ask the following:

- Has the national government adopt the Sustainable Development Goals within their national development planning?
- Has the national government integrated biodiversity values in its national development planning?

- Has the national government develop a specific National Strategic Plan/National Action Plan on biodiversity?
- Has the National Plan/Strategic Plan on biodiversity breakdown into Local Plans properly?
- Is the national/local government properly implement the strategic plan/action plan?
- Are environment impact assessments conducted for major projects and do they integrate biodiversity considerations?
- Is land-use planning and infrastructure development have considered the biodiversity in their implementation?
- Does policy development in different sectors integrate biodiversity considerations, through strategic environmental assessments?
- Is the government integrating biodiversity and environmental concerns into sectoral or cross-sectoral plans, programs, and policies in trade, economy, land use-planning, energy and any other activities that affect biodiversity (either directly or indirectly)?
- Has the national government ensure the policy coherence across sectors for sustainable development?

Audit case studies

The following case studies are examples on how protecting biodiversity is not all about preserving the environment but to sustain the living of humans and its activities.

SAI Costa Rica (2011): Report on the effects of the Payment for Environmental Services Program implemented in Costa Rica

Audit Objective
The general objective of the audit was framed in the evaluation of the environmental, economic and social effects of the Payment for Environmental Services (PES) program.
The analysis carried out required the development of indicators, both for the evaluation of the effects of the program in the environmental, economic and social spheres, as well as for institutional management, as the responsible institutions do not have such indicators.

Scope
The evaluation of the effects of the PES program includes the environmental, economic and social dimensions from its beginning in 1997 until 2010.

Audit Criteria
Economic, social and environmental indicators.

Findings
- Limitations on institutional management related to the Payment for Environmental Services Program to maximize its effects.
- Weaknesses in prioritization criteria do not ensure payments in areas with mayor contribution to conservation.

Recommendation
- To formulate the medium and long-term planning of the program.
- To issue policies and adjust the prioritization criteria so as to assure the goals of the program.
- To SINAC and FONAFIFO must establish the joint program monitoring and evaluation scheme to obtain the results that guarantee compliance with the conservation objectives for which it was created the PSE program; as well as the adjustment of the payment modalities and the respective tariffs according to the opportunity cost associated with the use of the land.

SAI Estonia (2015): State activities in nature conservation management to guarantee the preservation of semi-natural communities

Audit Objective
National Audit Office (NAO) of Estonia audited whether the organisation and financing of the conservation of semi-natural communities has been effective, i.e. guaranteed high-quality and consistent maintenance of communities in conservation areas to the extent that is necessary for the preservation and improvement of their condition.

Scope
Audit was focused on protection of such habitat types (so called semi-natural grasslands or semi-natural communities), which need regular maintenance (mowing and herding) for the preservation of specific condition, necessary for these habitats specific biodiversity. Audit analysed the organisation of the management of semi-natural habitats in private and state-owned lands and the efficiency of the subsidies mechanism.

Audit Criteria
a. Protection and management of the semi-natural habitats is organised in such way, which secures the achievement of the goals of nature conservation development plan.
b. Financing of the restoration and management of the semi-natural habitats is sufficient for achieving the management goals.

Findings
The audit found that the desired goals have not been achieved, as the support schemes of protection works do not motivate the farmers sufficiently, the management of nature conservation is split between different agencies and fragmented depending on land ownership and does not guarantee the performance of works in areas whose maintenance does not generate much interest.

Recommendation
a. Organise the works required for achievement of the protection goals of semi-natural communities also in communities, where the state's activities and the financial support provided so far have not motivated the land maintainers to perform the works;
b. Increase the supervision of the maintenance of semi-natural communities to guarantee the necessary maintenance quality and thereby the achievement of the ecological goals of such communities; and
c. The state should assume a more active role in informing landowners and maintainers about the communities that need to be maintained on both private and state land, and the conditions of their maintenance. It should be guaranteed that this information is publicly quickly and easily accessible.

Summary of the report could be accessed at http://www.riigikontroll.ee/tabid/206/Audit/2344/Area/15/language/en-US/Default.aspx

SAI of New Zealand (2012): Department of Conservation (DOC): Prioritising and partnering to manage biodiversity

Audit Objective
To assess how effectively DOC uses the information it has on biodiversity to prioritise its resources. We also assessed how effective DOC has been in working with others to manage indigenous biodiversity to achieve the greatest gains with the resources available.

Scope
For 2012/13, DOC has about $202 million available to meet its objective of maintaining and restoring indigenous biodiversity.10 This audit assessed how effectively DOC has directed the resources available to it to manage biodiversity.

Audit Criteria
Criteria for assessing the different case:
- Common understanding of biodiversity risks
- Clarity of shared purpose
- Implemented working agreement or memorandum of understanding
- Clearly defined roles and responsibilities
- Implemented plan of action 9 Performance framework
- Results reported
- Adaptive management
- Effective working relationships
- Biodiversity improvements

Findings
In our 2012 report, we said that the Department was recognised for its leading conservation methods and practices but was not "winning the battle against the threats to New Zealand's indigenous species and the habitats they live in". We also stated that "at best, efforts to date are merely slowing the decline of biodiversity in New Zealand, which is a cause for concern".
We acknowledged the difficult and complicated task the Department has in managing biodiversity. The task crosses geographical boundaries – between private and public land and waterways – and organisational boundaries at various levels of government and outside government.
The Department is responsible for managing biodiversity on conservation land and waterways. Outside the conservation estate, the Department provides support, advice, and funding to others who lead biodiversity management on private land. The Department's ability to effectively work with others in protecting indigenous biodiversity is highly dependent on its ability to engage willing partners in a variety of collaborative arrangements.
Despite the Department's difficult operating environment, the report identified the need for significant improvements and made eight recommendations. These recommendations had three broad themes. We recommended that the Department make improvements in:
- prioritising to manage biodiversity (recommendations 1 and 2);
- strategic integration (recommendations 3, 4, and 5); and
- working with others to manage biodiversity (recommendations 6, 7, and 8).

Recommendation

Prioritising to manage biodiversity

SAI of New Zealand recommended that the Department of Conservation:

1. put in place an implementation and risk management plan for its new prioritisation tools, ensuring that:
   - staff have the skills and support needed to successfully use the new prioritisation processes; and
   - there is adequate ongoing consultation with communities and key stakeholders and partners as part of prioritisation; and
2. ensure that there is effective long-term monitoring and reporting of the effects of biodiversity management, including through the Ministry for the Environment's national environmental reporting.

Strategic integration

SAI of New Zealand recommended that the Department of Conservation:

3. renew all conservation management strategies in a timely manner and before they expire;
4. prepare and implement working agreements with local authorities as a standard practice for managing biodiversity in the regions; and
5. establish longer-term plans and resourcing commitments with partners that are working on core biodiversity operations.

Working with others to manage biodiversity

SAI of New Zealand recommended that:

6. where biodiversity of national significance is at risk and requires timely and integrated responses, the Department of Conservation's national office ensure that effective regional leadership and co-ordination with other agencies is in place to respond to risks appropriately.

SAI of New Zealand recommended that the Department of Conservation:

7. produce policies, practices, and tools for preparing working agreements and collaborative action plans that would be appropriate for the range of partnerships it will be involved in; and
8. review the criteria for the Biodiversity Advice Fund for larger multiple-year collaborative projects, advocate for using standardised tools and templates, and set out specific reporting requirements for repeated funding applications.

Follow up report could be accessed at: https://www.oag.govt.nz/2012/biodiversity/docs/biodiversity.pdf

SAI of the Netherlands: Implementation of the ecological compensation principle

In 2006, the Netherlands Court of Audit audited the implementation of the ecological compensation principle.
Projects such as road construction or the creation of an industrial area can cause ecological damage. The ecological compensation principle is a way to compensate for ecological damage and to avoid or reduce the impact that these kinds of projects have on the environment.

Audit objective

Assess the authorities' efforts in the Netherlands to conserve nature areas, in order to advance sustainable spatial planning.

Scope

- The actions of the ministries of Spatial Planning, Nature, and Infrastructure to address
- legal aspects of the ecological compensation principle,
- communication with involved parties, and
- assignment and fulfillment of responsibilities.
- The actions of local authorities and the private parties that cause ecological damage.

Criteria

- European legislation: the habitat and birds directives
- Dutch legislation on nature protection and spatial planning
- Netherlands Court of Audit standards on the quality of policy information and auditing policy processes

Findings

- Case studies show that the Nature Conservation Policy, as applied, inadequately ensures the conservation of nature areas.
- Ecological damage occurred when it could have been avoided.
- In many cases, necessary ecological compensation was not made.

Recommendations

- The ministries should improve the way they control the implementation and effectiveness of the policy of conservation of nature areas.
- The ministries should make information and training on the relevant laws and standards available, especially to those who must implement them (for example, municipal civil servants).

SAI of the United States: Wind power and protection of wildlife

In 2005, the Government Accountability Office (GAO) of the United States performed an audit entitled Wind Power: Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife. In response to concerns that wind power development was not adequately regulated to protect wildlife, the GAO evaluated the existing laws and regulations.

Audit objective
Assess:
- studies and expert opinions on the impact of wind power facilities on wildlife in the United States and possible actions to reduce or prevent the impact; and
- the roles and responsibilities of government agencies in regulating wind power facilities and in protecting wildlife.

Scope
Federal and state laws and regulations related to wind power development and protection of wildlife.

Criteria
Laws, regulations, and expert opinions

Findings
- Wind power affected wildlife in some areas of the country. However, because the original population level of species was mostly unknown, it was difficult to determine whether the impact was serious.
- The development of wind power is regulated at the federal, state, and local levels. Since most development has taken place on non-federal land, it has been regulated by state or local agencies that vary in how they consider the potential impact on wildlife before allowing development.
- Some wildlife killed at wind power facilities was protected by federal laws, and action was taken at these facilities.
- No action was taken where species unprotected by federal law have been killed, although the federal government has issued draft guidelines to help agencies decide on appropriate locations for wind power facilities.

Recommendations
The Fish and Wildlife Service should provide state and local regulatory agencies with information on the
- potential impact on wildlife of wind power, and
- available resources to help them decide where wind power facilities should be approved

COPING WITH CHALLENGES IN AUDITING BIODIVERSITY

Based on a mini survey circulated among INTOSAI WGEA members, SAIs indicated several challenges when performing audit on biodiversity topics. The challenges were categorized into two major groups, challenges come from internal SAIs and challenges come from external SAIs.

Coming from internal SAI	*Coming from external SAI*
1. Biodiversity is a complex issues/too technical 2. Biodiversity has a broad scope of issues 3. Risk identification and impact measurement issue 4. Mandate issue 5. Lack of guidelines to audit the issue	1. Data availability 2. Coordination issue 3. Lack of government's institutional and financial capacities 4. Incoherency between international and national legislation 5. Lack of regulation – regulation ambiguity 6. Lack of awareness from the government 7. Entities resistance 8. Political intervention

Using the survey, SAIs were also asked to share their experiences in coping with those challenges. The efforts could be categorized into two major groups. First, through SAIs development, which mean that SAI put efforts to improve its own capacity and its auditors in auditing biodiversity. Second, through cooperation with external, which mean that SAIs cooperate with external bodies/individuals to improve its audit capacity on biodiversity. Below are examples of SAIs efforts in coping the challenges in auditing biodiversity.

SAIs Development	*Cooperating with External*
1. Trainings 2. Develop new audit methods/guidelines 3. Creation of new division/prioritize to audit biodiversity 4. Use of ISSAIs/specific manuals 5. Participation in regional WGEA 6. The consideration of Biodiversity issue in Performance Audit on Environmental Issue	1. Working with academics/focus groups/ experts 2. Communicate with government on funding and legislation 3. Communicate the coherency in the government through the audit reports

Appendix 1
List of Biodiversity-related Conventions and Agreements

The following are the principal International Environment Agreements affecting biodiversity. Some main features of these agreements are described in Chapter 3.

No	Name	Brief Information	Objective
1	**Convention on Biological Diversity** (CBD)	**Date Signed:** 5 June 1992 **Date Coming into Force:** 29 December 1993 **Number of parties** (in September 2018): 196 **List of Parties:** https://www.cbd.int/information/parties.shtml **Web site:** https://www.cbd.int/ **Convention text:** https://www.cbd.int/doc/legal/cbd-en.pdf	The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from commercial and other utilization of genetic resources. The agreement covers all ecosystems, species, and genetic resources.
2	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	**Date Signed:** 3 March 1973 **Date Coming into Force:** 1 July 1975 **Number of parties** (in January 2019): 183 **List of Parties:** https://www.cites.org/eng/disc/parties/index.php **Website:** http://www.cites.org/ **Convention text:** https://www.cites.org/sites/default/files/eng/disc/CITES-Convention-EN.pdf	The CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.
3	**Convention on the Conservation of Migratory Species of Wild Animals** (CMS)	**Date Signed:** 23 June 1979 **Date Coming into Force:** 1 November 1983 **Number of Parties** (in December 2017): 127 **List of Parties:** https://www.cms.int/en/parties-range-states **Website:** http://www.cms.int/ **Convention text:** https://www.cms.int/sites/default/files/instrument/CMS-text.en_.PDF	The CMS, or the Bonn Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species, by concluding regional multilateral agreements for the conservation and management of specific species or categories of species, and by undertaking co-operative research and conservation activities. Every party makes a commitment to • prohibit or restrict the harvesting of migratory species; • restrict damage to habitats, introduction of invasive exotic species, and other activities and conditions that might obstruct migrations or interfere with migratory species; and • enter into separate international agreements on specific migratory species or groups of species whose range or migratory route includes areas within the party's jurisdiction.

No	Name	Brief Information	Objective
4	Convention on Wetlands (popularly known as the Ramsar Convention)	**Date Signed:** 2 February 1971 **Date Coming into Force:** 21 December 1975 **Number of parties** (in May 2018): 170 **List of parties:** https://www.ramsar.org/sites/default/files/documents/library/annotated_contracting_parties_list_e.pdf. **Website:** http://www.ramsar.org/ **Convention text:** https://www.ramsar.org/sites/default/files/documents/library/current_convention_text_e.pdf	The Ramsar Convention provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.
5	World Heritage Convention (WHC)	**Date Signed:** 16 November 1972 **Date Coming into Force:** 17 December 1975 **Number of parties** (in January 2017): 193 **List of Parties:** http://whc.unesco.org/en/statesparties/ **Web site:** http://whc.unesco.org/ **Convention Text:** http://whc.unesco.org/archive/convention-en.pdf	In 1972, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) recognized the need to identify and permanently protect the world's special areas. The World Heritage Convention, founded on the principle of international co-operation, provides protection for the world's cultural and natural heritage. The primary mission of the WHC is to identify and conserve the world's cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through a closer co-operation among nations.
6	International Plant Protection Convention (IPPC)	**Date Signed:** 6 December 1951 **Date Coming into Force:** 3 April 1952 **Number of parties** (in January 2019): 183 **List of Parties:** https://www.ippc.int/en/countries/all/list-countries/ **Web site:** https://www.ippc.int/en/ **A revised Convention text of the Convention was adopted in 1997:** https://www.ippc.int/static/media/files/publications/en/2013/06/06/1329129099_ippc_2011-12-01_reformatted.pdf	The IPPC aims to protect world plant resources, including cultivated and wild plants by preventing the introduction and spread of plant pests and promoting the appropriate measures for their control. The convention provides the mechanisms to develop the International Standards for Phytosanitary Measures (ISPMs), and to help countries to implement the ISPMs and the other obligations under the IPPC, by facilitating the national capacity development, national reporting and dispute settlement. The Secretariat of the IPPC is hosted by the Food and Agriculture Organization of the United Nations (FAO).
7	International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Management Convention or BMW Convention)	**Date Signed:** 13 February 2004 **Date Coming into Force:** 8 September 2017 **Number of contracting parties** (in October 2018): 77 **Web information:** http://www.imo.org/ (Look for "marine environment" and then "Ballast Water Management") **Global Ballast Water Management program:** http://archive.iwlearn.net/globallast.imo.org/	The objective of the BMW is to prevent, minimize, and ultimately eliminate the transfer of harmful aquatic organisms and pathogens by controlling and managing sediments and the release of ballast water from ships.
8	United Nations Convention on the Law of the Sea (UNCLOS)	**Date Signed:** 10 December 1982 **Date Coming into Force:** 16 November 1994 **Number of contracting parties :** 157 **Convention text:** http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.	This convention set up a legal regime for the seas and oceans and regulates all aspects of the resources and uses of the oceans. The convention concerned about the territorial sea and the contiguous zone, the continental shelf, the high seas, fishing and conservation of living resources of the high seas

No	Name	Brief Information	Objective
9	International Convention for the Prevention of Pollution from Ships (MARPOL).	**Date Signed:** 17 February 1973 **Date Coming into Force:** 2 October 1983 **Number of parties** (in January 2018): 156 **Website:** http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx	The objective of this convention is to preserve the marine environment in an attempt to completely eliminate pollution by oil and other harmful substances and to minimize accidental spillage of such substances.
10	The Cartagena Protocol on Biosafety	**Date Signed:** 29 January 2000 **Date Coming into Force:** 11 September 2003 **Number of Parties:** (in January 2019): 198 **List of Parties:** http://bch.cbd.int/protocol/parties/ **Website:** http://bch.cbd.int/protocol **Convention text:** http://bch.cbd.int/protocol/text/	The objective of the Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of 'living modified organisms resulting from modern biotechnology' that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements
11	**The International Treaty on Plant Genetic Resources for Food and Agriculture** (ITPGRFA)	**Date Signed:** 3 November 2001 **Date Coming into Force:** 29 June 2004 **Number of Parties:** (in January 2019): 145 **List of Parties:** http://www.fao.org/fileadmin/user_upload/legal/docs/033s-e.pdf **Website:** http://www.fao.org/plant-treaty/overview/en/ **Treaty Text:** http://www.fao.org/3/a-i0510e.pdf	The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security. The Treaty covers all plant genetic resources for food and agriculture, while its Multilateral System of Access and Benefit-sharing covers a specific list of 64 crops and forages. The Treaty also includes provisions on Farmers' Rights.
12	International Whaling Commission (IWC)	**Date Signed:** 2 December 1946 **Number of Parties:** (in January 2019): 89 **List of Parties:** https://www.state.gov/documents/organization/191051.pdf **Website:** https://iwc.int/home **Convention Text:** https://archive.iwc.int/pages/view.php?ref=3607&k=	The purpose of the IWC is to provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry.
13	Sanitary and Phytosanitary Agreement (SPS)	**Date Coming into Force:** 1 January 1995 **Agreement Text**: https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm	Known as the SPS Agreement, is an international treaty of the World Trade Organization. It was negotiated during the Uruguay Round of the General Agreement on Tariffs and Trade. Broadly, the sanitary and phytosanitary ('SPS') measures covered by the agreement are those aimed at the protection of human, animal or plant life or health from certain risks.
14	Nagoya Protocol	**Date Signed:** 29 October 2010 **Date Coming into Force:** 11 September 2003 **Number of Parties:** (in January 2019): 113 **List of Parties:** https://www.cbd.int/abs/nagoya-protocol/signatories/default.shtml **Website:** https://www.cbd.int/abs/ **Convention text:** https://www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf	Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity also known as Nagoya Protocol on Access and Benefit Sharing. By ensuring benefit-sharing, this protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being.

No	Name	Brief Information	Objective
15	The Agenda 2030 for Sustainable Development in 2015, or known as Sustainable Development Goals (SDGs) 	**Date adopted:** 25 September 2015 **Website:** https://sustainabledevelopment.un.org/sdgs **UN ResolutionText:** http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/1	The Agenda 2030 has 17 Goals and 169 targets that was adopted by 193 Heads of State and Government as a commitment to eradicate poverty, achieve sustainable development by 2030 world-wide and ensuring no one is left behind. Despite the interconnection between the goals with biodiversity topics[26], among the 17 Goals, Goal 14 and Goal 15 have the most related with biodiversity.
16	The Paris Agreement 	**Date Adopted:** 12 December 2015 **Date Signed** : 22 April 2016 **Date Coming into Force:** 4 November 2016 **Number of Parties:** (in June 2017): 184 of 197 members have ratified. **Website:** https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement **Convention text:** https://unfccc.int/sites/default/files/english_paris_agreement.pdf	The aim of the agreement is Enhancing the implementation" of the UNFCCC through: a. Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change; b. Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; c. Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

26 Secretariat of CBD working together with FAO, World Bank, UN Environment and UNDP developed a Technical Note on "Biodiversity and the 2030 Agenda for Sustainable Development" which elaborated the interconnections between SDGs targets and Aichi Biodiversity targets. Full document is available at: https://www.cbd.int/development/doc/biodiversity-2030-agenda-technical-note-en.pdf

Appendix 2
Regional Biodiversity Agreements

The following is a list of some biodiversity-related agreements by geographic region. These agreements may have a direct or indirect link with the protection of biodiversity. Information on these agreements can be found on the Web through a search engine.

Geographic region	Regional biodiversity agreements
Europe	• Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) • Kyiv Resolution on Biodiversity • Convention on Co-operation for the Protection and Sustainable Use of the Danube River (Danube River Protection Convention, also called the Sofia Convention) • Gothenburg Target of the European Union • Natura 2000 • European Union countries adopted legislation to protect habitats and species: the Habitats Directive complements the Birds Directive and calls for the creation of a network of sites called Natura 2000. Signatories are to establish Special Protection Areas (SPC) for birds and Special Areas of Conservation (SAC).
Africa	• African Convention on the Conservation of Nature and Natural Resources • Lusaka Agreement on Cooperative Enforcement Operation Directed at Illegal Trade in Wild Fauna and Flora—for Eastern, Central and Southern African countries • Protocol concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region • African Eurasian Waterbird Agreement (with Europe) • Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the East African Region • Convention on Lake Victoria Fisheries Organization

Geographic region	Regional biodiversity agreements
Asia	• Agreement for the Establishment of the Near East Plant Protection Organization • Convention on the Protection of the Black Sea against Pollution • Plant Protection Agreement for the Asia and Pacific Region • Regional Convention for the Conservation of the Red Sea and of the Gulf of Aden Environment • Framework Convention for the Protection of the Marine Environment of the Caspian Sea • Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin
South Pacific Islands	• Convention for the Protection of the Natural Resources and • Environment of the South Pacific Region and Related Protocols • (SPREP Convention) • Framework Agreement for the Conservation of Living Marine • Resources on the High Seas of the South Pacific (The Galapagos Agreement) • ASEAN Agreement on the Conservation of Nature and Natural • Resources • Convention on the Conservation of Nature in the South Pacific • Plant Protection Agreement for the Asia and Pacific Region • Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
South and Central America	• Regional Convention for the Management and Conservation of the Natural Forest Ecosystems and the Development of Forest Plantations • The Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the Northeast Pacific (Antigua Convention) • Agreements on the Exploitation and Conservation of the Maritime Resources of the South Pacific • Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the South-East Pacific • Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America • Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific • Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere • Inter-American Convention for the Protection and Conservation of Sea Turtles • Treaty for Amazonian Cooperation
Caribbean	• 1999 Protocol Concerning Pollution from Land-Based Sources and Activities to the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region • Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region • Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention)

Appendix 3
Convention on Biological Diversity: Selected Articles

Below are some important articles of the CBD that are referred in the document. The full text of the CBD can be found at: http://www.biodiv.org/doc/legal/cbd-un-en.pdf

Article 1. Objectives

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Article 3. Principle

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Article 8. In-situ Conservation

Each Contracting Party shall, as far as possible and as appropriate:

a. Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;

b. Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;

c. Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;

d. Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;

e. Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;

f. Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies;

g. Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health;

h. Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;

i. Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components;

j. Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices;

k. Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations;

l. Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and

m. Cooperate in providing financial and other support for in-situ conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.

Article 12. Research and Training

The Contracting Parties, taking into account the special needs of developing countries, shall:

a. Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for the specific needs of developing countries;

b. Promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries, inter alia, in accordance with decisions of the Conference of the Parties taken in consequence of recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice; and

c. In keeping with the provisions of Articles 16, 18 and 20, promote and cooperate in the use of scientific advances in biological diversity research in developing methods for conservation and sustainable use of biological resources.

Article 13. Public Education and Awareness

The Contracting Parties shall:

a. Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and

b. Cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity.

Article 14. Impact Assessment and Minimizing Adverse Impacts

1. Each Contracting Party, as far as possible and as appropriate, shall:

    a. Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;

    b. Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;

    c. Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;

    d. In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

    e. Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.

Article 15. Access to Genetic Resources

1. Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.

2. Each Contracting Party shall endeavour to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention.

3. For the purpose of this Convention, the genetic resources being provided by a Contracting Party, as referred to in this Article and

4. Articles 16 and 19 are only those that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in accordance with this Convention.

5. Access, where granted, shall be on mutually agreed terms and subject to the provisions of this Article.

6. Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.

7. Each Contracting Party shall endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in, such Contracting Parties.

8. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 and 19 and, where necessary, through the financial mechanism established by Articles 20 and 21 with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.

Article 16. Access to and Transfer of Technology

1. Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.

2. Access to and transfer of technology referred to in paragraph 1 above to developing countries shall be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms where mutually agreed, and, where necessary, in accordance with the financial mechanism established by Articles 20 and 21. In the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. The application of this paragraph shall be consistent with paragraphs 3, 4 and 5 below.

3. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary, through the provisions of Articles 20 and 21 and in accordance with international law and consistent with paragraphs 4 and 5 below.

4. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology referred to in paragraph 1 above for the benefit of both governmental institutions and the private sector of developing countries and in this regard shall abide by the obligations included in paragraphs 1, 2 and 3 above.

5. The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.

Article 19. Handling of Biotechnology and Distribution of its Benefits

1. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, to provide for the effective participation in biotechnological research

activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such Contracting Parties.

2. Each Contracting Party shall take all practicable measures to promote and advance priority access on a fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties. Such access shall be on mutually agreed terms.

3. The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.

4. Each Contracting Party shall, directly or by requiring any natural or legal person under its jurisdiction providing the organisms referred to in paragraph 3 above, provide any available information about the use and safety regulations required by that Contracting

   Party in handling such organisms, as well as any available information on the potential adverse impact of the specific organisms concerned to the Contracting Party into which those organisms are to be introduced.

Article 26. Reports

Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.

Appendix 4

Strategic Plan on Biodiversity 2011-2020

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1
By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2
By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3
By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4
By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5
By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6
By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7
By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8
By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9
By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10
By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11
By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12
By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13
By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14
By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15
By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16
By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

Target 17
By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18
By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19
By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20
By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

Appendix 5
Sources of Biodiversity Information

Gullison et al[27] (2015) listed several important sources of biodiversity information and pointed out the importance of engaging stakeholders and experts throughout the process and the need to have a long-term biodiversity monitoring.

Scope	Resources	URL	Comments
General Resources	Google Scholar	scholar.google.com	Searches the world's scientific literature, including grey literature
	Integrated Biodiversity Assessment Tool for Business	https://www.ibatforbusiness.org	Spatial layers of many conservation priorities, including: • IUCN Red List of Threatened Species • Birdlife International Important Bird Areas and Endemic Bird Areas • Alliance for Zero Extinction sites • World Database of Protected Areas • Key Biodiversity Areas • Biodiversity Hotspots • High Biodiversity Wilderness Areas
	A to Z Areas of Biodiversity Importance	www.biodiversitya-z.org	Definitions, information and links to many of the world's biodiversity prioritization frameworks
	The Nature Conservancy Biodiversity and Ecosystem Services Trends and Conditions Assessment Tool	bestcat.org.s3.amazonaws.com/index.html	Maps biodiversity and ecosystem service sensitivity for corporate sites
Habitats and ecosystems	World Wildlife Fund Global Ecoregions	wwf.panda.org/about_our_earth/ecoregions/about/	Science-based prioritization of the terrestrial, freshwater and marine habitats
	NatureServe conservation database of species and ecosystems	www.natureserve.org	Conservation assessments for species and habitats in the Americas
	The Nature Conservancy Ecoregional Assessments	www.conservationgateway.org/ConservationPlanning/SettingPriorities/EcoregionalReports/Pages/EastData.aspx	Conservation plans for >150 of the world's ecoregions
	IUCN Red List of Ecosystems	www.iucnredlistofecosystems.org	Conservation assessments for a small but growing number of ecosystems assessed in a manner analogous to IUCN species assessment methodology

27 Gullison, R.E., J. Hardner, S. Anstee, M. Meyer. 2015. *Good Practices for the Collection of Biodiversity Baseline Data*. Prepared for the Multilateral Financing Institutions Biodiversity Working Group & Cross-Sector Biodiversity Initiative

Scope	Resources	URL	Comments
Protected areas	International Union for the Conservation of Nature and United Nations Environment Programme	www.protectedplanet.net	Comprehensive global database of terrestrial and marine protected areas
	United Nations Educational, Scientific and Cultural Organization (UNESCO) List of World Heritage sites	whc.unesco.org/en/list/	Information on sites qualifying for World Heritage status
	World Network of Biosphere Reserves	www.unesco.org/new/en/natural-sciences/	PDF maps and information on the global network of Man and the Biosphere sites
	The Ramsar Convention on Wetlands	www.ramsar.org	Information on wetlands on Ramsar's List of Wetlands of International Importance
	Association for Southeast Asian Nations Heritage Parks	chm.aseanbiodiversity.org	Information on ASEAN's Heritage Parks designated to conserve areas of particular biodiversity importance
	Natura 2000 Sites	ec.europa.eu/environment/nature/natura2000/index_en.htm	European network of protected areas established under 1992 Habitats Directive and 1979 Birds Directive
	Protected Areas Data	gapanalysis.usgs.gov/padus/data/	National inventory of U.S. terrestrial and marine protected areas
Recognized biodiversity sensitive Areas	Endemic Bird Areas	www.ibatforbusiness.org	Integrated spatial data on various potential critical habitats
	Important Bird Areas		
	Key Biodiversity Areas		
	Alliance for Zero Extinction		
	Biodiversity hotspots		
	Large intact landscapes		
Species		www.iucnredlist.org	Global conservation assessments for species
		www.natureserve.org	Conservation assessments for species and habitats in the Americas
	Global Biodiversity Information Facility Biodiversity Data	http://www.gbif.org	Freely available data on the occurrence of species. More than half a billion occurrences in database. These data can be used to understand the occurrence and occupancy (or distribution) of species, and to understand endemism and range-restriction.
	The Botanical Information and Ecology Network	http://bien.nceas.ucsb.edu/bien/	Standardized botanical observation records, geographic range maps, diversity maps, species lists, and a species-level phylogeny for all of the plants in the New World.
	Spatial Analysis of Local Vegetation Inventories Across Scales	www.salvias.net/pages/	Hosts vegetation plot data from around the world that can serve as reference or benchmark data for assessing habitat condition
	A Global Information System on Fishes	www.fishbase.org	The largest and most accessed online database of finfish including information on taxonomy, distribution and ecology.
Ecosystem services	Artificial Intelligence for Ecosystem Services	www.ariesonline.org	A suite of web-based tools to support ecosystem service assessment and valuation
	Toolkit for Ecosystem Service Site-based Assessment	www.tessa.tools	Technical support to the non-specialist for site-based assessment of ecosystem services

Glossary

audit objective	A precise statement of what the audit intends to accomplish and/or the question the audit will answer. This may include financial, regularity or performance issues.
audit scope	The framework or limits and subjects of the audit.
audit criteria	Criteria are benchmarks against which the subject matter can be assessed.
biodiversity	"The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems." The definition covers plants, animals, humans and micro-organisms, their genes, and the systems they inhabit.
biodiversity hotspot	Area that harbours a great diversity of **endemic species** and, at the same time, have been significantly impacted and altered by human activities. To be declared a hotspot, the area must have lost 70 percent of more of its original habitat.
compliance audit	With regard to environmental issues, may relate to providing assurance that governmental activities are conducted in accordance with relevant environmental laws, standards and policies, both at national and international (where relevant) levels. See also **regularity audit**.
Convention on Biological Diversity	Signed at the 1992 Earth Summit and ratified by 190 countries as of 2007, this convention obliges countries to protect plant and animal species through habitat preservation and other means. Protection of endangered species is also enforced through CITES—the 1973 Convention on International Trade in Endangered Species.
coordinated audit	Any form of co-operation between **joint** and **concurrent** audits. This can be either a joint audit with separate reports or a concurrent audit with a single, international audit report in addition to separate national reports.
concurrent audit	An audit conducted more or less simultaneously by two or more SAIs, but with a separate audit team from each SAI reporting only to its own legislature or government and on only the observations and/or conclusions pertaining to its own country.
desertification	Land degradation in arid, semi-arid and dry sub-humid areas brought about by factors such as climatic variations and human activities.
Earth Summit	UN Conference on the Environment and Development (UNCED) held in Rio de Janeiro in 1992. This conference was a major milestone in a global effort to deal with global environmental problems: 105 countries endorsed the Rio Declaration.
ecosystem	A dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit.

ecological integrity	The ability of an ecosystem to function healthily and continue to provide natural goods and services and maintain biodiversity.
endemic	A species or higher taxonomic unit found only within a specific area.
environmental audit	Audit by a SAI of an environmental subject, for example environmental policies or programs, environmental aspects of other government policies and public money related to environmental measures. Environmental auditing can encompass all types of audit: **financial, compliance, and performance** audits.
eutrophication	The increase in additions of nutrients to freshwater or marine systems, which leads to increases in plant growth and often to undesirable changes in ecosystem structure and function. Eutrophication is often a result of **nutrient loading.**
ex-situ conservation	The conservation of components of biological diversity outside their natural habitats, often in such institutions as zoos, museums, botanical gardens, aquariums and gene banks.
extinction	Disappearance of a taxonomic group of organisms from existence in all regions.
financial audit	The audit of financial statements allows the auditor to express an opinion on whether financial statements are prepared, in all material respects, in accordance with an identified financial reporting framework. See also **regularity audit.**
game animals	Wild animals, birds or fish hunted for food or sport.
genetics	The chromosomes, genes and deoxyribonucleic acid (DNA) that determine the uniqueness of each individual and species. Also used to denote the scientific study of heredity.
habitat	The environment in which an animal or plant lives, generally defined in terms of vegetation and physical features.
in-situ conservation	The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.
invasive species	Organisms that enter an ecosystem in which they are not naturally known to exist—through deliberate or inadvertent actions by humans— and thereby pose a threat to native species. Invasive species are also known as alien or exotic species.
IUCN	International Union for Conservation of Nature and Natural Resources. See **World Conservation Union**
joint audit	Audit conducted by one audit team composed of auditors from two or more SAIs, who prepare a single audit report for publishing in all participating countries.
List of Wetlands of International Importance	Each signatory to the Ramsar Convention is obliged to select at least one wetland site for inclusion in the List, in accordance with the Criteria for Identifying Wetlands of International Importance delineated by the Convention.
living modified organism	Any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology.
Millennium Development Goals	In September 2000, 191 countries adopted the United Nations Millennium Declaration that led to the Millennium Development Goals (MDGs). The MDGs are a set of specific targets for poverty reduction, health, education, gender equality, environmental sustainability and global partnerships to be reached by 2015.
nutrient loading	Excess nutrients such as nitrogen and phosphorus compounds come mainly from municipal sewage and farm runoff containing fertilizers and animal waste. When these nutrients are introduced to lakes, rivers, and marine environments, they can cause **eutrophication**.
performance audit	An audit of the economy, efficiency and effectiveness with which the audited entity uses its resources in carrying out its responsibilities.

Ramsar List	See **List of Wetlands of International Importance**
regularity audit	Attestation of financial accountability of accountable entities, involving examination and evaluation of financial records and expression of opinions on financial statements; attestation of financial accountability of the government administration as a whole; audit of financial systems and transactions, including an evaluation of compliance with applicable statutes and regulations; audit of internal control and internal audit functions; audit of the probity and propriety of administrative decisions taken within the audited entity; and reporting of any other matters arising from or relating to the audit that the SAI considers should be disclosed.
resilient (resilience)	The capacity of an ecosystem to return to its original stage after modification or disturbance.
species	A group of organisms capable of interbreeding freely with each other but not with members of other species.
sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
sustainable development goals	**the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect and in order to leave no one behind, it *is* important that we achieve each Goal and target by 2030.**
sustainable use of biodiversity	The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs of present and future generations.
wetland	Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water. Note that the Ramsar Convention on Wetlands; see the box on the Ramsar Convention under section 3.3 of this document.
World Conservation Union	The World Conservation Union (IUCN) is the world's largest conservation network. The Union brings together 82 States, 111 government agencies, more than 800 non-governmental organizations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. The IUCN also publishes a 'Red List' of species threatened with extinction worldwide.
World Heritage List	A list of sites selected by the World Heritage Centre, a branch of United Nations Educational, Scientific and Cultural Organization, forming part of the cultural and natural heritage which the World Heritage Committee considers as having outstanding universal value.

Bibliography

Catalogue of Life – available at: http://www.catalogueoflife.org/annual-checklist/2018/info/totals

Convention on Biological Diversity (1992), (http://www.cbd.int)

Costas, C., Hillel, O., Matus, S., Sweeting, J., *Tourism and Biodiversity: Mapping Tourism's Global Footprint*, 53 pages, (http://www.unep.org/PDF/Tourism-and-biodiversity.pdf), 2003

Dudley, N. (Editor). 2008. *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. x + 86pp. With Stolton, S., P. Shadie and N. Dudley. 2013. *IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21*, Gland, Switzerland: IUCN. Xxpp.

Food and Agriculture Organization of the United Nations (FAO).2016.*Global Forest Resources Assessment 2015: How are the world's forests changing? Second edition.* Available at: http://www.fao.org/forest-resources-assessment

Gullison, R.E., J. Hardner, S. Anstee, M. Meyer. 2015. *Good Practices for the Collection of Biodiversity Baseline Data*. Prepared for the Multilateral Financing Institutions Biodiversity Working Group & Cross-Sector Biodiversity Initiative

Hardner, J., R.E. Gullison, S. Anstee, M. Meyer. 2015. *Good Practices for Biodiversity Inclusive Impact Assessment and Management Planning*. Prepared for the Multilateral Financing Institutions Biodiversity Working Group

Intergovernmental Panel on Climate Change—IPCC *Climate Change 2007: The Physical Science Basis: Summary for Policymakers, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, 18 pages, (http://www.ipcc.ch/SPM2feb07.pdf), 2007

International Union for Conservation of Nature (IUCN). 2017. Annual Report 2016. Full report is available at: https://www.iucn.org/about/programme-work-and-reporting/annual-reports

INTOSAI Working Group on Environmental Auditing (2004): *Results of the Fourth Survey on Environmental Auditing*, 26 pages, (http://www.environmentalauditing.org/intosai/wgea.nsf/viewContainerPub/fourth_survey_environmental_auditing.pdf/$file/fourth_survey_environmental_auditing.pdf), 2003

Merriam-Webster Dictionary. https://www.merriam-webster.com/dictionary/food%20chain

Michael P. Jensen, Camryn D. Allen, Tomoharu Eguchi, Ian P. Bell, Erin L. LaCasella, William A. Hilton, Christine A.M. Hof, Peter H. Dutton. Environmental Warming and Feminization of One of the Largest Sea Turtle Populations in the World. *Current Biology*, 2018; 28 (1): 154 DOI: 10.1016/j.cub.2017.11.057

Millennium Ecosystem Assessment *Ecosystems and Human Well-being: Synthesis*, Island Press, Washington DC, 137 pages, (http://www.millenniumassessment.org/documents/document.356.aspx.pdf), 2005

Millennium Ecosystem Assessment *Ecosystems and Human Well-being: Biodiversity Synthesis*, World Resources Institute, Washington DC, 86 pages. (http://www.maweb.org/documents/document.354.aspx.pdf), 2005

Millennium Ecosystem Assessment (2005): *Ecosystems and Human Well-being: Wetlands and Water—Synthesis*, World Resources Institute, Washington DC, 68 pages, (http://www.maweb.org/documents/document.358.aspx.pdf)

Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Desertification Synthesis*, World Resources Institute, Washington DC, 26 pages, (http://www.maweb.org/documents/document.355.aspx.pdf), 2005

Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Volume 1—Current State and Trends: Findings of the Condition and Trends Working Group*, Edited by Rashid Hassan, Robert Scholes, Neville Ash, Island Press, Washington, DC, 917 pages, (http://www.maweb.org/en/Condition.aspx), 2005

Mulongoy, K.J., Chape, S.P. (Eds), *Protected Areas and Biodiversity Report—An Overview of Key Issues*, 52 pages, (http://quin.unep-wcmc.org/resources/publications/pa_biodiv/), 2004

Neugarten, R.A., Langhammer, P.F., Osipova, E., Bagstad, K.J., Bhagabati, N., Butchart, S.H.M., Dudley, N., Elliott, V., Gerber, L.R., Gutierrez Arrellano, C., Ivanić, K.-Z., Kettunen, M., Mandle, L., Merriman, J.C., Mulligan, M., Peh, K.S.-H., Raudsepp-Hearne, C., Semmens, D.J., Stolton, S., Willcock, S. 2018. *Tools for measuring, modelling, and valuing ecosystem services: Guidance for Key Biodiversity Areas, natural World Heritage Sites, and protected areas*. Gland, Switzerland: IUCN. x + 70pp

Secretariat of the Convention on Biological Diversity, *Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species*, (https://www.cbd.int/decision/cop/default.shtml?id=7197), 2002

Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook 2*, Montreal, 81+vii pages, (https://www.cbd.int/doc/gbo/gbo2/cbd-gbo2-en.pdf), 2006

Secretariat of the Convention on Biodiversity and United Nations Environmental Programme, *Biosafety and the Environment: An Introduction to the Cartagena Protocol on Biosafety*, 20 pages, (http://wedocs.unep.org/bitstream/handle/20.500.11822/9993/cpbs-unep-cbd-en.pdf?sequence=1&isAllowed=y), 2003

Secretariat of the Convention on Biological Diversity. Strategic Plan for Biodiversity 2011-2020,13 pages (https://www.cbd.int/doc/decisions/cop-10/cop-10-dec-02-en.pdf), 2010

Secretariat of the Convention on Biological Diversity. *Global Biodiversity Outlook 3*. Montréal, 94 pages, (https://www.cbd.int/doc/publications/gbo/gbo3-final-en.pdf), 2010.

Secretariat of the Convention on Biological Diversity. *Global Biodiversity Outlook 4*. Montréal, 155 pages. (https://www.cbd.int/gbo/gbo4/publication/gbo4-en-hr.pdf), 2014.

Secretariat of the Convention on Biological Diversity with FAO, World Bank, UN Environment, and UNDP, Technical Note on "Biodiversity and the 2030 Agenda for Sustainable Development, 28 pages (https://www.cbd.int/development/doc/biodiversity-2030-agenda-technical-note-en.pdf), 2016

United Nations, *Addis Ababa Action Agenda of the Third International Conference on Financing for Development (Addis Ababa Action Agenda)*, 61 pages, (https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf), 2015

United Nations Environment Programme, *Global Environmental Outlook-3 (GEO-3)*, 416 pages, (https://wedocs.unep.org/bitstream/handle/20.500.11822/8609/GEO-3%20REPORT_English.pdf?sequence=7&isAllowed=y), 2002

United Nations Environmental Programme, *Global Environmental Outlook (GEO) Yearbook 2006*, 100 pages, (https://digital.library.unt.edu/ark:/67531/metadc28575/m2/1/high_res_d/UNEP_GEO_2006.pdf), 2006

United Nations Environment Programme and the Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals, *Migratory Species and Climate Change: Impacts of a Changing Environment on Wild Animals*, Bonn, Germany, 68 pages, (https://www.cms.int/sites/default/files/document/ScC14_Inf_09_Migratory_Species%26Climate_Change_E_0.pdf), 2006

United Nations, *Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development*, 21 pages (https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%20refinement_Eng.pdf), 2018.

World Conservation Union (IUCN), *Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species*, 25 pages, (https://portals.iucn.org/library/efiles/documents/Rep-2000-052.pdf), 2000

INTOSAI
Working Group
on Environmental
Auditing

www.wgea.org