INTOSAI
Working Group
on Environmental
Auditing

Auditing the Government Response to Climate Change

Guidance for Supreme Audit Institutions

2010

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 environmental auditing issues,
- facilitate exchange of information and experiences among SAIs, and
- publish guidelines and other informative materials.

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Acknowledgements and Foreword

The Intergovernmental Panel on Climate Change (IPCC) states that warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The IPCC also states that it is very likely that global warming is caused by human activity. Climate change is already happening and represents one of the greatest environmental, social and economic threats facing the planet, and both mitigation and adaptation efforts will be necessary to tackle climate change. As all countries will be affected by climate change actions at national level are required. All the countries that have signed the United Nations Framework Convention on Climate Change (UNFCCC) are committed to working constructively for global action to control climate change. Audits are required to contribute to improvements in governments' response to climate change.

This Guide was initiated by the INTOSAI Working Group on Environmental Auditing (WGEA). The mandate for the project was to prepare guidance material on auditing governments' management of climate change. The Guide includes background information, such as a description of sources of greenhouse gas (GHG) emissions, relevant international environmental agreements and domestic programmes; mitigation of GHG emissions, including emissions trading systems; adaptation to the impact of climate change; special considerations for developing countries; and measurement, verification and reporting.

The main objective of the Guide is to encourage Supreme Audit Institutions (SAIs) to conduct climate change audits and to support them in that context. We do hope that this Guide provides the reader with essential key questions and information needed in the planning phase of an effective and goal-oriented climate change audit. Auditing climate change issues is similar to auditing any other environmental topic, but specific climate change knowledge is required to scope the audit in the right way. This Guide is designed to be used as a reference book, as well as a document that can be read chapter by chapter. Essential information from this Guide has also been condensed into an e-learning and a face-to-face course available on the INTOSAI WGEA website.

This document was led by the SAI of Norway. In particular, I would like to thank the authors Kristine Lien Skog (Project Manager), Ragnar Brevik, Kristin Rypdal, Siri Hals Butenschøn, Sissel Iversen, Eirin Fremstad, Camilla Constance Fredriksen and Herdis Laupsa for their hard and excellent work in preparing the paper. Many thanks go also to the numerous other organizations and individuals who contributed to this paper. Similarly, I would like to acknowledge the contributions made by the SAIs worldwide, especially those in the project sub-committee: the SAIs of Australia, Austria, Brazil, Canada, China, Indonesia, Poland, the Russian Federation, Slovenia, South Africa, the Netherlands, the United Kingdom, the United States, Zambia, and Zimbabwe. A special thanks also to the Global Coordinated Audit on Climate Change project, headed by the SAI of Canada, for excellent cooperation and interaction and to the SAI of New Zealand for its editing support. We are also very grateful that the UNFCCC secretariat welcomed our invitation to provide comments and feedback on the guide.

Readers are invited and encouraged to consult this paper as well as information on other WGEA products and services on the INTOSAI WGEA website http://www.environmental-auditing.org/. We hope you will find this Guide useful.

Mihkel Oviir
Auditor General of Estonia
Chair of INTOSAI WGEA

Jørgen Kosmo
Auditor General of Norway
Project Leader

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Executive Summary

Auditing the government's response to climate change is an important exercise. This Guide is, like climate change itself, quite extensive. In this executive summary, we introduce the main information needed to understand the environmental problem and its impacts. We then describe central key questions to be answered by the auditor when planning climate change audits.

What is climate change?

Climate change is described as one of the biggest environmental challenges of this century. According to the Intergovernmental Panel on Climate Change (IPCC), scientists have now very high confidence that greenhouse gas (GHG) emissions from human activities has an overall net warming effect in national and joint statements.

More specifically, the IPCC's Fourth Assessment Report, from 2007 states that the warming of the climate system is unequivocal. This is evident from observations that show:

- An increase in average air and ocean temperatures
- An increase in the average global sea level
- Widespread melting of ice and snow
- Changes in weather, such as wind patterns, the amount and type of precipitation, and frequency of severe weather events.

Impacts of climate change

The IPCC has also assessed how climate change might impact on society, the environment and on the economy. Climate change will have wide-ranging effects on the natural ecosystems and socio-economic sectors. Settlements and societies that live in areas prone to climate change and that are dependent on scarce resources are particularly vulnerable to the impacts on climate change.

Potential climate changes impacts:

- Water resources:
  - Reduction in quality and quantity of freshwater supplies;
- Agriculture and food supply:
  - Changes in crop yields
  - Increased irrigation demands;
- Ecosystems and biodiversity:
  - Loss of habitats and species;
- Human health:
  - Weather-related mortality
  - Infectious diseases
  - Air quality respiratory illnesses;
- Flooding due to sea level rise and extreme weather events.

Adaptation and mitigation

Climate change mitigation involves taking actions to reduce GHG emissions and to enhance sinks aimed at reducing the extent of global warming.

Climate change adaptation involves taking action to moderate the harm or exploit benefits caused by the actual or expected effects of global warming.

Extensive emission cuts are needed to reduce the negative impacts of climate change. At the same time, extensive action is needed to adapt to present and expected future changes. Historically, human caused GHG emissions have been directly related to our economic growth and welfare, along with extensive use of fossil fuels. Therefore, it is challenging to reduce the GHG emissions. The negative impacts of climate change will mostly be experienced in developing countries, where it is challenging to adapt.

The most central audit criteria

The United Nations Framework Convention on Climate Change (UNFCCC or the Convention) is the main global response to the challenge of climate change. The Convention and its Kyoto Protocol spell out a number of commitments for Parties, and are consequently a good start for auditors when looking for climate change specific audit criteria.

The Guide extracts and describes the following commitments:

- All Parties [shall formulate], implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions
- All Parties [shall] develop, periodically update, publish and make available … national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases … using comparable methodologies
- All Parties [shall] facilitate adequate adaptation to climate change [and] cooperate in preparing for adaptation to the impacts of climate change
- All Parties, including Non-Annex I Parties, shall establish plans for activities aimed at adaptation to the adverse effects of climate change
- All Parties [shall promote] and cooperate in the development, application and diffusion, including transfer of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases
- All Parties to the UNFCCC shall promote research, systematic observation and development of data archives with a view to reducing uncertainty about the causes and

[1] A carbon sink is a reservoir that accumulates and stores some carbon-containing compounds for an indefinite period. The main natural sinks are absorption of carbon dioxide by the oceans, and photosynthesis by plants and algae.

effects of climate change
- [The] developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under [the Convention]

Also, the Guide describes some audit criteria that are useful when auditing compliance with climate change performance:

- Criteria on good governance:
  - Effective accountability arrangements
  - Transparency in decision-making
  - Involving the public and engaging stakeholders
  - Management by objectives and results;
- Criteria on good management: internal control systems.

Key questions when planning climate change audits

This Guide leads the auditor through all the phases needed to understand, identify and design climate change audits. The planning stage when scoping an audit is often based on a certain research process. In this Guide, the process is structured as a four-step process, incorporating several key questions that are posed to the auditor. These questions are described and illustrated in each Step. The four Steps are given for both mitigation audits and adaptation audits.

The four Steps for planning mitigation audits are:

- Step 1: Identify the emissions
  - What are the overall trends and projections for GHG emissions?
  - What are the main sources of GHG emissions?

- Step 2: Map the government's response in mitigating climate change
  - What are the international mitigation commitments?
  - What are the national targets for mitigating GHG emissions?
  - Which are the relevant responsible public bodies, and what are their roles and responsibilities?
  - What are the key policy instruments for reducing GHG emissions?

- Step 3: Choose audit topics and priorities
  - Are targets and objectives being achieved? (Effectiveness risk analysis)
  - Are there risks related to the use of policy instruments? (Effectiveness risk analysis)
  - Is the government doing things in the right way? (Efficiency risk analysis)
  - Are the financial resources misstated? (Efficiency risk analysis)
  - Does the government focus on keeping the costs low? (Economy risk analysis)
  - What should be the overall audit objectives?
- Step 4: Design the audit
  - Will the government meet its emissions targets or commitments?
  - Are policy instruments effective?
  - Is the governance of the climate change response efficient?

The following key questions might be useful when planning adaptation audits:

- Step 1: Get an overview of the country's vulnerability to climate change
  - What are the actual and potential impacts of climate change?
  - What is the adaptive capacity?
  - What is the vulnerability to climate change?

- Step 2: Map the government's response in adapting to climate change
  - What are the objectives and targets of adaptation policies?
  - What are the policy instruments for adaptation?
  - Who are the public players and what are their roles and responsibilities?

- Step 3: Choose audit topics and priorities
  - Has the government assessed the key vulnerabilities in a proper manner? (Efficiency risk analysis.)
  - Has the government developed an efficient over plan or strategy? (Efficiency risk analysis.)
  - Has the government addressed the need for climate change action in the most vulnerable sectors and areas? (Efficiency risk analysis.)
  - Are the financial resources misstated? (Efficiency risk analysis.)
  - Are the appropriate actions being carried out to adapt to the identified vulnerabilities? (Effectiveness risk analysis.)
  - Is the government focusing on keeping the costs of adaptation as low as possible? (Economy risk analysis.)
  - What should be the audit objectives?

- Step 4: Design the audit
  - Have the responsible ministries identified the climate change-related threats?
  - Does the government have in place an overarching policy, plan or strategy?
  - Is the adaptation governance efficient?
  - Are policy instruments effective?

The Guide also describes relevant sources for further reading, case studies illustrating audits done by a range of countries and lessons learned (these are highlighted in separate boxes). In the appendices, the auditor can find examples of mitigation and adaptation audits, design matrices, a description of the UNFCCC review process and a glossary.

Chapter 1: Introduction

1.1 A GLOBAL CHALLENGE

Governments around the world have confronted the global challenge of climate change through international commitments. The Intergovernmental Panel on Climate Change (IPCC) has stated that warming of the climate system is unequivocal and very likely caused by an observed increase in the concentration of human-induced greenhouse gases (GHGs) in the atmosphere.[2] Furthermore, the increase in global average air and ocean temperatures will have an overall negative impact on human beings, ecosystems, and the species they contain. Climate change also contributes to challenges such as decreases in the quality and quantity of fresh water and to a more uneven distribution of food resources.

The UN Development Programme (UNDP) considers climate change to be the greatest global challenge of this century, as increased exposure to droughts, floods and storms is already limiting opportunities and reinforcing inequalities.[3] The detailed potential impacts of climate change and the probability and degree of confidence among scientists, can be found in the IPCC's Fourth Assessment Report.

Climate change is a natural process, but it is the recent rapid changes induced by human activity that have made the issue so important. So far, climate change has mainly been caused by emissions from developed countries. Yet, it is the developing countries that have felt the consequences of climate change the hardest. Further complexity arises from the fact that most climate change scenarios show increases in GHG emissions from developing countries.

It is now firmly established that both mitigation and adaptation efforts will be necessary to tackle climate change.[4] The extent of the consequences of climate change and the future course of human development will depend on the action taken now and in the years ahead.

The IPCC's Assessment Reports

The Intergovernmental Panel on Climate Change (IPCC), the leading body for the assessment of climate change, was established by the United Nations Environment Programme and the World Meteorological Organization to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences.

The four assessment reports published by the IPCC form the scientific basis for this guide. The most recent report, the fourth, was published in 2007.

For more information about the IPCC, see its website, www.ipcc.ch, where most of its reports can be downloaded.

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 and aims at stabilising GHG concentrations "at a level that would prevent dangerous anthropogenic interference with the climate system".[5] The Convention is the main international response to climate change, having been signed by almost 200 countries. The Kyoto Protocol to the UNFCCC was adopted in 1997.[6] It commits the developed countries to stabilise their GHG emissions by establishing legally-binding quantified emissions targets. The UNFCCC also commits its Parties (Member Countries) to promoting and preparing for adaptation. Future climate change negotiations may result in even stricter commitments for Annex I Parties, more specific commitments for non-Annex I Parties, and specific commitments for funding and technology transfer that should be considered as audit criteria in future audits.

2 IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010], pp. 30-31.
3 UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.
4 Mitigation in the climate change context refers to implementing policies to reduce GHG emissions and to enhance sinks. Adaptation refers to an adjustment of natural or human systems in response to actual or expected stimuli and their effects. Both definitions are from the IPCC Fourth Assessment Report glossaries: mitigation from Appendix I of the Contribution of Working Group III, adaptation from Appendix I of of the Contribution of Working Group II.
5 UNFCCC, 1992. The United Nations Framework Convention on Climate Change. [Online] Available at unfccc.int/essential_background/convention/background/items/2853.php [Accessed 12 April 2010].
6 UNFCCC, 1998. The Kyoto Protocol. [Online] Available at unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 12 April 2010]

1.2 AUDITING CLIMATE CHANGE IS IMPORTANT

The main objective of this Guide is to inspire and support Supreme Audit Institutions (SAIs) to conduct more audits of governments' climate change response. By helping SAIs to understand the risks involved, and by illustrating ways of designing audits, this Guide can contribute to effective and goal-oriented audits. This, in turn, may contribute to improving government performance and management.

The general cost-effectiveness of early action is stated in the Stern Review on the Economics of Climate Change. According to this review, the benefits of strong, early action considerably outweigh the costs.[7] Climate change is a field of urgent importance, where new initiatives are being continually established. A large and growing amount of money will be spent globally on reducing emissions, enhancing sinks and adapting to climate change.

SAIs can play an important role in helping governments improve their performance and management. It is against this background that SAIs should carry out audits of governments' current climate change responses. Climate change involves a wide range of risks that make it particularly relevant to auditors, for example, risks related to goal attainment, policy instruments and transparency. Several audits are conducted or under development from all over the world, for example the INTOSAI WGEA Cooperative International Audit on Climate Change. Climate change audits address different risks, and provide useful information and tips on how to audit climate change issues.

Auditing a government's response to climate change is similar to auditing other environmental issues. Environmental audits require a deep understanding of the environmental threats and their impacts on the economy, society and the environment. This understanding is the first step when identifying relevant environmental audits in general and also when planning climate change audits. Also, the complexity of GHG emissions and their impacts, as well as the cross-sectoral organisational structure and policy instruments, make certain specific knowledge crucial in relation to succeeding in climate change auditing.

In this Guide, we will apply existing audit skills and methodology, including financial, compliance and performance approaches, to the topic of climate change. Relevant information for auditors on mitigation and adaptation issues is therefore described in detail, with references to further information, if available.

1.3 CONTENT AND STRUCTURE OF THE GUIDE

First, the auditor will find a chapter on the background to climate change (Chapter 2). It provides an overview of climate change: what it is, its causes, and how it can threaten ecosystems and human beings. This knowledge is offered in order to understand essential key questions when planning the audit.

Audit criteria for climate change policy are then presented (Chapter 3), including international audit criteria (including the UNFCCC and its Kyoto Protocol), for setting standards for national responsibility and action against climate change. This Chapter also gives general knowledge about good governance and good management (including accountability, transparent decision-making, and internal control systems), that also contribute to the audit criteria framework.

An SAI can choose to conduct both mitigation and adaptation audits. Each SAI must consider the relevance of both approaches. This Guide presents the adaptation and mitigation audit approaches in separate Chapters; this is because there are important differences in the way governments handle mitigation and adaptation policy and, consequently, in choosing the most appropriate audit approach. A methodological framework is therefore applied when planning mitigation issues (Chapter 4) and when planning adaptation issues (Chapter 5), which will help the auditor when designing climate change audits. Although a separate description and analysis is needed for mitigation and adaptation issues, it is still possible to conduct one audit that covers elements from both. For instance one audit could consider climate change mitigation and adaptation funding, or synergies and conflicts between national mitigation and adaptation policies.

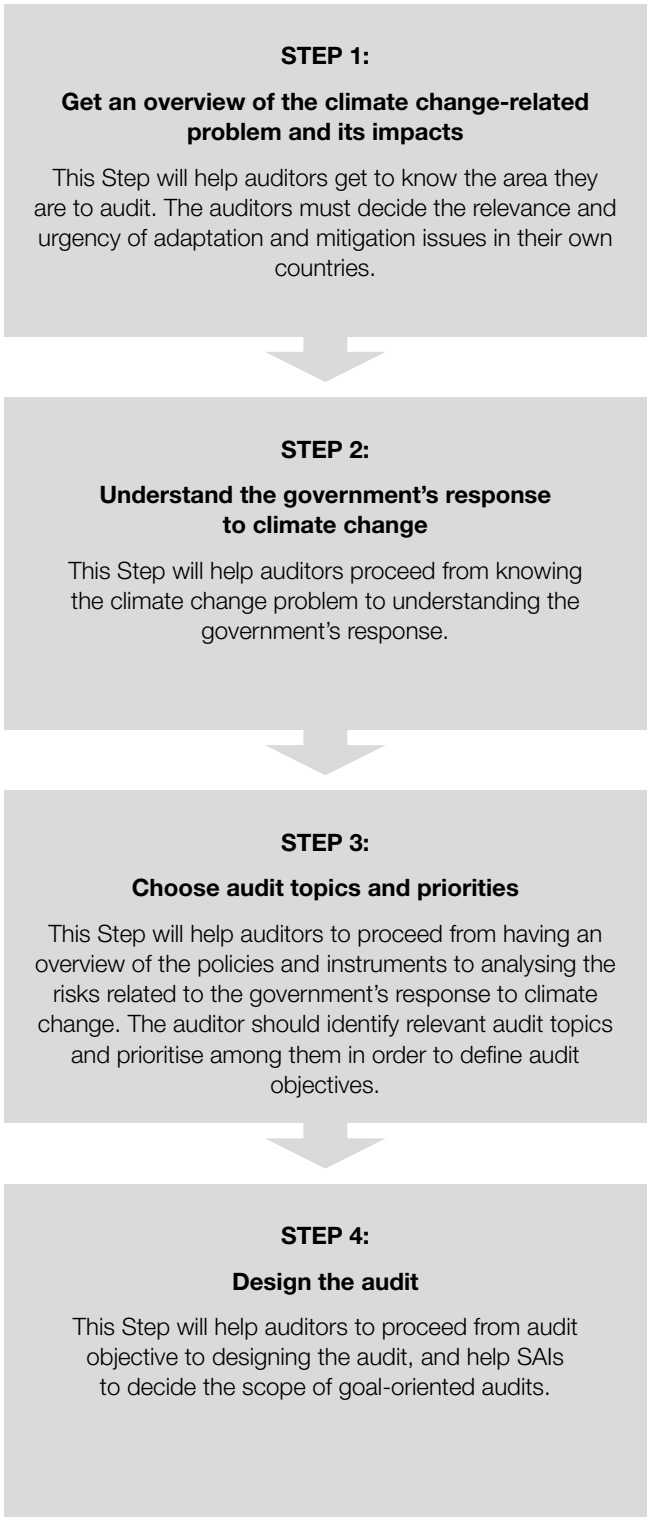
Climate change mitigation and adaptation requires strong, coherent and coordinated actions throughout government, the economy and the whole society. The auditor needs to clearly understand all these aspects before scoping the audit. This Guide sets out a step-by-step process for describing different actions and considerations relevant when planning and designing climate change audits (see Figure 1.1).

All four Steps should be included in the planning stage of an audit, but how an audit is done in practice may differ for a number of reasons, for example:

- Depending on knowledge about climate change, it may be relatively straightforward to identify the climate change threats and the government response in Steps 1 and 2; if the auditors are unfamiliar with climate change policy, this may require more thorough consideration.
- Time and access to internal and external resources will influence how much and what kind of information the auditors are able to gather in the planning stage.
- Whether the SAI has the mandate and authority to conduct the audit, and thereby what kind of information it is relevant to consider in the planning stage.

[7] N. Stern, 2006. The Economics of Climate Change The Stern Review. Cambridge: Cambridge University Press.

Figure 1.1
The four-Step approach to designing climate change audits



- The four-step process is not necessarily sequential, and the Steps may overlap. For example, when scoping audits, it may be necessary to collect supplementary information on identified risk areas.

Risk assessment is a key tool used in Step 3 and a design matrix is a planning tool used to design the audit in Step 4.

This Guide includes several Appendices containing examples of different climate-change audit approaches, including their main findings and the methods used. The Appendices also contain examples of design matrices and further information on the UNFCCC review process, as well as a glossary list.

Lesson learned:
Document the planning process

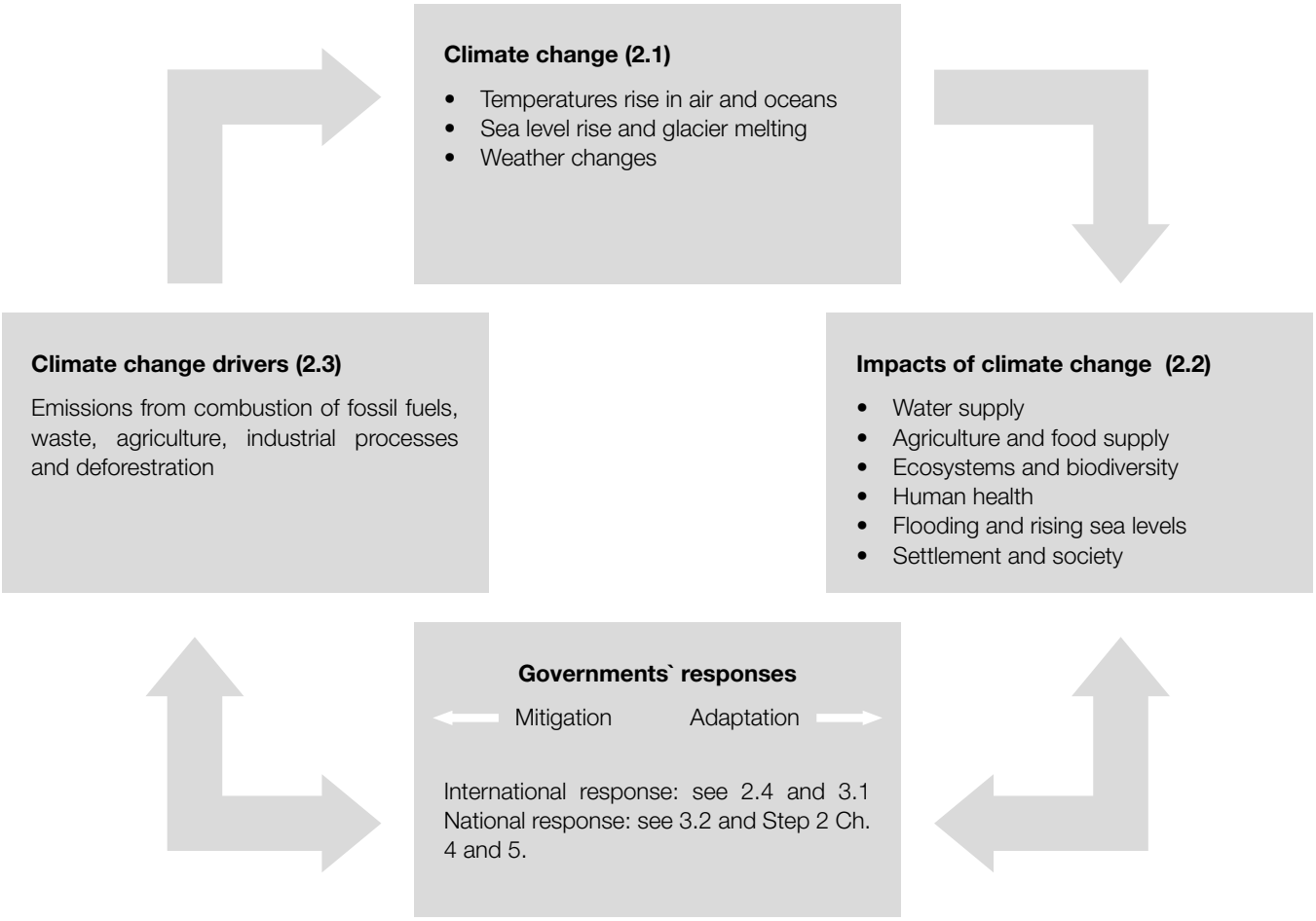
The auditor must adequately plan and document the planning of the work needed to address the audit objectives. This could be done while conducting a preliminary study.

Chapter 2:
Background to climate change

The IPCC's Fourth Assessment Report states that it is very likely that most of the rise in temperature during the last 50 years is caused by GHG emissions from human activity. Furthermore, it is assumed that rising temperature and climate change will have a large impact on biodiversity, human health, food production, freshwater supplies and many other areas.[8] These impacts will have significant economic, social and environmental effects.

This Chapter is organised into four main sections. The first describes the evidence of climate change as presented by the IPCC. Section 2.2 describes the impacts of climate change, and Section 2.3 highlights the causes of anthropogenic climate change. Finally, Section 2.4 presents the main international response to climate change, the United Nations Framework Convention on Climate Change (UNFCCC). Figure 2.1 shows the relationship between the sections.

Figure 2.1
Climate change drivers, indicators and impacts



Source:
IPCC, 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Online] Available at www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html [Accessed 12 April 2010]

[8] IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

2.1 WHAT IS CLIMATE CHANGE?

A climate is defined as the average weather observed during a period of time. We speak of climate in terms of local, regional and sometimes even global weather. Climate change occurs when the climate deviates from the average climate during a long time period.[9]

The IPCC's Fourth Assessment Report states that the warming of the climate system is unequivocal. This is evident from observations that show:[10]

- An increase in average air and ocean temperatures
- An increase in the average global sea level
- Widespread melting of ice and snow
- Changes in weather, such as wind patterns, the amount and type of precipitation, and frequency of severe weather events.

2.1.1 Temperature rise in air and oceans

From 1906 to 2005, the global mean temperature increased by 0.74 degrees Celsius. Especially in recent years, the mean temperature has increased substantially since the recording of global temperatures started around 1850. A total of 20 of the 21 warmest registered years have occurred during the last 25 years. The rise in global mean temperature during the last 50 years has been twice as great as during the last 100 years.[11]

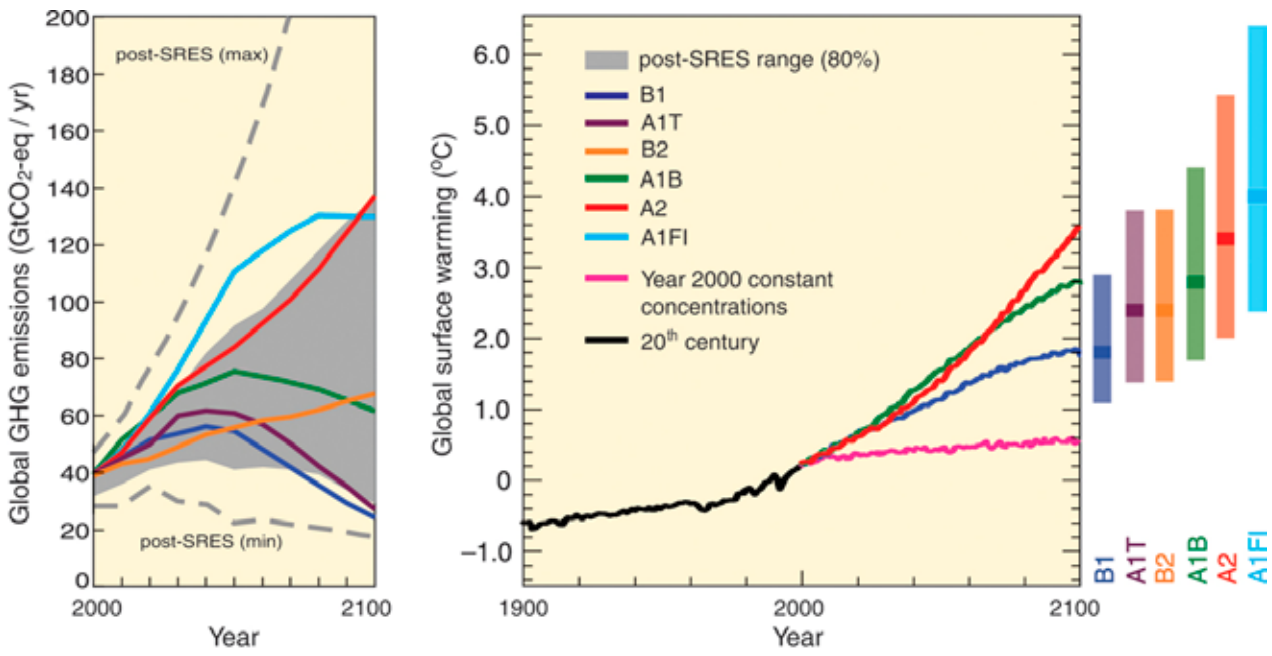
The IPCC Report states that the temperature increase is widespread throughout the globe, but higher in the northern latitudes. It is expected that inland regions will generally warm faster than oceans and coastal zones. The main rise in ocean temperature is in surface water, but new scientific findings show that the global average ocean temperature has increased down to depths of at least 3,000 metres.

If no climate change policies were implemented to reduce emissions, climate models predict a global warming of about 1.8 to 4 degrees Celsius between 1990 and 2100.[12] Even a 1.4 degrees Celsius rise would be greater than in any century time-scale trend for the past 10,000 years. Figure 2.2 illustrates different scenarios of global GHG emissions and averages of surface warming, based on 20th Century simulations. All temperatures are relative to the period 1980-1999.

The left panel in Figure 2.2 illustrates different scenarios of GHG emissions described as coloured lines, and the range of scenarios are marked as gray shaded area. The emissions include all types of GHGs. In the right Panel, the black line is the 20th century simulations of surface temperatures. Coloured lines are different scenarios shown as continuations of the 20th-century simulations. The pink line is a simulation where atmospheric consentrations of GHG-emissions are held at values in 2000. The bars at the right of the figure indicate the likely range assessed for the six different scenarios of expected global GHG emissions at 2090-2099.

According to the IPCC, when it comes to regional and seasonal warming patterns, projections become much more uncertain. Most areas are expected to warm, but the cold northern regions are expected to experience the greatest warming during winter. The reason is that snow and ice reflect sunlight. Less snow means more heat is absorbed from the sun; this

Figure 2.2
Scenarios for GHG emissions from 2000 to 2100 (in the absence of additional climate policies) and projections of surface temperatures



Source:
IPCC, 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Online] Available at www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html [Accessed 12 April 2010]

[9] See Appendix I: Glossary in B. Metz et al., eds., 2007. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.
[10] IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010].
[11] IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.
[12] These projections are based on a wide range of assumptions about the main forces driving future emissions, such as population growth and technological change; see IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010].

results in increased warming. By the year 2100, winter temperatures in northern Canada, Greenland and northern Asia are predicted to rise by 40 per cent more than the global average.

2.1.2 Sea level rise and glacier melting

As the upper layers of the oceans warm, water expands and the sea level rises. Increased temperatures also cause glaciers to melt; this too causes the sea level to rise. The IPCC reports that the mean sea level has risen by nearly 20 centimetres during the 20th Century. Models suggest that a warming of 0.6 degrees Celsius would result in the observed sea level rise to date.

In 2007, IPCC forecasted a sea level rise of 18 centimeters to 59 centimeters by 2100. This would mainly be caused by the thermal expansion of the upper layers of the ocean as they warm, with some contribution from melting glaciers. The uncertainty range is large, and changing ocean currents, local land movement, and other factors will cause local variations compared to the global average. The IPCC's Fourth Assessment Report states that the contraction of the Greenland ice sheet is predicted to continue contributing to sea level rise after 2100. If this contraction is sustained for centuries, it may lead to the virtually complete disappearance of the Greenland ice sheet. If this were to happen, that Greenland melted ice, by itself, would cause sea levels to rise by about seven metres.[13]

According to the IPCC's Fourth Assessment Report (WGI), snow cover has declined by about 10 per cent since the late 1960s at mid and high latitudes in the Northern Hemisphere. It is also very likely that the annual duration of lake and river ice cover has shortened by about two weeks during the 20th Century. Almost all recorded mountain glaciers in non-polar regions have retreated during this period as well. In recent decades, the extent of Arctic sea ice in the spring and summer has decreased and the Arctic sea ice has thinned.

2.1.3 Changes in weather

Many regions of the world are experiencing increasing amounts of precipitation. However, there are large regional differences. For example, an increase of 0.5 – 1 per cent per decade has been measured in most mid- and high-latitude areas in the Northern Hemisphere, accompanied by a two per cent increase in cloud cover. Precipitation over tropical land areas have increased by 0.2 to 0.3 per cent per decade, while a decline in precipitation of about 0.3 per cent per decade during the 20th Century has been observed in sub-tropical land areas (10 to 30°N) in the Northern Hemisphere. The frequency and intensity of droughts in parts of Africa and Asia is expected to be greater than the global average.[14]

IPCC states that global precipitation is predicted to increase, but local trends are much less certain. By the second half of the 21st Century, it is likely that winter precipitation will rise in northern mid to high latitudes and in Antarctica. For the tropics, models suggest that some land areas will see more precipitation, and others less. Australia, Central America and Southern Africa show consistent decreases in winter rainfall. Climate models also consistently show extreme precipitation events becoming more frequent in many areas.

The frequency and intensity of extreme weather events such as storms and hurricanes is likely to continue to increase. There is now higher confidence in the projected increases in droughts, heat waves and floods, as well as in their adverse impacts.[15]

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[13] J. A. Lowe et al., 2006. "The Role of Sea-Level Rise and the Greenland Ice Sheet in Dangerous Climate Change: Implications for the Stabilisation of Climate". In H. J. Schnellnhuber et al., eds., Avoiding Dangerous Climate Change. Cambridge: Cambridge University Press.

[14] S. Solomon et al., eds., 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

[15] IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

2.2
IMPACTS OF CLIMATE CHANGE

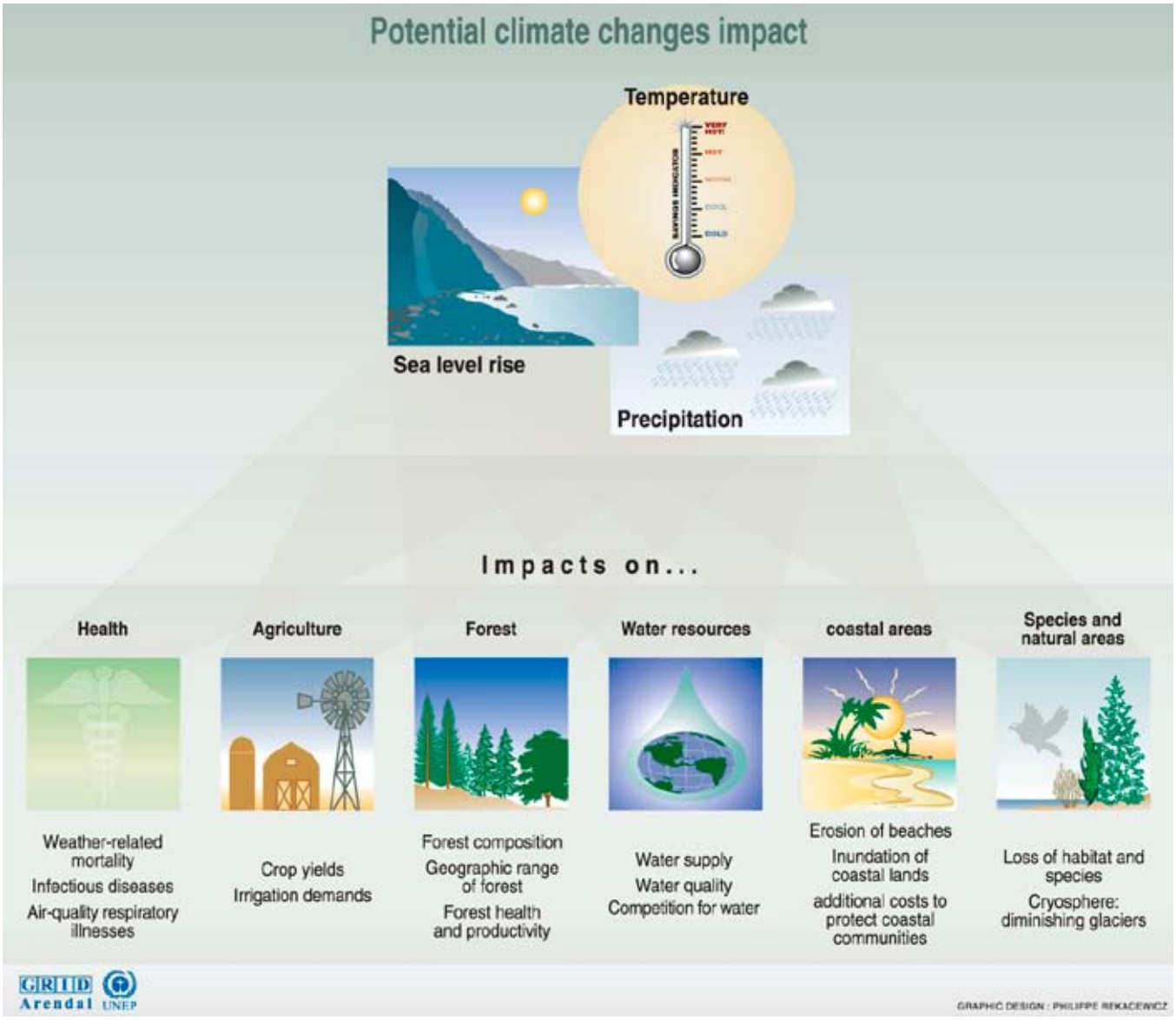
"We have heard the warnings. Unless we act, now, we face serious consequences. Polar ice will melt. Sea levels will rise. A third of our plant and animal species could vanish. There will be famine, particularly in Africa and Central Asia."

UN Secretary General Ban Ki-moon

Climate change will have wide-ranging environmental, socio-economic and other effects, as illustrated in Figure 2.3 below. This includes impacts on water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity, and coastal zones. It must be emphasised that the impacts of climate change often exacerbate already existing stresses (e.g., making dry zones hotter and dryer).

Climate change is often only one of the causes underlying environmental stress. The systems that are already dependent on scarce resources are the ones most vulnerable to climate change impacts. In this sense, climate change not only influences environmental concerns, but directly adds to them.

Figure 2.3
Potential climate change impacts



Source:
UNEP/GRID-Arendal, 2000. Potential climate change impacts. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at maps.grida.no/go/graphic/potential-climate-change-impacts [Accessed 12 April 2010][16]

[16] GRID-Arendal is an official United Nations Environment Programme (UNEP) collaborating centre.

2.2.1 Water resources

Changes in precipitation and ice melting can lead to severe water shortages in some parts of the world. Saltwater intrusion from rising sea levels will reduce the quality and quantity of freshwater supplies in many places in the world. According to the UNFCCC, higher ocean levels are already contaminating underground water sources. The areas most affected are located in Israel and Thailand, and in various small island states in the Pacific and Indian Oceans and the Caribbean Sea. Some of the world's most productive deltas are also experiencing poorer water quality, such as China's Yangtze Delta and Vietnam's Mekong Delta. In South Asia and the Middle East, groundwater levels are falling rapidly.[17]

According to the IPCC, the extent of drought-affected areas is likely to increase in the future. If this occurs, droughts will be more frequent, and there will be problems due to changed patterns of rainfall and runoff. Increased exposure to drought is of particular concern in sub-Saharan Africa, but South Asia, Australia and Latin America may also be affected.[18] In addition to water shortages, droughts can have other effects such as forest fires.

Reduced access to water resources affects all sectors and regions. Billions of people already lack access to fresh water, so this is a major concern.[19] Combined with an increase in other factors that put pressure on water resources, such as population growth and industrial development, climate change will have a marked impact on the distribution and availability of water.[20] Reduced flows in rivers can also have negative impacts on, for instance, hydroelectric production.

2.2.2 Agriculture and food supply

The projected effect of climate change on agriculture and food supply varies a great deal between different regions of the world. In the northern part of the world, the IPCC describes an expectation of increased agricultural production due to increased temperature. However, at lower latitudes, and in tropical and dry regions in particular, we can expect a decrease in crop productivity. Rising temperatures and changes in precipitation will also cause shifts in crop growing seasons, particularly in sub-Saharan Africa, Eastern Asia and South Asia.[21]

The effect of climate change on agricultural production is expected to vary. United Nations Development Programme states that in developed countries, productivity is expected to grow and the growing season will be extended, at least in response to a small rise in temperature. By contrast, developing countries will face decreased production. Globally, we may experience overall growth in production, but food resources are expected to be even more unevenly distributed than today.[22]

Sub-Saharan Africa is one of the poorest and most rainfall-dependent regions in the world. Agricultural producers have limited resources already. This makes them vulnerable to even minor shifts in rainfall patterns and temperature. This can lead to increased malnutrition and reduced opportunities for reducing poverty (see also Figure 2.4).

The increasing frequency of heavy precipitation events in most areas of the world is expected to result in more damage to crops and more soil erosion. Water logging in high-latitude winters may also be an increasing problem because of more rain and snow. On the other hand, higher temperatures may mean drier soil in summer. Local changes in soil moisture are clearly important to agriculture, but the IPCC concludes that it is still difficult to create models that simulate them accurately.[23]

17 UNFCCC, n.d. Future effects. [Online] Available at unfccc.int/essential_background/feeling_the_heat/items/2905.php [Accessed 9 March 2010].
18 IPCC, 2007. M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press
19 UNFCCC, n.d. Future effects. [Online] Available at unfccc.int/essential_background/feeling_the_heat/items/2905.php [Accessed 9 March 2010].
20 UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.
21 IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press
22 UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.
23 See also, C. Nellemann et al., 2009. The environmental food crisis: The environment's role in averting future food crises. A UNEP Rapid Response Assessment. [Online] Available at www.grida.no/publications/rr/food-crisis/ebook.aspx [Accessed 10 April].

2.2.3 Ecosystems and biodiversity

Species distribution tends to follow their climate zone. When the climate zones change, so does the spread of species. Changes in migratory patterns, flowering seasons and the distribution of flora and fauna have been already detected throughout the world.[24]

Potentially, temperature increases could severely increase rates of species extinction and the destruction of habitats. The extinction risk rate for plants and animals is estimated to be 20-30 per cent if the global rise in temperature exceeds 1.5 to 2.5 degrees Celsius.[25] Coral reefs, boreal forests, and Mediterranean and mountain habitats are expected to be especially affected. Different species will extend their habitat at the expense of other species, whereas others may die out because of changes in the basis for their existence. Most of the world's endangered species, probably 25 per cent of mammals and 12 per cent of birds, may become extinct during the next few decades. This is because warmer conditions alter the forests, wetlands, and rangelands that birds and mammals depend on, combined with the fact that human development prevents them from migrating elsewhere.[26]

Corals are vulnerable to temperature fluctuations. Even a small temperature rise is expected to lead to bleaching of corals and widespread mortality. This mortality has already begun. In the same time, coral reefs are vital for sustaining of many fish stocks. If coral reefs collapse, the food supply and livelihood of many people will be affected. The UNDP reports that most of the 30 million small-scale fishers in the developing world are dependent in some form on coral reefs to maintain fish feeding and breeding grounds. Moreover, 400 million poor people who live in tropical costal areas get more than half of the protein and essential nutrients in their diets from fish.

2.2.4 Human health

Millions of people are likely to be affected by climate change. An increase in malnutrition and ensuing health problems is expected. This has particular implications for child growth and development. Heat waves, floods, storms and other extreme weather events are likely to cause an increase in deaths, disease and injuries.[27] Climate change and altered weather patterns would affect the range, intensity, and seasonality of many major tropical vector-borne and other infectious diseases, such as malaria and dengue fever; these diseases already kill one million people annually, most of them children. There is also expected to be an increased burden of diseases that result from floods, droughts and storms, like cholera and diarrhoea.[28]

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2.2.5 Flooding and coastal areas

Rising sea levels are expected to have serious impacts in coastal areas, including erosion. A rise in sea levels means more storm surges, flooding and wave damage to coastlines. Island states and countries with low-lying deltas are especially vulnerable to rising sea levels. According to the IPCC, this effect will be made even worse by increasing human-induced pressures in these areas.[29] Flooding may also have an impact on infrastructure, food supplies, biodiversity and water quality.

The melting of glaciers and ice caps reduces water availability and affects seasonal flows in regions supplied by melt water from mountain ranges[30], but it can also cause flooding and soil erosion, as well as rising sea levels.

By the 2080s, due to rising sea levels, the number of people affected by floods is expected to increase by many millions. The largest numbers of people affected will be in densely populated and low-lying mega-deltas in Asia and Africa, but small islands are also particularly vulnerable. For instance, Indonesia's Environment Minister, Rachmat Witoelar, warned in January 2007 that his country – comprising about 17,000 islands where millions depend on fishing and farming – could lose 2,000 small islands by 2030 due to a rise in sea levels as a result of climate change.[31]

The UNDP states that in sub-Saharan Africa, by 2020, between 75 million and 250 million more people could have their livelihoods and human development compromised by a combination of rising temperature, increased water stress, and drought.[32]

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24 See UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.

25 IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

26 See UNFCCC, n.d. Future effects. [Online] Available at unfccc.int/essential_background/feeling_the_heat/items/2905.php [Accessed 9 March 2010].

27 IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

28 See, for instance, R. B. K. Singh, 2001. The Influence of Climate Variation and Change on Diarrheal Disease in the Pacific Islands. Environmental Health Perspectives [Online] 109 (2), pp. 155-159. Available at www.ehp.niehs.nih.gov/members/2001/109p155-159singh/singh.pdf [Accessed 12 April 2010].

29 IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010], p. 48.

30 More than one-sixth of the world's population currently lives in these areas; see IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press, p.11.

31 Quoted in H. Reid et al., 2007. Up in Smoke? Asia and the Pacific. The threat from climate change to human development and the environment. The fifth report from the Working Group on Climate Change and Development. [Online] Available at www.iied.org/pubs/pdfs/10020IIED.pdf [Accessed 12 April 2010], p. 56.

32 See UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.

2.2.6
Settlement and society

As shown above, climate change already has and will continue to affect many areas and systems, such as coastal areas, human health, biodiversity, agriculture and freshwater supplies. These effects may be direct or indirect. Extreme weather events, for example, will directly impact the most vulnerable industries, settlements and societies. This particularly applies to those who live in coastal and river flood plains, those whose economies are closely dependent on climate-sensitive resources, and those in areas prone to extreme weather events - especially places also experiencing rapid urbanisation.[33]

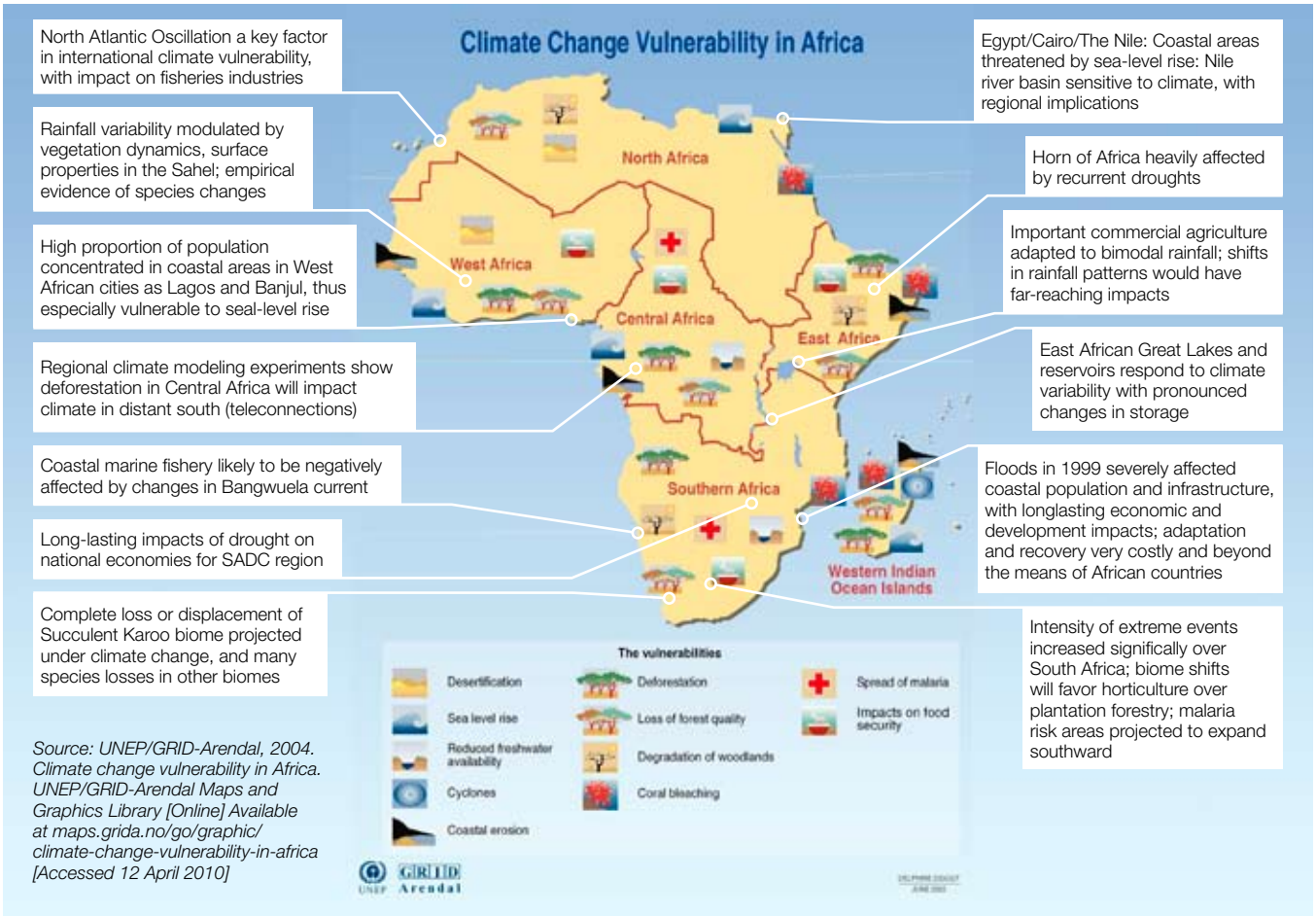
Fresh water shortages may lead to mounting conflicts about water access, streams of refugees and a reduced livelihood for many people. Rising sea levels and reduced food productivity may also undermine livelihoods and add to pressures leading to forced migration. This, in turn, may lead to huge changes in demographic and economic patterns and land use. In general, these indirect effects will bring about the most serious consequences in those societies already facing huge stresses such as drought, water shortages and other pressures on people's livelihoods.

Climate change will affect societies world-wide. The main impact of climate change is a result of its interaction with other non-climate sources of change and stress. Although all parts of the world are expected to be affected to some extent by climate change, vulnerability and the ability to adapt are unevenly distributed. Vulnerability to climate change is dependent on the geographical, social and sector context. Some areas are high-risk locations, for example, coastal and riverside areas.[34]

Locations dependent on water supplies and some combination of agriculture, forestry and tourism will be highly affected by climate change. The economic and social costs of climate change (for instance, extreme weather events) will increase, and poor communities in high-risk areas are expected to be most vulnerable. These communities also tend to be the ones least able to adapt. Therefore, it seems that the risk of overall monetary damage is often greater in industrialised areas, but the risk of total human damage is often greater in less developed areas.[35]

Figure 2.4 shows different aspects of the challenge Africa faces: multiple stresses make most of Africa highly vulnerable to environmental changes, and climate change is likely to further increase this vulnerability. This Figure shows the regions of Africa most vulnerable to specific impacts of climate change.

Figure 2.4
Climate change vulnerability in Africa



Source: UNEP/GRID-Arendal, 2004. Climate change vulnerability in Africa. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at maps.grida.no/go/graphic/climate-change-vulnerability-in-africa [Accessed 12 April 2010]

33 IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010].
34 IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press
35 L. Berstein, 2007. Industry. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

2.3 CLIMATE CHANGE DRIVERS: WHAT CAUSES CLIMATE CHANGE?

The world's climate has always varied considerably during long periods of time. This is due to natural changes in solar radiation, changes in the Earth's orbit and volcanic activity. Yet, the reason why climate change is the subject of increasing international attention is that there is now very good reason to believe that the rapid and increasing climate changes we are facing today (described in Section 2.1) are caused by human activity creating increased GHG emissions.

2.3.1 Greenhouse gases (GHGs)

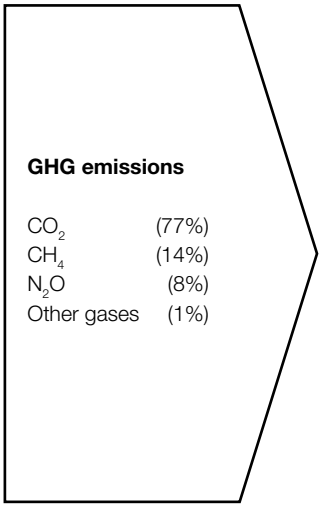
Anthropogenic emissions (emissions related to human activity) of GHGs have significantly affected the climate system. GHGs are a natural part of the ecosystem. GHGs from human activities create a surplus of GHGs in the atmosphere. This will in turn increase the amount of heat captured in the atmosphere. Figure 2.5 gives a sector-by-sector overview of human activities influencing the amount of GHGs in the atmosphere (this is discussed further in Section 2.3.3).

The way the climate has changed during the 20th Century is consistent with what we would expect from an increase in GHGs and aerosols. The IPCC's Fourth Assessment Report concludes that there is new and stronger evidence that most of the warming observed during the last 50 years is attributable to human activities. Box 2.1 provides an overview of the main GHGs. It also explains how GHG emissions can be commonly expressed in carbon dioxide equivalents.

As long as GHG levels keep rising, the climate will continue to change. The temperature will probably rise further in spite of any future emission reductions, because the GHGs remain in the atmosphere for a very long period of time and the response of the climate system is slow.

Figure 2.5
World human produced greenhouse gas emissions by sector

Sector			End use / Activity	
Energy	Transportation	13.5%	Road	9.9%
			Air	1.6%
			Rail, ship and other transport	2.3%
	Electricity and heat	24.6%	Residential buildings	9.9%
			Commercial buildings	5.4%
			Unallocated fuel combustion	3.5%
	Other fuel combustion	9%	Iron and steel	3.2%
			Aluminium/Non-Ferrous metals	1.4%
			Machinery	1.0%
	Industry	10.4%	Pulp, paper and printing	1.0%
			Food and tobacco	1.0%
			Chemicals	4.8%
	Fugitive emissions	3.9%	Cement	3.8%
			Other industry	5.0%
			Transmission and distribution emission losses	1.9%
	Industrial processes	3.4 %	Coal mining	1.4%
			Oil/ Gas extraction, refining & processes	6.3%
	Land Use Change	18.2%	Deforestation	18.3%
			Harvest/ Management	2.5%
			Afforestation	-1.5%
			Reforestation	-0.5%
			Other	-0.6%
	Agriculture	13.5%	Agricultural energy use	1.4%
			Agricultural soils	6.0%
			Livestock & Manure	5.1%
			Rice cultivation	1.5%
			Other agriculture	0.9%
	Waste	3.6%	Landfills	2.0%
			Wastewater, other waste	1.6%



Note:
All data are for 2000. Land use change includes both emissions and absorptions; absorption is indicated by negative digits. The Figure is based on UNEP/GRID-Arendal, 2009. World Greenhouse Gas Emissions by Sector. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at maps.grida.no/go/graphic/world-greenhouse-gas-emissions-by-sector2 [Accessed 12 April 2010]

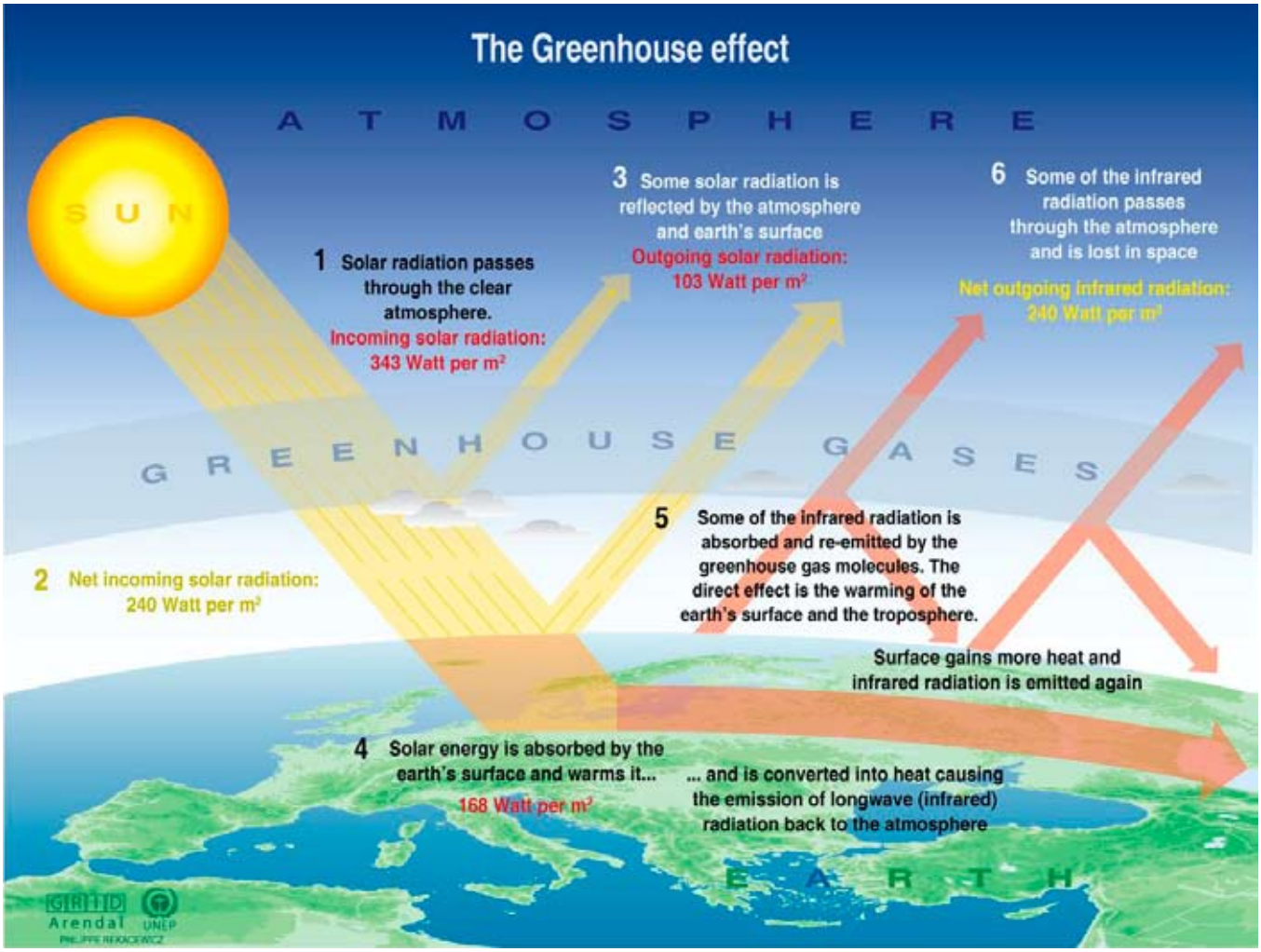
Box 2.1
Greenhouse gases

GHGs and their sources *Carbon dioxide* (CO_2) is mainly emitted from the combustion of fossil fuel and deforestation. It contributes about 80 per cent of the total emission of anthropogenic GHGs. ***Methane*** (CH_4) is mainly released by landfills, agriculture and rice cultivation. Sources of ***nitrous oxide*** (N_2O) include chemical fertilisers, industrial processes and the burning of fossil fuels.

There are also other gases and aerosols influence the climate. For example, groups of synthetic chemicals to be sources of GHGs: ***sulphur hexafluoride*** and ***perfluorocarbons*** (PFCs) used in products or emitted as a by-product of industrial processes, and ***hydrofluorocarbons*** (HFCs) used as replacements for ozone-depleting substances.

CO_2-equivalents and global warming potential. The GHGs differ in their radiative properties and lifetime. For ease of comparison, non-carbon dioxide emissions of GHGs are expressed in CO_2 equivalents to indicate their contribution to global warming, the so-called global warming potential (GWP). GWP is used as a standardised measure when comparing different GHGs. For example, one tonne of methane is equivalent to 21 tonnes of carbon dioxide. Because the gases differ in how long they remain in the atmosphere, these values are normally based on the effect integrated during the first 100 years after the emission year (100 year GWP).

Figure 2.6
The greenhouse effect



Source:
UNEP/GRID-Arendal, 2002. Greenhouse effect. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at maps.grida.no/go/graphic/greenhouse-effect [Accessed 12 April 2010]

2.3.2
The greenhouse effect

The greenhouse effect is a natural phenomenon that regulates the temperature on Earth. Without the presence of GHG in the atmosphere, the Earth would release the same amount of energy back into space as it would have got from the sun. GHGs, which constitute less than one per cent of the atmosphere, keeps the Earth's surface warm. It does this by absorbing and retransmitting outgoing infrared energy from the Earth's surface, heated itself by solar radiation. Natural GHGs include water vapour, carbon dioxide, methane, nitrogen oxide and ozone. Without any greenhouse effect, the average temperature on Earth would be -18 degrees Celsius; at present, the average temperature is 15 degrees Celsius.[36] Figure 2.6 illustrates the greenhouse effect.

Since the pre-industrial age, the concentration of carbon dioxide in the atmosphere has increased by about 31 per cent, methane by 141 per cent and nitrous oxide by 17 per cent. This increase has intensified the greenhouse effect.[37]

2.3.3
The carbon cycle: sinks and sources

The Earth's four major reservoirs of carbon are the atmosphere, the terrestrial biosphere, the oceans, and sediments (including fossil fuels). The carbon cycle is the cycle by which carbon is exchanged between these reservoirs. This cycling of carbon is a prerequisite for life on Earth.

About half of the carbon dioxide released into the air by human activity has been absorbed by the land and oceans. The processes, regions or systems that absorb GHGs are called sinks. Sinks are important as they influence the total quantity of greenhouse gases in the atmosphere. Any reduction in their capacity will increase global warming. The oceans and the photosynthesis carried out by vegetation on land and in the oceans are natural sinks. Forest constitutes the primary sink for carbon dioxide, as young trees can absorb a lot of carbon dioxide during many years. Humans may affect this sink, e.g., through forestry. Another example of a sink is the injection and storage of carbon dioxide in geological reservoirs.

Human activities influence the carbon cycle and the amount of carbon in the reservoirs. Important examples are increased carbon dioxide in the atmosphere caused by the burning of fossil fuels, and deforestation. Flows from fossil fuel reservoirs to the atmosphere constitute around 80 per cent of the anthropogenic contribution to increased carbon dioxide in the atmosphere. On the other hand, through forest management, human activities can enhance the sink of carbon dioxide (see Figure 2.5 for an overview of human activities influencing the amount of GHGs in the atmosphere).

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Some changes are rapid, for example, the release of carbon dioxide into the atmosphere during a deforestation process, while other processes, such as the exchange of carbon from the atmosphere to the deep ocean, are very slow. About 50 per cent of the increase in carbon dioxide in the atmosphere is removed within 30 years, while about 20 per cent may remain in the atmosphere for many thousands of years.[38]

The huge number of interactions between the different carbon reservoirs makes the modelling of the carbon cycle very complex. The net balance of change in vegetation is uncertain. There is still considerable discussion about estimating the quantities of GHGs absorbed from the atmosphere from agricultural and land use change activity. Consequently, the auditor should be aware of these potential complexities and sources of uncertainty if using modelled projections of GHG emissions and removals or considering how the government is responding to them.

[36] See climate projections at myclimate, 2010. Greenhouse effect [Online] Available at www.myclimate.org/en/information-climate-tips/facts-about-climate-change/role-of-humans/greenhouse-effect.html [Accessed 10 March 2010].

[37] Schimel, D. Alves, I. Enting, et al , Radiative Forcing of Climate Change. in Houghton JT, Meira Filho LG, Callander BA, et al. (eds), Climate Change 1995. The Science of Climate Change, The Contribution of WGI to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press.

[38] IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

2.4 THE MAIN INTERNATIONAL RESPONSE

"Yet those to suffer most from climate change will be in the developing world. They have fewer resources for coping with storms, with floods, with droughts, with disease outbreaks, and with disruptions to food and water supplies. They are eager for economic development themselves, but may find that this already difficult process has become more difficult because of climate change."[39]

Any consideration of the causes and effects of climate change highlights the need to mitigate GHG emissions. But even with major reductions in emissions, we will still be facing future changes in the climate. This necessitates international and national efforts to mitigate and adapt to climate change in all sectors and countries.

The UNFCCC was adopted in 1992 at the UN Conference on Environment and Development, also known as the Rio Conference. Most of the countries in the world are parties to the Convention, which makes it one of the most important international environmental treaties.[40] The Kyoto Protocol is a protocol to the UNFCCC. It was adopted in 1997. The Protocol is aimed at establishing a first step towards achieving the main objective of the Convention: to stabilise GHG emissions from human activities. The Protocol establishes emission targets for the Annex I Parties - industrialised countries and countries in transition (see Box 3.1 for a description of the various Parties). The Convention came into force in 1994, and the Protocol came into force in 2005. The rules for the fulfilment of the Protocol for the first commitment period (2008-2012) were agreed upon in the Marrakesh Accords. Progress under the UNFCCC is summarised in Table 2.1.

Table 2.1
Timeline for key UNFCCC events[41]

Year	Outcome
1992	UN Conference on Environment and Development (Rio de Janeiro, Brazil): **United Nations Framework Convention on Climate Change**
1997	**Kyoto Protocol:** outlines legally-binding commitments to cut emissions for Annex I Parties
2001	**Marrakesh Accords:** spell out more detailed rules for the Protocol (e.g., for technology transfer and the flexible mechanisms) and prescriptions for implementing the Convention (concluded a cycle of negotiations, including the Buenos Aires Plan of Action and the Bonn Agreements)
2005	The Kyoto Protocol enters into force
2007	**Bali Action Plan:** launches a process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action
2008	Start of the five-year commitment period under the Kyoto Protocol (2008-2012)
2009	**The Copenhagen Accords**

[39] See UNFCCC, n.d. Future effects. [Online] Available at unfccc.int/essential_background/feeling_the_heat/items/2905.php [Accessed 9 March 2010].
[40] UNFCCC, 2007. Uniting on Climate: A guide to the Climate Change Convention and the Protocol. Bonn: UNFCCC.
[41] For a more thorough review of the process, see UNFCCC, 2004. The Ten First Years. Bonn: UNFCCC; and UNFCCC, 2007. Uniting on Climate: A guide to the Climate Change Convention and the Protocol. Bonn: UNFCCC.

Chapter 3:
Audit criteria for climate change policy

In this Chapter, three kinds of audit criteria suitable for auditing climate change policy will be presented: international agreements, criteria for good governance, and criteria for good management.

3.1 INTERNATIONAL AGREEMENTS: UNFCCC AND THE KYOTO PROTOCOL

The United Nations Framework Convention on Climate Change (UNFCCC or the Convention) is the main global response to the challenge of climate change. The Convention and its Kyoto Protocol spell out a number of commitments for Parties, and it is in these agreements that we must start looking for audit criteria.[42]

The UNFCCC is based on the principle of "common but differentiated responsibilities". The developed or industrialised countries should "take the lead" in modifying anthropogenic emissions in the long term.[43]

The different Parties are described in Box 3.1.

Box 3.1
Annex I and Annex II Parties

- Annex I Parties are those countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, and a number of countries defined as economies in transition (EITs).*
- Annex II Parties are a sub-group of the Annex I countries. They include the members of the OECD, but not the EITs.
- Non-Annex I Parties are all other countries which are Party to the UNFCCC. They also include the least-developed countries and other countries especially vulnerable to the adverse impacts of climate change.
- The Annex I and II Parties are listed in the Convention (in Annex I and II); the same grouping of Parties is also used in the Kyoto Protocol.

* Countries undergoing the process of transition to a marked economy under the UNFCCC are Belarus, Bulgaria, Croatia, Estonia, Latvia, Lithuania, Romania, Russian Federation, Slovenia and Ukraine.

More specifically, the Annex I Parties have to take on more responsibility than the non-Annex I Parties:

1. First, they shall help developing countries to meet their commitments
2. Secondly, they shall take the first steps towards reducing GHG emissions (this second point was also included in the Kyoto Protocol).

The commitments under the Convention are of a general nature. They are not country-specific or time-bound. There is one exception, however: reporting to the UNFCCC Secretariat. The Convention establishes rules for the timing of national communications for both Annex I and non-Annex I Parties and inventory submissions from Annex I Parties, as explained below.

The emission targets established by the Kyoto Protocol are binding for all Annex I Parties which have ratified the Protocol. The Protocol specifies emission targets for each Party. It also has a set time frame: the first commitment period runs from 2008 to 2012.[44] Parties to the Protocol who do not fulfil their commitments within the period can, according to the Protocol, be subject to economic sanctions.

The following Section explains the commitments from both the Convention and the Protocol as they relate to monitoring and reporting, mitigation, adaptation, technology, funding, and research.

3.1.1 Mitigation commitments

The Convention commits all Parties to adopt programmes containing measures to reduce anthropogenic emissions of GHGs and enhance and maintain sinks. The developed countries have a further commitment of adopting mitigation policies that show that they are taking the lead in modifying longer-term trends in anthropogenic emissions.

> *"All Parties [shall formulate], implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions."*
>
> (The Convention, Article 4, paragraph 1.b and e)

42 As of 12 April 2010, 194 countries have signed and ratified the Convention, see unfccc.int/essential_background/convention/status_of_ratification/items/2631.php. 190 countries have ratified the Protocol, see unfccc.int/kyoto_protocol/background/status_of_ratification/items/2613.php. Only Parties that have ratified the Convention can be a Party to the Protocol. The Protocol has not been ratified by the United States and its commitments therefore do not apply to the USA.

43 The Convention, Article 4, paragraph 2.a.

44 Member Parties not in compliance with their targets can be held to account by a Compliance Committee. It can impose a penalty of 30 per cent of a Party's emission target to be made up for in the subsequent period.

While the objective of the UNFCCC is a long-term target, the Kyoto Protocol has a short-term and measurable target. The Protocol contains a set of legally-binding emissions targets for industrialised countries. The aggregated target for all Annex I Parties is a reduction of at least 5 per cent from 1990 levels by 2008-2012.[45] The Protocol thus establishes binding, quantifiable reduction targets for Annex I Parties (see Table 3.1).[46]

Table 3.1
Reduction targets (2008-2012) for Annex I Parties (in per cent)

Party	Emissions target (Kyoto)	Emissions target (EU)	Party	Emissions target (Kyoto)	Emissions target (EU)
Australia	+8		Liechtenstein	-8	
Austria	-8	-13	Lithuania	-8	
Belgium	-8	-7,5	Luxembourg	-8	-28
Bulgaria	-8		Monaco	-8	
Canada	-6		Netherlands	-8	-6
Croatia	-5		New Zealand	0	
Czech Republic	-8		Norway	+1	
Denmark	-8	-21	Poland	-6	
Estonia	-8		Portugal	-8	+27
European Union	-8		Romania	-8	
Finland	-8	0	Russian Federation	0	
France	-8	0	Slovakia	-8	
Germany	-8	-21	Slovenia	-8	
Greece	-8	+25	Spain	-8	+15
Hungary	-6		Sweden	-8	+4
Iceland	+10		Switzerland	-8	
Ireland	-8	+13	Ukraine	0	
Italy	-8	-6,5	United Kingdom	-8	-12,5
Japan	-6		United States	-7* (not ratified)	
Latvia	-8				

Source:
UNFCCC, 1998. The Kyoto Protocol. [Online] Available at unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 12 April 2010]; Commission of the European Communities, 1999. Preparing for the Implementation of the Kyoto Protocol. Communication from the Commission to the Council and the European Parliament. COM(1999)230 final. Brussels

The use of national policy measures

In order to achieve the reduction targets, the Kyoto Protocol commits Annex I Parties to make use of a number of national policies and measures, including:

- increased energy efficiency
- protection and enhancement of sinks of GHGs
- promotion of sustainable forms of agriculture
- development of new technologies
- phasing out of market imperfections in all GHG emitting sectors
- limitation of GHG emissions from the transport sector
- the limitation of methane emissions.[47]

Annex I Parties shall also cooperate to improve the effectiveness of these policies and measures. They will also endeavour to implement them in a way that minimises the effects on other Parties and, in particular, on countries that are particularly vulnerable to the adverse effects of climate change.[48]

The use of international policy instruments

In order to contribute to a cost-effective fulfilment of the Protocol, the use of international economic policy tools is permitted. These tools are generally referred to as the flexible mechanisms and they include Joint Implementation (JI), Clean Development Mechanism (CDM) and emissions trading.[49] The flexible mechanisms mean that GHG emissions can have an economic value. Normally, this value is expressed as the value of a tonne of carbon dioxide or CO_2 equivalents (see Box 2.1 in Chapter 2). The market determines the price of one tonne of carbon dioxide. Using these mechanisms is voluntary. However, if a country chooses to make use of them, there are certain procedures and rules that can be used as audit criteria.

The mechanisms can be used to meet the emissions targets, but they can only supplement domestic action.[50] A country's implementation of the Protocol is reviewed by a Compliance Committee's facilitative branch. However, the facilitative branch has no sanctioning powers.

The Clean Development Mechanisms (CDM) system enables Annex I Parties[51] under the Kyoto Protocol to invest in projects that reduce expected GHG emissions in developing country Parties.[52] In return for their investment, they get credits in the form of certified emission reductions (CERs). The financing and recipient Parties decide on how to share the credits from the project. The Parties can use the credits to offset their

> *"The purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3"*
>
> (The Protocol, Article 12.)

45 The base year for some countries is different from 1990.
46 We return to EU climate change policies in Chapter 4.
47 See the Protocol, Article 2, paragraph 1.
48 See the Convention, Article 4, paragraph 8 for a list of these groups of countries.
49 It should be pointed out that this concerns trading between Parties, not companies.This policy instrument will be described in Chapter 4, Step 2 on mitigation.
50 UNFCCC (2001). Marrakesh Accords & Marrakesh Declaration. [Online] Available at: unfccc.int/cop7/documents/accords_draft.pdf [Accessed 11 April 2010].
51 The investor can, in practice, be the government of a country or a company from an Annex I country with a cap on GHG emissions. For more information, see the section on the ETS.
52 See the Kyoto Protocol, Article 12.

own GHG emissions, save them for a subsequent period, or sell them. Sustainable development is stated in the Kyoto Protocol as a goal of CDM, alongside assisting Annex I Parties in achieving compliance with their commitments.

The projects must qualify for registration and issuance of the credits, a process which is regulated by the CDM Executive Board, an international board under the United Nations. In order to be considered for registration as a CDM project, a Designated Operational Entity in the host country, named by the Executive board, must approve the project.

Conditions that must be fulfilled to be registered as a CDM project by the Executive Board include:

- Approval of the project and affirmation that the project meets the country's criteria for sustainability by a Designated National Authority in the host country
- The project must be "additional" which means:
  - Investment in a CDM project must be additional to the financing and technology transfer commitments of Annex II Parties
  - A CDM project cannot be profitable without the investment of an Annex I Party
  - GHG emissions after the CDM project must be lower than they would have been without a CDM-registered project
  - Voluntary participation by parties involved
- 2 per cent of the CERs generated must go to an Adaptation Fund.

For the finished project to be confirmed, the project developer is required to measure the emissions reductions, and the reductions must be verified by an independent controller. Once a year verified credits (CERs) are issued by the Executive Board and transferred from the projects to the project owners (investor).

The Joint Implementation (JI) mechanism works in a very similar way to CDM in that it offers an opportunity for Annex I countries to invest cost-effectively in another country. Under JI, however, both the financing and recipient countries are Annex I Parties with emission targets under the Protocol. JI projects generate emission reduction units.

Yet another kind of credits generated under the flexible mechanisms is removal units. These units are generated on the basis of land use, land-use change, and forestry activities such as reforestation. These activities also mitigate climate change, and therefore the credits can according to specific rules be used to meet targets set under the Protocol.

Emissions trading under the Protocol can take place between countries. Some regions/countries have established separate emissions trading schemes that are consistent with the Kyoto requirements (for example, the EU Emissions Trading Scheme, see later in this Section. Emissions trading between countries can be a way of fulfilling a country's commitment under the Protocol.

Under the Protocol, there is a reserve of allowed emissions distributed among the countries as assigned allowance units (AAUs). It must be noted that AAUs, or permits in emissions trading schemes, are not the same as credits generated through the previously mentioned activities. Although the amount of credits or projects can be unlimited, and can be used to meet targets, there is only a limited amount of allowances in a certain emissions trading scheme, or under the Protocol.

> *"The parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments […]. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments"*
>
> (The Protocol, Article 17.)

Establishing of emissions trading schemes is done to facilitate emissions trading with other countries and between companies. Normally, such schemes are established in national law or legislation. Rules established under such legislation can also include provisions for verification and control.

An example of an emission trading scheme is The European Union Emission Trading System (EU ETS), a market mechanism for trading emission allowances within the EU. Through establishing a ceiling on total GHG emissions within the EU, a corresponding number of emission allowances are distributed between the countries. Companies get (free or through an auction) emission allowances based on their historic emissions. The EU ETS aims to reduce emissions by setting a monetary value on the right to emit one tonne of CO_2-equivalents, and making this right tradable to ensure cost-effectiveness. Companies that emit less GHGs than their allowances permit can sell surplus allowances. Conversely, companies that emit more GHG than their allowances permit must buy allowances. The companies report back to their national authorities in order to verify that emission allowances are being used or emission reductions have taken place.

3.1.2 Monitoring and reporting commitments for mitigation

All Parties must submit national communications containing information about GHG emissions and removals and implementation activities. Annex I Parties must also submit annual GHG inventories.

Both the Convention and the Protocol have established systems for monitoring and reporting. All Parties must follow the reporting requirements of the Convention, whereas the Kyoto reporting only applies to the Annex I Parties who have ratified the Protocol. The reporting requirements of the Convention build on the IPCC Guidelines for National Greenhouse Gas

> *"All Parties [shall] develop, periodically update, publish and make available … national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gasses … using comparable methodologies."*
>
> (The Convention, Article 4, paragraph 1.a)

Inventories and Good Practice Guidance (the latest Guidelines were produced in 2006). The Guidelines provide specific and detailed methodological guidance for each sector, as well as general principles.[53]

Annex I Parties reporting requirements

National communications and annual inventories are required to be submitted by the Annex I Parties to the Convention Secretariat.[54] They are then subject to separate in-depth and technical reviews.

For Annex I Parties, national communications were due six months after the Convention entered into force for that Party and every four years thereafter.

Also, Annex I Parties are required to submit annual inventories of anthropogenic GHG emissions by sources and removals by sinks.

The Kyoto Protocol establishes a more comprehensive reporting and accounting system than the Convention. To ensure compliance with the emission targets and the functioning of the flexible mechanisms, a Kyoto Protocol accounting system has been established. This system comprises:[55]

- National systems for the estimation of GHG emissions and removals
- Reporting requirements (national communications and annual reports) and review procedures
- A Compliance Committee.

Each Annex I Party must also establish a national registry for its holdings in tradable units. A transaction log is maintained by the Convention Secretariat. The log is used to verify transactions of tradable units.[56]

The enforcement branch of the Compliance Committee decides if a Party is in compliance with the Protocol's methodological and reporting requirements and the Party's emissions commitments. If a Party fails to meet its reporting requirements, it can be suspended from participating in the Kyoto mechanisms.

Appendix C describes the UNFCCC review process in more detail.

Non-Annex I Parties reporting requirements

Reporting requirements of non-Annex I Parties include consideration of their own resource situation, and any financial assistance they get from Annex II Parties. The first national communication from non-Annex I Parties was due three years after the entry into force of the Convention for that Party or three years after financial resources were made available. These Parties do not need to submit annual inventories.

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53 IPCC, n.d. Taskforce on National Gas Inventories. [Online] Available at www.ipcc-nggip.iges.or.jp/ [Accessed 12 April 2010].
54 For a thorough review of the Compliance Committee, see UNFCCC, n.d. Compliance under the Kyoto Protocol. [Online] Available at unfccc.int/kyoto_protocol/compliance/items/2875.php [Accessed 30 March 2008]; and UNFCCC, 2007. Uniting on Climate: A guide to the Climate Change Convention and the Protocol. Bonn: UNFCCC.
55 See UNFCCC, 2007. Uniting on Climate: A guide to the Climate Change Convention and the Kyoto Protocol. UNFCCC.
56 The CDM Executive Board maintains a CDM registry for non-Annex I Parties participating in CDM projects.

3.1.3 Adaptation commitments

> *"All parties [shall] facilitate adequate adaptation to climate change [and] cooperate in preparing for adaptation to the impacts of climate change."*
>
> *"All Parties, including Non-Annex I Parties, shall establish plans for activities aimed at adaptation to the adverse effects of climate change."*
>
> (The Convention, Article 4, paragraphs 1e and 5)

The obligations of international climate change agreements with respect to adaptation are fewer and less specific than those for mitigation. Member Parties to the Convention have no legally-binding commitments for adaptation. However, least developed countries are offered assistance to prepare and implement National Adaptation Programmes of Action (NAPA). These action plans focus on immediate adaptation needs. Guidance on adaptation is provided through the Nairobi Work Programme (NWP) formulated by the UNFCCC, which can be regarded as an appropriate framework for establishing good practice for national adaptation strategies.

The NWP's objective is to improve Parties' understanding and assessment of the impacts of climate change and countries' vulnerability to these impacts. This, might enable them to make informed decisions about practical adaptation measures. Key actions to this end include impact and vulnerability assessments, data collection and analysis, modelling, and adaptation assessments. Adaptation strategies should be based on sound scientific, technical and socio-economic assessments, as well as relevant experience (domestic and, if appropriate, from other countries)

Annex II Parties to the Convention are obliged to provide financial assistance to help developing countries to prepare for adaptation. Three funds where established for this purpose: the Adaptation Fund under the Kyoto Protocol, the Special Climate Change Fund and the least Developed Countries Fund under the Convention.

3.1.4 Commitments on technology, funding and research

Development and transfer of technology

> *"All Parties [shall promote] and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases."*
>
> (The Convention, Article 4, paragraph 1.c)

The UNFCCC commits all Parties to cooperate on developing and transferring technology that can control GHG emissions. Furthermore, developed countries shall take all practicable steps to promote, facilitate and finance the transfer of environmentally sound technologies.[57] It is highlighted that developed and developing countries must cooperate to make sure that technologies are not only transferred but also made accessible, in the sense that know-how and capacity must be enhanced in recipient countries.

The development and transfer of technology is a theme in the Marrakesh Accords. A framework was established for "meaningful and effective action" to meet the technology requirements under the Convention. This framework focuses on assessing technology needs, establishing an efficient information system, and removing barriers to technology transfer and capacity building.

Scientific research

> *"All Parties to the UNFCCC shall promote research, systematic observation and development of data archives with a view to reducing uncertainty about the causes and effects of climate change."*
>
> (The Convention, Article 4, paragraph 1.g)

Scientific research is related to two interlinked yet different areas. One is climatology, which focuses on understanding climatic change;[58] the other is environmental science, which emphasises measuring impacts and changes in ecosystems and human systems.

Also, Article 5 of the Convention stipulates activities Parties to the Convention shall carry out in order to fulfil their commitments related to scientific research. This includes supporting and developing international and intergovernmental efforts to conduct, assess and finance research, data collection and systematic observation, as well as strengthening research capacities and capabilities. These efforts are required to take into account the particular needs of developing countries.[59]

Funding

> *"[The] developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligation under [the Convention]'."*
>
> (The Convention, Article 4, paragraph 3)

Annex II Parties to the Convention are obliged to provide financial assistance to the developing countries. In order to assist the developing country Parties, particularly the least-developed countries and small island developing states, new and additional funds should be made available. Funds can be provided through multilateral channels or as development assistance.

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57 The Convention, Article 4, paragraph 5.

58 By climatology we mean an interdisciplinary science that includes atmospheric science, ceanography, geophysics, geography, glaciology and others.

59 This is also in line with the message of the UNFCCC, Uniting on climate. Common concerns about the knowledge of climate change include the need to increase developed countries' participation in climate observation networks in developing countries, and the deterioration of climate observation systems in many regions.

60 According to the Bali Action Plan; see UNFCCC, 2007. Bali Action Plan. Decision 1/CP.13. [Online] Available at unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3 [Accessed 12 April 2010].

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3.1.5 The Copenhagen Accords and global climate change agreements after 2012

Ongoing negotiations are taking place under the UNFCCC to reach a global agreement on future climate commitments. The negotiations have taken place along two parallel tracks, one an extension of the Kyoto Protocol, the other discussing a possible new global treaty involving long-term commitments that could also include specific commitments for developing countries.[60] The second track also included policy approaches and positive incentives related to reducing emissions from deforestation and forest degradation in developing countries, as well as enhanced action on adaptation and technology development and transfer. Both tracks aimed at reaching an agreement by the end of 2009.

The Parties to the Convention met in Copenhagen in December 2009, but failed to reach agreement on specific commitments. However, the majority of Parties reached a more general agreement – the Copenhagen Accord.

The Copenhagen Accord includes the following elements:

- To work to limit global warming to 2 degrees Celsius, but no deadlines were set.
- That deep cut in emissions are required to reach this target, and to cooperate on achieving a peak in global and national emissions as soon as possible. Annex I Parties submitted quantified emission targets for 2020 in early 2010. Non-Annex I Parties will submit a set of mitigation actions for implementation. This is voluntary for the least developed countries and small island states.
- Developed countries will provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries. Developed countries agreed by the Copenhagen Accord to provide new, additional resources, including forestry and investments through international institutions. These new, additional resources involve funding of almost USD 30 billion for the period 2010-2012, with allocations balanced between adaptation and mitigation. The developed countries will jointly mobilise USD 100 billion dollars a year by 2020 to address the needs of developing countries. A burden sharing is yet to be negotiated.
- That non-Annex I Parties will report national inventories and mitigation actions every second year through their national communication.

The Copenhagen Accord was not adopted by all the UNFCCC Parties, and the work continues to reach a global agreement on future climate commitments. Future climate change negotiations may result in stricter commitments for Annex I Parties, more specific commitments for non-Annex I Parties, and specific commitments for funding and technology transfer that should be considered as audit criteria in future audits.

3.2 CRITERIA FOR GOOD GOVERNANCE

In this Section, we introduce relevant aspects of good governance that can serve as norms and standards when auditing national governance in the climate change field.[61] The presentation of these criteria will include examples of both adaptation and mitigation.

We concentrate on general processes and systems that contribute to good governance, and thereby to achieving climate change targets. These criteria for good governance are relevant evaluation tools when auditing mitigation and adaptation issues, as shown in Steps 3 and 4 in Chapters 4 and 5.

3.2.1 Effective accountability arrangements between government departments and public entities

Climate change policy involves a wide range of sectors with considerable potential for conflicting objectives and targets. It is very important, therefore, to coordinate efforts to ensure that the policy as a whole is effective. One possible audit criterion is whether the government has organised its work on climate change in a way that makes for effective accountability.

First, the government must have a good overview of the parties and agencies involved, and a clear and documented responsibility map. Procedures for coordination must be documented and a forum for inter-sectoral work established.

Secondly, the efforts of the different sectors and players must be complementary, not conflicting. This means that there must be coordination in practice, not just on paper. There are many risks to the success of such coordination, for instance, if the body responsible for reaching the targets does not have the authority to apply central policy instruments. However, it is acknowledged that the optimal way of coordinating the efforts will vary between countries with different climate change issues, political structures and so on.

3.2.2 Transparency in decision-making

Transparency in decision-making is important, as it will probably lead to an open process. Transparency makes it possible to check that the government complies with laws and keeps the public interest in mind. A lack of transparency carries a risk of fraud and corruption, for instance in connection with the use of flexible mechanisms.[62]

3.2.3 Involving the public and engaging stakeholders

To succeed in climate change policy, it is necessary to involve groups that have relevant knowledge as well as those affected when the politics/policies are implemented.[63] Effective communication with external parties is also important.[64]

3.2.4 Management by objectives and results

If your country has international or national targets for mitigation, adaptation or science and technology, reaching these targets will often depend on implementation by central, regional and local government. This is especially important in the context of climate change because the issue is so complex, and because there are many interlinked players and different sectors. The legislature may have set requirements for the government administration that require it to manage by objectives and results.

According to such principles of governance, the government should:[65]

1. **Define objectives and expected results**

   The ministry in charge of climate change policy must clearly communicate what is expected from each of the subordinate government agencies and other ministries. This means that the overall objectives and targets must be operationalised[66] in all sectors and at all levels. Targets should be specific, measurable, attainable, relevant and time-bound (SMART). National objectives, sector targets and indicators should be clearly communicated to all relevant public bodies and other existing levels of government and/or administration. This may include treaties dividing up targets and assigning duties and responsibilities between states or regions that may make up a particular country.

2. **Develop implementation strategies**

   The government should ensure that objectives and expected results will be achieved, that resources are used effectively, and that all entities involved are in compliance with laws, regulations and standards. The authorities must develop plans and programmes to describe their obligations and targets, what risks they consider to be involved in achieving them, and what actions are needed to ensure they will meet their commitments. The authorities must also identify activities to minimise risks, and then implement them. These activities should be necessary and suitable for the intended purpose; this means that cost-benefit analyses are required. The ministry in charge must follow up the other bodies in order to achieve the overall target.

3. **Provide the information needed to assess efficiency and goal achievement**

   The government should provide the information necessary for effective decision-making. Relevant and reliable information is as important in the planning stage (before implementing climate change policies) as it is when evaluating the cost-effectiveness of the chosen policy instruments.

   The government should monitor performance to find out whether changes are needed in order to reach the overall target. Monitoring and reporting are established as commitments under the Convention and the Protocol (see Section 3.1.2). The results from the national communications to the UNFCCC Secretariat should be used by governments to improve policies, and they should be made available to the public in order to improve transparency.[67]

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61 For more information about performance auditing and governance, see ISSAI 3000, Implementation Guidelines for Performance auditing. [Online] Available at www.issai.org/media(708,1033)/ISSAI_3000E.pdf [Accessed 24 March 2010].

62 The UNFCCC has discussed transparency in information reported to it; see, for instance UNFCCC, 2006. Report of the centralized in-depth review of the fourth national communication of Norway. [Online] Available at unfccc.int/resource/docs/2006/idr/nor04.pdf [Accessed 24 March 2010]

63 See more about engaging stakeholders in UNDP, 2004. Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures. Cambridge: Cambridge University Press.

64 From INTOSAI, 2004. INTOSAI GOV 9100. Guidelines for Internal Control Standards for the Public Sector. [Online] Available at www.issai.org/media(574,1033)/INTOSAI_GOV_9100_E.pdf [Accessed 12 April 2010], p. 38. See also UNECE, 1998. Convention on access to Information, Public Involvement in Decision-making and Access to Justice in Environmental matters, done at Aarhus Denmark, on 25 June 1998. [Online] Available at www.unece.org/env/pp/documents/cep43e.pdf [Accessed 12 April 2010].

65 The items are based on the Norwegian Regulations on Financial Management in Central Government, Section 4.

66 "Operationalised" means to describe or define something in a way that allows it to be quantifiably measured.

67 The reports are available on the UNFCCC webpage, unfccc.int/national_reports/items/1408.php.

Collecting information should be an ongoing process that follows effective procedures. The information should be: appropriate (is the required information there?), timely (is it there when required?), current (is the latest information available?), accurate (is it correct?) and accessible (is it easily available to the relevant parties?).[68]

4. Use appropriate risk-based management

In risk management, risks can be defined as "the probability of something happening that will impact on objectives". Risk management aims to achieve an appropriate balance between realising opportunities for gains while minimising losses. It is an integral part of good management practice and an essential element of good corporate governance. Risk-based management is an ongoing process that should be renewed and updated frequently.

In climate policy, there is a risk of not preventing or preparing for climate change impacts, not attaining the targets, and of inefficient use of money. Risk management can also reduce the risk of corruption and fraud. The risk of fraud and corruption is further explained in Chapters 4 and 5.

3.2.5 Criteria for good management: internal control systems

An internal control system is a management tool used by entities to control and start activities (for instance, policies and procedures) to achieve their goals. All entities involved, both government bodies and private partners – for instance companies buying or selling emission allowances – could have an internal control system.

Well defined targets and an efficient organisational structure are very important preconditions for an efficient internal control system. When in place, the internal control system can contribute to achieving goals by making sure the system works as intended.[69]

The set of audit criteria for internal control systems is based on an INTOSAI model.[70] The model has five components:

1. Control environment[71]

All the organisational structures, authorities, responsibilities and human resources have to fit the challenges involved in managing the risks. (This is discussed briefly under good governance.)

2. Risk assessment

- Identifying the entities' objectives and targets
- Identifying risks: External and internal factors that could impact on the achievement of the objectives and targets.
- Consider and prioritise among the risks: Priority-setting in accordance with their seriousness and how they will impact on achieving the objectives and targets.

3. Control activities

Control activities are established to address risks and to achieve the entity's objectives. They include a wide range of activities, such as authorisation and approval procedures, segregation of duties, controls of access to resources and records, reviews of operations and so on. Corrective actions can complement control activities, and both detection and preventive control activities are necessary.

4. Information and communication

Information about how established risks are being managed must be communicated, to get feedback that could result in the current risk management being reconsiderd.

5. Monitoring

Ongoing monitoring assesses whether the implemented activities lead to the entities' defined objectives.

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68 From INTOSAI, 2004. INTOSAI GOV 9100. Guidelines for Internal Control Standards for the Public Sector. [Online] Available at www.issai.org/media(574,1033)/INTOSAI_GOV_9100_E.pdf [Accessed 12 April 2010], pp. 36-38.

69 It pays to remember that an internal control system, in itself, is no guarantee of achieving the goal. This requires effective policy instruments.

70 INTOSAI, 2004. INTOSAI GOV 9100. Guidelines for Internal Control Standards for the Public Sector. [Online] Available at www.issai.org/media(574,1033)/INTOSAI_GOV_9100_E.pdf [Accessed 12 April 2010]; INTOSAI INTOSAI GOV 9120. Internal Control: Providing a Foundation for Accountability in Government. [Online] Available at www.issai.org/media(576,1033)/INTOSAI_GOV_9120_E.pdf [Accessed 12 April 2010].

71 Control environment is the attitude, awareness, and actions of the board, management, owners, and others about the importance of control. This includes integrity and ethical rules, commitment to competence, board or audit committee participation, organizational structure, assignment of authority and responsibility, and human resource policies and practices. Source: Accounting Institute Seminars, 2009. Auditing Dictionary of Terms. [Online] Available at www.ais-cpa.com/glosa.html [Accessed 24 March 2010}.

Chapter 4:
How to plan mitigation audits

This Chapter describes aspects of designing mitigation audits, and its structure follows the Steps already described in the Introduction to this Guide:

1. **Identify the GHG emissions**
2. **Map the government's response in mitigating climate change**
3. **Choose audit topics and priorities**
4. **Design the audit**

4.1 STEP 1: IDENTIFY THE GHG EMISSIONS

The main objective of this Step is to identify past, present and future GHG emissions in your country, and how these emissions are distributed by sector. This information is needed in order to know if the government will meet its emission targets.

GHG emissions could be identified by providing the answers to two key questions:

- **What are the overall trends and projections for GHG emissions?**
- **What are the main sources and sinks of GHG emissions?**

Emissions data from relevant years is needed to identify the risks in Step 3 and to assess whether the authorities will meet their targets in the short and long term.[72] The key questions in this Step are most relevant to compliance and performance audits that consider GHG emissions and the attainment of GHG targets. For financial auditors, it is probably more useful to go straight to Step 2.

4.1.1 Key question: What are the overall trends and projections for GHG emissions?

The government is responsible for producing inventories of GHG emissions and removals. The government is therefore the most natural place to search for information. If your country is an Annex I Party, it is committed to report annually on its GHG inventory to the UNFCCC. National communications from non-Annex I Parties will normally include inventory reporting (see Section 3.1.2).

The current most reliable emissions data for most countries are those prepared for the UNFCCC. They may contain the information about estimated effects of individual policy instruments. The auditor should use the information from those inventories or, if necessary, wait until the data becomes available. If no inventory is communicated to the UNFCCC, or if it is not detailed enough or up to date, the auditor must look for other sources of emissions data. Data could be available at public government bodies, public or private statistics agencies, and in some cases data could have been registered and collected by international non-governmental organisations and research institutions.

The auditor may find that up-to-date data for actual emissions are not available. If this happens, trends can be estimated with the help of indicators (e.g., traffic growth). Specialists can assist the auditor in deciding whether the data is reliable.[73] Depending on the desired output and scope of the audit, the auditor may think about asking specialists to get more reliable data for use in the audit report. If there is a lack of data or there is doubt about the reliability of the data, that is also an important audit finding.

In addition to identifying past overall national emissions and removals, projections are very valuable when considering the expected short- and long-term trends in emissions. Projections are estimates of future emissions and removals based

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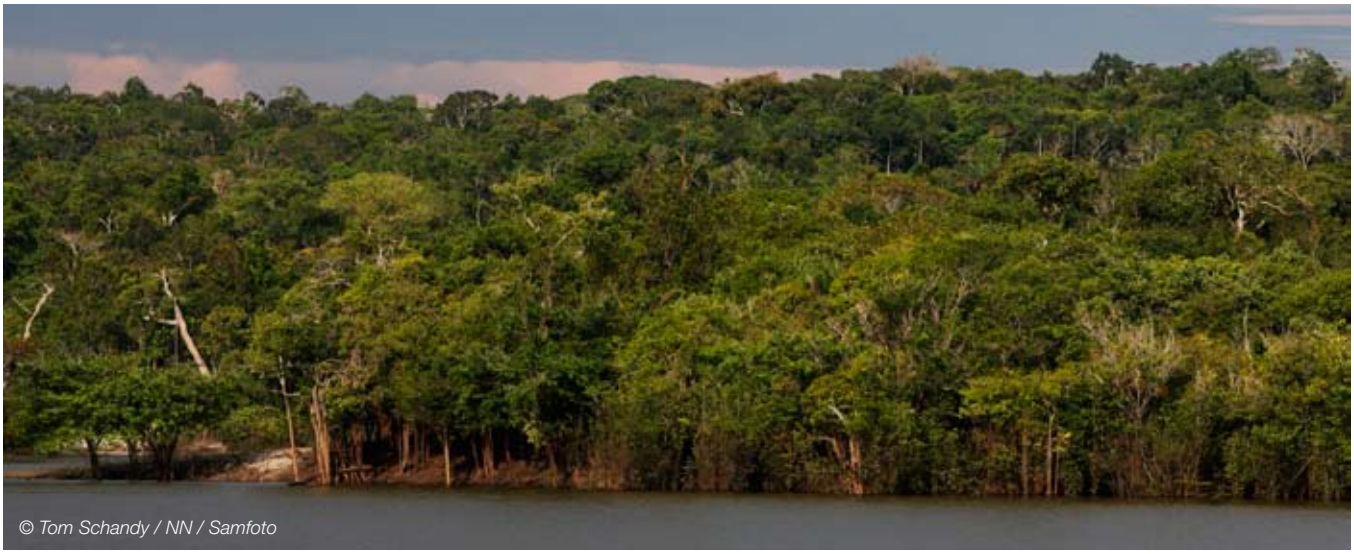
[72] For more information on the existence and use of climate change data, see also INTOSAI WGEA, 2010. Environmental Accounting: Current Status and Options for SAIs, www.environmental-auditing.org

[73] The Annex I country reports are subject to review by the UNFCCC. This process is described in Appendix C.



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on historical emissions and removals. Projections also include assumptions about changes in underlying human activities that affect emissions, such as economic growth and increased energy consumption. If reliable national scenarios are not available, the SAI may consider getting specialist advice.

4.1.2 Key question: What are the main sources and sinks of GHG emissions?

Defining the source of emissions can help identify each sector's contribution to GHG emissions. The sector contributions to GHG emissions are described in Figure 2.5. Detailed definitions and a classification of different sources are provided in the IPCC's reporting guidelines as adopted by the UNFCCC. Examples of different types of sources and sinks are listed in Table 4.1.[74]

Table 4.1
Carbon dioxide emissions and sinks by sources

Source	CO_2-equivalents Base year 1990	CO_2-equivalents Present	CO_2-equivalents Short term	CO_2-equivalents Long term
Energy production				
Transport				
Buildings				
Industry				
Agriculture				
Forestry				
Waste				
Total GHG emissions				

Assessing which emissions sectors/sources are the most important could be relevant to further analysing the risks associated with these sources/sectors. For example, the SAI of Canada carried out a mitigation audit of the energy sector by investigating the work on reducing GHGs emitted during energy production and consumption. The energy sector was chosen as energy production and consumption accounted for more than 80 per cent of the GHG emissions in Canada at that time.[75]

Forests are very important for reducing the growth in global carbon dioxide concentrations, as they are sinks of atmospheric carbon dioxide concentration. The Convention considers removals by sinks in each country as part of their GHG inventory, while special accounting rules have been established for the Kyoto Protocol.

Forests have a major role in climate change policy: they have the potential to absorb and store about one-tenth of global carbon emissions projected for the first half of this century into their biomass, soils and products. When forests are cleared, overused or degraded, they contribute to about one-sixth of global carbon emissions. The net growth or decrease in national forest reserves therefore corresponds to a negative or positive contribution to GHG emissions (sinks are also described in Section 2.3.3.

In their effort to map emission sources, some auditors will identify significant GHG emissions from a large forestry sector, with several audit risks associated with it. For example, the SAI of Brazil has carried out an audit of mitigation in the forestry sector. This topic was chosen because 75 per cent of carbon dioxide emissions in Brazil come from land-use change and the forestry sector (see Appendix A, Box A.1 for further reading).

[74] The sector contributions to GHG emissions are fully described in separate chapters in B. Metz et al., eds., 2007. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press. Note that shipping and aviation are not included in national totals pursuant to the inventory guidelines, but are reported separately as a memo item. Auditing mitigation in these sectors may not be included in the SAI's audit mandate.

[75] See Appendix A.2 for further description of the audit.

4.2
STEP 2: MAP THE GOVERNMENT RESPONSE IN MITIGATING CLIMATE CHANGE

The auditor must gain a broad understanding of climate change and how its many issues relate to the particular country, in order to understand the government's response to climate change and identify possible risks associated with its actions.

A broad approach covering all sectors in the planning stage can be a useful starting point if our SAI is unfamiliar with climate change audits and the sectors involved. If the government has already published a comprehensive strategy, this can be a starting point for Step 2. Other sources of information are set out in Box 4.1. Extensive planning may lead to the discovery of several risk areas and the need for several concurrent audits. However, a sector-oriented approach could be useful when risks in a particular sector are especially relevant.

To make the audit planning stage easier the auditor can identify the most relevant sector or sectors and identify sector targets and their management in this Step. There is also a third option of choosing a policy-instrument oriented approach, if Step 2 shows that government has expressed an intention to mitigate emissions directly or indirectly through certain policy instruments.

Several key questions can be answered by the auditor as a way of collecting appropriate information for understanding the government's response:

1. **What are the international mitigation commitments?**
2. **What are the national targets for mitigating GHG emissions?**
3. **Which are the relevant responsible public bodies, and what are their roles and responsibilities?**
4. **What are the key policy instruments for reducing GHG emissions?**

Box 4.1
Sources of information

- National documents: laws, strategies, action plans, propositions and reports to the Parliament etc.
- Interviews with key players and experts
- IPCC, Fourth Assessment Report, Chapter 13 www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter13.pdf
- National reporting to the UNFCCC: unfccc.int/national_reports/items/1408.php

4.2.1
Key question: What are the international mitigation commitments?

Identifying a country's commitments is the first task when auditing compliance with international mitigation commitments. International emission commitments are described in Section 3.1.1 and can be summarised as follows:

- The UNFCCC objective is to achieve stabilisation of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system
- The Kyoto Protocol commits most developed countries to reducing or stabilising their GHG emissions at certain levels during 2008 – 2012
- The European Union is committed as a whole, and it also commits every Member State, to mitigate its emissions in relation to its EU commitment (see Box 4.2 and Table 3.1).

Box 4.2
EU emission targets

The European Union (EU) is a separate Party to the Kyoto Protocol, with a separate emissions reduction target of 8 per cent from 1990 emissions levels. In 2003, the then 15 countries of the EU redistributed their targets (see Table 3.1). The targets are approved by the European council. The new country quotas vary from reductions of more than 20 per cent to increases of 27 per cent.

The "3x20" 2020 package

EU climate change policy is based on the objective of limiting the temperature rise to 2 degrees Celsius above levels in the pre-industrial era. In order to operationalise this target, the European Commission has presented a climate change and renewable energy policy package. The "3x20" heading refers to a call to achieve the following targets by 2020:

- a 20 per cent increase in energy efficiency
- a 20 per cent reduction in GHG emissions (which could be changed to 30 per cent, depending on the outcome of international negotiations for a post-Kyoto agreement)
- a 20 per cent share for renewables in overall EU energy consumption.

In addition, the Commission expressed its intention to increase the proportion of biofuels in vehicle fuels to 10 per cent.

Reference:
European Commission, 2010. Climate Change. [Online] Updated 16 March 2010. Available at ec.europa.eu/environment/climat/home_en.htm [Accessed 24 March 2010].

4.2.2
Key question: What are the national targets for mitigating GHG emissions?

Auditors need to identify relevant emission targets in their own countries in order to audit compliance with mitigation objectives and targets. National targets for reducing GHG emissions may meet the international commitments, and in some countries the national targets are even stricter. Targets covering both short- and long-term emissions should be considered, although an audit of plans to deliver a long-term target may be difficult.

Are the targets divided into relevant sectors? According to the principles of good governance, the target should be divided into operational, quantified targets for each sector (see Section 3.2). Note that your country may also have other targets that influence GHG emissions, such as energy saving, the use of biofuels, forest management policies, and waste management (see Box 4.3). It is useful to identify these other targets and work out if they complement or conflict with each other.

Any set targets for relevant sectors should be identified for auditing for effectiveness and efficiency of policy instruments. The SAI of the Netherlands audited the European trading scheme and its implementation in the Netherlands. Its report was published in 2006. The Government had defined separate concrete emission targets for all relevant sectors, which were applicable as criteria in compliance auditing (see Figure 4.1 and a description of the audit in Appendix A.3).

It is worth noting that the lack of an official target for reduction or international commitment does not mean a SAI cannot audit the government response to climate change. There are often other regulations and laws that stipulate how challenges around climate change should be managed. For example, the SAI of China has conducted several mitigation related audits without basing the audit on national or international targets. Amongst others, the Shanghai Municipal Audit Office audited the application, management and effects of special funds for the coal-burning boilers' alternative clean energy policy, and the contribution from the alternative clean energy policy to the reduction of greenhouse gas emissions. The audit was based on a relevant legal framework, regulations for the prevention of pollution and other governance principles, as well as energy-related regulations.

4.2.3
Key question: Which are the relevant responsible public bodies, and what are their roles and responsibilities?

Sector contributions to GHG emissions were mapped in Step 1. In this key question, the auditor may want to identify actions aimed at reducing these emissions, as well as identifying key players and their roles and responsibilities.

The way a government chooses to organise itself could strongly affect its efficiency and effectiveness when it comes to mitigating climate change. The auditor must understand the roles and responsibilities of public bodies in order to identify risks, ask relevant audit questions and address audit findings. If the auditor struggles to understand the roles and responsibilities, it could mean that the government's response to climate change is itself unclear (see Box 4.4 for an example of an audit seeking to address unclear roles and responsibilities). A lack of clarity may contribute to inefficiency and lead to a failure to achieve targets, and it could constitute an audit finding in itself.

In some countries, overall responsibility and the relevant policy tools rest with one ministry. In other countries, responsibility for meeting overall international commitments and national emission targets rests with the environment or climate ministries, but other ministries are responsible for targets and policy instruments within their sectors, for instance the ministry of agriculture.

Reducing GHG emissions might involve different levels of a country's political system, such as regional and national government. The roles and responsibilities relating to achieving targets may also be divided between several regions within a country, and the policy instruments for reducing GHG emissions may likewise differ between regions.

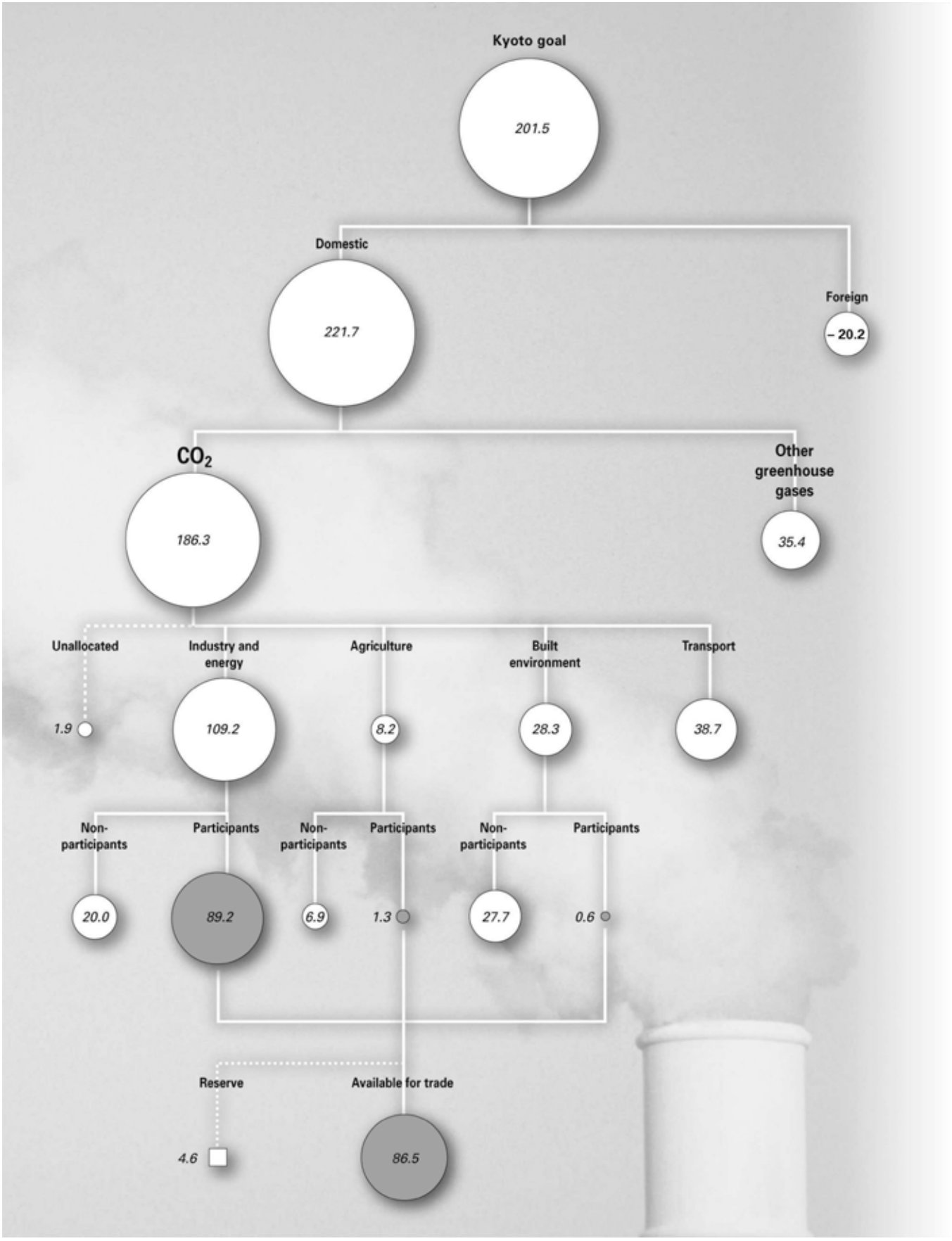
Box 4.3
Relevant sectors that influence mitigation policies described in other INTOSAI WGEA guides

- Forest management is relevant when considering how a country manages land use change and forest conservation. In addition, sink policy may be considered in national plans and objectives relating to climate change mitigation and adaptation. See: Auditing Forests: Guidance for Supreme Audit Institutions.
- Annual total greenhouse gas emissions from the global energy sector are still increasing, mainly from the combustion of fossil fuels. Demand for heat, electricity and transport fuels is increasing. Authorities are advocating energy saving and the production of renewable energy, although biofuel production is controversial. See: Auditing Sustainable Energy: Guidance for Supreme Audit Institutions.
- Waste contributes less than five per cent of global GHG emissions. However, there are major uncertainties about emissions from the waste sector. The largest source is landfill methane. National audits in this field could contribute to more consistent and adequate inventory and monitoring systems and more climate-friendly waste management practices. The INTOSAI WGEA guide Towards Auditing Waste Management covers all aspects of the waste stream and relevant public bodies. The INTOSAI WGEA website also covers relevant topics in this field.

Box 4.4
An example of an audit addressing unclear roles and responsibilities

In an audit conducted by the SAI of the Republic of Slovenia, a risk of unclear roles and responsibilities was identified in the audit. No government body was responsible for monitoring and evaluating the effectiveness and efficiency of measures carried out by different ministries, agencies or other bodies from different sectors (e.g., agriculture, transport and the energy sector). Furthermore, there were no projections for long-term GHG emissions, and this made it impossible to plan long-term climate change mitigation.

Figure 4.1
Targets of the Dutch policy (in million tonnes CO_2 equivalents for 2010)



Source:
Algemene Rekenkamer, 2006. The European Emissions Trading Scheme and its implementation in the Netherlands. [Online] Available at www.rekenkamer.nl/english/News/Audits/Introductions/2007/11/European_CO2_emission_trading_system_and_its_implementation_in_the_Netherlands [Accessed 12 April 2010]

4.2.4
Key question: What are the key policy instruments for reducing GHG emissions?

Policy instruments include both government instruments aimed at ensuring effective management and goal achievement, and policy tools and instruments aimed at triggering action to limit climate change.

Several criteria relating to good governance are described in Section 3.2. These criteria can be used as a standard of comparison in order to identify whether the administration has put in place systems to develop, assess and implement policies to achieve national targets and international commitments.

Relevant policy information could be found in national strategies and plans, National Communications or reports on Demonstrable Progress under the Kyoto Protocol communicated to the UNFCCC. Box 4.5 gives an example of a national strategy in which the auditor can identify relevant policy instruments.

Box 4.5
An example of how to implement a cross-sectoral mitigation strategy

In addition to examining whether national targets are set, the auditor must also determine whether the government has developed appropriate strategies or plans to meet its commitments for mitigation of greenhouse gas emissions. The United Kingdom's carbon budgets are an example of how this could be done. The statutory Carbon Budgets process was introduced by the Climate Change Act 2008 to run alongside existing statutory and voluntary requirements relating to the mitigation and reporting of emissions by the UK Government.

The statutory Carbon Budget approach of the Climate Change Act 2008 requires the setting of national budgets for three five-year periods at a time, the first three being 2008-2012, 2013-2017 and 2018-2022. The Government is required to establish a plan for delivering the statutory Carbon Budgets, and the Climate Change Committee reports annually on the Government's progress in relation to its plans and the Carbon Budgets.

The Government's first plan, The Low Carbon Transition Plan (July 2009), established detailed plans by sector, and set out the relevant policy tools and the amount of carbon savings expected to be delivered. The Government plans to meet the Carbon Budgets through domestic measures, but if it fails to do so, it is obliged under the Act to buy emission credits from abroad. The Plan made individual government departments responsible for carbon budgets that encompassed their share of the carbon reductions to be achieved by policy tools in their sectors and their own operational carbon emissions. Government departments must produce their own Carbon Reduction Plans by Spring of 2010, detailing what actions they will take in relation to their carbon budgets.

Table 4.2 introduces a range of selected national policy instruments which governments can implement to directly control GHG emissions.[76] Note that other instruments may also indirectly result in increased GHG emissions.

To gain a good overview, it is useful to map key policy instruments implemented by the authorities within each sector identified in Step 1. For some countries there can be regional economic or political cooperation, which calls for a common set of goals and policy instruments. See Box 4.6 for a description of the EU climate policies.

Box 4.6
EU climate change policies

Two elements have been singled out as particularly important in EU climate change policy: the EU emissions trading scheme (ETS) and the renewable energy and climate change package. (For information about the renewable energy programme, see the INTOSAI WGEA guide Auditing Sustainable Energy: Guidance for Supreme Audit Institutions on the INTOSAI WGEA webpage or visit the European Commission of Environment's web-page).

The EU emissions trading scheme

Established in 2003, the EU ETS is the world's largest tradable permits programme. It covers almost half of the total EU GHG emissions. Transport and agriculture are not included. Carbon dioxide is the main GHG included in the scheme (some operators with nitrogen dioxide emissions are also included).

Emission allowances are the main "currency" of the scheme. These allowances are issued or sold to operators by national governments. In addition, credits from JI or CDM projects can be bought and sold in the scheme.

The distribution of allowances is decided in National Allocation Plans (NAPs). NAPs are developed by EU Member States. Allowances are distributed to sectors and installations.

EU Member States report both to the UNFCCC Secretariat and to the European Commission (EC). Since the EU is a separate Party to the UNFCCC and the Kyoto Protocol, the EC must prepare a separate EU GHG inventory to be sent to the UNFCCC Secretariat. In addition, Member States must report GHG projections to the EC.

The current ETS expires at the end of 2012. The revised Directive 2009/29/EC on the EU ETS published in June 2009, describes the legal framework for the third trading period from 2013.

Sources:
European Commission, 2010. Emission Trading System (EU ETS). [Online] (Updated 29 March 2010) Available at ec.europa.eu/environment/climat/emission/ets_post2012_en.htm (Accessed 10 April 2010); European Commission, 2010. Climate Change. [Online] Updated 16 March 2010. Available at ec.europa.eu/environment/climat/home_en.htm [Accessed 24 March 2010].

[76] See a more detailed description in S. Gupta, 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

Table 4.2
Selected national mitigation policy instruments

Regulation and standards	These instruments specify the abatement technologies (technology standard) or minimum requirements for pollution output (performance standard) that are necessary to reduce emissions. They include legislation, building codes, abatement technology and minimum requirements for pollution output.
Subsidies and incentives	Direct payments, tax reductions, price support or equivalent from a government to an entity for implementing a practice or carrying out a specified action.
Taxes and charges	A levy imposed on each unit of undesirable activity by a source.
Tradable permits	This instrument establishes a limit on aggregate emissions by specified sources, requires each source to hold permits equal to its actual emissions, and allows permits to be traded among sources. Includes national and international emissions trading.
Voluntary agreements	An agreement between a government authority and one or more private parties with the aim of achieving environmental objectives or improving environmental performance over and above compliance with regulated obligations. Not all agreements are truly voluntary; some include rewards and/or penalties associated with participating in the agreement or achieving the commitments
Information policies	Required public disclosure by industry to consumers of environment-related information in general. This includes labelling programmes and rating and certification systems. Also includes education, public information and training
Research and development	Activities to reduce emissions that involve direct government funding and investment aimed at generating innovative approaches to mitigation and/or the physical and social infrastructure. Examples include prizes and incentives for technological advances. Includes the development and use of new mitigation technology.[77]
Non-climate policies	Other policies not specifically directed at emissions reduction but which may have significant climate-related effects, for instance, agriculture policy.

Source:
Based on Box 13.1 in S. Gupta, et al., 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

[77] Key mitigation technologies and practices for the respective sectors are shown in Table SPM.3 in IPCC, 2007. Summary for Policymakers. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

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4.3 STEP 3: CHOOSE AUDIT TOPICS AND PRIORITIES

This Step is about the auditor choosing and prioritising between different mitigation topics - by analysing the information gathered in Steps 1 and 2, and by identifying risks.

Risk assessment is an analytical audit selection process to identify areas that have high risk exposure or where there are opportunities for performance improvements. The risk analysis required in this Step is based on the potential risks related to economic issues and the efficiency and effectiveness of mitigation policies. The concept is further explained in Box 4.7.

The auditor could assess risks considering the following key questions in order to decide on relevant audit topics:

- **Are targets and objectives being achieved? (Effectiveness risk analysis)**
- **Are there risks related to the use of policy instruments? (Effectiveness risk analysis)**
- **Is the government doing things in the right way? (Efficiency risk analysis)**
- **Are the financial resources misstated? (Efficiency risk analysis)**
- **Does the government focus on keeping the costs low? (Economy risk analysis)**

After assessing and prioritising the risks, the auditor should be ready to define the overall audit objectives.

If risks about economic issues and efficiency are identified, they may also have an impact on effectiveness. If this is indeed what happens, these risks should be incorporated when designing the audit (in Step 4).

4.3.1 Key question: are targets and objectives being achieved? (Effectiveness risk analysis)

A natural starting point for considering effectiveness would be whether the national or international objectives and targets are likely to be achieved. Emission trends and projections collected in Step 1 could be compared with international and/or national emission targets identified in Step 2. This would enable the probability of targets not being reached to be considered.

These audits are based on the method used for compliance audits, as we are looking for discrepancies between audit criteria (emission reduction targets) and the outcome (emission trends). This means that audits of effectiveness require reliable information.

Three preconditions must be met in order to answer this key question and to include this approach in an audit:[78]

[78] If these preconditions are not met, this may be an audit finding in itself, as a lack of indicators describing objectives and expected results, see Section 4.3.2.

1. The targets must be suitable as audit criteria. The short-term targets are quantified for most of the developed countries in the Kyoto Protocol (see Section 3.1.1). Besides international obligations (if any), national targets are essential as audit criteria.[79]
2. The monitoring system must be transparent and reliable. If the country lacks information about its GHG emissions, it will be difficult to assess whether it will achieve its emission targets.[80]
3. If the government uses flexible mechanisms to fulfil its commitments, it must have specified how emission cuts will break down between emission reductions in the country in question and in other countries.

The emission trends might not be in line with short-term targets, for instance the Kyoto commitments to be achieved by 2012. Risks are also likely if the overall targets are not operationalised[81] and divided among relevant sectors.

The projections could be analysed to establish the probability of reaching the targets in the long-term, as explained in Step 1. The risk of emission targets not being met is high if the required emission cuts are high compared with projections, if the cost of making those cuts is high, and if realistic mitigation strategies have not been identified.

Box 4.7

Risk assessments relevant to Economy, Efficiency and Effectiveness of climate change policies

Risk is the probability of suffering harm or loss. Risk assessment is a planning tool to identify areas where there is a potential for improvement at the management level. It does this by focusing on areas prone to risk. The greater the negative consequences relating to the risk, the more consideration should be given to the problem.

Different aspects are relevant when assessing risks and designing audits. The main features in a service delivery model relevant to performance are as follows:

- Internal resources are allocated as inputs for the fulfilment of the commitments (objectives and targets)
- Activities (policy instruments and internal processes) are presented as production/delivery processes
- Output is the amount of goods and services produced by the government, such as the introduction of subsidies to support environmentally friendly behaviour
- The outcome consists of more wide-ranging considerations of whether the results (intended and unintended consequences) are in line with overall objectives and targets.

This Guide relates the risk assessments to the Economy, Efficiency and Effectiveness of programmes or governmental action.

- Economy deals with considerations at the input level, such as minimising the costs of an activity while having regard to appropriate quality
- Efficiency is about getting the most or best out of the available resources, thus ensuring that results are achieved: are things being managed in the right way?
- Effectiveness deals with considerations of goal attainment: will the Government meet their short- and long-term targets? Are there unintended consequences of the policies that are in place?

The relationship between the three Es and risks related to the government administration and the results or impacts of the government's implementation of policies is illustrated in the input-outcome model.

The Input-Output-Outcome model

Performance	**Inputs** Resources assigned	**Production / delivery process** Action done	**Outputs** Services provided	**Outcome** Objectives met
Risk assessments	**Economy** Is money being spent at the right time, in the right amounts and reliably? Are physical, material and human resources used efficiently?	**Efficiency** Are policies, procedures and controls established to ensure timeliness, quantity and quality at lowest costs?	**Efficiency** Are completed work units and services appropriate to ensure timeliness, quantity and quality at lowest costs?	**Effectiveness** Are short- and long-term results in line with objectives and intentions at lowest costs?
	• Unit costs of inputs	• Governance • Productivity • Unit costs of outputs		• Goal achievement • Cost-effectiveness • Customer satisfaction

Sources:
INTOSAI, 2004. ISSAI 3000. Standards and guidelines for performance auditing based on INTOSAI's Auditing Standards and practical experience. Vienna: INTOSAI; R. B. Raaum and S. L. Morgan, 2001. Performance Auditing: A Measurement Approach. 2nd ed. Altamonte Springs, Florida: The institute of Internal Auditors Research Foundation.

[79] If the overall national targets are weaker than the Kyoto targets or if the targets are not quantifiable, this may be an audit finding. In such instances, the targets are not suitable for monitoring performance.
[80] The SAI may want to assess the adequacy of GHG inventories. UNFCCC has worked out guidelines on how to develop inventory systems.
[81] Note: "Operationalised" means to describe or define something in a way that allows it to be quantifiably measured.

In Step 1, emissions and projections might also be identified for different sectors. If national emission targets are divided among relevant sources as a way of committing each sector, it might be useful to consider whether each sector will achieve their short and/or long term targets or not. If high risks are found in some sectors, those might be objects of the planned audit.

4.3.2 Key question: are there risks related to the use of policy instruments? (Effectiveness and efficiency risk analysis)

The second risk analysis relates to the use of policy instruments. In Step 2, relevant policy tools are described as measures for mitigating climate change. In this Step, the auditors could identify the risks related to the use of policy tools as a whole, and identify risks relating to the most relevant policy tools in their country. Aspects of efficiency also have a big effect on the effectiveness of policy instruments. The auditor could also investigate whether the observed emission results and trends are the result of factors other than policy. Reliability of available data is crucial when considering effectiveness.

If the emission trends and projections are above national targets or international commitments (see key questions in Sections 4.2.1 and 4.2.2, respectively) this may be due to weaknesses in implemented policy instruments. The potential risks could be as follows:

- There are currently not enough policy instruments to bring about significant changes in emissions rates.
- The key policy instruments (identified in Step 2) do not lead to the intended results or do not focus on the sectors with the largest emissions or where cuts can be made most efficiently. Note that reductions some sectors could be relatively unreachable by policy tools because development of new technology is required in order to include them in efforts to reduce GHG emissions. Transport could serve as an example.
- The government has not implemented policy instruments early enough to reach climate targets (for instance, according to the IPCC's Fourth Assessment Report, early action is necessary in order to meet the two-degree Celsius target).

The government may not utilise the full potential of each policy instrument. Risks are likely if the government has not measured the output of key policy instruments or forecasted each measure's contribution to emission reductions.[82]

In a situation in which policymakers have not decided the level of effect a policy instrument is supposed to have, there are no strong audit criteria, but the auditor could highlight the fact that the climate change policy is not measurable and therefore not goal-oriented. Risks are also likely if the government implements policy instruments before it has evaluated and compared their potential contribution to emission reductions.

National policy instruments: potential risk areas

Step 2 identified a range of policy instruments at the government's disposal in mitigating climate change (see Table 4.2):

- Regulations and standards
- Taxes and charges
- Tradable permits
- Voluntary agreements
- Subsidies and other incentives
- Research and development
- Information policies.

Different policy instruments have different inherent risks. More concrete risks could result if several instrument-specific preconditions are not met. These preconditions are described as evaluative criteria in the IPCC's Fourth Assessment Report:

- Environmental effectiveness – the extent to which a policy meets its intended environmental objective and targets, or results in positive environmental outcomes
- Cost-effectiveness – the extent to which the policy can achieve its objectives and targets at the minimum cost to society
- Normative considerations – the distributional consequences of a policy, which includes dimensions such as fairness and equity. For example, tradable permits may entail difficulties for small emitters
- Institutional feasibility – the implementation of a policy instrument may be affected by whether it is viewed as legitimate and accepted. In particular, effective policy instruments may need local acceptance to be implemented. This can be a challenge given discrepancies of policy interests between the national and local level.

Based on preconditions, different questions relevant to auditing national policy instruments are described in Table 4.4.[83]

International mitigation policy instruments: potential risk areas

As described in Chapter 3, some policy instruments are set up under the UNFCCC or the Kyoto Protocol.[84] Those instruments cross borders and involve many stakeholders, with subsequent potential risks of ineffectiveness and inefficiency.[85]

Flexible mechanisms: JI and CDM

When different countries are involved in Joint Implementation (JI) and CDM projects, there may be a risk that supervisory bodies and accountability arrangements are not in place. The risks are greater in unstable political situations and if the management systems in the recipient country contain weaknesses. Ideally:

- The project should be designed to result in actual emission reductions. The auditor can look for risks relating to whether the flexible mechanisms are effective tools for meeting the overall targets. If national control mechanisms are not in place to monitor effectiveness, the results of the investments in the projects may not be in line with the intentions and therefore less effective than expected.[86]
- Sufficient funding by government should have been allocated to using the mechanisms to meet the national targets.
- CDM projects' contribution to targets for sustainable development should be developed and defined in the recipient country.[87]

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82 This information should be detected in Step 2. Note that the government should provide such information.

83 See also S. Gupta, 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press, pp 750-768.

84 How auditors choose to approach the risk analysis depends on their audit mandate and relevance to their country.

85 The potential risk areas relating to the register system and fraud and corruption are described in the key question concerning risks of financial misstatements (Key question 4.3.4).

86 Even though projects are controlled by the UN, before certified allowances are issued, national governments may employ stricter standards than those set internationally, for example, when setting requirements for additionality, and contribution to sustainable development when selecting projects. The IPCC also points out that it has faced methodological challenges in relation to determining baselines and additionality; see S. Gupta, 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press, p. 748.

87 See Appendix A.6 describing an audit from the SAI of USA.

- The projects would not happen without money being transferred from the donor country.

Emissions trading scheme

A robust and transparent system for buying and selling emission allowances is needed to ensure that the price of tradable permits is an effective incentive for reducing emissions. According to the SAI of Canada, the emissions trading system needs several features to make it work effectively:[88]

- An absolute target, which limits total emissions
- Tradable credits, which create an economic incentive for companies to exceed their emissions targets
- Strict rules for monitoring and reporting emissions
- Public internet access to data on emissions and compliance
- Financial penalties large enough to encourage compliance.

If those preconditions are not met, the scheme may not contribute as intended to meet the GHG emission targets that have been set.

Research and development

Both existing and new technologies and practices will be needed to achieve the mitigation levels predicted in the IPCC stabilization scenarios. Policy instruments are required to provide long-term incentives for technology research and development, and for implementing existing and new technologies.

Risk assessments in developed countries could consider whether the government encourages, develops and implements technology suited to helping the country meet its short- and long-term mitigation targets. Auditors should also look at whether the government in a developed country is committing funds that contribute to transfer technology to developing countries. Auditors in developing countries could also identify risks by determining if their governments are focusing on actions aimed at benefiting from funds and transfers and using the available technology.[89]

If a government has started the development of new technology, either by establishing a programme or by funding research and development, there is a risk that developments are not being implemented in the relevant sector, and that the diffusion of the new technology or techniques is limited. These risks were assessed in the Moroccan performance audit of the national Centre of Renewable Energy Development.[90]

Establishing a market price for emissions should ensure that emissions are reduced as efficiently as possible, that the lowest-cost abatement options are being put in place first, and that a move away from carbon-intensive products is being encouraged. However, there are several factors affecting the price level in an international market. For example, several audits of the EU Emission Trading Scheme (ETS) show that the traded price of carbon does not yet provide enough incentives to encourage investment in low-carbon technology. This is mainly because too many emission allowances were distributed in the EU ETS; this reduced the market price of emission allowances. The carbon price must therefore be taken into consideration when analysing whether diffusion of new mitigation technology is successful.

Table 4.3 presents examples of possible mitigation technologies and practices for three emission sectors where risk can be assessed.

Table 4.3
Key mitigation technologies and practices in some sectors

Sector	Key mitigation technologies and practices currently commercially available	Key mitigation technologies and practices projected to be commercialised before 2030
Energy supply	• improved supply and distribution efficiency • switching from coal to gas; nuclear power • renewable heat and power (hydroelectric power, solar, wind, geothermal and bioenergy) • combined heat and power • early applications of Carbon Capture and Storage (CCS, e.g., storage of removed carbon dioxide from natural gas)	• CCS for gas, biomass and coal-fired electricity generating facilities • advanced nuclear power • advanced renewable energy, including tidal and wave energy, concentrating solar power, and solar PV
Transport	• more fuel-efficient vehicles • hybrid vehicles • cleaner diesel vehicles • biofuels • modal shifts from road transport to rail and public transport systems • non-motorised transport (cycling, walking) • land-use and transport planning	• second-generation biofuels • higher-efficiency aircraft • advanced electric and hybrid vehicles with more powerful and reliable batteries
Forestry/ Forests	• afforestation; reforestation; forest management; reduced deforestation • harvested wood product management; use of forestry products for bioenergy to replace fossil fuel use	• tree species improvement to increase biomass productivity and carbon sequestration • Improved remote sensing technologies for analysis of vegetation/ soil carbon sequestration potential and mapping land use change

Source:
S. Gupta, 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press

88 Office of the Auditor General of Canada, 2006. 2006 September Report of the Commissioner of the Environment and Sustainable Development. [Online] Available at www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_01_e_14983.html#def1 (Accessed 25 March 2010).

89 For more information and relevant considerations in developing countries, see M. Chidiak and D. Tirpak, 2008. Mitigation Technology Challenges: Considerations for National Policy Makers to Address Climate Change. UNDP.

90 Court of Accounts of Morocco, 2006. Performance Audit of the renewable energy development centre [Online] Available at www.environmental-auditing.org/Portals/0/AuditFiles/mc214fre06ar_sum_renewableenergy.pdf [Accessed 12 April 2010].

4.3.3
Key question: Is the government doing things in the right way? (Efficiency risk analysis)

Poor governance may have a serious negative effect on the efficiency of policy instruments. It may also seriously undermine the effectiveness and outcomes of these instruments. Efficiency is about whether things are being managed in the right way. Audit criteria for international commitments and good governance are described in Sections 3.1 and 3.2.

Examples of appropriate criteria for analysing efficiency of international commitments and good governance, respectively, might be

- The UNFCCC commits each country to developing a plan and submitting national communications. Annex I Parties must also submit annual inventories of GHG emissions
- Management systems contributing to effective and goal-oriented management must be in place.

Risks need to be identified in order to establish:

- Whether or not those management systems are in place
- The extent to which the organisational structure is suited to implementing climate change policies
- Whether human resources are capable of tackling the challenges of managing climate change policies.

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Box 4.8
Reduced emissions from deforestation and forest degradation – REDD

Deforestation and forest degradation account for between 15 and 20 per cent of global emissions of carbon dioxide. Commitments under the Kyoto Protocol include emissions from deforestation and forest degradation, but the countries with the biggest emissions from deforestation and forest degradation do not have emission reduction targets under the Protocol. Projects relating to deforestation are not included in the CDM, while projects that deal with reforestation are. Reduced emissions from deforestation and forest degradation, also known as REDD, are considered to be both a necessary and cost-effective way of controlling global emissions of GHGs.

The purpose of the international REDD initiatives, including the UN-REDD Programme and the Forest Carbon Partnership Facility (administered by the World Bank) is to create an incentive-based structure for developing countries to reduce emissions from deforestation and forest degradation. An ongoing process aims at including REDD initiatives in a future agreement under the UNFCCC. If this happens, funding for deforestation projects is expected to increase.

REDD initiatives have several risks associated with them. The SAIs of Brazil and Indonesia have both audited their respective governments' efforts to reduce emissions from deforestation. The SAI of Norway has audited the Norwegian government's efforts to support work on REDD internationally. Some common findings and high-risk areas can be indentified:

- The measurement, reporting and verification of emissions from deforestation remain a challenge
- Establishing a baseline for emissions is difficult because governments often lack good data and long-term observations of emissions from deforestation
- Reduced deforestation in one area might lead to increased deforestation in another
- Reductions in emissions may be of a temporary nature due to lack of long-term policy measures
- Challenges related to governance, corruption and the rule of law
- Increased funding could lead to an increased risk of fraud and corruption, as Interpol has warned, because the current supervision set-up is insufficient to monitor the funds.

In the short term, it is possible to audit the systems governing efforts to reduce emissions from deforestation and forest degradation. This could involve checking whether one or more of the risk factors mentioned above is also present in your country, and what the government is doing to address the risks. In the medium and long term, auditors can check the effectiveness of such policies. The most fundamental question could be whether the government is reaching its targets for reduced emissions from deforestation, if such targets have been set. If goals are not being reached, auditors can look for the reasons behind this. It is likely that the reason or reasons are related to one or several of the points listed above.

Lesson learned:
Use geographic information systems (GIS) when planning and conducting forestry audits

GIS integrates both hardware and software data to capture, manage, analyse and distribute geographically referenced information. The information can be used in many ways to reveal relationships, patterns and trends in the form of maps, globes, reports and charts. It is important to gain a sense of the reliability of GIS data used.

The SAI of Indonesia has successfully used GIS and GPS technology in auditing forest management. The technologies have been used in the planning stage to identify the problem/risk and in the execution stage to detect deforestation and forest degradation, and thereby whether they contribute to increase GHG emissions.

The auditor could consider whether the government has assessed the risks the country faces in relation to achieving its targets, and the extent to which the government has adopted plans suitable for what it is trying to achieve. An example of this approach in relation to the forestry sector is given in Box 4.8. Risks are likely if information is lacking, inaccurate or incomplete, if the plan is not comprehensive enough or unclear, if policies are not in place to implement the plan, or if the plan does not encompass the challenges identified in Step 1. Risks are also likely if there is a lack of administrative competence.

Emission trends and projections are aspects that an auditor may well choose to consider closely. Emissions and trends should be addressed with a critical eye by the auditor, because their transparency, accuracy and clarity cannot be taken for granted. The auditor could consider risks relating to whether the reporting to the UNFCCC seems appropriate given the national context, and whether there is a reliable system in place for monitoring progress. The auditor could also consider risks related to the establishment of a GHG inventory system, including responsibilities and the quality of the information produced (identified in Step 1 and considered in the key question concerning effectiveness of policy instruments implemented, described in section 4.3.2 . Accounting principles should be checked for consistency against international standards (UNFCCC) for reporting GHG emissions in national inventories.[91] (This analysis may require assistance from external experts.)

In terms of considering good governance, an audit could include carrying out relevant evaluations or estimates that address the cost-effectiveness of different policy tools. The auditor could also carry out risk assessments relating to the existence, transparency and quality of key information required for maximum effectiveness of policy instruments.[92]

An auditor may wish to consider the cost-effectiveness of policy instruments. Box 4.9 shows how the UK Government applies an analytical tool to help it summarise and appraise policies to do with its Climate Change Programme.[93]

The organisation of the management systems dealing with climate change also needs to be considered by the auditor in some audits. For instance, the organisation of the mitigation response may constitute a risk. As there are many different sources of GHG emissions covering a range of emissions sectors, it is likely that a wide range of public bodies responsible for one or more areas related to GHG emissions will be identified in Step 2. Furthermore, it is not uncommon that one policy instrument is implemented in several different sectors, thus making different government bodies responsible for following up the implementation. The responsibility for following up commitments on mitigation may differ in respect of governance level for the different sectors. Some of these sectors (or ministries) may even lack policies to mitigate climate change. It must also be noted that for some of the sector the goals of mitigation commitments may be conflicting to other commitments made by the responsible ministry, and this could create a challenge when managing both areas.

On the other hand, there is also a risk of inefficiency if responsibility for achieving the overall emission reduction goal is linked to one ministry (typically the ministry of environment) without efficient policy instruments at their disposal.. Finally, if the roles and responsibilities were hard to map in Step 2 because of complex organisational structures and unclear roles and responsibilities, this could itself be a risk indicator.

Box 4.9
Cost-effectiveness analysis of policy instruments

For the 2006 review of the Climate Change Programme, the British government applied a cost-effectiveness analysis (CEA) to existing and new instruments within the Programme. The purpose of CEA is to summarise the costs associated with achieving a key policy goal. All costs are brought to present-day values using standard discounting techniques. In order to allow comparison between different policies, a common unit of effectiveness must be chosen (e.g., tonnes of carbon dioxide saved). The cost-effectiveness is expressed as the net benefit per unit of effectiveness (in the case of climate policy, the benefit or cost per tonne of carbon emissions saved). The UK's National Audit Office (NAO) carried out an audit of the government's cost-effectiveness analysis. NAO found that not all policies or policy options were covered by the cost-effectiveness analysis, but they also found that the CEA was an appropriate tool for appraising policies, and that the results produced were reliable enough to compare policies. Further policy tools were chosen in line with analysis results. However, the NAO also found that few scenarios were included in the analysis and that uncertainty was not addressed fully through consideration of optimism bias or sensitivity analysis.

91 Note that the IPCC provides expert teams to review the inventories and national communications of Annex 1 Parties. The auditor could examine these reviews in order to consider risks related to governance (see Appendix C).
92 Risks concerning effectiveness of policy instruments implemented are described in Section 4.3.2.
93 National Audit Office, 2007. Cost-effectiveness analysis in the 2006 Climate Change Programme Review. London: National Audit Office.

4.3.4
Key question: Are the financial resources misstated? (Efficiency risk assessments)

Within their audit of the financial accounts of government, auditors may be expected to address the completeness, accuracy, regularity - and if relevant - the disclosure of government incomes and expenditures associated with climate change mitigation measures.

Box 4.10
Example from New Zealand

New Zealand is required to reduce its GHG emissions in the first commitment period of the Kyoto Protocol to 1990 levels, or take responsibility for the difference. New Zealand can meet its commitments by reducing emissions, using Kyoto Protocol mechanisms such as the Clean Development Mechanism, or offsetting emissions against carbon removed by forests. The financial effect for New Zealand will become known at the end of the first commitment period – after 2012.

Generally accepted accounting practice in New Zealand requires the Government to include the estimated effects of the Kyoto Protocol in its financial statements, either as an asset or a liability (whether contingent or otherwise). The Government has done so since the 2004/05 financial year, and the SAI has audited the estimate as part of its audit of the New Zealand Government's financial statements. Estimating New Zealand's likely emissions in future periods is a complex exercise involving inputs from many government agencies, including about agriculture, land use, forestry, energy and industrial processes. Projections also require estimates of the price of carbon and the effects of policies such as New Zealand's new emissions trading scheme.

In the period the SAI audited the estimate, forecasts have mainly estimated that New Zealand will be in a deficit position at the end of the first commitment period, and estimates of the costs have fluctuated depending on the extent of the quantum of the deficit and the carbon price. At one point, the cost of the deficit was forecasted to be around $1 billion. However, more recently, the forecast has changed to New Zealand meeting its Kyoto targets and being in a surplus position with an estimated financial effect of an asset of $200 million.

The movement from liability to asset is attributed to better measurement of carbon sinks, a drought affecting agricultural emissions, and fewer projected emissions from deforestation partly because of the effects of the new emissions trading scheme. This required careful audit scrutiny given the movement from the previous financial year. The Government engages experts to review its projections and methodology and the SAI relies on the work of those expert reviewers in forming its opinion.

For more information, see New Zealand Treasury, 2010. New Zealand's Position under the Kyoto Protocol. [Online] Available at www.treasury.govt.nz/government/kyotoposition [Accessed 12 April 2010]

The materiality of the financial resources on climate change and their disclosure in the accounts will determine the level of audit work auditors will need to do. For example:

- If a country's accounting policies require the disclosure of Kyoto commitments and potential liabilities or assets from not meeting or exceeding targets, the financial auditor will need to consider the reliability of the emissions register as a basis for determining the potential liability or asset in the accounts (Box 4.10 illustrates an example of this from New Zealand, and it highlights some of the issues that arise when its SAI audits the financial effect of the Kyoto Protocol)
- If a developing country's receipts of funding for mitigation measures are significant and ring-fenced for that purpose, the auditor may be required to test and provide assurance on the completeness of the accounting for the income and the regularity of the expenditure
- If a country is covered by an Emissions Trading Scheme that involves the sale of emissions allowances, the receipts for this may be material or subject to specific risks and should be separately disclosed in the accounts. If this happens, the financial auditor will need to test and provide assurance on the auction process and receipts.

The SAI of Sweden undertook a performance review of Sweden's emissions rights under the Kyoto Protocol.[94] The review found that failure in reporting led to a lack of transparency; this in turn meant the Swedish Parliament did not have the opportunity to consider the use of emission rights (see Box 4.11).

If the financial resources associated with climate change measures are not routinely covered in annual financial audits, the performance auditor may wish to identify and assess the risks of financial misstatement. This involves two risk considerations: one related to inherent risks; the other to control risks.

Box 4.11
Example from the SAI of Sweden

In an analysis of the value of Sweden's emissions rights, the SAI of Sweden concluded that, due to reductions in emissions, Sweden had a surplus of emissions rights. The total allocated amount of emission rights was based on the estimates in the Kyoto Protocol of a four per cent increase in emissions compared with 1990; and the Swedish Parliament had since set a more ambitious goal for emission reductions: a four per cent reduction compared with 1990. Under the Kyoto Protocol, surpluses can be cancelled, saved or sold. This means that, even if it cancelled the surplus, Sweden would still achieve its new national emission goal. Either way, the surplus was worth an estimated € 1 billion. The SAI of Sweden found that this was not reported by government to the Parliament, and that there was a lack of transparency and information in existing reporting processes. As a consequence, Parliament did not have the opportunity to decide how to handle the surplus, or the financial resources. Furthermore, even if the emission rights were sold, emissions would not decrease globally.

94 Riksrevisionen, 2010. Report summary: What are Sweden's Emission Rights Worth?

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Under these circumstances, a natural starting point could be to focus on some of the indicators of good governance and good management described in Chapter 3, including:

- The internal control systems of the entity in question, as this is an important indicator of whether the basic apparatus for addressing the risks of financial misstatements is in place. If the management seems not to take climate change seriously, this is likely to be reflected in laxer control.
- Accountability, transparency, and involvement of relevant stakeholders. Clear guidelines may be lacking on how to report emissions. Facilities could be tempted to under-report their emissions in order to reduce their costs. On the other hand, if the government grants emission permits free of charge, companies could be tempted to over-report their emissions in order to get as many permits as possible.
- Whether the operations of the government entity in question are orderly, that is, they are methodical and carried out in a well-organised way; and that they are ethical, that is, carried out according to moral principles.

Auditors could then focus their attention on components of the internal control systems that are inadequate. As this may include technical investigations, auditors could rely on third-party assessments. Auditors should then take extra care to check the qualifications of the third parties to carry out these assessments, their use of appropriate methods and the reliability of their calculations.

Registry systems

As a price is set on carbon, emissions trading can be financially audited.[95] A registry system for national and international transactions for emissions trading is important, as is a registry of emissions by facility, sector and overall.[96] Auditors can assess risks in establishing and operating the national emissions trading registry, including security procedures.[97] Risks are likely:

- If the responsible entity is unable to document the transactions (a larger question might be: has a reliable and transparent registry system for national and international transactions been established?)
- If any tasks related to the running of the emissions registry system or the ETS have been privatised or outsourced, as this could reduce government control if the tasks are not properly monitored.

Fraud and corruption

Fraud and corruption are general risk factors that affect more or less all sectors of government and all areas of public affairs.[98] The inherent characteristics of climate change – its comprehensiveness and complexity, the amount of funding involved, and the many challenges related to monitoring, control and enforcement – could entail a particularly high risk of fraud and corruption. The extent to which fraud and corruption is a risk will vary country-by-country, sector-by-sector, and policy instrument-by-policy instrument. For climate change auditors, the following rule of thumb can be used to prioritise between particular climate change topics from a fraud and corruption perspective: the higher the incentives in terms

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95 Even though the money is transferred between private parties, the functioning of the system is relevant to achieving national targets.

96 This is part of the reporting requirements of the Kyoto Protocol and is included in the review process of the national system of Parties with quantified commitments. See Section 3.1.2 and Appendix C.

97 All Annex I countries are obliged to have a national registry showing stocks and transactions of allowances, and failure to present acceptable registries can lead to exclusion from participation in the flexible mechanisms.

98 A survey carried out by Transparency International also suggests that corruption in the public sector takes much the same form and affects the same areas whether one is dealing with a developed country or a developing one. The survey also suggests that the methodologies are also remarkably similar. Source: J. Pope, 2000. TI Source Book 2000. Confronting Corruption: The Elements of a National Integrity System. Berlin: Transparency International, p. 14.

of economic pressure or potential profits and the greater the (perceived) opportunity, the greater the risk of fraudulent and corrupt activities.[99]

Risks of fraud and corruption are a possibility when using the flexible mechanisms[100] under the Kyoto Protocol (described in Chapter 3 and identified in Step 2), because:

- The mechanisms are both very complex and technically complicated. The mechanisms have led to the establishment of a global carbon market, which has already reached a considerable size and complexity.[101]
- Most of the transactions/projects in question are bilateral, and many of them are carried out in countries where there is good reason to look into their performance with respect to good governance and internal control.

To be managed properly, the flexible mechanisms require, amongst other things, an extensive bureaucracy, complex rules, and enough qualified technical experts to apply the rules consistently. All these factors make monitoring, control and enforcement difficult.[102] Bad performance on the three good governance indicators described above can be considered as "red flags" (significant indicators) with respect to fraud and corruption.

4.3.5 Key question: Does the government focus on keeping the costs low? (Economy and efficiency risk analysis)

The amount of funding involved in mitigation efforts is substantial. Meeting the commitments of the Kyoto Protocol is likely to involve considerable costs in some countries. On the other hand, non-compliance can also prove costly. Under the Kyoto Protocol, non-compliance can have significant long-term costs for a country that fails to live up to its Kyoto commitments (see also Chapter 3).

The auditor might consider risks by asking the following questions in relation to use of public resources:

- Have costs been minimised through good procurement, for instance, by using good-practice tendering procedures?
- Is money spent being spent at the right time, in the right amounts, and in a reliable way?
- Are physical, material and human resources used efficiently?

There are risks of inefficient spending on CDM and JI projects. If not planned adequately, the government might be forced into buying more expensive credits.

There might also be risks related to using new, "efficient" technologies. For instance, costs (both for investment and use of technologies) for making new technologies operational might be higher than anticipated because the technology may not have been properly tested. Tight time-frames could mean there is only limited time to use the results from evaluations and tests.

4.3.6 Key Question: What should be the overall audit objectives?

Defining audit objectives is one of the most important phases in the planning process. The objectives determine what the audit is to accomplish and form the basis for selecting audit questions, scope and methodology. Also, the audit objectives can be used to frame the structure of the report. Given the importance of objectives, SAIs will benefit from having an agreed process for working out why the audit should be conducted.

The process should be based on the following considerations:

- Prioritise risks to be considered in the audit
- Define the added value of the audit.

These are essential considerations before designing the audit (the next Step).

What risks should be prioritised in an audit?

If relevant risks are identified in the government's response to mitigating climate change when answering key questions in this Step, the auditor may conclude that a mitigation audit should be conducted. In this key question, the auditor could prioritise among the risks by considering their relevance.

Are the risks at the overall level and/or at the sector level or both?

This question concerns whether a holistic or sector approach to the audit is preferable. Depending on the audit mandate and identified risks, the SAI must decide whether the audit should cover overall targets and management levels or be limited to certain relevant sectors.

An holistic approach could be relevant when responsibility and policy tools are distributed between different sectors and risks have been identified in the overall management. For example, emissions trading schemes will often cover several sectors. Risks relating to national emission inventories and discrepancies in overall governance are also relevant focuses in relation to the fulfilment of emission targets and international agreements.

The need for cross-sectoral action makes it challenging for the auditor to scope the audit. Several large-scale audits that have been conducted have chosen to focus on the overall strategy and action in their first climate change mitigation audit. Typically, these audits look at how the government has responded to the need for new organisational and political structures. A broad and comprehensive audit can be a challenge for auditors, but it may be even more difficult to correctly scope the audit into relevant sectors or measures by only focusing on the most important risks. The auditors could also use this wide scoping to identify areas for future audits covering one sector or certain policy tools.

To ensure that the auditor maintains focus on materiality, it might also be possible to start with the sectors that have the highest emissions (identified in Step 1). Have targets been set for the selected sector and are these targets sufficiently operationalised (identified in the above key question)? If not, there is

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99 For a more thorough description of the driving forces behind fraud and corruption, see IFAC, 2006. ISA 240. The Auditor's Responsibility to Consider Fraud in an Audit of Financial Statements. International Federation of Accountants, p. 14 and J. Pope, 2000. TI Source Book 2000. Confronting Corruption: The Elements of a National Integrity System. Berlin: Transparency International, p. xviii, respectively. ISA 240 also adds "rationalization of the act" as a third aspect.

100 Money transactions relating to climate-related projects that are not part of the mechanisms (for instance deforestation and bilateral cooperation between developed and developing countries) could also be considered, of course.

101 According to the World Bank, the total value of the carbon market in 2008 was approximately USD 126 billion. Source: World Bank, 2009. State and Trends of the Carbon Market 2009. [Online] Available at wbcarbonfinance.org/docs/State___Trends_of_the_Carbon_Market_2009-FINAL_26_May09.pdf [Accessed 10 April 2010], p. 1.

102 See www.13iacc.org/, the 13th International Anti-Corruption Conference, where climate change and corruption was one of the main themes.

Box 4.12
Risk analysis in the energy sector

Energy production from non-renewable energy resources through the burning of fossil fuels such as gas, oil, coal and coke for heat and electricity production, may account for a large proportion of a country's total GHG emissions. Energy consumption may also indirectly affect emissions through increased consumption brought about by economic development. This highlights the need to include issues in the energy sector in a mitigation audit. Auditing energy policies (e.g., energy efficiency and use of renewable energy resources), could therefore be a way to scope a mitigation audit into one sector. The bullet points below present a selection of risks related to government response in the energy sector.

Possible risks to do with economy:

- Does government have the appropriate means and measures to ensure investments and implementation of policies is done at the lowest costs possible?
- Is there a risk that funding for renewable energy production is not spent as prescribed?

Possible risks to do with efficiency:

- Does regulation guarantee fair competition for new energy producers when entering the power market?
- Does government have the appropriate means and measures to monitor the development of energy production, consumption and energy efficiency?
- Is government able to monitor whether measures produce results?
- Does the licence system for energy production ensure effective processing of applications for the establishment of energy plants?

Possible risks to do with effectiveness:

- Are taxes on fossil fuels designed so that they serve as an incentive to decrease the use of fossil fuels and/or reduce consumption?
- Do funding systems for renewable energy produce results in relation to goals set?
- Do initiated programmes result in a decrease in energy consumption or an increase in energy efficiency?
- Do funding of new renewable energy sources lead to actual changes in the energy production marked, or is government energy strategy a barrier due to too high investment and production costs?

See also risks about adaptation issues (regarding social and environmental sustainability) described in key question 5.3.2.

For more information on how to audit energy, see the INTOSAI guide Auditing Sustainable Energy: Guidance for Supreme Audit Institutions.
You might also take also a look at other audits. For example, the SAI of Austria investigated programmes and measures related to energy saving and the contribution of this sector to fulfilling the Kyoto commitment. The UK's NAO has also done several audits on energy use and energy efficiency. In 2008, NAO published an audit review of the performance of programmes to reduce energy consumption and improve energy efficiency in households. See National Audit Office, 2008. Programmes to reduce household energy consumption. London: National Audit Office.

a risk that the sector in question will not fulfil its responsibility and that it will not give emissions enough priority. See Box 4.12 for examples of possible risks identified in the energy sector.

Are the risks related to the use of specific policy instruments?

In a performance audit, the auditor may conclude that there are some key policy instruments that seem ineffective and should become the focus of an audit. It could also be that a lack of policy instruments leads to ineffectiveness. A general delay in implementing the policy instruments suggests that the government is not getting the most out of the financial resources.

In financial auditing, the auditor may need to assess the transparency, regularity and accuracy of measurement and completeness of reported financial transactions. For example, risks of money transfers among the key players for subsidies and taxes might be material.

In compliance auditing, it could be relevant to focus on policy instruments if risks are identified around how the management follows rules, standards and international agreements in its use of specific policy instruments.

How will the audit add value?

The auditor should return to the questions asked at the start of Step 3 by considering the value of auditing the identified risks related to effectiveness, efficiency and economy.[103] The auditor should decide whether the audit will add value by considering:

- Relevance for improving management systems and policy instruments
- The likelihood of acquiring new knowledge or perspectives and providing a new level of transparency
- That the audit was done at the best possible time (in other words, when it could make the greatest difference).

Audits are often evaluations, considering the implementation and effects of certain programmes or government efforts. In order to ensure that the audit contributes to improvements in governance, the audit might be most valuable if it is published in advance of political processes or if it is scoped as a concurrent evaluation.

[103] See also Box 4.7.

4.4 STEP 4: DESIGN THE AUDIT

This final Step is about helping auditors to design audits of government responses to climate change. We propose using a design matrix for this design process. This involves formulating researchable questions, and identifying criteria and evidence. The researchable questions should be linked to audit objectives addressing elements found in Step 3. Specialists recommend including condition, effect and cause when formulating researchable questions.

In this Guide, we make use of the audit menu developed for the WGEA Global Coordinated Audit Project on Climate Change, and we make particular use of this menu's researchable questions and audit criteria. The structure of this Step reflects that of the previous Step: we begin by looking at the results (or the effectiveness) of mitigation policies, including the effectiveness of the policy instruments; before looking at the efficiency of the governance of these policies, including coordination and the setting up of internal control systems.

It is important to emphasise that choosing audit questions is not an either-or matter. This presentation should be regarded as a "menu" of options, in that auditors may use a combination of several audit questions. Although a performance audit will often (but not always) try to say something about the results of government policies and a financial audit will often say something about governance systems, a combination of these or similar perspectives could be fruitful. When designing the audit in this Step, it may be useful to also consider the feasibility of carrying out the audit, especially with regards to available audit criteria, information and audit evidence.

In this Step, we present three audit questions related to the risks analysed in Step 3:

1. **Will the government meet its emissions targets or commitments?**
2. **Are policy instruments effective?**
3. **Is the governance of the climate change response efficient?**

Lesson learned:
The audit team should agree on the best way to define the audit objectives

The audit team has gathered a lot of information in the planning phase. This information needs to be structured to scope the audit or identify different project ideas. Questions to be discussed could include:

- Situation: What is the environmental problem (GHG emissions)?
- Response: What has the government done to reduce the problem? Is it sufficient?
- Materiality: Why is the issue important? What are the consequences when performance risks are likely?

Please note that the suggested researchable questions are described here in a general manner. In practical audit planning, questions could deal with a range of topics around economy, efficiency and effectiveness related to the identified audit objective. Please also note that design is a continuous and evolving process throughout the audit. Therefore, there might be a need to adjust the objectives, questions and methodologies after the audit starts.

4.4.1 Will the government meet its emission targets or commitments?

We start by looking at ways of addressing whether targets, both short-term and long-term, are being reached. The most straightforward way of doing this is to look at the emissions targets from the Kyoto Protocol, comparing them with national communications to the UNFCCC and checking whether the government is on track to meet its commitment. However, there are other options for checking compliance with targets. These are presented below as researchable questions and supplemented by audit criteria and evidence. We also present examples of how this has been handled in various audit situations.

Researchable questions

- Is the government on track to meet its targets? Which targets have been met?
- Is use of the Kyoto mechanisms supplementary to domestic action?

Audit criteria

At the global level, the only binding and quantified emission targets stem from the Kyoto Protocol, and consequently only those countries that have ratified the Protocol and have commitments under it can use it as an audit criterion. This is described in more detail in Chapter 3. National targets, if they exist, should also be considered.

Audit evidence

The most important source of data for this kind of evaluation will be national emission figures. Such figures can be found in the national communications countries submit to the UNFCCC Secretariat. See Section 3.1.1 for more details on the reports and the reporting requirements. If a country or a group of countries has adopted a more long-term emissions target, projections are necessary in order to assess progress.

Examples

The SAI of Canada has also carried out audits of Canada's fulfilment of the Kyoto Protocol. See Figure 4.2 for a graph showing GHG emissions, compared to Canada's Kyoto target.

4.4.2 Are the policy instruments effective?

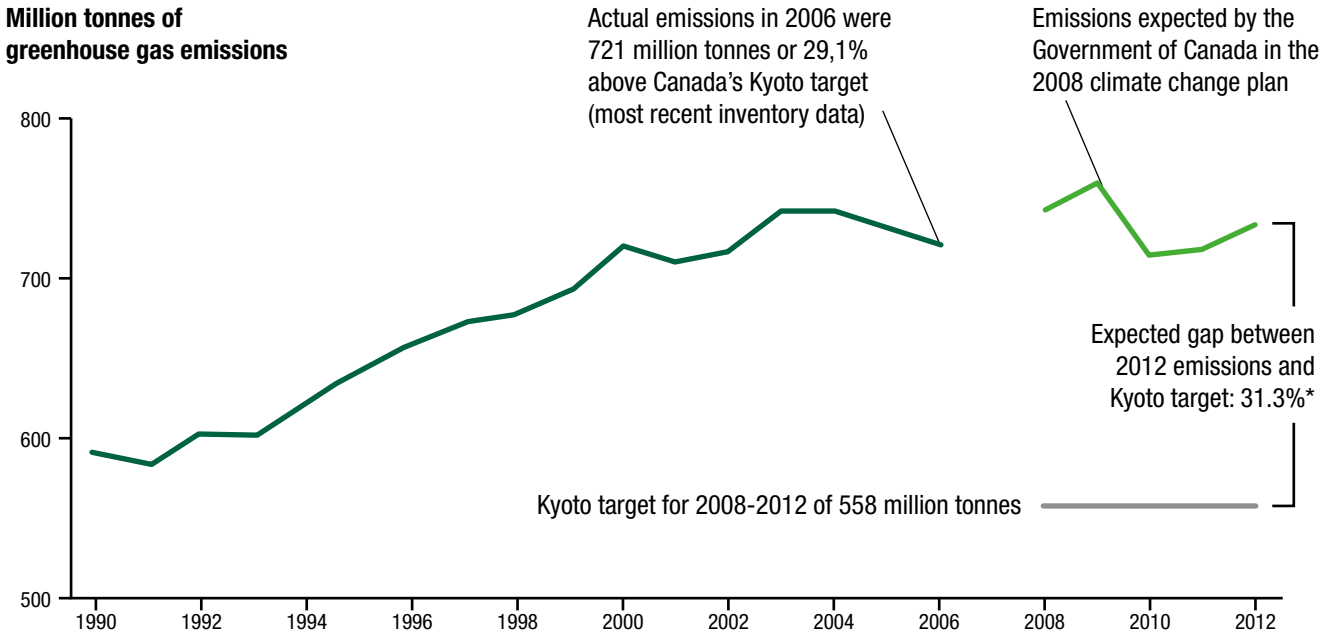
As pointed out above, auditing the results of mitigation efforts often involves more than just making a statement on whether or not emissions targets are being met. If the targets are not being met, the chances are that this is because the effectiveness of the policy instruments is inadequate or that insufficient instruments have been implemented. Again, we present researchable questions and audit criteria and evidence, as well as examples.

Lesson learned:
Joint audits are useful when auditing climate change policy

When auditing the implementation of international agreements, joint audits could be an efficient method of learning from each other's experience and comparing audit findings in order to identify good governance. Climate change is an area where coordinated audits have been successfully conducted at both the regional and global level. In addition, many similar policies and tools are being adopted all over the world that are suitable for a joint approach. For instance, mitigation tools could include carbon markets, collaborative investments and flexible mechanisms. Whitin the framework of the Global Coordinated Audit, the SAI of Norway actively communicated audit findings from other countries in their audit, Target achievement in the climate policy.

Figure 4.2
Canada is not on track to meet its obligations to reduce emissions

Under the Kyoto Protocol, Canada agreed to reduce its emission levels in the 2008–2012 period to six per cent below the 1990 level. The Government's own 2006 data revealed that greenhouse gas/GHG emissions were almost 29.1 per cent above Canada's Kyoto target and were rising, not declining.



The calculation of the percentage gap uses unrounded figures from the inventory but rounded figures from the 2008 climate change plan, because no unrounded figures were available.

Sources:
Office of the Auditor General of Canada, 2009. 2009 Spring Report of the Commissioner of the Environment and Sustainable Development, [Online] Available at www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_e_32544.html [Accessed 10 April 2010]

Besides looking at national policy instruments, we also highlight a set of instruments and policies that are based on international climate change agreements. This means that we include a set of more specific researchable questions on Clean Development Mechanism (CDM) projects and emissions trading schemes (ETS), as well as on technology and funding.

Researchable questions

- What are the main principles behind the choice of policy instruments? (Table 4.4 presents a selection of four evaluation criteria [environmental effectiveness, cost-effectiveness, distributional considerations and institutional feasibility] for environmental mitigation policy instruments and researchable questions that arise in relation to those instruments)

Table 4.4
Environmental policy instruments, evaluation criteria, and researchable questions

	Criteria			
Instrument	**Environmental effectiveness**	**Cost-effectiveness**	**Meets distributional considerations**	**Institutional feasibility**
Regulations and standards	Do performance standards limit technology development? Does the government have the necessary information to target regulations?	Cost implications for implementing regulations and standards? Does enforcement ensure compliance?	Do regulations and standards distort competition?	
Taxes and charges	Has the tax level been set high enough to induce change?	Is participation broad enough for the tax to have an impact? Are institutions strong enough to limit compliance costs? What are the marginal costs across sectors?		Are institutions strong enough to ensure compliance?
Tradable permits	Is the cap on emissions set low enough to have an effect? Is a rigorous system in place to ensure compliance?	Is coverage broad enough to have an effect?		Is there a risk of fraud and corruption? What is the capacity to control reported emissions?
Voluntary agreements	Have clear targets been set? Is there a baseline to compare with? Have private-sector players been involved enough in the design?	Are the costs of administering the agreements high compared with the effects?		Is the administration suitable to assure an effect?
Subsidies and other incentives	Are subsidies effective in reducing emissions?	Have the market-distorting effects been satisfactorily evaluated? Are funds being misallocated? Additionality?[105]	Do the subsidies target those who need them?	Are the subsidies kept beyond the planned time frame?
Research and development	Is the funding consistent and sufficient and does it have a long-term perspective? Is there a strategy for making use of new technologies?	Is the basis for the allocation of funding competitive and transparent? Is the government willing to take a risk on uncertain technologies?	Is the basis for allocating funding good enough?	Is there a system for checking for results and paying by results? Is an adequate administration in place?
Information policies	Does the government evaluate programmes? Do the programmes have an effect?	Is the effect of programmes small compared with costs?	Are campaigns targeted?	

Note:
This is an adapted version of Table 13.1 in S. Gupta, 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

[105] According to BusinessDictionary, addtionality is "Extent to which a new input (action or item) adds to the existing inputs (instead of replacing any of them) and results in a greater aggregate"; see BusinessDictionary, 2010. Additionality. [Online] Available at www.businessdictionary.com/definition/additionality.html [Accessed 10 April 2010].

- How does the government measure the relative contribution or effectiveness of each policy instrument?
- How efficient are the policy instruments? If they are not efficient, what are the reasons for this?

Audit criteria

Again, the UNFCCC and the Kyoto Protocol are the main global sources of audit criteria. Along with the Marrakesh Accords (see Section 3.1), the Protocol guides the implementation of some of the instruments (e.g., JI and the CDM). The criteria for good governance presented in Section 3.2 can be used here as well. Remember also that certain instruments or sectors can have special laws and regulations attached to them, so auditors must also consider national or regional legislation.

Examples

The SAI of Canada's report on the reduction of GHGs from energy production and consumption (summarised in the Appendix Box A.2) looks at whether three government programmes have achieved the expected results. The audit reports that, even though some progress has been made, emission targets are confusing. This makes it difficult to compare the outcome with the original targets. Also, efforts to reduce emissions from oil and gas production had minimal results.

Focusing on CDM and ETS

Two important policy instruments that deserve special mention are the CDM and ETS. Here we present some researchable questions that focus on these two instruments.

Researchable questions for CDM:

- What strategy and plans have been developed for the purchase of CDM quotas?
- What criteria are used for the selection of projects?
- What criteria are used to assess additionality and carbon leakage?
- What criteria are used to assess projects' contribution to sustainable development?
- What criteria are used to assess projects' contribution to technology transfer?

A review of the CDM mechanism done by the SAI of the USA (see Appendix A, Box A.6) touched upon several of the aspects mentioned above.[106] The SAI of the United States reviewed information on the ETS and CDM available from the EU, the UN, the academic literature, and market research firms to gain an understanding of the lessons learned from the ETS and the CDM.

Researchable questions for ETS

- Are reliable data available on actual and expected (projected) emissions at facility level?
- Are adequate registry systems in place?
- What are the principles for allocating the quotas for the plants? Do they contribute to goal achievement?
- Are reports on actual emissions from companies verified?
- Are reserves sufficient for future growth in the market?
- Are emissions trading systems efficient and cost-effective?
- In instances where quotas are sold, is the money received used to reduce emissions?

An audit focusing on implementation of the European ETS at the national level was conducted by the SAI of the Netherlands. This audit found that the ETS had been properly implemented, but that it placed too much emphasis on maintaining the competitiveness of Dutch industry compared with the emphasis placed on the Dutch Kyoto target. Another conclusion of the audit concerned the reliability of the Dutch emission data (see Box A.3).

Focusing on technology and science

There are no quantified targets for introducing technology development and transfer in the Convention or the Protocol. The Convention does, however, commit all Member Parties to promoting and cooperating in these areas. In that sense, these issues could also be covered under the next line of enquiry, which concerns plans and strategies. The auditor may already have examined Table 4.3 to gain an overview of relevant areas for auditing mitigation technology. Researchable questions are presented below.

Researchable questions for technology:

- Does the government have procedures in place for identifying, evaluating and implementing technology development programmes?
- Has the government followed these procedures?
- Has the government identified internal and external barriers to mitigation technology deployment and transfer?
- Do the programmes comply with national rules and procedures about governance, accountability, oversight requirements, and management?
- How have activities and programmes been coordinated internationally?
- Does the government monitor and report on the effectiveness of these programmes?

Focusing on funding

In the context of climate change mitigation, funding can include both national and international transfers. Particularly when dealing with international transfers of funds, this line of inquiry often overlaps with ordinary development assistance or with CDM projects.

Researchable questions for funding:

- Does the financing carried out comply with related internal financing rules and regulations?
- What procedures are in place for coordinating and avoiding duplication across funding agencies, programmes and the private sector?

Researchable questions for countries involved in transfers of funds:

- Are funds from donor countries to support programmes and projects aimed at controlling GHG emissions?
- Is there a robust framework in place to manage the funds received?
- Is the provision of funds facilitated through an appropriate fund transfer framework aimed at building capacity and achieving results (that is, reducing GHG emissions) in recipient countries?

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[106] The SAI of USA relied, in part, on this literature in arriving at their findings: E. Boyd et al., 2007. The Clean Development Mechanism: An assessment of current practice and future approaches for policy Tyndall Centre Working Paper 114. [Online] Available at www.tyndall.ac.uk/sites/default/files/wp114.pdf [Accessed 10 April 2010]; A. Cosbey, D. Murphy, and J. Drexhage, 2007. Market Mechanisms for Sustainable Development: How Do They Fit in the Various Post-2012 Climate Efforts? [Online] Available at www.iisd.org/pdf/2007/market_mechanisms.pdf [Accessed 10 April 2010]; P. Castro and A. Michaelowa, 2008. Empirical Analysis of Performance of CDM Projects. [Online] Available at www.indiaenvironmentportal.org.in/files/empirical-done.pdf [Accessed 10 April 2010]; L. Schneider, 2007. Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement. [Online] Available at www.oeko.de/oekodoc/622/2007-162-en.pdf [Accessed 10 April 2010]; C. Sutter and J. C. Parreno, 2007. Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects, Climactic Change (2007) 84, pp.75-90; C. Voigt, 2008. Is the Clean Development Mechanism Sustainable? Some Critical Aspects. Sustainable Development Law & Policy Volume VIII, Issue II.

Lesson learned:
Take a look at other audits covering international policy instruments, for example when auditing the effectiveness of emission trading systems

When reviewing international policy instruments such as emissions trading systems (ETS) and CDM, it is likely that another SAI has already reviewed these policy instruments. As the overall purposes of these policy instruments are the same in most countries, take a look at previously published audits to get an overview of what you can be expected to find, in terms of risks and actual audit findings. The SAI of the United States reports that reviewing the existing European Trade System has been useful in relation to the potential development of an American cap-and-trade system.

If your country follows all rules and procedures when implementing the ETS, the audit could benefit from looking at the effectiveness of the market mechanisms. Establishing a market price for emissions should ensure that emissions are reduced with maximum efficiency, with the lowest-cost abatement options being implemented first, and that a move away from carbon-intensive products is encouraged.

The carbon price could therefore be taken into consideration when reviewing whether the system leads to emission reductions, or whether diffusion of new mitigation technology is successful. Several audits show that because of over-allowance – thereby creating a surplus of permits in the first period of the EU-ETS - carbon prices in the market dropped, lessening economic incentives to reduce emission. This in turn makes it difficult to establish a traded price of carbon which, at the same time, provides sufficient incentives for investment in low-carbon technology.

Similar considerations could be taken into account when auditing CDM and JI (Joint Implementation) instruments. The projects may be approved before they are realised, but auditing the effectiveness and efficiency of the projects could add more knowledge in this field.

- Does the funding for climate change projects and programmes come in addition to funding for development assistance?
- Is adequate and reliable information about donor funding and its use available and easily accessible?
- To what extent does the funding contribute to reducing emissions in the recipient countries?

Even though the Convention and the Protocol mention funding and financing, auditors can also use criteria more commonly used when auditing development assistance. These include donor agreements and international evaluation criteria for development assistance under the UN.

4.4.3 Is the governance of the government's climate change response efficient?

The governance of climate change policies, programmes and projects can be an important determinant of the extent to which GHG emissions are reduced. Among other things, efficient governance involves established plans and strategies, management by objectives and results, coordination among players and information for use in decision-making.

An important element mentioned in Step 3 is fraud and corruption. Auditors can formulate specific audit questions focusing on these risks, or they can be integrated into the researchable questions listed below.

Researchable questions

- Are strategies or plans formulated in a way that contributes to efficient achievement of the objectives and targets for mitigating GHG emissions – at regional, national and sector levels and for all relevant sources (or sinks)?
- Are the targets SMART: specific, measurable, attainable, relevant and time-bound?
- Are the roles and responsibilities assigned to government agencies clear and documented?
- Do agencies adhere to roles and responsibilities? If not, why not? Do agencies have the necessary capacity and resources? Does the main responsible ministry provide effective oversight of responsible agencies and players?
- Are mitigation efforts coordinated to ensure that they are complementary rather than conflicting?
- Are plans, policy choices and targets based on adequate environmental, social and economic data?
- Are data, including results, for decision-making transparent and reliable (for instance, subject to a peer review / quality assurance process)?
- Are policies and programmes subjected to regular evaluation?
- Have key risks influencing goal achievement been assessed?

Audit criteria

The principles of good governance presented in Section 3.2 may be an important source of audit criteria here. Furthermore, all Parties are committed by the Convention to formulating and implementing plans and strategies for mitigation programmes. The Protocol reiterates this commitment. The ratification of these documents therefore means that governments must initiate strategies and plans to mitigate GHG emissions.

Audit evidence

The national communications from Parties to the UNFCCC contain information on implementation of activities (see Section 3.1). These can be used to gain an overview of the way the government organises its mitigation efforts. Public documents should also describe how implementation is coordinated, on what basis decisions are made, and should describe any plans for achieving the objectives and targets. Cooperation between responsible agencies should be documented.

Examples

The first audit question in the design matrix in Appendix F is "To what extent does the responsible ministry fulfil its overriding management responsibility to ensure goal achievement?" That Appendix also contains further tips and hints for audit criteria and evidence. An audit carried out by the SAI of Canada looked at how the federal government was managing the overall approach to climate change (see Box A.4 in Appendix A). It concluded that an effective governance structure had yet to be created and that no government-wide monitoring and reporting of climate change expenditure existed. The SAI of Canada also recommended that uncertainties and risks associated with the emissions data system should be assessed on an ongoing basis.

Lesson learned:
A lack of national standardised data may be a challenge

Note that some countries lack national standards for reporting the costs and effects of implemented policy instruments and initiated measures. Reviewing data provided by a regional agency not submitting to national standards for reporting can be a challenge, as there may be reliability issues with the data.

4.5 CONCLUSION

The four-step process described in this Chapter is meant to help auditors in the planning stage of an audit. In this Guide we propose using risk analysis as a means of identifying areas that have high risk exposure or where there are opportunities for performance improvements – or, in other words, areas where an audit will add value. The information collected in Steps 1 and 2 serves as background for making the risk analysis. This is done by identifying the GHG emissions and getting an overview of the government's response in mitigating these emissions.

The design matrix in many respects constitutes the end point of the planning stage. By identifying the audit objective, formulating researchable questions and linking these with audit criteria, and proposing possible sources of audit evidence, the auditor has a very good starting point for carrying out the actual audit.

The design matrix could also be used as a tool to communicate the design of the audit to internal and external stakeholders, and to structure the audit report. The auditor should be aware of the need to do minor updates in the design if needed when conducting the audit.

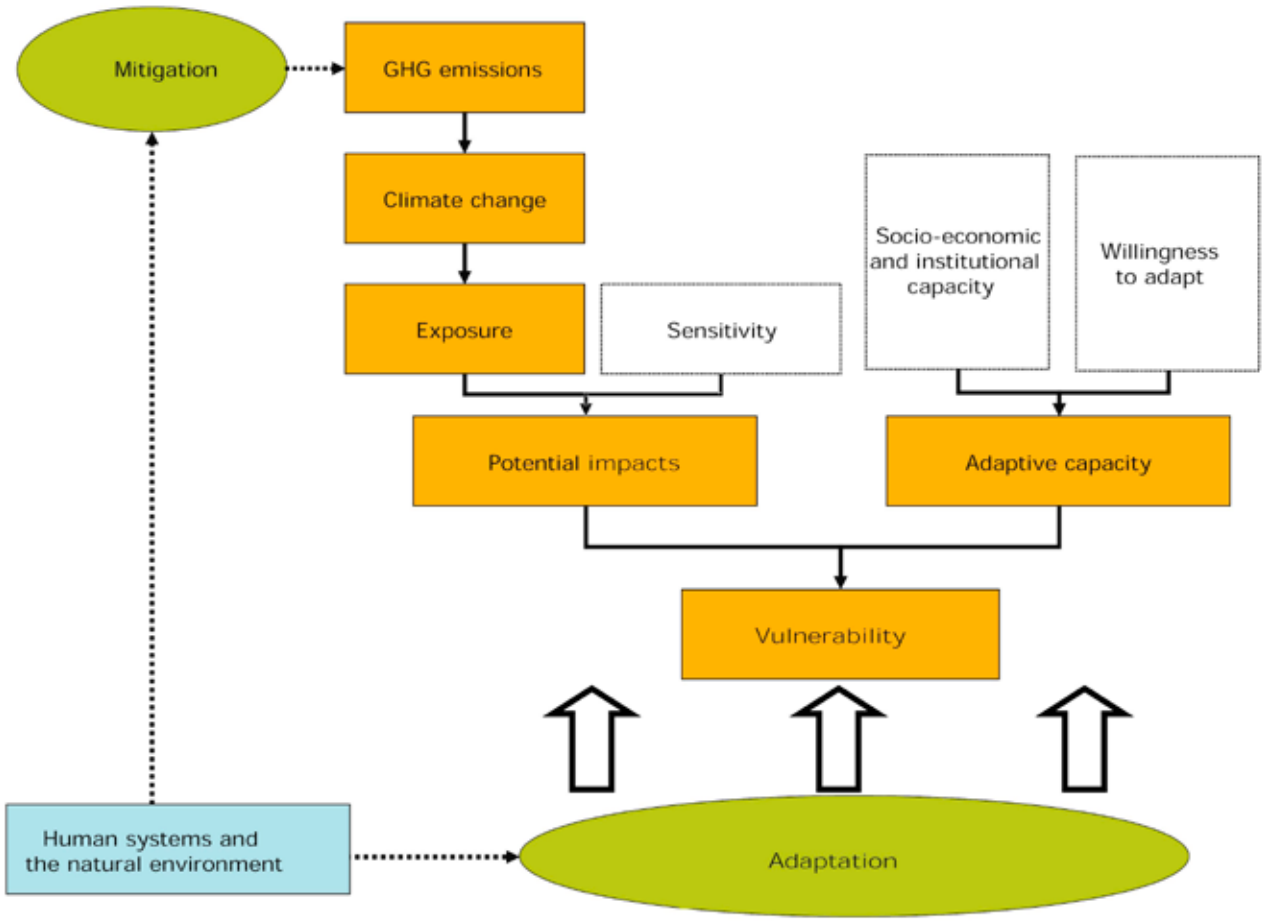
Chapter 5:
How to plan adaptation audits

Climate change adaptation refers to an adjustment of natural or human systems in response to actual or expected climatic stimuli or their effects.[107] In this Chapter, we will describe how adaptation to climate change can be audited.

The structure of this Chapter will follow the Steps described in Chapter 1:

- **Step 1: Get an overview of the country's vulnerability to climate change**
- **Step 2: Map the government's response in adapting to climate change**
- **Step 3: Choose audit topics and priorities**
- **Step 4: Design the audit**

Figure 5.1
Adaptation, vulnerability and its components



Sources:
S. Isoard, T. Grothmann and M. Zebisch, 2008: Climate Change Impacts, Vulnerability and Adaptation: Theory and Concepts. Paper presented at the Workshop Climate Change Impacts and Adaptation in the European Alps: Focus Water.

[107] Taken from Appendix I: Glossary in M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

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5.1
STEP 1: GET AN OVERVIEW OF THE COUNTRY'S VULNERABILITY TO CLIMATE CHANGE

The main purpose of this Step is to get an overview of the vulnerabilities to climate change. A good understanding of vulnerabilities is important when deciding where the government's response is most required and, therefore, where the SAI's actions will be most needed.[108]

A country's vulnerability to climate change is a product of the potential impacts and a system's adaptive capacity (this relationship is illustrated in Figure 5.1):[109]

- Climate change impacts are the effects of climate change on natural and human systems. The potential impacts, in turn, depend on exposure to changes in the climate system and the country's sensitivity
- Adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments of behaviour, resources and technologies. Important factors are socio-economic and institutional capacity and the willingness to adapt.

The extent to which the potential impacts of climate change will take place depends on adaptation efforts (and, in the longer term, on mitigation efforts).

The government is responsible for carrying out assessments of the vulnerability to climate change in order to identify appropriate adaptation measures. These assessments should serve as the main source of information for an SAI. Sometimes, however, an SAI may wish to consult other sources of information, either because the government has not adequately assessed the situation or because the SAI wants a second opinion (auditors can for instance consult non-governmental organisations (NGOs) or universities, contact neighbouring SAIs, or hire external consultants).

The auditor need to focus on the national and local impacts of climate change, adaptive capacity, and the vulnerability situation. The auditor should consider any trends and developments in the climate change threats, both in the short- and long-term. At the same time, the auditor should take account of international or regional initiatives that influence the country's adaptive capacity.

To understand the need for adaptation policy in your country, the auditor could answer the following key questions:

- **What are the actual and potential impacts of climate change?**
- **What is the adaptive capacity?**
- **What is the vulnerability to climate change?**

5.1.1
Key question: What are the actual and potential impacts of climate change?

The actual and potential impacts of climate change are the impacts that are, and may be occurring, because of climate change, without considering adaptation. Understanding the potential impacts of climate change in a country thus helps the auditor to understand where adaptation needs are most crucial. This, in turn, serves as a starting point for identifying areas to prioritise in an audit.

In Chapter 2, we distinguished between direct consequences of increases in global average air and ocean temperature, and their impacts. Direct consequences are described as an increase in the average global sea level, widespread melting of ice and snow and changes in weather (wind patterns, precipitation and severe weather events). We then described potential impacts.[111]

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[108] For more information on the existence and use of climate change data, see also INTOSAI WGEA, 2010. Environmental Accounting: Current Status and Options for SAIs. Draft. Presented at the INTOSAI WGEA Steering Committee Meeting, Dar es Salaam, Tanzania, 15–18 February 2010.

[109] Taken from Appendix I: Glossary, in M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press; R. Garnaut, 2009. Climate Change impacts on Australia. The Garnaut Climate Change Review.

[111] See Section 2.2 in this Guide, and M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

Auditors can consider a range of issues here, depending on the national context. Important areas include the impacts on society, the environment and the economy (see also the potential impacts listed in Chapter 2). To reiterate:

- Impacts on society: Climate change impacts many areas and systems, such as coastal areas, human health, agriculture and supplies of fresh water. Extreme weather events will have direct impacts on the most vulnerable industries, settlements and societies.
- Impacts on the environment: Essential ecosystems, such as forests, ocean and water habitats and coastal areas will be affected by climate change.
- Impacts on the economy: Adapting to climate change can be expected to involve considerable spending in the short term, but postponing adaptation measures may lead to increased costs in the long term.[112]

The absolute costs of adaptation are expected to rise over time, but fall as a percentage of GDP.[113] In the short term, absolute costs are expected to rise, especially in the East and the Pacific and in Latin America and the Caribbean. However, it is in Africa that adaptation costs are highest as a percentage of GDP (between 0.6 and 0.7 per cent), and where the absolute costs of adaptation show the most growth.[114]

The consequences of climate change and its impacts will vary in intensity in different parts of the world. In addition to regional differences, climate change impacts are felt at the local and national level. For audits of climate change adaptation to be effective, it is necessary for the auditor to understand thoroughly these specific impacts. Therefore, the auditor needs to focus on the national and sub-national adaptation context.

Useful sources of information include risk assessments carried out by government agencies or others. Such assessments can be related to specific issues, e.g., Health Canada's 2007 study, Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity. They can also be broader in scope, as shown in three studies from the United States:

- The United States Global Change Research Program's (USGCRP) assessment of the science and the impacts of climate change on the United States (see www.globalchange.gov/component/content/article/67-themes/154-publications).
- USGCRP's preliminary review of adaptation options for climate sensitive ecosystems and resources on June 20, 2008. (See www.globalchange.gov/publications/reports/scientific-assessments/saps/306)
- Other reports from the USGCRP include discussions of adaptation options related to transportation, human health and welfare, energy supply and demand, and sea level rise. (See www.globalchange.gov/publications/reports/scientific-assessments/saps)

5.1.2
Key question: What is the adaptive capacity?

How much a country is affected depends on its level of exposure to climate change, as described in the first key question (see Section 5.1.1). However, climate change impacts also depend on how well a country can cope with or adapt to these changes, its adaptive capacity. Adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change. It includes adjustments in behaviour, resources and technologies.

Education, income and health are generic factors that have an impact on adaptive capacity. Technology can potentially play an important role in adapting to climate change. Generally, socio-economic development will positively influence a country's adaptive capacity (development in this sense includes economic growth as well as human capital and governance structures).

A high adaptive capacity does not necessarily translate into actual adaptation measures. In many instances, direct and planned action is required to make use of the capacity that exists for adaptation at the local or national level.

Stakeholder consultation is an important approach to use in assessing adaptation needs. How well a group or system has coped with past or current climate threats provides a sound basis for assessments of present or future threats and adaptive capacity.[115]

Lesson learned:
Developed countries need to focus more on adaptation to climate change

Both developing and developed countries need to adapt to the impacts of climate change. Compared with efforts to mitigate emissions of greenhouse gases, developed countries have done little to adapt. Several SAIs have pointed out that early action is needed. Furthermore, efforts by a national government would greatly assist other levels of government to act and to implement measures.

112 N. Stern, 2006. The Economics of Climate Change The Stern Review. Cambridge: Cambridge University Press; M. L. Parry et al., 2009. The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates. Technical Summary. Consultative Draft.

113 M. L. Parry et al., 2009. The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates. Technical Summary. Consultative Draft.

114 M. L. Parry et al., 2009. The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates. Technical Summary. Consultative Draft. This study estimates that the cost of adapting to an approximately 2 degrees Celsius warmer world by 2050 is in the range of USD 75 billion to USD 100 billion a year between 2010 and 2050. Another study estimate the global costs of adaptation to rise from USD 10 billion in 2010 to 230–275 billion in 2050 (depending on emissions reduction targets); see, A. F. Hof et al., 2009. The effect of different mitigation strategies on adaptation costs. Environmental Science and Policy 12.

115 M. L. Parry et al., 2007. Technical Summary. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

5.1.3
Key question: What is the vulnerability to climate change?

A country's vulnerability to climate change will determine what kind of adaptation is needed. Vulnerability to climate change depends on the actual and potential impacts and adaptive capacity, as articulated in the two previous key questions. Consequently, it is dependent on the geographical, social and sector context. Vulnerability to climate change is therefore principally defined in local terms. To only consider vulnerability at the national level will, in many instances, be inadequate.

The vulnerability of both natural and human systems varies at both the macro- and micro-level. At a general level, countries characterised by, for instance, low educational levels, an inefficient public sector and internal conflicts will have lower adaptive capacity. In some developing countries, this could mean vulnerability across a wide range of important sectors, including water resources, agriculture and food security, human health, terrestrial ecosystems, coastal zones, and marine ecosystems.[116] Future climate risks can be assessed using climate models, scenarios and downscaling based on past and current data and observations, as illustrated in Box 5.1. Further references to useful literature is given in Box 5.2.

Box 5.1
Sea level rise and vulnerability in developing and developed countries

The poorest countries are often the worst off when it comes to potential impacts and adaptive capacity, and therefore vulnerability. Today, 46 million people live in flood-endangered areas. It is estimated that a sea level rise of half a metre will put around 90 million people at risk, while a rise of one metre increases the number of people at risk to 118 million.

Loss of land area can be significant for coastal and island states and flat lowlands, such as the Netherlands, Denmark, the Maldives, and Bangladesh. Denmark and the Netherlands both have a good chance of building dikes and to take other adaptation actions to limit the damage caused by sea level rise. In the Netherlands, significant land areas have already been reclaimed through an elaborate system of polders and dikes.

In contrast, Bangladesh is one of the world's poorest nations and also one of the countries most vulnerable to sea level rise. Digital terrain modelling techniques have been used to display the scenarios in Bangladesh given a potential sea level rise of 1.5 metres. The country's economy and the people's access to food depend on agriculture, which would be seriously affected by flooding and flood-related catastrophes predicted under these scenarios. Bangladesh has little adaptive capacity because it cannot afford to build dikes or otherwise prepare for a rise in sea level. Therefore, Bangladesh would be seriously affected and suffer great material losses and loss of human lives. Because of this, short- and long-term policy action is sorely needed.

Source:
C. Schreiner, 2004 What would a warmer world be like? [Online] Available at www.atmosphere.mpg.de/enid/1ws.html [Accessed 11 April 2010]

Box 5.2
Do you want to know more about adaptation?

- IPCC, Fourth Assessment Report, Working Group I (The Physical Science Basis) and II (Impacts, Adaptation and Vulnerability) (see www.ipcc.ch/).
- The UNFCCC Nairobi Work Programme generates and disseminates the latest knowledge and experience on adaptation. (see www.unfccc.int/nwp) Many countries have developed adaptation plans. Least-developed countries have developed National Adaptation Programmes of Action (see unfccc.int/4585.php).
- UNFCCC, Impacts, Vulnerabilities and Adaptation in Developing Countries (unfccc.int/resource/docs/publications/impacts.pdf)
- World Meteorological Organisation's climate pages (www.wmo.int/pages/themes/climate/index_en.html)
- The United Nations Environment Programme (www.unep.org/) focuses on environmental issues in general, including climate change. See for instance "The environmental food crisis – The environment's role in averting future food crises" (www.grida.no/_res/site/file/publications/FoodCrisis_lores.pdf).
- The United Nations Development Programme (www.undp.org/) offers development insights with a climate change perspective.
- The European Meteorological Society (www.emetsoc.org/) disseminates information and climate systems for Europe.

[116] UNFCCC, 2007. Impacts, Vulnerabilities and Adaptation in Developing Countries. UNFCCC. General impacts and vulnerabilities are also described in Chapter 2.

5.2 STEP 2: MAP THE GOVERNMENT'S RESPONSE IN ADAPTING TO CLIMATE CHANGE

The main purpose of this Step is to understand what the government is doing to promote adaptation to climate change, and to identify relevant audit criteria to be used in the audit. A basic understanding of the government's efforts is necessary background information that will help the auditor to identify areas to prioritise in audits.

Climate change may amplify an existing situation in a sector where a policy response is already in place. For instance, governments may have already implemented policy tools to prevent biodiversity loss, although they have not tailored the policy to a certain adaptation policy programme. If climate change impacts on biodiversity are considered to be high, the auditor could collect information on the biodiversity policy in this Step. At the same time, the auditor could highlight the need to take climate change into account in the long-term biodiversity policy.

The auditor must decide whether there is a plan or strategy to adapt to climate change. Such a strategy could be an overall strategy, one that is divided into sectors, or one divided by national, regional and/or local levels (or some combination of all of these). It could also deal with both short-term and long-term adaptation issues. Any existing plan or strategy can then be evaluated by the auditor.

To collect the information needed to understand the government's response, the auditor could answer the following key questions:

- **What are the objectives and targets of adaptation policies?**
- **What are the policy instruments for adaptation?**
- **Who are the public players and what are their roles and responsibilities?**

It is possible to choose one or more vulnerable sectors in this Step, and/or focus on the overall level of adaptation planning. Examples in the next few pages will look at overall and sector-based initiatives.

5.2.1 Key question: What are the objectives and targets of adaptation policies?

The objectives and targets of adaptation policies must reflect government efforts to adapt to climate change in both the short- and long-term. Short-term options include emergency planning and flood defence and management. In the longer term, governments can use natural resource management and land-use planning to reduce vulnerability. Governments also have some options that help adaptation efforts in both the short- and long-term: monitoring areas that are threatened by climate change; research and technology development; and capacity-building activities, both nationally and through global and inter-regional networks. It is important to distinguish between short- and long-term adaptation objectives and be aware of the differences when designing the audit.

When considering adaptation, the UNFCCC is an important source of criteria stemming from international environmental agreements. The commitments under the UNFCCC are described in Chapter 3 but can be summarised as follows:

- All countries must formulate and implement programmes of adaptation to expected impacts. For the least-developed countries, this may involve preparing National Adaptation Programmes of Action that identify priority activities and immediate needs and concerns
- The developed countries must help developing countries that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation. Support mechanisms include the provision of funding, insurance and technology transfer, and scientific and technical assistance for all Parties to enhance their knowledge base
- All countries shall cooperate on preparing for adaptation measures for coastal zones, water, agriculture and desertification, and minimise the adverse effects of adaptation projects.

Furthermore, Article 3 of the UNFCCC establishes that the Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.

It is important to link climate change adaptation to broader development objectives, for example the Millennium Development Goals (MDGs)[117] and sustainable development. Box 5.3 presents a list of multilateral environmental agreements (MEAs) that could be useful as audit criteria when conducting adaptation audits.[118]

Regional initiatives can also be relevant for the auditor when identifying objectives for adaptation policies. An example is EU policy (see Box 5.4), which sets out objectives for the preparation of an overall strategy, and for certain sectors (e.g., flooding).

Public policy has an important role in facilitating adaptation. According to the IPCC, this role includes reducing the vulnerability of people and infrastructure, providing information on risks to private and public investment and decision-making, and protecting public goods such as habitats, species and culturally important resources.[119]

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117 See, for example, Table V-6 in UNFCCC, 2007. Impacts, Vulnerabilities and Adaptation in Developing Countries. UNFCCC.

118 Note that all INTOSAI WGEA guides can be accessed through the website http://environmental-auditing.org. The guides can be found under WGEA Publications.

119 W. N. Adger et al. 2007. Assessment of adaptation practices, options, constraints and capacity. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Box 5.3

Multilateral environmental agreements relevant to adaptation auditing

A number of MEAs can be suitable as criteria for auditing adaptation issues:

- **Sustainable development**
  By signing The World Summit on Sustainable Development (WSSD), more than 180 leaders have committed to working towards sustainable development and poverty reduction, and to creating a more sustainable Earth. The agreement is described in the INTOSAI WGEA document The World Summit on Sustainable Development: An Audit Guide for Supreme Audit Institutions.
- **Biodiversity**
  The Convention on Biological Diversity (CBD) has goals and targets that are relevant to climate change, e.g., Goal 7 (address challenges to biodiversity from climate change, and pollution), and Target 7.1 (maintain and enhance resilience of the components of biodiversity to adapt to climate change). See also the INTOSAI WGEA document Auditing Biodiversity: Guidance for Supreme Audit Institutions. In addition, the CBD website has a specific section on climate change and biodiversity: www.cbd.int/climate/.
- **Water issues**
  Several international agreements are described in the INTOSAI WGEA report Auditing Water Issues: Experiences of Supreme Audit institutions. Amongst other things, the agreements concern desertification, water resources and conservation management, and marine resources conservation and management
- **Desertification**
  The UN Convention to Combat Desertification (UNCCD) commits its more than 190 country Parties to combat desertification and mitigate the negative effects of drought, an issue which is expected to become increasingly important with climate change (www.unccd.int/).
- **Millennium development goals**
  World leaders, meeting in September 2008, committed to achieving the MDGs by 2015 and to setting out concrete plans and steps for action. The Goals address issues that could also be intensified by climate change: poverty and hunger, universal education, gender equality, child health, maternal health, combating HIV/AIDS, environmental sustainability, and global partnership (see www.un.org/millenniumgoals/)

Box 5.4

EU policies relevant for adaptation auditing

EU White Paper: Adapting to climate change: towards a European framework for action

The objective of the EU's Adaptation Framework is to improve the EU's resilience when dealing with the impacts of climate change. It adopts a phased approach. Phase 1 (2009–2013) focuses on four pillars of action: building a solid knowledge base on the impact and consequences of climate change for the EU, integrating adaptation into EU key policy areas, employing a combination of policy instruments to ensure effective delivery of adaptation; and stepping up international cooperation on adaptation. Phase 1 lays the groundwork for preparing a comprehensive EU adaptation strategy to be implemented during Phase 2, commencing in 2013.

(See ec.europa.eu/environment/climat/adaptation/index_en.htm)

EU Directive on the assessment and management of flood risks

EU Directive 2007/60/EC aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive requires Member States to first carry out a preliminary assessment (by 2011) to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood-risk maps by 2013, and establish flood-risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters in the whole territory of the EU.

(See ec.europa.eu/environment/water/flood_risk/index.htm)

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National policy statements are usually used to formulate desired outcomes. The objectives and targets can be found, for example, in legislation or national budgets. An example is the United Kingdom's Climate Change Act 2008, which establishes a legislative framework for government to ensure effective adaptation to climate change (see Box 5.5). It also sets legally binding emissions reduction targets.

The objectives themselves may not be directly related to adaptation policy, but could be closely related to the management of a certain sector. Those objectives are also relevant when collecting audit criteria to conduct a sector-focussed audit. For instance, objectives may have been set to prevent food shortages even though climate change has not been taken into account. The climate change challenge could make the food policy relevant, and the objectives and commitments set out in the food policy highly relevant when conducting an adaptation audit.

5.2.2 Key question: What are the policy instruments for adaptation?

In order to be effective, policies must be supported by programmes or procedures (instruments) that put in place and maintain activities contributing to the desired outcome. Programmes must have clearly established goals, have enough resources available to them, and be subject to regular review (and improvement).

Given the particular nature of adaptation, policy instruments often primarily respond to two main challenges:

- Adaptation in most countries is still at an early stage, which means many governments need to play a role as *activator*
- Adaptation is a challenge for many sectors and levels of government, which means that *coordination* is an important task for national governments[120]

Box 5.5

Regulatory framework for adaptation in United Kingdom's Climate Change Act 2008

- A requirement for the government to carry out a country-wide Climate Change Risk Assessment (CCRA) every five years, the first within three years
- A requirement for the government to put in place a National Adaptation Programme to address the most pressing climate change risks, as soon as practically possible after the first CCRA
- A new Reporting Power for the government to be able to require public authorities and statutory undertakers (companies such as water and energy utilities) to report on how they have assessed relevant climate change risks and how they will assess them
- A requirement for the government to publish a strategy on how this new Power will be used, and provisions for the government to be able to publish an accompanying Statutory Guidance for reporting authorities
- Creation of the Adaptation Sub-Committee of the Committee on Climate Change to oversee progress on the National Adaptation Programme and the CCRA.

Source:
National Audit Office, 2009. Adapting to climate change. [Online] Available at www.nao.org.uk/publications/0809/adapting_to_climate_change.aspx [Accessed 12 April 2010]

[120] R. Swart et al., 2009. Europe Adapts to Climate Change. Comparing National Adaptation Strategies. Partnership for European Environmental Research.

Climate change adaptation policies may be short-, medium-, or long-term. Short- and medium-term policy is tailored towards climate-related impacts that have already occurred or may occur in the near future, such as extreme weather events. Long-term policy is about long-term planning and actions to avoid worst-case scenarios caused by climate change, such as water and food shortages, ecosystem destruction, and flooded land areas.

Policy instruments may correspond to short-term objectives, such as responding to current impacts. For example, emergency preparedness may have to be given the highest priority in some situations. Policy instruments may also respond to observed medium- and long-term climate trends. This level of response often involves first establishing a knowledge base on which to base future solutions. Finally, some adaptation is already taking place in response to anticipated changes based on models and scenarios.

Adaptation to climate change is still at an early stage and few governments have started taking direct action. Therefore, it is important that the auditor gain an overview of more than just the policy instruments directly related to adaptation. The auditor should also get an overview of policy instruments that were originally designed for other purposes but might have an indirect impact on adaptation measures. When identifying the government's adaptation policy, the auditor could benefit from understanding the costs involved, the delivery chain, and the arrangements for monitoring and review.

This Guide focuses on policies (planning and instruments) that can influence the activation, coordination and implementation of adaptation measures. Also, examples of policy instruments relevant to sectors especially vulnerable to climate change are described. Policy instruments available to a government administration can be divided into four categories: organisational, legal, economic, and informational.[121]

Box 5.6
Technology needs assessments

An important source of information for auditors when mapping technology development may be technology needs assessments (TNAs). These assessments enable developing countries to track the need for new equipment, techniques, practical knowledge, and skills. TNAs are voluntary and may be reported to the UNFCCC, and are designed to help developing countries to implement the commitment to transfer technologies from developed to developing countries (see Article 4, paragraph 5 of the Convention).

See the UNFCCC website for more information on TNAs: unfccc.int/ttclear/jsp/TNAReports.jsp]

Organisational policy instruments

How a government organises its administration has a strong effect on adaptation. Organisational policy instruments can play a part in designing and changing organisational structures and processes, in a way that enables entities to function in a more efficient, effective and goal-oriented manner. As implementation is often left to local levels of government or private-sector players, national governments often need to focus on providing the necessary tools, incentives and guidance at the sub-national level.

Organisational policy instruments are one important way that national governments can help entities to work in a more effective and goal-oriented way. This applies to both short-term emergency preparedness and to more long-term assessments of vulnerability and necessary adaptive measures. National adaptation efforts are often led and coordinated by a ministry, e.g., the ministry for the environment or equivalent. But it is important that a number of other players also take part in these processes and actions (see Section 5.2.3 for an overview of players and sectors relevant to adaptation).

In such complex situations, national governments often have to provide leadership, formulate clear objectives, and make sure policy design processes allow for integration. This can be done formally, e.g., by establishing working groups, or through informal forums, e.g., to identify necessary actions or establish roles. Furthermore, it is important that national governments provide leadership and coordination in both the planning and implementation stages.

Because a set of policy instruments often needs to be designed as a coherent whole, in order to make sure that it will work effectively, the organisation and coordination of adaptation is very important.[122] For example, regulations and economic instruments can complement education and awareness-raising, but may not be very effective without a system to ensure enforcement and compliance. It is important that the policy instruments lead to synergies with instruments that promote other, related objectives (for instance, reduced desertification and water issues are both related to each other and to the wider issue of sustainable development). Short-term adaptation should also involve synergies with long-term adaptation.

Coordinating the work involved in civil protection (in case of emergencies) assumes general risk and vulnerability assessments. Such assessments should be systematic both in scope and in timing. Where vulnerabilities are identified in several sectors, these should be considered together. For instance, although one ministry may have the overall responsibility for emergency preparedness, the nature of a particular emergency may in fact dictate which ministry takes the lead.

Legal policy instruments

Governments have a variety of legal powers they can use to address climate change adaptation issues. Legislation can correspond to international agreements. Most countries in the world have signed the UNFCCC. But international commitments are often vague in nature and need to be made more specific as they are adapted to national circumstances, for example, by setting targets and timelines for implementation.

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121 Based on Guidelines for Performance Auditing, published by the SAI of Norway 2005.

122 I. Niang-Diop and H. Bosch, 2004. Formulating an Adaptation Strategy. In UNDP, Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures. Cambridge: Cambridge University Press.

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National legislation can be divided into two broad categories. The first kind addresses national adaptation requirements. In the UK, for example, the government is required to produce a risk assessment and an adaptation plan and to report on its progress.

The second kind addresses specific adaptation requirements. An example is the Netherlands' Flood Defence Act. Because of the Act and the Coastal Defence Policy, the government has taken steps to build storm surge barriers that take a 50 centimeters sea-level rise into account, improve management of water levels through dredging, widen river banks, and conduct reviews of safety characteristics of all protecting infrastructure (such as dikes) every five years.[123] The government also prepares risk assessments of flooding and coastal damage, influencing spatial planning and engineering projects in the coastal zone, and identifying potential areas for dune reinforcement.

Specific legal requirements can also be incorporated into other legislation, e.g., planning laws or biodiversity laws. In many instances this means adopting laws requiring environmental impact assessments to be carried out, as happens in Egypt when seeking project approval and during regulation of setback distances for coastal infrastructures,[124] or planning laws making it mandatory to take long-term climate change into consideration.

For many SAIs, compliance audits can only be conducted if appropriate national laws exist. In performance auditing, enacted legislation is typically an audit criterion to measure government performance against. Many countries have introduced sustainable development as part of national legislation, an issue that can be extra pressing and relevant in the context of climate change and adaptation.[125]

Economic policy instruments

Governments have a wide range of economic policy instruments to choose from. These include:

- Grant support for third parties. This can be exemplified by Botswana, where the government has established programmes to re-create employment options after droughts and gives assistance to small subsistence farmers to increase crop production.[126] In Mexico and Argentina the government has facilitated the accumulation of commodity stocks as economic reserve, set up crop insurance provisions, and created local financial pools.[127] Governments can also provide funds to third parties (e.g., NGOs or universities) to carry out locally-based risk assessments. In the Philippines the government has financed adjustments of forestry treatment schedules to suit climate variations and construction of fire lines and controlled burning to improve adaptation in the forestry sector.[128]
- Funding for research and technology development. Knowledge and technology are essential for efficiently tackling climate change. For developing countries, technology needs in the adaptation context are often related to the management of crops, water and forestry, as well as technologies to protect against rising sea levels.[129] Box 5.6 presents more information about technology needs assessments, a process designed by the UNFCCC that aims to help developing countries to identify technology needs.
- Covering additional costs for adaptation. If costs related to new infrastructure increase due to forecasted impacts of climate change, governments can promote climate-resilient projects by covering these extra costs.
- Funding for emergency preparedness systems. For instance, governments fund the set-up and maintenance of warning systems.
- Funding for adaptation in developing countries. The UNFCCC commits developed countries to assist vulnerable developing countries, and small island states in particular, to adapt to climate change. Several funds and mechanisms have been established, including the Adpatation Fund[130] under the Kyoto Protocol, which is managed by its own board, and the Least Developed Countries Fund and the Special Climate Change Fund under the Convention, which are managed by the Global Environment Facility (GEF).[131]

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123 Government of the Netherlands, 1997. Second Netherlands' Communication on Climate Change Policies; and Government of the Netherlands, 2006 Fourth Netherlands National Communication under the United Nations Framework Convention on Climate Change.
124 M. El Raey, 2004. Adaptation to Climate Change for Sustainable Development in the Coastal Zone of Egypt. OECD.
125 See the two INTOSAI WGEA guidelines, The World Summit on Sustainable Development: An Audit Guide for Supreme Audit Institutions and Sustainable Development, and The Role of Supreme Audit Institutions, for tips and hints on how to audit sustainable development.
126 FAO, 2004. Drought impact mitigation and prevention in the Limpopo River Basin: A situation analysis. FAO.
127 M. Wehbe et al., 2006. Local perspectives on adaptation to climate change: lessons from Mexico and Argentina. AIACC Working Paper No. 39.
128 R. Lasco et al., 2006. Tradeoff analysis of adaptation strategies for natural resources, water resources and local institutions in the Philippines. AIACC Working Paper No. 32.
129 UNFCCC, 2009. Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention. Note by the secretariat of the UNFCCC SBSTA
130 See, http://afboard.org/index.html.
131 See, http://gefweb.org.

Informational policy instruments

Informational policy instruments can take the form of information, campaigns aimed at changing attitudes, and guidance or advisory activities. Promoting public education is one example. Knowledge and awareness about climate change impacts, vulnerability and adaptation are important. Governments often play a key role in promoting public knowledge and awareness of these issues. Government leadership is also an important factor in raising awareness. In Botswana, the national government has worked to build capacity among local authorities, especially on drought-related issues.

Better information systems to warn about the impacts of climate change are often needed. Warning systems could be needed for extreme weather events, such as storms and heavy rainfall leading to floods. Also, governments often need to improve the information used by decision makers, both government and private-sector. Better prediction of heat waves or droughts may help farmers to improve their crop and livestock management, which in turn may reduce vulnerability to food shortages.

5.2.3 Key question: Who are the public-sector players and what are their roles and responsibilities?

Who is responsible for carrying out adaptation policies varies between countries. In some countries, this responsibility is divided between several government bodies; in other countries a single government authority is responsible for environmental or climate change-related issues. In many countries, responsibility is divided between national, sub-national and local authorities. Note that, in particular, local government entities often are involved.

There can also be big differences between countries when it comes to who formulates policies and who carries them out. It is important to keep in mind who the relevant players are when identifying risks and audit objectives.

Adaptation is a complex policy area that covers many sectors, and it is often interlinked with other government responsibilities. Particularly when considering long-term adaptation efforts, the auditor must consider how a wide range of players and overlapping responsibilities may have an impact on adaptation strategies.

Sectors that are often involved in adaptation include agriculture, forestry and fisheries, industry, energy, transport, health, tourism, foreign affairs, finance, and insurance. Adaptation is also relevant in water resources management, biodiversity, infrastructure, management of coastal zones and mountain regions, land-use planning, and as an element in emergency preparedness (as explained in Section 5.2.2).

With so many players and sectors involved, it is essential that adaptation is integrated into sector policies. However, it is common for conflict to arise between sector interests and adaptation. For instance, there may be strong economic incentives to export agricultural products or to change land use from agriculture to biofuels. But, at the same time, food shortages may have already been exacerbated by climate change. In such situations, government intervention is often necessary. This could involve generating the necessary information and awareness that timely action is needed, while supporting adaptation capacity building and internalising external effects and resolving conflicts.[132]

[132] R. Swart et al., 2009. Europe Adapts to Climate Change: Comparing National Adaptation Strategies. Partnership for European Environmental Research.

5.3 STEP 3: CHOOSE AUDIT TOPICS AND PRIORITIES

In Steps 1 and 2, the auditor identified the need for adaptation and the government's response to climate change adaptation needs, respectively. Armed with this information, in this Step the auditor chooses audit topics by comparing the climate change threats with the government's response. This is what we refer to as risk analysis. The risk analysis considers whether there is a probability of gaps between identified audit criteria, management (efficiency), results (goal attainment/effectiveness), and the consequences of those gaps.

Definitions of risk analysis and how the risk assessment can be related to the economy, efficiency and effectiveness of governmental action are given in Box 4.7 in Chapter 4.

The auditor could answer the following key questions to analyse the risk and decide upon relevant topics and audit objectives:

- **Has the government assessed the key vulnerabilities in a proper manner? (Efficiency risk analysis)**
- **Has the government developed an efficient overall plan or strategy? (Efficiency risk analysis)**
- **Has the government addressed the need for climate change action in the most vulnerable sectors and areas? (Efficiency risk analysis)**
- **Are the financial resources misstated? (Efficiency risk analysis)**
- **What are the risks related to the results of government-led adaptation? (Effectiveness risk analysis)**
- **Is the government focusing on keeping the costs of adaptation as low as possible? (Economy risk analysis).**

After analysing and assessing the risks, the auditor will then define the audit objectives. This is the final question in this Step. Considerations of how an audit will contribute to better governance, and the availability of audit criteria and evidence, are important factors for the auditor when prioritising among audit topics.

5.3.1 Key question: Has the government assessed the key vulnerabilities in a proper manner? (Efficiency risk analysis)

A natural starting point for auditors when looking into the overall adaptation effort is to check whether the government has properly assessed the key vulnerabilities in the country. Vulnerability assessments should be comprehensive and coherent. An audit could be required in this field if the auditor has found significant vulnerability to climate change in Step 1, but the government itself has not made any comprehensive assessment.

If the government has based its information on vulnerability assessments, the auditor should investigate whether they focus on all important factors required to track the right short- and long-term climate change threats. Those factors were identified in Step 1, and evaluations of vulnerability assessments can be based on this information. It is also important to assess how reliable are the vulnerability assessments. It might be useful also to take a look at assessments developed by other countries. Furthermore it could be a good idea to interview specialists and ask for their opinion.

It is essential to develop a knowledge base for future changes in the climate. This could include investments in technology for climate modelling. Climate change scenarios should be at the foundation of assessments of future vulnerability, and for decisions on policy responses.

Many developing countries face the dual challenge of being exposed to the most severe impacts of climate change and having low adaptive capacity. In this context, it is particularly important that vulnerability assessments are carried out. Information collected in Step 2, for instance from National Adaptation Programmes of Action (NAPAs), can also be useful to auditors in Step 3. Furthermore, the UNFCCC's Nairobi Work Programme (NWP) and the United Nations Development Programme's Adaptation Policy Framework (APF) (see Box 5.7) can be used as criteria against which to evaluate your country's vulnerability assessment.[133] This approach to evaluating vulnerability assessments could also be useful to developed countries in order to identify topics and methodologies.

5.3.2 Key question: Has the government developed an efficient overall plan or strategy? (Efficiency risk analysis)

In Step 2, the auditor will have identified whether the government has developed an overall plan or strategy. In Step 3, the auditor could compare the information gathered in Steps 1 and 2 to form an opinion on whether the policy response of a government properly addresses the most important areas

Box 5.7
Do you want to know more about UN programmes for adaptation?

- UNFCCC, Nairobi Work Programme (unfccc.int/adaptation/sbsta_agenda_item_adaptation/items/3633.php).
  It consists of nine components: methods and tools; data and observations; climate modelling, scenarios and downscaling; climate-related risks and extreme events; socio-economic information; adaptation planning and practices; research; technologies for adaptation; and economic diversification.
- UNDP, Adaptation Policy Framework (www.undp.org/climatechange/adapt/apf.html).
  It consists of seven components: scoping and designing an adaptation project; assessing current vulnerability; assessing future climate risks; formulating an adaptation strategy; continuing the adaptation process; assessing and enhancing adaptive capacity; and engaging stakeholders.

[133] APF and NWP have been designed for developing countries in particular. It should be noted, however, that no similar framework has been established for developed countries, making the NWP and APF best-practice standards for these countries as well.

and sectors. The plan or strategy should correspond to the climate change-related vulnerabilities identified in Step 1 and targets identified in Step 2. The strategy should also include all important areas or sectors that are vulnerable to climate change. Risks are likely to be present if government policies do not respond to relevant vulnerabilities, targets and sectors, or if necessary actions are not identified.

Adaptation action requires local and national cross-sector involvement. It is very likely, therefore, that the adaptation policy is not adequate if an overall plan or strategy is lacking. Furthermore, auditors need to ask whether the objectives, policy instruments and organisation reflect short-term impacts and vulnerability as well as long-term considerations relating to future adaptation needs.

Risks of inefficiency are likely if the government has an overly complex management structure.[134] Organisational policy instruments were described in Step 2. Because adaptation is often a complex policy area, it is important that the organisational structure takes this complexity into account. However, the auditor should be aware that there are many ways of organising adaptation efforts, and the most important thing is that the organisational structure successfully responds to the threats posed by climate change.

Risks of inefficiency in the organisational structure are also likely if the government has not adequately:

- Put in place an appropriate system for monitoring, coordination, integration, clear division of responsibility, measurement, reporting, and accountability
- Produced information about performance that is complete, valid and reliable – and used this information to review and improve existing policies
- Developed a system for managing risks to promote goal achievement

Auditors can check for compliance with commitments stemming from international conventions. The most relevant international climate-change agreement related to adaptation policy auditing is the UNFCCC. These commitments are listed under Step 2.[135] As they can be regarded as "soft" commitments, it can be tempting for governments to postpone formulating concrete adaptation programmes. If the UNFCCC commitments have not been translated into national political action, SAIs could play an important role in driving this process forward by highlighting the importance of implementing international agreements.

Adaptation policy should follow the principles of good governance and management. Auditors can check whether there are conflicting objectives and targets. This is particularly important in order to avoid maladaptation or adaptation that will have negative effects on other sectors. Negative environmental consequences of government responses are likely if strategic environmental assessments (SEAs) have not been carried out.[136] As adaptation policies are often interlinked with other sectors and policy areas, not undertaking SEAs could be an indication of inadequate planning. In some situations, governments can be obliged by law to carry out SEAs, and auditors can check for compliance.

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SEAs are equally useful when evaluating the impacts of both adaptation and mitigation policies on the capacity to adapt. Measures to increase the use of biofuels in order to reduce emissions are a case in point. Biofuel use may be good mitigation, but their use can have negative impacts on food security, as arable land is used not to produce food but raw material for biofuels. In such instances, the mitigation policy has had a negative effect on adaptive capacity. Furthermore, adaptation strategies themselves may have significant impacts on biodiversity. SEAs are useful when developing the adaptation strategies before implementing the most environmentally friendly adaptation measures.

An audit of the overall strategy can take one or several approaches. The SAI of the United States has audited climate change adaptation. The principal recommendation of the audit was that the federal government should develop a national adaptation plan that includes setting priorities for agencies at different government levels. Such strategic federal planning could help government officials make more informed decisions on adaptation efforts. The audit identified several other risk areas, framed by the following questions:

- Do competing priorities make it difficult to pursue adaptation efforts, especially when there may be more immediate needs requiring attention and resources?
- Does a lack of site-specific data, such as local projections of expected changes, reduce the ability of officials to manage the effects of climate change?
- Are adaptation efforts constrained by a lack of clear roles and responsibilities among agencies at different levels of government?

134 See criteria for good governance in Section 3.2.1.
135 See also Chapter 3.
136 Strategic Environmental Assessment (SEA) is a systematic, proactive process for evaluating the environmental consequences of policy, plan or program proposals. This is to ensure that they are fully considered and addressed at the earliest appropriate stage of decision making, and that they are addressed on a par with economic and social considerations. For more information, see the INTOSAI WGEA documents Evolution and Trends in Environmental Auditing.

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Another approach is to assess whether government agencies have identified and managed risks related to handling future climate change impacts. This was done in an audit conducted by the SAI of United Kingdom (see Box B.1 in Appendix B). Another approach is to audit government adaptation actions in several of the sectors most likely to be affected by climate change, as was done by the SAI of Brazil (see Box B.2 for one example). In all three of the Brazilian audits of the government's adaptation efforts, similar overall weaknesses in the adaptation strategy were identified. Risk areas included unclear definitions of roles and responsibilities, an unsatisfactory system for storing data and making data available, and unclear guidelines for integrating adaptation into public policies.

Lesson learned:
Take a good look at the principles of good governance and management when analysing efficiency risks

Governance greatly influences the implementation and efficiency of national policy. The principles of good governance were described in Chapter 3. In general terms, risks are likely if weaknesses, such as unclear objectives and targets for policies, inadequate information and lack of an internal control system, are detected. The auditor could take a second look at those principles when analysing risks in this step. These principles could serve as supplementary audit criteria if no other, country-specific criteria for good governance are available.

5.3.3 Key question: Has the government addressed the need for climate change action in the most vulnerable sectors and areas? (Efficiency risk analysis)

The most vulnerable sectors are identified in Step 1. It must be stressed that risks in a sector or within an area could exist without considering climate change adaptation implications. Therefore, climate change will often make an audit within a sector or area more important, e.g., by assessing how the government has planned for climate change and its strengthened threats to biodiversity.

Is the government prepared for more extreme weather events?

As pointed out in Chapter 2, more extreme weather events are likely to be both a short- and longer-term consequence of climate change. Extreme weather events could be periods of very heavy rainfall that lead to flooding, or increased intensity and frequency of storms and hurricanes. These are situations where governments' efforts to handle the extreme situations are very important.

Risks are likely if there is no clear delegation of responsibility. Furthermore, it is often necessary to have a leading and coordinating unit. Several risk areas are also pointed out in the examples from audits conducted related to severe weather warnings (SAI of Canada, see Box B.3) and flooding (SAI of Tanzania, see Box B.4). Risk areas identified in the Canadian audit, and framed by the following questions, include:

- Does the government have a national programme or approach to verify the timeliness, accuracy or effectiveness of its severe weather warnings?
- Is there a national system that automatically warns the public about severe weather events or other emergencies?
- Does the department (Environment Canada) have an up-to-date long-term strategy for meeting its challenges? In the Canadian audit, this included implementing a robust and useful system to verify severe weather warnings, managing its monitoring networks during their lifecycle, and addressing risks related to the department's current strategy of relying on partners?

Is the government prepared for increased threat of flooding?

An increased threat of flooding may come from several climate change-related impacts, such as increased or intensified precipitation due to changed weather patterns, increased melting of glaciers due to rising temperatures, more frequent and violent storms, and rising sea level. Many countries face one or several of these threats. If the government fails to respond adequately, the consequences to people, infrastructure and the economy (see Box 5.8) may be significant. These threats may be present in the short term in some countries, and they are likely to increase in these countries in the medium- and long-term.

As shown in Box B.4, the SAI of Tanzania has audited the government's efforts to minimise the consequences of floods in an area of Tanzania. The SAI points out that the threat of floods increases with climate change, and it is therefore more pressing for the government to take steps to prevent damage and complete the rebuilding process from previous floods.

The SAI of Ukraine has audited the efficiency of the execution of the existing system and programmes for flood protection. The audit concluded that the system functioned inefficiently. Risk areas that were identified in the Ukrainian audit include:

- Funding allocated from the state budget in previous years was not enough for all the necessary maintenance and repair works
- Designs of building scheme and systems of flood protection were not available, making it impossible to create efficient systems for flood protection
- Appropriate planning for using public money allocated to the flood protection programmes was not carried out.

Rising sea level may increase the vulnerability of many countries, especially during the long term. Indications of risks related to sea level rise include lack of planning when building in coastal zones. Infrastructure of all kinds, including buildings, roads and other infrastructure and communications, is threatened by sea level rise. Another risk indication can be a lack of mapping of the consequences of sea level rise. If the government has not adequately mapped which areas that are likely to be threatened by rising sea levels, this could also mean the government does not have a strategy to respond to the consequences of sea level rise.

Box 5.8
Infrastructure and climate change

Because of climate change, infrastructure will face increased threats, including from flooding. This could include critical national infrastructure, such as energy generation, communications networks and water supply (see below). This means that negative impacts on infrastructure could have wider, negative consequences to business, goods and services production, with potentially serious consequences for the economy and for government revenues.

The most important techniques and technologies needed to protect against rising sea levels, especially in developing countries, are dikes, levees, floodways and floodwalls, and saltwater intrusion barriers.* Not using these techniques could be a sign of a risk. In order to cope with rising sea levels, countries can improve monitoring in coastal zones and establish early-warning systems. A lack of monitoring and warning systems could suggest an inadequate government response.

Furthermore, more than just infrastructure issues will need to be considered by a government when it responds to rising seas levels. For instance protecting threatened ecosystems and creating and restoring mangroves and dunes may be a part of any coping strategy.

Is the government prepared for increased threats to water supply?

Addressing water resource management issues is recognised as a priority when responding to climate change. Climate change is felt most directly through its impact on water availability. In many countries, especially developing countries, water availability and management are already significant challenges. These challenges are likely to increase with climate change. For developing countries, water availability will have an undeniable effect on development progress and the achievement of the Millennium Development Goals.[137]

If the government does not have an effective system for water resource management, this could mean that any adaptation efforts in the face of increased water stress are not enough. Auditors can check whether the government has established a holistic and multi-sector approach to deal with an increased threat of water shortages. This is particularly important as competition for water is expected to increase, between urban and rural areas, between different sectors, and even between different countries.

The SAI of Cyprus has evaluated the reasons for reduced water reserves in 2006 and 2007, which led to a need to import drinking water to meet consumers' needs during the summer of 2008. Risk areas identified in the audit include the difficulty of monitoring and controlling the water resources, as well as a lack of complete and detailed regulation of managing and developing water resources. The audit was not directly linked to adaptation policy, but climate change will make it even more necessary to ration water usage and preserve water resources.

The SAI of Brazil has audited water issues in the context of changing climate in the semi-arid region of Brazil. Risk areas that were explored in the Brazilian audit included whether:

- The adaptation effort lacked a clear definition of roles and responsibilities among public institutions that could compromise management and possibly also results
- The government carried out risk assessments for the semi-arid region
- Development policies related to water took climate change into account in an adequate way.

* UNFCCC, 2009. Second synthesis report on technology needs identified by Parties not included in the Annex I to the Convention. Note by the secretariat of the UNFCCC SBSTA.

137 United Nations World Water Assessment Programme, 2009. Climate change and water – An overview from the World Water Development Report 3: Water in a Changing World. Perugia: UNESCO – WWAP

Water issues are the theme of the INTOSAI WGEA guide Auditing Water Issues: Experiences of Supreme Audit Institutions from 2004. This guide provides an overview of water issues, key players and policy instruments, international agreements on water, SAIs' practices in auditing water programmes and policies, and results of audits of water issues.

Is the government prepared for increased threats to food supply and agriculture?

Chapter 2 notes that the agriculture sector is likely to be affected by climate change, and affecting the food supply in many countries as a consequence. Governments need to respond to these impacts, but there are a variety of other risk areas to consider. In the face of temperature rise and changes in the timing, magnitude and distribution of precipitation (which are likely to increase moisture and heat stress on crops and livestock) audits can check if the government has:

- reconfigured irrigated production systems to use water more efficiently and to incorporate the use of marginal quality water
- increased capture and retention of rainwater
- improved heat tolerance of livestock
- strengthened pest management systems to cope with increased threats from insects, pathogens and weeds

As the climate changes and agricultural systems face increasing risks of soil erosion, runoff, landslides and pest invasions, the auditor can also check whether the government has properly addressed land degradation.

Given that the frequency and intensity of extreme events (heat waves, droughts, floods etc.) is likely to increase, leading to reduced yield levels and disruptions in production, it is relevant to ask if the government has:

- Taken steps to build or enhance systems for conveying climate information to rural populations
- Diversified rural economies to reduce reliance on climate-sensitive agricultural practices
- Promoted more agricultural research and development
- Linked adaptation and mitigation efforts
- Incorporated adaptation into mainstream development policies.

The government does not necessarily have to take all of these measures. However, if confronted by severe impacts of climate change in the agricultural sector, the government must address at least some of them.

In developing countries, climate change impacts will be increasingly magnified where poverty is pervasive and social safety nets are weak. This makes it particularly important to mainstream adaptation in the agriculture sector into broader development policies. For developing countries, the most commonly identified technology needs in the agricultural sector are for crop management technologies. As a consequence, auditors could check that the government has taken steps to introduce crops that are more resilient to drought, heat, salt-intrusion and pests, more tolerant of fertilisers, and see if the quality of seeds has improved.

The SAI of Brazil has audited the adaptation actions in the agricultural and livestock sectors (see Box B.2). The main finding of the audit refers to deficiencies in identifying potential climate change-related threats. The Brazilian audit identifies possible several risk areas:

- Meteorological data that is difficult to access
- Early-stage adaptation actions in the agricultural and livestock sector that are insufficient to meet the possible threats
- Unclear instructions about considering climate change scenarios when planning and implementing policies
- Deficiencies in the coordination, integration, governance and accountability of government actions – especially inaccurately defined roles and the existence of institutions with overlapping activities.

The SAI of Australia has audited the administration of the regional delivery of two natural resource management programmes (see Box B.5). Risk areas in this audit include:

- Transparency and accountability issues about government funds managed by States/Territories
- The quality and measurability of the targets in the regional plans: the absence of enough scientific data has limited the ability of regional bodies to link the targets in their plans to programme outcomes
- The possibility of reporting on the extent to which outputs (activities "on the ground") contribute to the outcomes sought by government
- Not enough information in annual reports to make an informed judgement as to the progress of the programmes neither towards outcomes sought or intermediate outcomes.

Is the government prepared for increased threat to biodiversity?

IPCC's Fourth Assessment Report concluded that climate change will have significant impacts on all biodiversity: ecosystems, species, genetic diversity, and ecological interactions.[138] The changes are significant in relation to the long-term stability of nature and the many benefits and services that humans derive from it.[139]

Adaptation strategies are necessary to respond to climate change impacts on biodiversity. A biodiversity adaptation strategy should highlight the identification of vulnerable ecosystems, species and genetic resources, and propose action to protect biodiversity and human societies. Risks are likely if the government has no biodiversity adaptation strategy or action plan.

To find out whether the government has fulfilled its role of developing a proper strategy, the auditor can identify risks by establishing if there plans and actions incorporating vulnerable sectors and adaptation needs, by asking:[140]

- Is the overall adaptation plan based on ecosystem assessments? (This is especially important for developing countries that are dependent on access to natural resources.)

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137 United Nations World Water Assessment Programme, 2009. Climate change and water – An overview from the World Water Development Report 3: Water in a Changing World. ???: UNESCO – WWAP

138 IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

139 Secretariat of the Convention on Biological Diversity, 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change, Montreal. CBD Technical Series No.41.

140 All the adaptation areas are described in the CBD review. The auditor could take a look at this publication for further reading.

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- Does the government have plans and measures for biodiversity and adaptation in, for instance, coastal areas, the water sector, the agricultural sector, forests, and the urban environment?
- Does the government have plans and measures for biodiversity and human health?

The INTOSAI WGEA guide Auditing Biodiversity: Guidance for Supreme Audit Institutions covers the information needed for understanding biodiversity and the threats to it, relevant governments' responses to these threats, relevant players, suggestions of various topics when choosing what type of biodiversity issues need to be audited, and ideas and advice for designing the audit. In that guide, climate change is described as one of the main threats to biodiversity. The Section Mainstreaming biodiversity into economic sectors and development planning in the guide is highly relevant to adaptation planning. Relevant sectors for adaptation planning are also mentioned, such as energy, fisheries, forestry, mining, land development, and infrastructure.

The INTOSAI WGEA guide Auditing Forests: Guidance for Supreme Audit Institutions provides insights into risk areas for governments' forestry management, and describes ways of designing audits of the forestry sector. In many countries, climate change impacts could mean that such audits will have a great impact.

Is the government prepared for increased threats to fisheries?

Climate change threatens the sustainability of both fisheries and aquaculture, due to impacts such as warming temperatures, physical changes and extreme weather events.[141] The main impacts on both marine and freshwater ecosystems are related to species distribution and habitat composition. Warmer temperatures may have both positive and negative effects on fisheries and aquaculture, depending on region and latitude. Ecosystem productivity is likely to decrease in tropical regions and increase around the poles.

Ecosystem changes in turn impact on livelihoods, which has implications for food security and income in societies dependent on aquatic natural recourses. According to an expert group in the United Nations Food and Agriculture Organization (FAO), climate change requires urgent adaptation measures in response to opportunities and threats to food and livelihood.

If fisheries are threatened by climate change, planning and measures to adapt fisheries are required. Risks are likely if:

- An overall adaptation plan or strategy is lacking or insufficient
- Adaptation strategies do not consider both short-term impacts (caused by extreme events) and long-term impacts (caused by reduced or changed productivity of aquatic ecosystems)
- The adaptation measures are not specific to the context and if the scope does not cover all community, national and regional levels.

In addition, FAO identified several success criteria for developing efficient measures to reduce vulnerability to climate change in the fisheries sector. Factors that should be considered when analysing risks in the government response include checking if the government has: developed the knowledge base and the policy, legal and implementation frameworks; put in place a technical and organisational structure for capacity building; and enabled financial mechanisms by incorporating food security into existing and new financial mechanisms.

INTOSAI WGEA has produced guidance material on audits on sustainable fisheries, Auditing Sustainable Fisheries Management: Guidance for Supreme Audit Institutions. The management of fish resources and the need for adaptation action are highly interconnected, and adaptation and fishery management audits are therefore also interrelated. In this Guide, we focus on the relationship between fisheries and climate change, and what to consider when conducting adaptation audits in the fisheries sector. The fisheries guide provides the reader with further background information, tips and ideas on how to plan audits of the sustainability of fishery management.

141 FAO, 2009.Climate change implications for fisheries and aquaculture, Overview of current scientific knowledge. FAO Fisheries and Aquaculture Technical paper No. 530. Rome: FAO. FAO, 2008. Report of the FAO expert Workshop on Climate Change Implications for Fisheries and Aquaculture. Rome, Italy, 7-9 April 2008. FAO Fisheries Report No. 870. Rome, FAO.

Is the government prepared for more health-related threats?

According to IPCC's Fourth Assessment Report, projected climate change-related exposures are likely to affect the health status of millions of people, particularly in countries with low adaptive capacity.[142] For instance, increased malnutrition has implications for child growth and development. Due to heatwaves, floods, storms, fires and drought, more deaths are to be expected.

In some countries, climate change could lead to increased risks related to the spreading of diseases or more incidences of heat-related diseases. If health sector management in these countries is already inadequate, problems can be expected to increase with climate change. IPCC also points out that weak public-health systems and limited access to primary health care contribute to high levels of vulnerability and low adaptive capacity for hundreds of millions of people.[143]

5.3.4 Key question: Are the financial resources misstated? (Efficiency risk analysis)

Many of the risk elements mentioned above are relevant to financial auditing. Complex management systems and diverse responsibilities are likely to increase the risk of material misstatements.

Assessing and analysing the inherent risks of financial misstatements in the context of climate change adaptation is particularly important, given that the consequences of material misstatements may be significant, even if public expenditure is not very high.

Factors that could indicate inherent risks of material misstatements in the adaptation context include:

- The implementation of new programmes or major changes being made to existing ones
- The introduction of new legislation, regulations and directives
- High public expectations, as adaptation is often directly related to people's livelihood
- The transfer of funds and technology (to which the UNFCCC commits its Member Parties), particularly as these transfers are transnational and made between developed and developing countries (see Box 5.9)
- Public-private partnerships relating, for example, to insurance programmes for natural disasters as these could be susceptible to corruption.

The auditor must also understand the audited entity's internal control system.[144] Climate change adaptation will probably be a field experiencing rapid growth of both funding and operations, where new technologies are applied or foreign operations are expanded. These conditions make it particularly important that management establishes its own control systems. The management must also ensure that a proper control environment exists; this includes management's attitude, awareness and actions. External auditors should direct their attention to areas where this system is inadequate.

Box 5.9
Risks of fraud and corruption

The funds managed through the Global Environmental Facility (GEF) to support adaptation are currently quite limited compared to the funds already allocated to mitigation measures and, to a large extent, channelled through the global carbon market.* However, recent studies by the UNFCCC Secretariat show funding for adaptation will have to increase sharply in the coming years to reach the level of annual investment and financial flows needed for adaptation in 2030.** In other words, the economic incentives for engaging in fraudulent and corrupt practices are likely to be stronger in the adaptation context in the coming years.

As to the question of opportunities for fraud and corruption to take place, it should be underlined that the mechanisms and systems related to climate change adaptation are different from the Kyoto mechanisms in many respects, as the former are more similar to and linked with "traditional" official development assistance (ODA). However, adaptation measures still face many of the same challenges as mitigation measures with respect to monitoring, control and enforcement (see Chapter 4).

* *As of October 2006, USD 215 million was available through GEF to support adaptation. (Frequently Asked Questions about GEF's Work on Adaptation, Global Environment Facility, October 2006.*

** *About USD 50 billion in 2030. Source: UNFCCC, 2007. Investments and financial flows relevant to the development of an effective and appropriate international response to climate change. [Online] Available at http://www.unfccc.int/4053.php [Accessed 12 April 2010].*

5.3.5 Key question: What are the risks related to the results of government-led adaptation? (Effectiveness risk analysis)

Auditing the effectiveness of adaptation policies can involve two questions:

- Have the policy objectives and targets been achieved?
- Can effectiveness gains be attributed to the policy pursued?

When auditing mitigation policy, the results of implemented policies can be measured as quantified emissions. When auditing adaptation policy, the policies are more integrated and the results are often difficult to identify and measure. Nor are the targets necessarily connected to a particular adaptation policy, as described in Section 5.2.1.

When considering risks relating to goal achievement (effectiveness), the targets identified should be concrete and auditable. Short-term targets, such as emergency preparedness for flooding or extreme weather events, could be considered at the output level: risks are likely if plans, persons, infrastructure, roles and responsibilities are not sufficiently deployed to reduce the possible damage. There is also a risk of not enough government coordination if weaknesses have been revealed in the crisis alert system in previous crises (e.g., health crises caused by suddenly occurring diseases or natural disasters).

142 IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

143 U. Confalonieri et al, 2007. "Human Health". In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

144 For a description of standards for internal control systems the reader is referred to the good governance section in Chapter 3.

Long-term target achievement, such as ensuring food or water supply, could also be assessed, but mainly by looking at milestones and interim measures and auditing progress against these.

There are a number of risk indicators auditors should keep in mind:

- Whether the objectives and targets of policies are not clear enough or too complex, or if the roles and responsibilities of public bodies are unclear (as identified in Step 2). This can often be what happens for adaptation policies, as this is a policy area that often involves several different sectors and programmes.
- Whether a country has set targets for technology development. This could also be relevant to developing countries that have identified technology needs but find there are various barriers to the transfer of these technologies from other countries. If the government has not taken steps to address the barriers to technology transfer listed in Box 5.10, this could indicate an inadequate policy for introducing new technologies.

5.3.6 Key question: Is the government focusing on keeping the costs of adaptation as low as possible? (Economy risk analysis)

Routines and procedures should be implemented to keep costs down to the lowest possible level, for instance, in connection with procurements and acquisitions. It should be borne in mind that it is often difficult to justify adaptation costs on cost-benefit grounds alone, and when dealing with long-term adaptation, in particular, both the costs and potential benefits are often not known. In many instances, however, this is more a question of effectiveness, and not economy in the strictest sense.

Auditors could also look at both the actual and potential costs of adaptation programmes. A key challenge here is that the audited entity may not distinguish environmental costs from expenditure relating to its ongoing activities.[145] Financial audits could also consider the costs of the impacts of climate change if no government action is taken to adapt to these impacts. However, such assessments require highly complex calculations. SAIs could rely on third-party estimates, taking extra care to ascertain the quality of such judgements.

Another risk area could be whether the government is focusing on keeping costs low or spending economically. Are good procurement procedures in place? The risk of corruption can be substantial in many instances, as pointed out in Section 5.3.4.

5.3.7 Key question: What should be the audit objectives?

Defining audit objectives is one of the most important elements of the planning process. The objectives define what the audit is to accomplish and form the basis for selecting audit questions, scope and methodology. (We discuss this in Step 4.) The process of defining the audit objectives could focus on prioritising between risks to be considered in the audit, and defining the added value of the audit.

Box 5.10
Barriers to technology transfer

There are many barriers to technology transfer, the most important of which include:

- Market and economic barriers, such as high costs, limited state resources, and a lack of potential investors
- Lack of human capacity in recipient countries
- Information and awareness barriers, for instance on the ecological safety of technologies and on the impacts of climate change
- Regulatory and policy-related barriers
- Lack of transport infrastructure
- Poor soil quality in recipient countries.

Source:
UNFCCC, 2009. Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention. Note by the secretariat of the UNFCCC SBSTA

Are the prioritised risks at the overall or sector level, or both?

Depending on the audit mandate and the risks identified, the SAI must decide whether the audit should cover overall targets and management levels or be limited to certain relevant sectors. When carrying out audits of adaptation, the auditor can choose between a sector approach or an approach that encompasses a more comprehensive or holistic view of the government's adaptation efforts.

A holistic approach can be usefully employed to get an overview of the government's general response to climate change impacts, vulnerabilities and adaptation. If risks are likely and an overall response to adaptation needs is lacking, this could be the place to start. If responsibility is divided between many players and among several levels of government, auditors could adopt a holistic approach to shed light on the consequences of unclear responsibilities.

If an assessment of climate change impacts does identify particularly vulnerable sectors, auditors could focus on these. (Some of the more vulnerable sectors were mentioned in Step 1, and risks within these pointed out in Step 3.) Depending on your national or local context, some of the following sectors may be relevant:

- Forestry, agriculture (arable land and livestock) and fisheries
- Infrastructure (transport; public, residential and commercial buildings etc.)
- Coastal zones, flooding and landslides
- Food supply
- Public health
- Sensitive ecosystems.

The auditor could also consider risks relating to whether the policy response is particularly inadequate in one specific sector. This is because findings from one sector could give indications of weaknesses in others.

[145] INTOSAI WGEA, 2001. Guidance on Conducting Audits of Activities with an Environmental Perspective. INTOSAI.

How will the audit add value?

The auditor should return to the questions asked in the introduction to Step 3 by considering the impact of auditing the identified risks related to effectiveness, efficiency and economy.

The auditor can form an opinion on how the audit will add value by considering:

- The relevance for improving management systems and policy instruments
- The likelihood of getting new knowledge or perspectives
- The appropriateness of timing.

Lesson learned:
The initial approach to climate change auditing depends on identifying high risk areas and an SAI's previous knowledge

Climate change auditing is a highly complex field. However, SAIs need to start looking at climate change. One way to get started could be to adopt an overall perspective in relation to the government's efforts to adapt to climate change: Have vulnerabilities been assessed? Has an overall plan or strategy been formulated?

Another approach could be to start by looking into a specific sector. If an SAI has particular knowledge within a sector, adding a climate change perspective could be fruitful. SAIs have also started by looking at particularly vulnerable sectors in which an audit can contribute added value for society and government.

5.4
STEP 4: DESIGN THE AUDIT

The purpose of this Step is to proceed from risk assessments and audit objectives to designing of the audit. We propose using a design matrix for designing the audit. This involves defining audit objectives or overall audit questions, identifying audit criteria and evidence, and presenting potential findings (risk areas). See Appendix E for introduction to the design matrix.

Organising this Step for adaptation is different to organising it for mitigation. Many countries have international mitigation commitments. There are no clear-cut international commitments binding countries to adaptation commitments. However, the UNFCCC does state that countries must formulate and implement programmes to facilitate adequate adaptation. As we point out in Step 2, formulating a programme assumes knowing what that programme is intended to respond to.

Understanding the threats is a good starting point for understanding adaptation efforts. Once this has been done, the auditor can then begin to examine whether a plan, strategy or programme has been developed, and if it has been done in a satisfactory way. Auditors can also look at the efficiency of governance systems. Finally, if a strategy or plan has been implemented, the auditor can assess the effectiveness of the policy instruments that have been employed to tackle climate change.

In this Step, it could be useful to consider the feasibility of carrying out the audit at the same time as designing the audit. Four audit questions will be presented and discussed:

1. **Have the responsible ministries identified the climate change-related threats?**
2. **Does the government have an overarching policy, plan or strategy in place?**
3. **Is the governance of adaptation efficient?**
4. **Are policy instruments effective?**

5.4.1
Have the responsible ministries identified the climate change-related threats?

The natural place to start for auditors is to ask whether the responsible ministry (often the ministry of the environment or of climate change) adequately understands the threats climate change represents. Some of the information gathered during Step 1 of this Guide can be useful when evaluating the government's assessment.

Researchable questions

- Has the government made a commitment to carry out an overall assessment of climate change vulnerability, impacts and adaptation? (Box 5.11 lists examples of researchable questions and audit criteria that are related to monitoring and forecasting climate change)
- Has the government produced a comprehensive and coherent country-specific assessment of climate change-related risks?
- Has the assessment been subject to quality control, review and a consultation process?

Audit criteria

As pointed out in Chapter 3, the UNFCCC can be a source of audit criteria for audits of adaptation efforts. The Nairobi Work Programme (NWP) can also be used as an audit criterion. It is not a binding document, but a series of documents that highlight best practices in the adaptation field. Even though the NWP was mainly developed to assist developing countries, it remains one of the most comprehensive frameworks for adaptation.

Several other international environmental agreements – e.g., on desertification or biodiversity – could also be used as a source of audit criteria, as these areas are heavily influenced by climate change.

National legislation can also be a relevant source of audit criteria. Laws on area planning, building codes etc. may contain provisions that require assessments of present and future threats.

Methodologies and audit evidence

Interviews with the government ministry responsible for carrying out assessments of climate change are a good starting point for data collection. Geographical information systems (GIS) can be helpful for SAIs when mapping areas vulnerable to impacts of climate change and how the government has handled the corresponding threats.

Box 5.11
Focusing on monitoring and forecasting impacts

Monitoring climate trends and forecasting future impacts is important because it provides invaluable information about what adaptation will be needed in the years to come. This work is part of the current policy response, as the government should use funding and other incentives to promote research. It is also part of future policy responses, as monitoring and forecasting impacts will form an important basis for assessing future climate change-related threats.

Researchable questions

- Has the government identified and prioritised the necessary modelling and monitoring activities and programmes?
- Does the government have access to the capability required to undertake such activities and programmes?
- Has the government implemented the activities and programmes?
- What results have been achieved?
- Have the activities and programmes been evaluated? Have the evaluations been used to improve activities and programmes?

Audit criteria

The UNFCCC commits its Parties to promoting scientific research, modelling and forecasting. For more on this, see Chapter 3. The guidelines for national communications can also be used. National research programmes often also contain commitments for governments.

Lesson learned:
Geographic information systems (GIS) are useful when planning and conducting adaptation audits

The geographical information system (GIS) is a system that captures, stores, analyses, manages and presents data that are linked to location.

The SAI of Norway has concluded a review on floods and landslides. GIS was used to obtain an overview of areas prone to flooding or landslides, establishing the number of buildings in these areas and thereby quantifying the risk. GIS was also helpful when reviewing how local municipalities take into account the risk of floods and landslides. The same could be done in an audit on climate change. GIS could, for example, be used to establish areas that will be affected by different rises in sea level. By quantifying the number of buildings or inhabitants affected by rising sea levels, the audit could help the public understand the potential of climate change. The same could be done with areas of potential drought, areas exposed to extreme weather, melting glaciers, or other climate change-related impacts.

Examples

Appendix G of this Guide gives an example of a design matrix constructed for floods and landslides. The first line of enquiry in the design matrix in focuses on whether the government has adequately assessed the risk of floods and landslides, an issue that has become more pressing due to climate change.

5.4.2 Does the government have in place an overarching policy, plan or strategy?

The government should respond accordingly to an assessment of climate change-related threats. This was also the message of Step 2 in this Guide, and auditors can use information about threats as a starting point for evaluating the government's overall response. The focus can be on the overall response, as well as on strategies or plans covering several sectors where climate change is an important factor.

Researchable questions

- What commitments has the government made in relation to adaptation to climate change?
- Has the government developed a policy, plan or strategy for adaptation that responds to all major identified impacts and vulnerabilities, both short- and long-term?
- Have judgements been made and communicated about the extent to which threats are to be avoided, mitigated or accepted?
- Has the government assessed and clearly stated its understanding of the costs and benefits of adaptation efforts?
- Has the government identified relevant policy instruments for adaptation to climate change?
- Are overall expected results being achieved?
- Is the government on track to meet its national or international commitments?
- Is the government monitoring and evaluating overall performance?
- Is the government reporting in a transparent way on overall performance? Is the information complete, valid and reliable?

Audit criteria

Auditors can use the UNFCCC as a criterion here. Section 3.1.3 of this Guide presents adaptation commitments, including the commitment to formulate and implement programmes and strategies to facilitate adequate adaptation. Several countries have now developed adaptation plans or national adaptation strategies. These are a natural starting point for identifying audit criteria, as, in most instances, government performance must be compared with its own standards. The UNDP Adaptation Policy Framework (APF) is a source of best practice for adaptation policy formulation.

Methodology and audit evidence

Policies, plans and strategies can be evaluated to see whether they cover all relevant threats. Government documents should also contain information about costs and benefits.

The SAI of the United Kingdom has carried out an audit that provides an overview of government policy on adapting to climate change, including progress throughout government departments in identifying and managing risks from future climate change impacts. (This audit is summarised in Box B.1.) The report presents departments' self-assessment of their current capacity to assess and manage climate change risks. The methodology was designed to provide an overview of domestic climate change policy in England. The approach included four methods:

1. A survey of departments represented on the cross-government adaptation programme, to gather information about:
   - key risks to objectives relating to future climate change, and any policy responses to date;
   - an assessment of the significance of climate change risks;
   - views on barriers and particular challenges for adaptation; and
   - scores in a self-assessment framework[146] that are indicators of the capacity to assess and manage climate change risks
2. A review of policy literature, to gain an overview of the domestic climate change adaptation policy landscape

[146] See Appendix 2 to the NAO report.

3. Interviews with the agency coordinating and driving forward the adaptation policy process (the Adaptation to Climate Change Programme)
4. Consultation with stakeholders during scoping and fieldwork stages of the review.

Examples

The SAI of Canada has carried out an audit of the federal government's progress in implementing a strategy for climate change adaptation (see Box B.6). The responsible government agency had not yet developed such a strategy. Furthermore, coordination between government agencies was inadequate. This is also an interesting finding in relation to the next line of inquiry (Section 5.4.3), which focuses on the efficiency of governance.

5.4.3 Is the governance of adaptation efficient?

Efficient governance systems and clear coordination are important, as adaptation is often an issue that involves sometimes conflicting responsibilities across many sectors, different ministries, and many players. Government leadership is almost always necessary. Adaptation processes often need to include other levels of government (local, regional, supranational), the private sector and civil society. (This audit question corresponds to the organisational policy instruments identified in Section 5.2.2.)

Researchable questions

- Are the roles and responsibilities assigned to government agencies clear, well-defined and documented?
- Are there clear, well-defined and documented roles and responsibilities for other players, including sector interests, local and regional levels of government, civil society and the private sector?
- Are there conflicting goals between the different ministries?
- Are adaptation efforts coordinated across government and other stakeholders, to ensure they are complementary rather than conflicting?
- Has the government put in place sufficient and effective systems for monitoring, coordination, integration, assigning clear responsibility, measurement, reporting, and accountability?
- Do channels for communication exist between stakeholders from the different levels of government, the private sector and the various sectors involved, and are they working properly?

Due to its dynamics, the climate change scenario demands quick action and well-established communication channels between sectors, entities, ministries, public and private spheres, and countries. Good communication channels are useful in relation to informing about good practices, sharing experiences, opinions and technologies and developing solutions together. Therefore, the auditors should verify whether such channels exist and how they are working to tackle the climate change problems.

Audit criteria

Specific audit criteria relating to the efficiency of governance will often be national in character. In Section 3.2, we presented a number of criteria that can be regarded as the basis for best practice in governance. Auditors can use these criteria to evaluate government performance.

Methodology and audit evidence

Auditors can, for example, check whether climate change has been taken into account in planning documents. A review of the documentation of policy processes can be useful to get an overview of key players and their roles and responsibilities. Interviews with stakeholders can clarify the processes.

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Examples

Several of the questions under the second line of enquiry in the flood and landslide design matrix deal with coordination and handling of responsibility (see Appendix G). One important element is the relationship between national government agencies and players at the municipal level.

5.4.4 Are policy instruments effective?

Focusing on the results of policy instruments can be useful in relation to short-term adaptation efforts, for instance, emergency planning or flood defences. Generally, auditors can audit the effectiveness of policy instruments as long as clear objectives and targets have been set for the policies. For longer-term adaptation, the objectives and targets may be less clear.

Researchable questions

- Does the government monitor and evaluate performance for specific policy instruments? Are legal policy instruments, such as laws and regulations, properly implemented and enforced? Are economic policy instruments, such as grants, properly administered and are they benefiting the intended recipients? (Box 5.12 presents examples of additional researchable questions for technology and funding, and Box 5.13 for adaptation-related aid)
- Does the government report in a transparent way on performance for specific policy instruments? Is the information complete, valid and reliable?
- If progress is unsatisfactory – overall or for specific policy instruments – does the government understand the reasons and is it addressing the problems?

Audit criteria

National laws, regulations and directives can be used as audit criteria. The UNFCCC does not stipulate any concrete policy instruments, but it does commit Member Countries to promoting research, technology and public awareness.

Methodology and audit evidence

Reports from responsible ministries can be used to assess the effectiveness of policy instruments. Comparisons with the results from other comparable countries or sectors can also be useful.

Examples

An audit by the SAI of the United Kingdom on building and maintaining river and coastal flood defences found that more could be done to improve the cost-effectiveness of the responsible government agency's management. This audit is summarised in Box B.7.

Box 5.12
Focusing on technology and funding

In Step 4 on mitigation, we focused on technology and funding. Although the researchable questions and audit criteria listed in that section were aimed at controlling emissions, many of them also apply to adaptation efforts. We therefore repeat them here, but from an adaptation point of view.

Researchable questions for technology

- Are technology issues part of the government's overall strategy on how to adapt to climate change?
- Does the government have procedures in place for identifying, evaluating and implementing technology development programmes?
- Has the government followed these procedures?
- Has the government identified internal and external barriers to deploying and transferring adaptation technology?
- Do the programmes comply with national rules and procedures for governance, accountability, oversight requirements, and management?
- How have activities and programmes been coordinated internationally?
- Are technologies implemented?

Researchable questions for funding

- Does the financing comply with internal financing rules and regulations?
- What procedures are in place for coordinating and avoiding duplication across funding agencies, programmes and the private sector?

Box 5.13
Focusing on adaptation-related aid

Researchable questions for countries involved in transfers of funds

- Are funds obtained from donor countries to support programmes and projects aimed at adapting to climate change?
- Is there a robust framework in place to manage the funds received?
- Is the provision of funds facilitated through an appropriate fund transfer framework aimed at building capacity and achieving results in recipient countries?
- Does the funding for climate change projects and programmes come in addition to funding for development assistance?
- Is adequate and reliable information on donor funding and its use available and easily accessible?
- To what extent does the funding contribute to improving adaptation in the recipient countries?

Additional audit criteria for transfers of funds

Even though the Convention and the Kyoto Protocol mention funding and financing, auditors can also use criteria more commonly used when auditing development assistance. These include donor agreements and international evaluation criteria for development assistance under the UN.

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5.5 CONCLUSION

The four-step process described in this Chapter is meant to help auditors in the planning stage of an audit. In this Guide we propose using risk analysis as a means of identifying areas that have high risk exposure or where there are opportunities for performance improvements – or, in other words, areas where an audit will add value. The information collected in Steps 1 and 2 serves as background for making the risk analysis. This is done by identifying the threats posed by climate change and getting an overview of the government's response in adapting to these threats.

The design matrix in many respects constitutes the end point of the planning stage. By identifying the audit objective, formulating researchable questions and linking these with audit criteria, and proposing possible sources of audit evidence, the auditor has a very good starting point for carrying out the actual audit.

The design matrix could also be used as a tool to communicate the design of the audit to internal and external stakeholders, and to structure the audit report. The auditor should be aware of the need to do minor updates in the design if needed when conducting the audit.

Appendix A:
Examples of mitigation audits

Box A.1

The SAI of Brazil: Performance Audit to assess public policies regarding Legal Amazon forest region, considering mitigation of greenhouse gas emissions

Background

This topic was chosen because 75 per cent of carbon dioxide emissions come from land-use change and forestry sector.

Audit objectives

The audit assessed greenhouse gases emissions mitigation public policies for the Legal Amazon forest region.

Scope (lines of enquiry and methodology)

1. To assess if public policies for the Legal Amazon creating relevant negative impacts on the emissions have mechanisms to compensate or reduce those impacts; if public policy planning is done in a way that takes GHG emission mitigation into consideration; if there are coordination, integration, governance and accountability actions done to promote GHG emission reduction.
2. Period Covered: 2008.
3. Audited entities; Civil Cabinet of the Presidency, Ministry of Environment, Ministry of Agriculture, Ministry of Transportation, Ministry of Planning, Ministry of Science and Technology, Ministry of Agriculture, Ministry of National Integration, National Institute of Colonization and Agricultural Reform, and Superintendency of the Amazon Region Development.

Criteria

- Climate Change National Plan (2008) and UNFCCC – Article 4.

Audit findings and evidence

- Supervision, control and monitoring actions conducted by the Ministry of Environment and the Ministry of Science and Technology have had significant results in reducing deforestation and, as a consequence, the GHG emissions of the sector.
- However, actions of other government institutions in the region, such as policies related to the agriculture and livestock sector and to rural settlements, do not yet have a significant effect on GHG emissions of the related activities, despite the growing importance of environmental matters in the executive agenda of those institutions.
- Actions to promote sustainable productive activities - important for maintaining a continuous drop in deforestation - are not yet properly structured.
- The Climate Change National Plan (PNMC in Portuguese) was important to identify and organize climate change public policies, and bringing the matter into the spotlight. Additionally, specific targets were proposed to reduce GHG emissions for the forest sector. However, the Plan did not detail the mechanisms necessary to implement the proposed actions.
- Furthermore, aspects of governance and accountability are still an issue. This might compromise the expected results, considering the low historical level of cooperation among the Federal Government institutions responsible for the group of policies related to deforestation in the Legal Amazon region.

Recommendations

- The responsible institutions for coordinating the Climate Changes National Plan must make a action plan with activities, roles, responsibilities and resources necessary for implementing the proposed measures and mitigation targets, as well as making information available in the Internet about actions and results achieved;
- The Ministries with public policies in the region should promote conservation, environmental measures and sustainable productive activities, according to the opportunities for improvement identified in the audit.

Reference

www.tcu.gov.br

Box A.2

The SAI of Canada: Reducing GHGs emitted during energy production and consumption

Background

This report is Chapter 3 of the report of the Commissioner of the Environment and Sustainable Development to the House of Commons for 2006.

Audit objectives

Determine whether the federal government can demonstrate:

1. Whether selected federal government programmes achieved expected results in reducing GHG-emissions during the production and consumption of energy in Canada.
2. Whether selected programmes contribute as expected to the achievement of its broader short-term commitments and long-term goals for GHG-emission reductions.

Scope (lines of enquiry and methodology)

Under objective 1, the audit covered three energy programmes and initiatives implemented in the period 2000-2006, each funded by $ 100 million or more. Under objective 2, programmes intended to reduce GHG-emissions were examined. The SAI interviewed government officials and key stakeholders such as recipients, provincial government officials and relevant leaders in the energy field. In carrying out the audit, the SAI also reviewed programme files, reports, financial statements and other documents, as well as field visits to sites receiving funding.

Criteria

- Criteria related to results:
  - Establishing of result indicators and evidence that these were being used
  - Measures that assure the quality of the information, and identify and manage key risks
  - Adjustments and corrective actions.
- Criteria related to financial management:
  - Fair and reliable information about all appropriations and expenditures
  - Systems in place to provide financial management control
  - Measures that assure the quality of the information.
- Fair and reliable information on how programmes contribute to the achievement of governmental goals for GHG emission reduction is dependent on:
  - Clearly defined common goals and relationships among programmes
  - Performance indicators based on goals and applicable to programmes
  - Evidence that performance was measured, compiled and reported based on indicators and contributions to common targets
  - Measures that identified and managed key risks
  - Adjustments to the programme based on relevant information.

Audit evidence

- Each of the programmes has made progress, and in 2006 they had achieved 22 percent of the reduction expected by 2010. Confusing emission targets made it difficult to determine the actual results, and public reports did not consistently describe the contribution to emission reductions and other targets.
- The Wind Power Production Incentive is also progressing towards its targets, and the programme was adjusted based on lessons learned. A long-term strategy has yet to be developed.
- Efforts to reduce emissions from oil and gas productions had minimal results. The federal government is counting on technical solutions, but it has not clearly stated how and to what extent Canada will reduce greenhouse gas emissions when oil and gas production are expected to increase.

Recommendations

- Natural Resources Canada should ensure that a wind power strategy for Canada is developed, and that the evaluation of the Wind Power Incentive is completed. It should also carry out an economy analysis to clarify the economics of wind power and implications for the wind power programme.
- The Government of Canada should clarify how and to what extent the oil and gas sector will contribute to GHG emission reductions, and develop an implementation plan.
- Natural Resources Canada should ensure the establishment of concrete and clear emission targets for each programme funded for this purpose. The Department should provide clear and detailed information about performance and the costs of these programmes.

Follow-up

Natural Resources Canada agrees with the recommendations, but does not fully indicate when and what action will be taken to follow up the audit.

Reference

http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_03_e_14985.html

Box A.3

The SAI of the Netherlands: The European Trading Scheme and its implementation in the Netherlands

Background

The effectiveness of an emissions trading scheme (ETS) can be limited if there is an overly large number of emission allowances, because this leads to low marked prices, which in turn may compromise the potential of the whole ETS system to reduce GHG emissions. The ETS system may also tempt companies to present their emissions as lower than they really are. The audit was completed in December 2006 and updated in May 2007.

Audit objectives

Determine if the Netherlands has properly implemented the EU ETS in a way that meets the goals of the Dutch Kyoto policy and ensures the effectiveness of the CO_2 Emissions Trading Scheme.

Scope (lines of enquiry and methodology)

The audit focused on:

1. How the ministers determined the total amount of CO_2 emission allowances and how this amount had been allocated among companies in the second national allocation plan (NAP 2)
2. To what extent the European CO_2 emissions trading system overlaps with existing Dutch sustainability policy
3. If an adequate monitoring, supervision and verification system was in place

Audit evidence

- The main conclusion of this audit is that, in general, the Netherlands has properly implemented the EU ETS, though, in setting and allocating the total number of carbon dioxide emission allowances, it placed rather too much emphasis on the interests and competitiveness of industry and electricity producers; this has come at the expense of the Dutch Kyoto goal. Moreover, the implementation of the trading system was not always transparent. As a result, the Netherlands did less to contribute to the potential effectiveness and efficiency of the EU ETS than it could. It is fair to say that the Netherlands is probably not the only member state in this position.
- The total amount of emission allowances the government initially planned to set aside for the second trading period entailed few restrictions on carbon dioxide growth, thereby giving rise to a not insignificant risk that the Netherlands would fail to meet its Kyoto goal.
- The allocation of carbon dioxide allowances was dominated by the financial interests and the competitiveness of the participating companies. The process was also insufficiently transparent; the allowances were allocated partly on the basis of confidential information that is not available to the public (including the Netherlands Court of Audit) and is thus impossible to verify.
- Owing to the introduction of the EU ETS (in 2005), existing Dutch sustainable energy policy has become less effective in reducing CO_2 emissions. The policy should have been subjected to a cost-benefit analysis after the introduction of the ETS. This has yet to occur.
- There is no reason to conclude that the data provided by Dutch companies about their CO_2 emissions are not sufficiently reliable. There is, however, room for improvement in the monitoring, supervision and verification system.

Recommendations

- In the upcoming debate in Brussels on the modification of the trading system, the government would be well advised to advocate a greater measure of harmonisation among the Member States with regard to determining allowance totals.
- The allocation of CO_2 emission allowances should be more harmonised across the EU. A simpler and more transparent allocation of emission allowances is needed.
- The government should conduct a cost-benefit analysis of every instrument associated with the sustainable energy policy, and on that basis reconsider the advisability of that instrument.
- In the future, the reliability of the emissions data should be made less dependent on subsequent verification. The validation of the monitoring plans, the compliance supervision and the verification of the emission reports should be more balanced.
- To enhance the quality of the monitoring, supervision and verification system as a whole, more information from the verification stage should be made available.
- The government should continue to push for the EU-wide harmonisation of the accreditation of verifiers.

Reference

http://www.rekenkamer.nl/english/News/Audits/Introductions/2007/11/European_CO2_emission_trading_system_and_its_implementation_in_the_Netherlands

Box A.4

The SAI of Canada: Managing the Federal Approach to Climate Change

Background

This report is Chapter 1 of the report of the Commissioner of the Environment and Sustainable Development to the House of Commons for 2006.

Audit objectives

1. To determine the extent to which the federal government has put in place a suitable management framework for the climate change initiative
2. To determine whether the federal government is able to assess its major climate change spending and report reliably and fairly on the costs involved in the climate change initiative
3. To determine whether greenhouse gas emission reduction strategies, including targets and policy tools for selected sectors such as transportation and large final emitters, are based on sound data and analysis
4. To determine whether the federal government is prepared to implement an effective domestic greenhouse gas emissions trading system in Canada.

Scope (lines of enquiry and methodology)

The audit focused on three central agencies and five departments based on their relative contribution to the federal climate change initiative. For each audit objective, the SAI of Canada interviewed departmental officials and reviewed departmental files, reports, and other documentation. Stakeholders were also interviewed about perspectives on federal performance, including that of provincial governments, industry, environmental non-government organisations, and market experts in the area of emissions trading. The SAI also identified international practices concerning emissions trading by reviewing key documentation and consulting relevant stakeholders.

Criteria

- The federal government should develop and implement a regime for managing and coordinating the federal climate change initiative, and the Privy Council Office and Treasury Board Secretariat should play appropriate roles in managing this horizontal initiative. (Objective 1)
- The government should develop and implement a framework for monitoring and reporting climate change expenditures. (Objective 2)
- The federal government should conduct adequate analyses (economic, environmental, social and risk) with respect to Canada's overall greenhouse gas emissions reduction target, sectoral emissions reduction targets, and selected policy tools. (Objective 3)
- The federal government should conduct adequate analyses, identify main steps, develop an action plan, and implement required actions for Canada's proposed domestic emissions trading system. (Objective 4)

Audit evidence

- The government has made efforts to develop a management and accountability framework, but has yet to create an effective governance structure for managing its climate change activities and produce reporting on performance results.
- There is no government-wide consolidated monitoring and reporting of climate change expenditures. The Treasury Board Secretariat is currently developing a system for capturing spending and performance information.
- Three federal climate change plans were developed (in 2000, 2002 and 2005), and the emission reduction approach in two important areas (light-duty gasoline vehicles and large industry) may slow the increase in Canada's greenhouse gas emissions. Analyses were insufficient to support some targets and policy tools.
- The SAI identified a lack of credible independent verification of the model, data and results used to determine progress in connection with voluntary agreements with the automotive sector.
- Government has made progress in mandatory facility reporting. Key risks, including the assurance of actual reductions in greenhouse gas emissions and transparency in reporting, remain unresolved.

Recommendations

Environment Canada should ensure that emission reductions are is real, measurable and verifiable, and that methods used to calculate the emissions are transparent. The uncertainties and risks associated with the system and the implementation of actions to address them should also be assessed on an ongoing basis.

Follow-up

The recommendations from the audit will be considered when developing an environmental agenda for reducing air pollution and greenhouse gas emissions.

Reference

http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_01_e_14983.html#ch1hd3c

Box A.5

The SAI of Ukraine: Performance audit to assess the implementation by Ukraine of the Kyoto Protocol committments

Background

The audit was carried out in May–June 2009 as part of the EUROSAI WGEA Audit of Climate Change.

Audit objectives

1. To assess the government's implementation of the commitments ensuing from the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol (KP)
2. To assess the realization of the environmental investments involvement mechanism
3. To assess the effectiveness and efficiency of utilization of the state budget funds allocated for the above purposes during 2005-2008 and first three months of 2009.

Scope (lines of enquiry and methodology)

The major focus of the audit was one government ministry and two central agencies, based on their relative contribution to the implementation of the UNFCCC, namely, the Ministry for Nature Environmental Protection, National Environment Investments Agency, State Hydro-Meteorological Agency of the Ministry for Emergency Situation of Ukraine. Moreover, the key documentation from 35 central and local executive authorities responsible for the KP commitments implementation in Ukraine was reviewed.

Criteria

- Compliance by the central governmental authorities and agencies with the KP commitments
- Realization of the National Plan of activities to implement the Kyoto Protocol and the UNFCCC
- Establishment of effective mechanisms to implement the KP commitments.

Audit findings and evidence

- Ukraine's ratification of the UNFCCC & KP gives the country a chance to get large foreign investments, to modernize the sectors of the national economy and reduce its anthropogenic load within its territory.
- The legislative framework developed by the government havs not determined the specific activities and executives responsible to carry out systematic observations and establishment of the data banks regarding climatic system, scope and timing of climate change as well as its economic and social consequences.
- Climate change observation system of Ukraine is out-of-date (almost 100 per cent wear and tear of equip ment) and cannot comply with the UNFCCC requirements.
- The National Plan of Activities for implementation of Kyoto Protocol commitments was not completed before the start of the Kyoto Protocol period (2008 – 2012).
- The Government of Ukraine has launched the implementation of the flexible mechanisms to ensure environmental motivated investments as permitted in the Kyoto Protocol. However, because of the government's delay in establishing a project infrastructure for Joint Implementation projects, the country's opportunities of direct foreign investments in the projects are reduced.
- To introduce an emissions trading system in Ukraine, with emission allowances based on the domestic anthropogenic emissions sources, is not recommendable at the current stage. There are two reasons for this; firstly the country lacks the necessary national legislation, which was supposed to be presented in the national plan, and secondly the country is in a phase of privatization of its big enterprises, and foreign investments in these can result in reduction or liquidation of the expected results, as well as expansion of the out-of-date technologies, loss of competitive positions at the market and possibility to act there as an equal partner.

Recommendations

- To provide for the obligatory execution of the National Plan within the time frames stipulated by it;
- To provide for the development of the unified state task program for the development of the constructions and facilities for observation and forecasting of climate change, its consequences for the sectors of economy, systems of population life-support and environmental control;
- To stimulate the activities of executive authorities on establishing the infrastructure for the joint implementation projects, which are considered the most prospective economic instruments for Ukraine;
- To develop and submit for the consideration to the Parliament of Ukraine draft laws on emission allowances trading, regulating the amounts of greenhouse emissions and its removal by sinks.

Follow-up

The government agreed with all the recommendations from the audit and is now being developing a plan of its implementation.

Reference

The Supreme Audit Office of Poland (eds.), 2009. EUROSAI Audit on Climate Change. Joint Final Report. Warzaw: EUROSAI.

Box A.6

The SAI of the United States: Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism

Background

Requested by members of two U.S. House of Representatives committees—the Committee on Energy and Commerce and the Committee on Oversight and Government Reform. Report was issued November 2008.

Audit objectives

Examine the effects of, and lessons learned from: Phase I of the European Union's Emissions Trading Scheme (ETS), and the Kyoto Protocol's Clean Development Mechanism (CDM).

Scope (lines of enquiry and methodology)

We reviewed information on the ETS and CDM available from the EU, the UN, the academic literature, and market research firms. We also conducted semi-structured interviews with international government official, industry representatives, environmental advocacy organizations, market traders, researchers, and owners, developers and auditors of CDM projects. Following our data collection and interview process, we then collaborated with the National Academy of Sciences (NAS) to recruit a panel of experts to assist in identifying the key themes and lessons learned from the ETS and CDM that could influence decision making in the United States. The 26 experts were recruited based on their experience and expertise with international climate change programs and their knowledge of the U.S. policy development process. We engaged the experts using a Web-based questionnaire that included both open- and closed-ended questions. Finally, we identified important themes through a content analysis of responses to the open-ended questions, and summarized responses to the closed-ended questions.

Criteria

This job was classified as a routine non-audit. Our work was evaluative and based on available information and expertise, but we did not use established criteria in assessing these international programs.

Audit evidence

EU Emissions Trading Scheme

- The primary effect of the first ETS phase was to establish a functioning carbon market for allowances in which the price of emissions fluctuated with supply and demand. The price collapse after the release of emissions data in 2006 showed that Phase I was over-allocated– - the cap exceeded actual emissions. This resulted primarily from uncertainty surrounding the data used to set the cap and distribute allowances.
- The effect of Phase I on technology development and innovation was uncertain but likely minimal, in part because the first trading phase did not provide enough time to affect investments in clean technology. The price collapse of carbon allowances also reduced the incentive to invest in new technologies.
- The method for allocating allowances may have important economic effects, namely, free allocation may distribute wealth to covered entities whereas auctioning could generate revenue for governments.

Clean Development Mechanism

- The CDM has helped industrialized countries make progress toward achieving their emissions targets at less cost, and has involved developing countries in these efforts.
- However, despite a lengthy, rigorous review process, it is nearly impossible to ensure that all projects were additional - that is, that the emission reductions would not have occurred in the absence of the CDM. Non-additional projects can compromise the integrity of programs that allow the use of CDM credits for compliance, such as the ETS, because they enable covered entities to increase their emissions without a corresponding reduction in a developing country.
- Although the CDM requires that each project assist a host country in achieving sustainable development, no uniform standards or criteria for evaluating sustainable development impacts exist. Given that CDM's market-based design encourages its participants to pursue low-cost projects, it may ultimately be difficult for the CDM, as currently structured, to make significant contributions toward sustainable development goals.

Matters for Congressional Consideration

- Understanding the lessons learned from the ETS and the CDM provides the U.S. Congress with an opportunity to draw on this experience as it considers legislation intended to limit emissions of greenhouse gases.
- Specifically, the lessons learned from the ETS - the importance of reliable data on emissions, the need for long-term certainty, and the impact of allowance allocation on wealth transfers—relate directly to the development of a domestic cap-and-trade system.
- In addition, the lessons learned from the CDM: —(1) that it may be possible to achieve the CDM's goals more cost-effectively through other means; (2) that carbon offsets are inherently uncertain and can potentially undermine the integrity of a cap-and-trade scheme; and (3) that potential reforms, while promising, may not address fundamental challenges with offsets - may prove useful in informing congressional deliberations over the use of CDM credits or other types of carbon offsets in domestic climate change programs.

Follow-up

Because we did not audit government agencies there was not a government response.

Reference

http://www.gao.gov/new.items/d09151.pdf.

Appendix B:
Examples of adaptation audits

Box B.1
The SAI of United Kingdom: Adapting to Climate Change

Audit objectives

This report provides an overview of government policy on adapting to climate change, and progress across government departments in identifying and managing risks from future climate change impacts.

Scope (lines of enquiry and methodology)

The report presents departments' self-assessment of their current capacity to assess and manage climate change risks. The methodological approach uses a framework for effective climate change risk management developed by the SAI of United Kingdom for the purpose of the report. This approach is based on five themes: leadership, policy and strategy, people, partnerships, and processes. (The framework is presented in more detail in Appendix 1 of the report.)

Criteria

- The Climate Change Act 2008 established a statuary framework for work on climate change adaptation, including the requirement to undertake a UK-wide climate change risk assessment.
- The cross-government Adapting to Climate Change (ACC) Programme was established in 2008 to bring together and drive forward work in government and the wider public sector on adaptation.
- The Department for Environment, Food and Rural Affairs (Defra) provides the ACC Programme delivery team, but responsibility for embedding adaptation into individual government policies is given to the relevant government department.

Audit evidence

- Government departments showed signs of growing awareness and understanding, progress in identifying and assessing risks, and examples of individual policy responses.
- The government departments were at different stages of including climate change risk assessment and management: five departments were at the implementation stage, and four were at a capacity building stage. However, all departments were able to highlight relevant risks to their objectives, and give examples of policy responses.
- Departments highlighted that climate change risk management is a challenge because of the long timescales and uncertainties involved, the difficulty in prioritising resources between addressing current needs and future risks, and the need to build capacity.

Recommendations and follow-up

Not available.

Reference

http://www.nao.org.uk/publications/0809/adapting_to_climate_change.aspx

Box B.2

The SAI of Brazil: Performance audit to assess adaptation measures towards agriculture and livestock sector considering climate change scenarios

Background

As agriculture depends very much on natural resources and weather conditions, this sector is likely to be the one most affected by climate change.

Audit objectives

To verify the extent to which the actions of the Federal Public Administration are promoting successfully the adaptation of the livestock and agriculture sector to possible climate change scenarios. Activities in this sector is highly dependant on climate factors, which in turn means that climate change can have significant impact on the productivity of these sectors. Ultimately these impacts could have major affects on food safety, the Brazilian balance of trade, and could cause serious social problems.

Scope (lines of enquiry and methodology)

To assess if the main vulnerabilities resulting from the identified risks in the agriculture and livestock sector were mapped; if there are adaptation actions in place to enable the agriculture and livestock sector to respond to the identified risks; and if there are established appropriate systems of coordination, integration, governance, and accountability for those actions.

Criteria

- The Climate Change National Plan of 2008 and UNFCCC, Article 4.

Audit findings and evidence

- The main finding relates to deficiencies in identifying potential climate change risks. The primary cause of these difficulties is poor access to meteorological data. A large part of that data is still in printed version (books, notebooks, maps, etc.), and needs to be digitalized.
- Poor data means that low-resolution climate-change models have to be used. This affects identification of the country's vulnerabilities in relation to possible climate change scenarios, which makes the identification of risks more difficult.
- The adaptation actions of the sector are still in their very early stages, and are insufficient, in their current form, to deal with problems that could come from climate change. The possible reason for this is the lack of clear instructions to agencies to consider climate change scenarios when planning and implementing public policies for the agriculture and livestock sector.
- The Climate Change National Plan has not yet set guidelines for adaptation actions in the sector. More studies and a high resolution climate model are necessary to better predict Brazil's risks and vulnerabilities to climate change.
- There were also deficiencies in the coordination, integration, governance and accountability of the government actions in relation to climate change. Significant deficiencies relate to the lack of accurate definition of roles to be taken by various public agencies and by the overlapping activities of several institutions.

Recommendations

- Promote actions to make policy makers aware of the need to consider climate change scenarios when planning and elaborating public policies for the sector
- The Climate Change National Plan needs to include guidelines for adaptation actions to the sector, establishing targets and due dates to implement the measures
- More clearly define the roles and responsibilities of entities in charge of climate change actions, in order to better organize actions and avoid overlapping of activities
- Better coordinate and integrate government actions addressed to tackle climate change, in order to increase effectiveness
- Monitor the implementation of Climate Change National Plan, in order to verify if entities are following guidelines in the Plan
- Make short- and long- term meteorological data available for research institutions responsible of carrying out studies on climate change, especially the ones responsible for developing regional climate models
- Consider climate change scenarios when planning and designing adaptation actions for the sector
- Put in place measures to promote studies to map vulnerabilities relating to water availability and planned water management; consider climate change scenarios when authorizing water uses
- See if there is an opportunity to integrate existing meteorological data networks.

Reference

www.tcu.gov.br

Box B.3

The SAI of Canada: Managing Severe Weather Events – Environment Canada (2008)

Background

This report is Chapter 2 of the report of the Commissioner of the Environment and Sustainable Development to the House of Commons for December 2008.

Audit objective

The objective was to determine if Environment Canada's systems and procedures adequately support the delivery of timely and reliable severe weather warnings to Canadians.

Scope (lines of enquiry and methodology)

The audit examined Environment Canada's management of its weather observation network, the implementation of a new, advanced forecaster workstation, and the delivery and verification of severe weather warnings. It also examined the Department's planning process supporting the current and future delivery of severe weather warnings. The methodology included a review and analysis of key documents, interviews with relevant managers and department heads, visits to storm prediction centres, and meetings with forecasters, technicians and international organisations.

Criteria

The SAI of Canada used criteria for strategic planning, monitoring, verification and delivery from the Treasury Board of Canada Secretariat and the World Meteorological Organization.

Audit findings and evidence

- Environment Canada does not have a national programme or approach to verify the timeliness, accuracy or effectiveness of its severe weather warnings
- There is no national system in place that automatically warns the public about severe weather events or other emergencies
- Environment Canada has not adequately managed its weather observation networks to ensure that it can continue to provide the necessary data to issue and verify severe weather warnings
- The department does not have an up-to-date long-term strategy for meeting its many significant challenges, including implementing a robust and useful system to verify severe weather warnings, managing its monitoring networks over their lifecycle, and addressing risks related to the department's current strategy of relying on partners

Recommendations and follow-up

- Environment Canada should document and implement the policies, systems and procedures necessary to support its commitment to full life cycle management of its monitoring network assets, and prepare a fully costed long-term strategy supported by a capital plan for its monitoring networks
- The steering committee for the new forecaster workstation should ensure that clear timelines and deliverables with assigned accountabilities are established for the implementation of the workstation
- Environmental Canada should develop a costed strategy to improve the effectiveness of its own "push" technologies, and create a national public alerting system (with other departments); establish and implement a national program for verifying the quality of severe weather warnings; and regularly assess the effectiveness of severe weather warnings from a user's perspective
- Environment Canada should establish and document an updated long-term strategy for its weather and environmental services

Environment Canada agreed with all the recommendations.

Reference

http://www.oag-bvg.gc.ca/internet/docs/parl_cesd_200812_02_e.pdf

Box B.4

The SAI of Tanzania: Floods in Babati – a performance audit of the management of prevention and mitigation of floods at central, regional and local levels of government

Background

Babati District has experienced devastating floods many times. Forecasted changes in climate and rainfall patterns are expected to lead to an increased risk of flooding.

Audit objectives

The report aims at contributing to solutions for the challenge of preparing flood defences.

Scope (lines of enquiry and methodology)

The purpose of the audit is to examine how the responsible agencies, national and regional, have implemented the national strategic guidance on disaster management. During the audit, a conclusion regarding the current performance of the responsible agencies in dealing with disasters, particularly regarding prevention/mitigation of floods, was formed.

Criteria

- Both the national Disaster Management Department and the Manyara Regional Disaster Management Committee are responsible for promoting good preparedness and management of disasters. The essence of this is competent planning done to protect citizens against any kind of disaster which looms in the country
- The Disaster Relief Coordination Act (1990), which addresses all four elements of disaster management: preparedness, prevention/mitigation, responses, and recovery/rehabilitation
- The National Operational Guidelines for disaster management (2003), which also address all four elements of disaster management

Audit findings and evidence

- There is a very high risk of future floods causing further damage, due to the overall absence of strategic disaster management planning and actions
- Regional and local authorities are not prepared, at a fundamental level, for handling disasters (this includes a lack of coordination)
- The Disaster Management Department did not perform its oversight function properly and had not put in place the necessary budget for monitoring flood-related activities
- Town planning is not forward looking in regard to floods: Some of the homes and businesses have been located at low-lying areas, and plots have been located in areas that were supposed to be reserved for water passage
- Action has not been taken in the last 15 years to increase the capacity of water discharge by building bigger culverts; hence, there is a risk that the embankment acts like a dam during a flood
- Preventive structures along the river, including bridges, have been inadequately maintained.

Recommendations

- Monitor and control growth of grass barriers without allowing cattle grazing in prohibited areas
- Ensure that the on-going engineering design will result in culverts with a discharge capacity that will accommodate enough water flow to prevent water from nearby lakes flooding through Babati township
- Ensure that rehabilitation works on flood mitigation structures is done much earlier, to prevent the probable closing of roads during floods
- Share knowledge from previous floods to those responsible for rehabilitating roads, to make sure that hydrological calculations regarding the run-off from the watershed areas surrounding the sensitive discharge points take past flood events into account
- Take into account flood risks when allocating land, and ensure that preventive structures or measures are installed in flood-prone areas
- Include disaster management expenditure projections in annual budgets
- Ensure that civil society and local officers at respective levels of government play their roles in anti-flood programmes
- Execute oversight roles (Disaster Management Department) to ensure that regional and district authorities play their roles in pre-disaster planning, and that training give enough emphasis on flood prevention and mitigation activities
- Develop a systematic register of floods, and conduct proactive analyses of flood risks for flood-prone and economically important areas

Reference

http://environmental-auditing.org/tabid/126/CountryId/273/Default.aspx.

Box B.5

The SAI of Australia: Regional Delivery Model for the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality

Background

The way that natural resources are used and managed is fundamental to the long-term economic viability of the agricultural sector as well as the wellbeing of current and future generations of Australians.

Audit objective

The audit's objective was to assess and report on the administration of the regional delivery of two natural resource management programmes: the Natural Heritage Trust, and the National Action Plan for Salinity and Water Quality.

Scope (lines of enquiry and methodology)

The scope of the audit encompassed both the Department of the Environment, Water, Heritage and the Arts and the Department of Agriculture, Fisheries and Forestry, including the joint team of staff from both departments working together under a common management structure for the delivery of both programmes. The audit focused on:

- The implementation of the regional delivery systems
- Governance and financial management for regional delivery
- Monitoring, evaluation and reporting on the programmes' performance.

Criteria

- The Natural Heritage Trust of Australia Act 1997 established the Natural Heritage Trust, which aims to conserve, repair and replenish Australia's natural capital infrastructure
- National Action Plan for Salinity and Water Quality, which addresses dryland salinity and improved water quality.

Audit findings and evidence

- The regional delivery model for the two programmes was reasonable given the scale of the natural resource management challenge
- Transparency and accountability issues regarding government funds managed by States/Territories must be addressed
- The quality and measurability of targets in the regional plans is an issue for attention: the absence of sufficient scientific data has limited the ability of regional bodies to link the targets in their plans to programme outcomes
- It is not possible to report on the extent to which outputs (activities "on the ground") contribute to the outcomes sought by government
- The information reported in annual reports has been insufficient to make an informed judgement as to the progress of the programmes towards either outcomes or intermediate outcomes

Recommendations and follow-up

- Give priority to documenting and disseminating information regarding the cost-effectiveness of investments in achieving results, and lessons learned or insights from investments
- Clearly define the authority of the Joint Steering Committees over the release of funds and management of accounts, and streamline payments to regional bodies based on performance requirements
- Provided audited financial statements (acquittals) to indicate that funds have been spent for their intended purposes, return unspent funds remaining in State/Territory single holding accounts or offset these against future allocations, and disclose interest earned and its use
- Implement a performance measurement framework that includes core performance indicators, rules supporting the collection of performance data, dissemination of guidance to regional bodies, and meaningful intermediary outcomes.

The departments agreed on all the recommendations.

Reference

http://www.anao.gov.au/uploads/documents/2007-08_Audit_Report_21.pdf

Box B.6

The SAI of Canada: Adapting to the Impacts of Climate Change

Background

This report is Chapter 2 of the report of the Commissioner of the Environment and Sustainable Development to the House of Commons for December 2008.

Audit objectives

Determine whether the federal government, in cooperation with other levels of government and key stakeholders, as appropriate:

- Has set priorities based on the identified risks to Canadians posed by climate change and developed a climate change adaptation strategy and action plans to manage the risks
- Is implementing the climate change adaptation strategy and action plans, and is assessing, on a regular basis, the progress it has made in implementing adaptation measures.

Determine whether the federal government has organised itself to obtain, analyse and disseminate sufficient and appropriate information to help identify the potential impacts on and risks to Canadians posed by climate change.

Scope (lines of enquiry and methodology)

The audit focused on whether Environment Canada (EC) and Natural Resources Canada (NRC) have adequately assessed the impacts of climate change on Canadians and developed and implemented an appropriate adaptation strategy and action plans consistent with Canada's commitments under the UNFCCC and the Kyoto Protocol. The audit also looked at other departments to capture specific roles in programme design, or knowledge management related to setting priorities.

Criteria

- Identification of priorities and development and implementation of action plans
- Information to identify and address potential impacts and risks

Audit evidence

- The government has not yet put in place key measures to support Canadians in adapting to a changing climate. Nor has it clarified how it intends to manage its own adaptation efforts
- The government has not developed a strategy for federal adaptation efforts to indicate the expected results and timelines, and which departments would assume what responsibilities. Federal progress in working with provinces and territories has been limited
- Some departments have begun work on their own strategies, but only one has been completed. Departments have made limited progress in using available information about the changing climate to assess potential implications on federal policies and programmes
- The federal government has not yet organised its activities in climate science to make sure that the federal departments and others obtain the required information.

Recommendations

- EC and the Privy Council Office should identify the responsibilities and accountabilities of the federal departments and agencies that are to be involved in a federal adaptation effort. Those departments and agencies should then clarify how the Government of Canada will manage adaptation to a changing climate.
- Working with other federal departments and agencies producing or using information needed for adaptation efforts and with other levels of government and stakeholders, EC and NRC should identify and fill gaps in the required information, including results of impacts and adaptation research and results from climate science; and identify the need for initiatives that provide decision makers with access to information and technical expertise on adaptation tailored to their needs.

Follow-up

The department and central agencies have accepted all recommendations, but the responses make no firm commitments to specific actions with time frames for implementation.

Reference

http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_02_e_14984.html; for a full list of objectives, the scope and approach, criteria and recommendations, see pp. 24-8.

Box B.7

The SAI of the United Kingdom: building and maintaining river and coastal flood defences in England

Background

This value-for-money report was prepared for presentation to the House of Commons and was released in June 2007. It was carried out in response to a streamlining of flood defence management; a similar report was published in 2001.

Audit objectives

Building on the progress made since the last report, this report sets out those areas where there is room for further improvements in the value-for-money performance of the Environmental Agency (EA).

Scope (lines of enquiry and methodology)

The report examines EA management of flood risk from rivers and the sea. It focuses on the building and maintenance of flood defences. The methods used included interviews; data analysis, including financial analysis; a review of the asset inspection process; a meta-analysis of existing information on the cost of flooding; a review of flood risk management in three EU countries (France, the Netherlands and Poland); and stakeholder consultations.

Criteria

Improvements in cost-effectiveness to improve the value-for-money performance of the EA. The EA is the principal flood risk management authority in England. It has permissive powers, under the Water Resources Act of 1991, to manage flood risk arising from designated "main" rivers and the sea.

Audit evidence

To improve cost-effectiveness, the EA needs to address:

- Inconsistencies in its management of assets across the country
- The absence of reliable data on the lifespan of assets while scientific research is ongoing
- The lack of a clear management policy for dealing with assets owned and managed by third parties
- The need for further changes to existing work practices
- That the focus on constructing new flood defences to protect large numbers of additional households and to meet the Department's Public Service Agreement target is unlikely to benefit smaller rural communities
- The proportion of construction funds spent developing proposals, which limits the number of schemes that could otherwise be built
- Weaknesses in its data systems.

Recommendations

The report recommends that the EA:

- Focus more consistent attention on maintaining those flood defences considered to be medium or high risk
- Implements a national management policy for dealing with third party assets
- Draws up the findings of the planned benchmarking exercise to generate real maintenance efficiency savings
- Introduces the planned improvements in training for staff involved in maintenance and emergency response
- Conducts a review, in accordance with good practice, at the end of each major project to determine whether benefits were realised and to identify lessons learned
- Streamlines its approval process so that detailed plans are not commissioned until the proposed project has undergone a simplified gateway review
- Makes improvements to the computer asset database.

Follow-up

Not available.

Reference

http://www.nao.org.uk/publications/0607/building_and_maintaining_river.aspx

Appendix C:
The UNFCCC's review process

The UNFCCC has established a process for an in-depth review of the national communications submitted by the Annex I Parties. The in-depth review is conducted by an international team of experts, coordinated by the UNFCCC Secretariat. The review of each national communication aims to provide a comprehensive, technical assessment of a Party's implementation of its commitments. The in-depth review results in a detailed review report, which typically expands on and updates the national communication. The review reports aim to make it easier for the Conference of the Parties (COP) to assess the implementation of commitments by Annex I Parties. The reports also make it easier to compare the information in the Parties' national communications, although no common indicators are used. National communications from non-Annex I Parties do not undergo a similar review, but the Secretariat regularly compiles synthesis reports on these communications.

A separate annual review process has been established for submitted GHG inventories, and the information reported under the Convention and the Kyoto Protocol is reviewed jointly (if applicable). The review process takes place in three stages; the first two stages are carried out by the Secretariat, while in the final stage, the information is subject to an in-depth review by a team of international experts representing Annex I and non-Annex I Parties. The review team prepares an assessment of the submitted information, including recommendations for improvements to the Party. The Party is given an opportunity to comment on the review findings before the review report is made publicly available. The inventories are reviewed in accordance with review principles agreed by the Convention, the basic principle being that inventories must be accurate, complete, consistent, comparable and transparent. Adherence to the Guidelines developed and adopted by the IPCC is a main criterion.

Some aspects of the inventory reviews are specific to reviews under the Kyoto Protocol. Firstly, for every Party, review teams appraise the basis for stipulating the assigned amount of emissions before the first commitment period. In this initial review, there is also appraisal of the national system for estimating GHG inventories established under the Kyoto Protocol (Article 5.1).

Article 5.2 of the Kyoto Protocol has established provisions for so-called "adjustments". This means that, if the review team has identified deviations from established guidelines and the Party is unwilling to voluntarily change their estimates, the review team may replace the Party's estimate with an estimate that, in practice, worsens the situation for the Party in question. Adjustments may be made when establishing the assigned amount of emissions or for any years during the commitment period. Final application of any adjustment is decided by the Compliance Committee. Failure to report information and the conclusions from a review (including adjustments exceeding a defined threshold) may have consequences for eligibility for participation in the Kyoto mechanisms or compliance with the Protocol.

The initial and annual reviews under the Kyoto Protocol also address the national registry and its transactions with the international transaction log (ITL).[147]

[147] The ITL verifies transactions proposed by registries to ensure that they are consistent with rules agreed under the Kyoto Protocol. Each registry sends transaction proposals to the ITL, which checks each proposal and sends its approval or rejection to the registry. Once approved, registries complete the transaction. In the event that a transaction is rejected, the ITL sends a code indicating which ITL check has been failed, and the registry terminates the transaction.

Appendix D: **Glossary**

Abatement - Refers to reducing the degree or intensity of greenhouse-gas emissions.

Accountability - The obligation to demonstrate and take responsibility for performance in light of agreed-upon expectations. It answers the question: Who is responsible to whom and for what?

Adaptation - involves taking action to moderate the harm or exploit benefits caused by the actual or expected effects of global warming.

Adaptive capacity - The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences of climate change.

Aerosol - An aerosol is a suspension of fine particles or droplets in the air. Atmospheric aerosols scatter and absorb sunlight, and affect the earth's heat balance by reflecting sunlight back into space and through indirect effects on cloud formation and atmospheric chemistry. Aerosols are produced from both natural and human processes such as volcanic eruptions, forest fires, desert dust storms, and burning of coal and oil.

Afforestation - Planting of new forests on lands that historically have not contained forests.

Annex I Parties – Those Parties of the United Nations Framework Convention on Climate Change, which are countries that were members of OECD in 1992, and a number of countries defined as economies in transitions (EITs).

Annex II Parties – A sub-group of the Annex I countries. They include the members of OECD, but not the EITs.

Annex B countries - Annex B of the Kyoto Protocol contains a list of the industrial nations committed to regulating their greenhouse gas emissions in the period between 2008 and 2012. The list of Annex B countries is not identical to that of Annex I countries.

Anthropogenic greenhouse emissions - Greenhouse-gas emissions resulting from human activities.

Assigned Amount Units (AAU) – An emission certificate as defined by the Kyoto Protocol. Annex B countries can use AAUs to fulfill their obligations as stipulated in Article 3, Paragraph 1 of the Kyoto Protocol. Under the Protocol there is a reserve of allowed emissions distributed among the countries.

Biomass fuels or biofuels - A fuel produced from dry organic matter or combustible oils produced by plants. These fuels are considered renewable as long as the vegetation producing them is maintained or replanted. Their use in place of fossil fuels cuts greenhouse gas emissions because the plants that are the fuel sources capture carbon dioxide from the atmosphere.

Biosphere - The biosphere is the earth's 'layer of life'—i.e. the regions of the planet on which life is found (or which are able to support life). It is concentrated on the surface of the planet (the land and the oceans) but also extends into the lower atmosphere and throughout the soil.

Business-as-usual emissions - Greenhouse gas emissions that would occur in the absence of any specific requirements to reduce emissions.

Cap - Upper emissions limit or emissions goal for emissions trading at the national level and targets for all macro-sectors (energy production; industry; trade, commerce and services; transport and households) and particularly for what is known as the emissions trading segment, that is the parts of industry that participate in emissions trading in accordance with the guideline.

Capacity building - The process of developing the technical skills and institutional capability in developing countries and economies in transition to enable them to address effectively the causes and results of climate change (In the context of climate change).

Carbon dioxide (CO_2) - Carbon dioxide is a gas which presently makes up about 0.038 per cent of the earth's atmosphere. It is an important greenhouse gas. Even though its concentration in air is tiny, carbon dioxide is an essential natural component; without it, plant photosynthesis cannot take place.

Carbon market - A popular but misleading term for a trading system through which countries may buy or sell units of greenhouse-gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union. The term comes from the fact that carbon dioxide is the predominant greenhouse gas and other gases are measured in units called "carbon-dioxide equivalents."

Carbon sequestration - Carbon sequestration is the uptake or absorption of carbon, usually in the form of carbon dioxide. Major examples of carbon sequestration include uptake of carbon dioxide by growth of forests (through photosynthesis), and absorption of carbon dioxide by the oceans (through dissolution and chemical reactions).

Certified Emission Reductions (CER) - CERs are emissions certificates issued by bodies of the UN Framework Convention on Climate Change and the Kyoto Protocol for the successful completion of Clean Development Mechanism (CDM) climate protection projects.

Clean Development Mechanism (CDM) - A mechanism under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive certified emission credits (CER) for doing so which they may apply towards meeting mandatory limits on their own emissions.

Executive Board of the Clean Development Mechanism - A 10-member panel elected at COP-7 which supervises the CDM and has begun operation in advance of the Protocol's entry into force.

Compliance - System for checking adherence to reduction obligations, including measures and sanctions to be implemented if a country does not fulfill its obligations to reduce emissions as laid down in the Kyoto Protocol.

Compliance Committee - A committee that helps facilitate, promote and enforce on compliance with the provisions of the Kyoto Protocol. It has 20 members with representation spread among various regions, small-island developing states, Annex I and non-Annex I parties, and functions through a plenary, a bureau, a facilitative branch and an enforcement branch.

'Common but differentiated responsibilities' - In the Kyoto Protocol, the principles of equity and common but differentiated responsibilities and respective capabilities reflected the general acceptance by developed countries of their greater historical contribution to the accumulation of greenhouse gas emissions, in addition to their relatively greater resource capacity to develop and take remedial action. This leadership principle is reflected in the additional obligations imposed on Annex I countries.

EITs - countries with economies in transition included in the group of Annex I Parties. Those are Central and East European countries and former republics of the Soviet Union in transition from state-controlled to market economies.

Emissions allowance - Permission to emit one ton of carbon dioxide or carbon dioxide equivalent in a specified period of time. Emissions allowances and the Kyoto units are known as ERU (Emission Reduction Units) and CER (Certified Emission Reductions). They derive from the project-based mechanisms JI (Joint Implementation) and CDM (Clean Development Mechanism), referred to jointly as "certificates."

Emission Projections - Estimates of future emissions and removals based on emissions inventories and on assumptions about changes in underlying human activities.

Emissions Reduction Unit (ERU) - Emissions certificates that are issued for the successful completion of Joint Implementation (JI) climate protection projects.

Emissions trading - One of the three Kyoto mechanisms, by which an Annex I Party may transfer Kyoto Protocol units to or acquire units from another Annex I Party. An Annex I Party must meet specific eligibility requirements to participate in emissions trading.

Expert review teams - Groups of experts, nominated by Parties, who review national reports submitted by Annex I Parties to the UNFCCC, and the Kyoto Protocol.

Financial Mechanism - Developed country Parties (Annex II Parties) are required to provide financial resources to assist developing country Parties implement the Convention. To facilitate this, the Convention established a financial mechanism to provide funds to developing country Parties. The Parties to the Convention assigned operation of the financial mechanism to the Global Environment Facility (GEF) on an on-going basis, subject to review every four years. The financial mechanism is accountable to the COP.

Flexible mechanisms – A reference made to the international economic tools (the flexible mechanisms) which can be used by Parties of the Kyoto Protocol to fulfil the Protocol, more exactly Clean Development mechanisms (CDM), Joint implementation (JI) and emission trading.

Global warming potential (GWP) - An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

Global Environment Facility (GEF) - The GEF is an independent financial organization that provides grants to developing countries for projects that benefit the global environment and promote sustainable livelihoods in local communities. The Parties to the Convention assigned operation of the financial mechanism to the Global Environment Facility (GEF) on an ongoing basis, subject to review every four years. The financial mechanism is accountable to the COP.

Governance - The processes and structures through which power and authority are exercised, including the decision-making processes. It answers the questions: Who participates? How do they participate?

Greenhouse gases - Greenhouse gases are gases that contribute to the greenhouse effect in the earth's atmosphere. They are essentially transparent to incoming sunlight, but absorb heat radiated from the earth's surface, trapping this heat in the atmosphere and causing the atmosphere and earth's surface to maintain a warmer temperature than would be the case in the absence of these gases. The main greenhouse gases are water vapour and carbon dioxide. Carbon dioxide, methane and nitrous oxide are the main greenhouse gases that are increasing due to human activities.

Hydrofluorocarbons (HFCs) - Hydrofluorocarbons are molecules containing solely carbon, hydrogen and fluorine. These synthetic molecules are up to 14000 times more powerful than carbon dioxide as greenhouse gases over a 100-year time frame.

Implementation - Actions (legislation or regulations, judicial decrees, or other actions) that governments take to translate international accords into domestic law and policy.

IPCC - Intergovernmental Panel on Climate Change. The IPCC was established in 1988 by the World Meteorological Organization and the UN Environment Programme to provide comprehensive, objective, open and transparent peer-reviewed assessments of the latest scientific, technical and socio-economic literature produced worldwide relevant to climate change and its risks and impacts, and options for mitigation and adaptation. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies. The IPCC is independent of the Convention.

Joint implementation (JI) - A mechanism under the Kyoto Protocol through which a developed country can receive "emissions reduction units" when it helps to finance projects that reduce net greenhouse-gas emissions in another developed country (in practice, the recipient state is likely to be a country with an "economy in transition"). An Annex I Party must meet specific eligibility requirements to participate in joint implementation.

Kyoto Protocol - The Kyoto protocol under the UNFCCC was adopted in 1997, and took effect in 2005. The protocol commits Annex I Parties (Annex I of the UNFCCC, i.e. those countries that were members of OECD in 1992 and a number of countries defined as economies in transition) to reduce or limit their greenhouse gas emission in the period 2008-2012 relative to a 1990 baseline.

Marrakesh Accords - Agreements reached at COP-7 which set various rules for "operating" the more complex provisions of the Kyoto Protocol. Among other things, the accords include details for establishing a greenhouse-gas emissions trading system; implementing and monitoring the Protocol's Clean Development Mechanism; and setting up and operating three funds to support efforts to adapt to climate change.

Measurable emission reductions - Ensuring that the actual level of greenhouse gas emissions associated with an action can be quantified.

Methane (CH_4) - Methane is the main component of natural gas; it is a powerful greenhouse gas with 25 times the warming effect of carbon dioxide over a 100-year time scale.

Mitigation - In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere.

National adaptation programmes of action (NAPAs) - Documents prepared by least developed countries (LDCs) identifying urgent and immediate needs for adapting to climate change. The NAPAs are then presented to the international donor community for support.

National communication - A document submitted in accordance with the Convention (and the Protocol) by which a Party informs other Parties of activities undertaken to address climate change. Most developed countries have now submitted their fourth national communications; most developing countries have completed their first national communication and are in the process of preparing their second.

Non-Annex I Parties - These Parties are all other countries which are Party to the UNFCCC. They also include the least-developed countries and countries especially vulnerable to the adverse impacts of climate change.

Non-governmental organizations (NGOs) - Organizations that are not part of a governmental structure. They include environmental groups, research institutions, business groups, and associations of urban and local governments. Many NGOs have special expertise on climate change.

Nitrous oxide - Nitrous oxide is a colourless, non-flammable gas; it is a powerful greenhouse gas with 298 times the warming potential of carbon dioxide over a 100-year time scale.

Operationalise - to describe or define something in a way that allows it to be quantifiably measured.

Ozone - Ozone is a molecule which consists of three atoms of oxygen. It is toxic to animals and plants, and damages human respiratory systems. In the lower atmosphere it is a pollutant produced from emissions of other compounds during fuel combustion. However, ozone in the upper atmosphere occurs naturally and acts to reduce the amount of dangerous ultraviolet radiation reaching the earth's surface.

Perfluorocarbons (PFCs) - Perfluorocarbons are compounds consisting of carbon and fluorine. They do not deplete the ozone layer but are very strong greenhouse gases with long lifetimes in the atmosphere.

Performance - To demonstrate how well things are managed with regard to expected results. It answers the questions: Are the expected results accomplished? Are they accomplished within budget and in the most efficient manner? Are there undue, unintended consequences?

Precautionary principle - In the Kyoto Protocol, the precautionary principle states that 'where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'. However, it is envisaged that such measures 'should be cost-effective so as to ensure global benefits at the lowest possible cost'.

Precipitation - The condensation of moisture from water vapour in the atmosphere and its fall or deposition as rain, snow, dew, etc.; an instance of this, a shower of rain, snow, sleet, etc.

Ratification - Formal approval, often by a Parliament or other national legislature, of a convention, protocol, or treaty, enabling a country to become a Party. Ratification is a separate process that occurs after a country has signed an agreement. The instrument of ratification must be deposited with a "depositary" (in the case of the Climate Change Convention, the UN Secretary-General) to start the countdown to becoming a Party (in the case of the Convention, the countdown is 90 days).

Registries, registry systems - Electronic databases that will track and record all transactions under the Kyoto Protocol's greenhouse-gas emissions trading system (the "carbon market") and under mechanisms such as the Clean Development Mechanism.

Removal units (RMU) – Credits under the Kyoto Protocol generated on the basis of Land use, land-use change and forestry (LULUCF) activities such as reforestation.

Research and systematic observation - An obligation of Parties to the Climate Change Convention; they are called upon to promote and cooperate in research and systematic observation of the climate system, and called upon to aid developing countries to do so.

Stern Review on the Economics of Climate Change' - According to this review, the benefits of strong, early action considerably outweigh the costs.

Sink - A sink refers to a carbon sink or greenhouse gas sink, or a mechanism of uptake of carbon or other greenhouse gases, e.g. in the form of carbon dioxide. Examples include photosynthesis of vegetation, and absorption of carbon dioxide by the oceans.

Source - A source refers in this Guide to a carbon source or greenhouse gas source, or a mechanism of release of greenhouse gases. Examples include burning of coal, oil and gas and biomass burning.

Stratosphere, stratospheric - The stratosphere is the upper atmosphere, above normal clouds, where temperature does not decline with altitude. This contrasts with the troposphere, or lower atmosphere, where clouds form and temperature falls with increasing altitude. The concentration of ozone peaks in the stratosphere.

Sustainable development - Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technology transfer - A broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change among different stakeholders

The Copenhagen Accords - a document that several delegates at the United Nations Climate Change Conference agreed to "take note of" at the final plenary session of the Conference in Copenhagen December 2009. The Copenhagen Accord includes an objective to limit global warming to two degrees Celsius, emphasises that deep cuts in emissions are required to reach this target, and highlights the need for an agreement to cooperate on achieving a peak in emissions as soon as possible. The Copenhagen accord also states that developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.

Troposphere, tropospheric - The troposphere is the lowest portion of earth's atmosphere. The troposphere extends from the surface upwards, to an altitude of about 8 kilometres over the poles, and to about 16 kilometres over the equator. It contains three-quarters of the atmosphere's mass. Temperature falls with increasing altitude within the troposphere, which is in contrast to the situation in the stratosphere. The continuous movement of air within the troposphere (and the cooling as air rises) creates clouds and rain; thus the troposphere is the layer where most of the world's weather takes place.

Transparency -The open conduct of government activities, so that parliamentarians and the public can monitor and challenge the government's performance to ensure it is consistent with policy intentions, fairness, propriety, and good stewardship. Knowing that their actions and decisions are visible encourages ministers and managers of public programs to behave in ways that can withstand public scrutiny.

Trust funds - Funds earmarked for specific programmes within the UN system.

UNDP – The United Nations Development Programme is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience and resources. UNDP are on the ground in 166 countries, working with them when identifying solutions to global and national development challenges.

UNFCCC - The United Nations Framework Convention on Climate Change (UNFCCC or the Convention) is the main global response to climate change. The UNFCCC is an multilateral agreement who rests on the principle of 'common but differentiated responsibilities'. That is, developed or industrialised countries should take the lead in modifying manmade emissions in the long term.

Verifiable emission reductions - Ensuring that the methodology used to calculate emission reductions is transparent and replicable, and the appropriate data required to verify or audit the calculations is available and can be confirmed.

Vulnerability - The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Appendix E: **Design Matrix**

The design matrix has different functions:

- A planning tool to support identification of the most relevant and feasible audit design
- A communication tool to describe the design to the board of the SAI, the government or others
- An efficiency tool to encourage systematic data collection and analysis
- An effectiveness tool to enable the appropriate connection to be made between the expected audit findings (what the audit will enable the SAI to communicate), the criteria for - and the design of - the audit (researchable questions and methodology).

The design matrix may help to define the audit objectives, researchable questions, audit criteria, audit evidence, methods of collecting audit evidence, expected audit findings (risk areas), and implementation risk (see Table 4.1). Step 4 in the Guide describes examples covering the four first columns but developing a full-scale matrix during the planning stage is recommended.

The complexity of climate change issues makes the design matrix even more useful when planning climate change audits. Please note that more tailored matrices are needed when conducting national audits in order to address and adapt the audit to the identified risks and national constraints. Two examples of different full-scale design matrices are described in the following enclosures.

Table 4.1:A
A design matrix scheme

WHAT				HOW	FEASIBILITY	
Audit objective	**Audit question**	**Audit criteria**	**Audit evidence**	**Method**	**Risk areas**	**Implementation risk**
What do we wish to achieve through the audit?	What do we wish to find out?	What yardstick will be used?	What information do we need?	Where are the data and how will they be collected and analysed?	What conclusions can we draw?	Professional uncertainty in the design and project plan?

Appendix F:
Example of a design matrix – mitigation

Audit objective: What do we wish to achieve through the audit?

The goal of the investigation is to assess the authorities' work on implementing the decisions of parliament about climate change, and to show that unclear goals can prevent target achievement.

WHAT		HOW		FEASIBILITY	
Audit question	**Audit criteria**	**Audit evidence**	**Method**	**Risk areas**	**Implementation risk**
1 **To what extent does the responsible ministry fulfil its overriding management responsibility to ensure goal achievement?**	The ministry's overriding responsibility for coordinating climate efforts. The sector ministries' general responsibility in the environmental field. Good governance and management criteria.	The main emission targets and how they have they been operationalised. The ministry's decision basis and plan for achieving the target. The sector ministries' contributions to interdepartmental processes.	Document analysis and interviews. The documents to be examined will be identified in consultation with the ministry. The interviews will be with the responsible ministries and other sector ministries.		The systems may be changed during the period (for example, through reorganisation of the work).
1.1 Has the responsible ministry ensured that the overriding goals are sufficiently clearly defined and operationalised?	Good governance and management criteria.	That the goals can be documented, that they have been operationalised in the form of sub-goals and a time schedule.	A review of public documents, and interviews.	Overriding goals exist, but the extent to which sector goals are defined and sufficiently operationalised varies.	
1.2 Has the responsible ministry ensured that the sector goals are sufficiently clearly defined and operationalised?	Good management criteria. In an area where goal achievement is dependent on inter-sector cooperation, sector goals must be defined, known and used in the sector ministries. Instructions for official studies and reports.	That the sector goals can be documented in public documents or in internal documents, such as minutes of meetings or similar, and used as measures for the ministries in question.	Request relevant documentation and use interviews to check whether the goals are used in the actual work.	That the goals are not sufficiently defined and operationalised in all sectors, for instance in relation to the Kyoto period. The sector ministries do not feel enough ownership, there are conflicting objectives, and the goals are not used in day-to-day administration.	
1.3 Are roles and responsibilities sufficiently defined and clarified between the responsible ministry and other ministries?	See above. Goal achievement in the area is dependent on inter-sector cooperation. Clear roles and responsibilities are a precondition for setting clear goals and defining responsibility for implementation.	An overview of how the different ministries' responsibilities are described in official reports, proposals and governing documents, and how they are perceived by the ministries themselves.	Public documents, minutes, remits and similar. Interviews may help to reveal whether what is documented is also put into practice.	Various alliances, coalitions and differences in ministries' powers might be an obstacle to the defined roles and responsibilities being respected.	
	Good management criteria. UNFCCC and the Kyoto Protocol. The ministry's overriding responsibility for implementing the country's climate policy.	Documentation from ministries and agencies that provide good management information. Statistics and projections.	Official reports to UNFCCC, misc. white papers to the Parliament.	Inadequate systems to measure the effect of policy instruments. Too seldom reporting to ensure good control. Uncertainty whether the measurements actually reflect actual developments.	

Appendix G:
Example of a design matrix – floods and landslides

	WHAT		HOW	FEASIBILITY	
Audit question	**Audit criteria**	**Audit evidence**	**Method**	**Risk areas**	**Implementation risk**
1: Has the risk of floods and landslides been adequately mapped and is there enough knowledge about the risks?					
1.1 Are there areas that have not been mapped?	Recommendations to the national parliament. Reports to the parliament. Planning and building legislation.	Information about the extent of the mapping of the different risk types. Information about climate changes has been taken into account in the mapping.	Data from the relevant directorate and geological registers. Interviews with municipalities and county governors, focus groups with municipalities. Questionnaire survey of county governors.	Risk that flooding and landslide risks have not been sufficiently mapped in several municipalities.	Different levels of data baselines makes comparison difficult. Lack of a common terminology may make it difficult to compare map data. Not updated data to include new buildings.
1.2 Is the mapping of satisfactory quality?	Legislation relating to insurance against and compensation for natural disasters. Planning and building legislation. Recommendations to the parliament.	Information that the municipalities pass on knowledge.	Interviews with municipalities and county governors, focus groups with municipalities. Questionnaire survey of county governors.	That knowledge is not passed on to those who need it.	Difficult to get enough documentation.
1.3 Is the knowledge gained from the mapping passed on to relevant users?	Reports to the parliament about regional planning responsibility and about the relationship between central and local government.	Information that the municipalities pass on knowledge.	Interviews, focus groups, questionnaire survey (as in 1.2)	That knowledge is not passed on to those who need it.	Difficult to get enough documentation.
1.4 Is the knowledge actually used?	Planning and building legislation.	Information that shows that the knowledge is used.	Interviews, focus groups, questionnaire survey (as in 1.2).	Indications that the municipalities do not make enough use of the available knowledge.	Planning and building legislation.

	WHAT		HOW	FEASIBILITY	
Audit question	**Audit criteria**	**Audit evidence**	**Method**	**Risk areas**	**Implementation risk**
2: Is there enough government control to prevent flood and landslide risks?					
2.1 Are the ministries sufficiently coordinated as regards floods and landslides?	Legislation relating to water resources. Planning and building legislation.	Information about the different ministries' areas of responsibility, how the ministries cooperate, and whether there are conflicting goals.	Interviews with the relevant ministry and directorate of environmental affairs. Map the number of objections and dispensation cases.	Fragmentation of responsibility – too many parties involved.	Legislation relating to water resources. Planning and building legislation.
2.2 How does the ministry carry out its responsibility for preventing floods and landslides?	Legislation relating to water resources. Recommendations and reports to parliament.	Information about how the directorate and the ministry: · work in relation to floods and landslides · process objections · handle dispensation cases · make use of their opportunities to change the requirements for reservoir levels.	Mapping of the different ministries' areas of responsibility. Interviews with county governors and directorates. Interviews with the directorate. Questionnaire to the municipalities.	Various weaknesses in the ministries' control and the directorate's management. Possible areas the directorate has registered as risk areas that have not been made safe.	Data that provide an overview of objections and dispensations may be difficult to access.
2.3 Does government control ensure that national goals for floods and landslides are given enough attention at the municipal level?	Recommendations to parliament. Planning and building legislation. Reports to the parliament of the relationship between central and local government. The regulations for appropriations. Good management criteria.	Is the legislation appropriate? Have regulations been issued as expected? Does the ministry ensure that the legislation is implemented? What expertise do the municipalities have? Are there risk and vulnerability analyses and are floods and landslides mentioned in them? Information about the municipalities' mapping of landslide risks and use of flood-zone maps.	Interviews with county governors and relevant directorates. Questionnaire survey of municipalities and county governors. Analysis in relation to flood maps. Questionnaire surveys of municipalities and county governors.	National goals are not followed up enough in the municipalities due to conflicting goals and lack of resources. Building takes place in landslide and flood risk areas without the necessary safety measures being in place. Not all municipalities have updated risk and vulnerability plans. Even fewer have risk and vulnerability plans that include flood and landslide risk.	

Bibliography

Chapter 1

IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010].

Stern, N., 2006. The Economics of Climate Change The Stern Review. Cambridge: Cambridge University Press.

UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.

UNFCCC, 1998. The Kyoto Protocol. [Online] Available at http://unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 12 April 2010]

UNFCCC, 1992. The United Nations Framework Convention on Climate Change. [Online] Available at http://unfccc.int/essential_background/convention/background/items/2853.php [Accessed 12 April 2010].

Chapter 2

Berstein, L., 2007. Industry. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

IPCC, 2007. Climate Change 2007: Synthesis Report. [Online] Available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [Accessed 10 April 2010].

IPCC, 2007. Summary for Policymakers. In S. Solomon et al., eds., , The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

IPCC, 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Online] Available at http://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html [Accessed 12 April 2010].

J. A. Lowe et al., 2006. The Role of Sea-Level Rise and the Greenland Ice Sheet in Dangerous Climate Change: Implications for the Stabilisation of Climate. In H. J. Schnellnhuber et al., eds., Avoiding Dangerous Climate Change. Cambridge: Cambridge University Press.

myclimate, 2010. Greenhouse effect [Online] Available at http://www.myclimate.org/en/information-climate-tips/facts-about-climate-change/role-of-humans/greenhouse-effect.html [Accessed 10 March 2010]

Nellemann, C., et al., 2009. The environmental food crisis: The environment's role in averting future food crises. A UNEP Rapid Response Assessment. [Online] Available at http://www.grida.no/publications/rr/food-crisis/ebook.aspx [Accessed 10 April].

Reid, H., et al., 2007. Up in Smoke? Asia and the Pacific. The threat from climate change to human development and the environment. The fifth report from the Working Group on Climate Change and Development. [Online] Available at http://www.iied.org/pubs/pdfs/10020IIED.pdf [Accessed 12 April 2010].

Schimel, D. Alves, I. Enting, et al , Radiative Forcing of Climate Change. in Houghton JT, Meira Filho LG, Callander BA, et al. (eds), Climate Change 1995. The Science of Climate Change, The Contribution of WGI to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Singh, R. B. K., 2001. The Influence of Climate Variation and Change on Diarrheal Disease in the Pacific Islands. Environmental Health Perspectives [Online] 109 (2), pp. 155-159. Available at http://www.ehp.niehs.nih.gov/members/2001/109p155-159singh/singh.pdf [Accessed 12 April 2010].

Solomon, S., et al., eds.,2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

UNDP, 2007. Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World. UNDP.

UNEP/GRID-Arendal, 2000. Potential climate change impacts. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at http://maps.grida.no/go/graphic/potential-climate-change-impacts [Accessed 12 April 2010].

UNEP/GRID-Arendal, 2004. Climate change vulnerability in Africa. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at http://maps.grida.no/go/graphic/climate-change-vulnerability-in-africa [Accessed 12 April 2010].

UNEP/GRID-Arendal, 2009. World Greenhouse Gas Emissions by Sector. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at http://maps.grida.no/go/graphic/world-greenhouse-gas-emissions-by-sector2 [Accessed 12 April 2010].

UNEP/GRID-Arendal, 2002. Greenhouse effect. UNEP/GRID-Arendal Maps and Graphics Library [Online] Available at http://maps.grida.no/go/graphic/greenhouse-effect [Accessed 12 April 2010].

UNFCCC, 2004. The Ten First Years. Bonn: UNFCCC.

UNFCCC, 2007. Uniting on Climate: A guide to the Climate Change Convention and the Protocol. Bonn: UNFCCC.

UNFCCC, n.d. Future effects. [Online] Available at http://unfccc.int/essential_background/feeling_the_heat/items/2905.php [Accessed 9 March 2010].

Chapter 3

Accounting Institute Seminars, 2009. Auditing Dictionary of Terms. [Online] Available at http://www.ais-cpa.com/glosa.html [Accessed 24 March 2010].

Commission of the European Communities, 1999. Preparing for the Implementation of the Kyoto Protocol. Communication from the Commission to the Council and the European Parliament. COM(1999)230 final. Brussels.

INTOSAI, 2004. INTOSAI GOV 9100. Guidelines for Internal Control Standards for the Public Sector. [Online] Available at http://www.issai.org/media(574,1033)/INTOSAI_GOV_9100_E.pdf [Accessed 12 April 2010]

INTOSAI, 2004. ISSAI 3000. Standards and guidelines for performance auditing based on INTOSAI's Auditing Standards and practical experience. Vienna: INTOSAI.

INTOSAI, 2001. INTOSAI GOV 9120. Internal Control: Providing a Foundation for Accountability in Government. [Online] Available at http://www.issai.org/media(576,1033)/INTOSAI_GOV_9120_E.pdf [Accessed 12 April 2010].

UNDP, 2004. Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures. Cambridge: Cambridge University Press.

UNECE, 1998. Convention on access to Information, Public Involvement in Decision-making and Access to Justice in Environmental matters, done at Aarhus Denmark, on 25 June 1998. [Online] Available at http://www.unece.org/env/pp/documents/cep43e.pdf [Accessed 12 April 2010].

UNFCCC, 2007. Bali Action Plan. Decision 1/CP.13. [Online] Available at http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3 [Accessed 12 April 2010].

UNFCCC, 2006. Report of the centralized in-depth review of the fourth national communication of Norway. [Online] Available at http://unfccc.int/resource/docs/2006/idr/nor04.pdf [Accessed 24 March 2010].

UNFCCC, 2001. Marrakesh Accords & Marrakesh Declaration. [Online] Available at: http://unfccc.int/cop7/documents/accords_draft.pdf [Accessed 11 April 2010].

UNFCCC, 1998. The Kyoto Protocol. [Online] Available at http://unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 12 April 2010]

UNFCCC, n.d. Compliance under the Kyoto Protocol. [Online] Available at http://unfccc.int/kyoto_protocol/compliance/items/2875.php [Accessed 30 March 2008]

Chapter 4

Accounting Institute Seminars, 2009. Auditing Dictionary of Terms. [Online] Available at http://www.ais-cpa.com/glosa.html [Accessed 24 March 2010]

Algemene Rekenkamer, 2006. The European Emissions Trading Scheme and its implementation in the Netherlands. [Online] Available at http://www.rekenkamer.nl/english/News/Audits/Introductions/2007/11/European_CO2_emission_trading_system_and_its_implementation_in_the_Netherlands [Accessed 12 April 2010].

Boyd, E., et al., 2007. The Clean Development Mechanism: An assessment of current practice and future approaches for policy Tyndall Centre Working Paper 114. [Online] Available at http://www.tyndall.ac.uk/sites/default/files/wp114.pdf [Accessed 10 April 2010].

BusinessDictionary, 2010. Additionality. [Online] Available at http://www.businessdictionary.com/definition/additionality.html [Accessed 10 April 2010]

Castro, P. and A. Michaelowa, 2008. Empirical Analysis of Performance of CDM Projects. [Online] Available at http://www.indiaenvironmentportal.org.in/files/empirical-done.pdf [Accessed 10 April 2010].

Chidiak, M., and D. Tirpak, 2008. Mitigation Technology Challenges: Considerations for National Policy Makers to Address Climate Change. UNDP.

Court of Accounts of Morocco, 2006. Performance Audit of the renewable energy development centre. [Online] Available at http://www.environmental-auditing.org/Portals/0/AuditFiles/mc214fre06ar_sum_renewableenergy.pdf [Accessed 12 April 2010].

Cosbey, A., D. Murphy, and J. Drexhage, 2007. Market Mechanisms for Sustainable Development: How Do They Fit in the Various Post-2012 Climate Efforts? [Online] Available at http://www.iisd.org/pdf/2007/market_mechanisms.pdf [Accessed 10 April 2010].

European Commission, 2010. Emission Trading System (EU ETS). [Online] (Updated 29 March 2010) Available at http://ec.europa.eu/environment/climat/emission/ets_post2012_en.htm [Accessed 10 April 2010].

European Commission, 2010. Climate Change. [Online] Updated 16 March 2010. Available at http://ec.europa.eu/environment/climat/home_en.htm [Accessed 24 March 2010].

Gupta, S., et al., 2007. Policies, Instruments and Co-operative Arrangements. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

IFAC, 2006. ISA 240. The Auditor's Responsibility to Consider Fraud in an Audit of Financial Statements. International Federation of Accountants

INTOSAI, 2004. ISSAI 3000. Standards and guidelines for performance auditing based on INTOSAI's Auditing Standards and practical experience. Vienna: INTOSAI.

INTOSAI WGEA, 2010. Environmental Accounting: Current Status and Options for SAIs. Draft. Presented at the INTOSAI WGEA Steering Committee Meeting, Dar es Salaam, Tanzania, 15–18 February 2010.

IPCC, 2007. Summary for Policymakers. In B. Metz et al. (eds.), Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Metz, B., et al., eds., 2007. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

National Audit Office, 2007. Cost-effectiveness analysis in the 2006 Climate Change Programme Review. London: National Audit Office.

National Audit Office, 2008. Programmes to reduce household energy consumption. London: National Audit Office.

New Zealand Treasury, 2010. New Zealand's Position under the Kyoto Protocol. [Online] Available at http://www.treasury.govt.nz/government/kyotoposition [Accessed 12 April 2010]

Office of the Auditor General of Canada, 2009. 2009 Spring Report of the Commissioner of the Environment and Sustainable Development. [Online] Available at http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_e_32544.html [Accessed 10 April 2010].

Office of the Auditor General of Canada, 2006. 2006 September Report of the Commissioner of the Environment and Sustainable Development. [Online] Available at http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_01_e_14983.html#def1 [Accessed 25 March 2010].

Office of the Auditor General of Canada, 2006. Reducing Greenhouse Gases Emitted During Energy Production and Consumption. [Online] Available at http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200609_03_e_14985.html [Accessed 10 April 2010].

Pope, J., 2000. TI Source Book 2000. Confronting Corruption: The Elements of a National Integrity System. Berlin: Transparency International.

Riksrevisionen, 2010. Report summary: What are Sweden's Emission Rights Worth?

Raaum, R. B., and S. L. Morgan, 2001. Performance Auditing: A Measurement Approach. 2nd ed. Altamonte Springs, Florida: The institute of Internal Auditors Research Foundation.

Schneider, L., 2007. Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement. [Online] Available at http://www.oeko.de/oekodoc/622/2007-162-en.pdf [Accessed 10 April 2010].

The Supreme Audit Office of Poland (eds.), 2009. EUROSAI Audit on Climate Change. Joint Final Report. Warzaw: EUROSAI.

Sutter, C., and J. C. Parreno, 2007. Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects, Climactic Change (2007) 84, pp.75-90.

Voigt, C., 2008. Is the Clean Development Mechanism Sustainable? Some Critical Aspects, Sustainable Development Law & Policy Volume VIII, Issue II.

United States Government Accountability Office, 2008. International Climate Change Programs: Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism. [Online] Available at http://www.gao.gov/new.items/d09151.pdf [Accessed 12 April 2010].

World Bank, 2009. State and Trends of the Carbon Market 2009. [Online] Available at http://wbcarbonfinance.org/docs/State___Trends_of_the_Carbon_Market_2009-FINAL_26_May09.pdf [Accessed 10 April 2010].

Chapter 5

Accounting Chamber of Ukraine, 2008. Audit report on the efficiency of execution of the flood protection programs. [Online] Summary available at http://environmental-auditing.org/tabid/126/CountryId/384/Default.aspx [Accessed 12 April 2010].

Isoard, S., T. Grothmann and M. Zebisch, 2008: Climate Change Impacts, Vulnerability and Adaptation: Theory and Concepts. Paper presented at the Workshop Climate Change Impacts and Adaptation in the European Alps: Focus Water.

Adger, W. N., et al. 2007. Assessment of adaptation practices, options, constraints and capacity. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Audit Office of the Republic of Cyprus, 2008. Water management: The serious reduction of water reserves in Cyprus. [Online] Summary available at http://environmental-auditing.org/tabid/126/CountryId/389/Default.aspx [Accessed 12 April 2010].

Australian National Audit Office, 2007. Regional Delivery Model for the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality. Audit Report No. 21 (2007–08). [Online] Available at http://www.anao.gov.au/uploads/documents/2007-08_Audit_Report_21.pdf [Accessed 12 April 2010].

Barker, T., et al., 2007. Technical Summary. In B. Metz et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Carter, T. R., et al., 2007. New assessment methods and the characterisation of future conditions. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

U. Confalonieri et al, 2007. "Human Health". In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

El Raey, M., 2004. Adaptation to Climate Change for Sustainable Development in the Coastal Zone of Egypt. OECD.

FAO, 2004. Drought impact mitigation and prevention in the Limpopo River Basin: A situation analysis. Roma: FAO.

FAO, 2008. Report of the FAO expert Workshop on Climate Change Implications for Fisheries and Aquaculture. Rome, Italy, 7-9 April 2008. FAO Fisheries Report No. 870. Rome, FAO.

FAO, 2009.Climate change implications for fisheries and aquaculture, Overview of current scientific knowledge. FAO Fisheries and Aquaculture Technical paper No. 530. Rome: FAO.

Garnaut, R., 2009. Climate Change impacts on Australia. The Garnaut Climate Change Review.

Government of the Netherlands, 1997. Second Netherlands' Communication on Climate Change Policies.

Government of the Netherlands, 2006. Fourth Netherlands National Communication under the United Nations Framework Convention on Climate Change.

Hof, A. F., et al., 2009. The effect of different mitigation strategies on adaptation costs. Environmental Science and Policy 12.

INTOSAI WGEA, 2001. Guidance on Conducting Audits with an Environmental Perspective. INTOSAI.

INTOSAI WGEA, 2010. Environmental Accounting: Current Status and Options for SAIs. Draft. Presented at the INTOSAI WGEA Steering Committee Meeting, Dar es Salaam, Tanzania, 15–18 February 2010.

IPCC, 2007. Summary for Policymakers. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

Lasco, R., et al., 2006. Tradeoff analysis of adaptation strategies for natural resources, water resources and local institutions in the Philippines. AIACC Working Paper No. 32.

Metz, B.,et al., eds., Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.

Moss, R., et al., 2008. Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts and Response Strategies. Technical Summary. IPCC.

National Audit Office, 2009. Adapting to climate change. [Online] Available at http://www.nao.org.uk/publications/0809/adapting_to_climate_change.aspx [Accessed 12 April 2010].

National Audit Office, 2007. Building and maintaining river and coastal flood defences in England. [Online] Available at http://www.nao.org.uk/publications/0607/building_and_maintaining_river.aspx [Accessed 12 April 2010].

Niang-Diop, I., and H. Bosch, 2004. Formulating an Adaptation Strategy. In UNDP, Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures. Cambridge: Cambridge University Press.

Parry, M. L., et al., 2007. Technical Summary. In M. L. Parry et al., eds., Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Parry, M. L., et al., 2009. The Cost to Developing Countries of Adapting to Climate Change – New Methods and Estimates. Technical Summary. Consultative Draft. [Online] Available at http://siteresources.worldbank.org/INTCC/Resources/Executivesummary.pdf [Accessed 12 April 2010]

Office of the Auditor General of Canada, 2006. Adapting to the Impacts of Climate Change. [Online] Available at http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200812_02_e_31819.html [Accessed 12 April 2010].

Office of the Auditor General of Canada, 2008. Managing Severe Weather Events – Environment Canada. [Online] Available at http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200812_02_e_31819.html [Accessed 12 April 2010].

Schreiner, C., 2004. What would a warmer world be like? [Online] Available at http://www.atmosphere.mpg.de/enid/1ws.html [Accessed 11 April 2010].

Secretariat of the Convention on Biological Diversity, 2009. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change, Montreal. CBD Technical Series No.41.

Stern, N., 2006. The Economics of Climate Change The Stern Review. Cambridge: Cambridge University Press.

R. Swart et al., 2009. Europe Adapts to Climate Change. Comparing National Adaptation Strategies. Partnership for European Environmental Research.

UNFCCC, 2007. Impacts, Vulnerabilities and Adaptation in Developing Countries. UNFCCC.

UNFCCC, 2007. Investments and financial flows relevant to the development of an effective and appropriate international response to climate change. [Online] Available at http://www.unfccc.int/4053.php [Accessed 12 April 2010].

UNFCCC, 2009. Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention. Note by the secretariat of the UNFCCC SBSTA.

United Nations World Water Assessment Programme, 2009. Climate change and water – An overview from the World Water Development Report 3: Water in a Changing World. ??: UNESCO – WWAP

Wehbe, M., et al., 2006. Local perspectives on adaptation to climate change: lessons from Mexico and Argentina. AIACC Working Paper No. 39.