EXAMPLE ROAD MAPS FOR DEVELOPING
Climate Change-Related Statistics[1]

Finalized based on the feedback from the
UNECE Expert Forum for Producers and Users of Climate Change-Related Statistics

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Contents

1 Introduction to road maps

The example road maps (i.e. work plans), presented in this document, are intended to support progress towards the Conference of European Statisticians' (CES) *Recommendations on Climate Change-related Statistics* by helping countries to:

- Think about what the real priorities are taking into account national climate policy and international climate reporting requirements.
- Understand what data exist and where the gaps are.
- Identify and engage with stakeholders to learn about their needs and challenges.
- Realistically evaluate the available resources, progress made and competing priorities.
- Commit to the priority actions to develop statistics for climate change analysis and policies.

New climate data needs are arising from global climate agreements, the Paris climate agreement, the 2030 Sustainable Development Agenda and other global initiatives. National statistical offices, as gatekeepers of social, economic and environmental statistics, are well positioned to contribute to international climate reporting and national policies. Existing official statistics, if made more accessible and improved for these purposes, would provide a valuable tool for analyzing the drivers of climate change and its economic, environmental and social impacts.

The *CES Recommendations on Climate Change-related Statistics* were developed in response to the growing data needs challenging both statistical and climate communities. They highlight three areas where official statisticians can contribute with concrete actions:

- Provision of statistics for the compilation of national greenhouse gas emission inventories.
- Compilation of statistics and indicators to support the analysis of the drivers and impacts of climate change as well as mitigation and adaptation efforts.
- Development of statistical infrastructure – classifications, definitions, data collections, organizational structures, knowledge, products and services – for these statistics.

Countries asked the UNECE Steering Group on Climate Change-related Statistics to help countries to put these recommendations in use. The Steering Group, then, developed the example road maps covering the *CES Recommendations* and illustrating a practical approach to their implementation. The road map also encourages the development of data and statistics to compile the set of key climate change-related indicators and the related metadata[2], finalized by a dedicated Task Force in 2017.

At an expert meeting in 2016, countries reviewed the example road maps and saw them as an effective way to improve the quality and relevance of statistics for climate policy. The road maps can also help engage key stakeholders and attract investments for the improvement of statistics.

This document provides three example road maps for the development of climate change-related statistics in three fictional countries with basic, intermediate and advanced statistical capacities. The examples are offered as guides to national statistical offices in the development of actual national road maps. They have been created with the aid of an Excel-based tool designed to help countries prioritize the implementations of the CES recommendations.[3] Furthermore, Annex I includes an assessment tool to review the status of affairs when launching the preparation of a national road map on climate change-related statistics.

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[2] www.unece.org/statistics/statstos/task-force-on-a-set-of-key-climate-change-related-statistics-using-seea.html
[3] This tool is available at www.unece.org/stats/climate.html

2 Example Road Map - Non-Annex I country with a basic capacity to measure climate change

2.1 Current climate conditions – Country 1

Climate change is expected to seriously impact this example country. Over the past decades, increased climate variability has been noted across its entire territory. Five of the past years were very dry or extremely dry. At the same time, four of these years were also characterized by extreme flood events. Due to the country's geographic conditions and reliance on coal for home heating, air pollution is significantly pronounced in the winter months in larger urban areas.

The country is highly vulnerable to climate change threats because of the economic role of climate-sensitive sectors, such as agriculture and forestry. Economically and socially, it has limited capacity to address climate change risks.

Currently, over 70 per cent of greenhouse gas emissions originate from the energy sector, followed by agriculture with a share of more than 12 per cent and industry with a 10 per cent share of emissions. Electricity production is mostly based on ageing coal-fired generating stations but also on newer natural gas plants, renewable energy and hydropower. The potential for decreasing greenhouse gas emissions rests in particular in increased energy efficiency (which requires access to more modern technology than the country currently has); use of biomass and wind power.

2.2 Assessment of priorities for climate change-related statistics – Country 1

An assessment of the current situation of climate change-related statistics in the country, is a good starting point for drafting a road map on climate change-related statistics. An assessment tool, prepared based on the approaches of the diagnostic tool[4] designed for the implementation of the System of Environmental Economic Accounts (SEEA) and the Environment Statistics Self-Assessment Tool (ESSAT)[5], is provided as Annex I. Some of the questions of the assessment tool are helpful for preparing the launch of the work on the road map. Some questions may help guide the preparation of the road map together with stakeholders.

In this section of the road map, the country's priorities for the development of climate change-related statistics are outlined in three areas with the aid of the Excel-based prioritization tool:

A. The development of data required for the compilation of the national greenhouse gas inventory
B. The development of data required for other climate change analysis, such as the set of key climate change-related indicators
C. The development of statistical infrastructure and capacity required to produce climate change-related statistics

2.2.1 Priorities for developing data for greenhouse gas emission inventories – Country 1

Background: As a non-Annex 1 country, there is no obligation for Country 1 to prepared an annual greenhouse gas emission inventory for submission to the UNFCCC. However, the Ministry of Energy has

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4 SEEA Diagnostic Tool, Annex II: unstats.un.org/unsd/envaccounting/ceea/meetings/ninth_meeting/UNCEEA-9-6d.pdf
5 Environment Statistics Self-Assessment Tool (ESSAT): unstats.un.org/unsd/environment/FDES/essat.htm

produced and submitted two so-called "national communications" and, more recently, a biennial update that include national estimates of emissions that are similar to those found in formal inventories.

The activity data required for the estimation of greenhouse gas emissions are obtained mainly from the statistical office but also from a number of other sources, official and informal: surveys administered by the Ministry of Energy; peer-reviewed academic publications; the national development strategy published by the Ministry of Planning; unpublished government studies and expert judgement.

A number of gaps exist in the data required for estimation of emissions., including inadequate time series and more detailed metadata. Institutional arrangements for data collection and processing and quality assurance should be more clearly defined. A systematic monitoring and data collection system needs to be established for the preparation of the inventory.

Analysis of priorities: Analysis of priorities in producing data for GHG inventories (see Table 1.1) shows that there are several actions that should be undertaken right away or as soon as possible in Country 1.

- **Enhance awareness in the NSO of how official statistics are or could be used for GHG inventories (1.1)** – This awareness is very low at the moment. Only one employee within the NSO has been engaged in supporting the estimation of GHG emissions. Awareness must be raised among more technical staff at more senior levels of the NSO to ensure official statistics are used to the greatest extent possible in the production of climate change-related statistics.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Immediately or as soon as possible
  - *Duration:* on-going
  - *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers.

- **Ensure that GHG inventory calculations use existing official statistics as much as possible (1.2)** – Further to point 1.1., there are opportunities to use official statistics in inventory compilation that are not currently exploited because of poor coordination between the NSO and the Ministry of Energy. In particular, the Ministry of Energy does not use the results of NSO's energy surveys, choosing instead to run its own surveys at considerable additional cost.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Immediately or as soon as possible
  - *Duration:* on-going
  - *Expected result:* Greater use of official statistics – especially energy surveys – in inventories and better collaboration of the NSO and inventory compilers.

- **Improve coherence of GHG inventories and official statistics where possible (1.3.1)** – The national inventory is not fully coherent with official statistics due to, among others, the treatment of emissions from transportation. A bridge table explaining the reason for this incoherence to users should be prepared.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Immediately or as soon as possible
  - *Duration:* 6 months
  - *Expected result:* Greater transparency regarding the differences between official statistics and the national inventory and the underlying reasons

- **Improve the quality of energy statistics (1.3.2)** – Though the NSO has a long-standing program of energy surveys, the underlying methods have not been updated for many years and the quality of the results has been called into question (this is one reason why the Ministry of Energy chooses to run its own energy

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Immediately or as soon as possible
  - *Duration:* Tw years

surveys). The survey methods should be thoroughly reviewed and any necessary modifications implemented as soon as possible.

- o *Expected result:* Improved data on energy consumption to feed into the national energy balance compiled by the Ministry of Energy

- **Improve data on waste and the production of heat and electricity for own use and from renewable energy sources (1.3.4) –** Data on the management of solid waste do not currently exist. As a result, estimated emissions from landfills and waste incineration are entirely based on modelled estimates. A survey of waste management companies should be designed to fill this gap.

  - o *Responsible agency / partner agencies:* NSO and Ministry of Municipal Services
  - o *Start:* Immediately or as soon as possible
  - o *Duration:* Three years
  - o *Expected result:* Improved data on the management of municipal solid waste (e.g., quantities of waste landfilled, recycled and incinerated by type) result in improved estimates of emissions from waste management

- **Facilitate collaboration between the statistical system and national inventory system (2.1) –** Currently, collaboration is *ad hoc* and relies on an informal arrangement between the one NSO staff member engaged in climate change-related statistics and the Ministry of Energy. This arrangement needs to be formalized and the NSO staff member should be formally appointed as the focal point within the NSO responsible for managing collaboration with the national inventory compilers at the Ministry of Energy.

  - o *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - o *Start:* Immediately
  - o *Duration:* on-going
  - o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- **Create a national working group between the NSO, the GHG inventories agencies and other relevant organizations (2.2) –** A formal interdepartmental working group on GHG inventory data needs should be established to ensure that data needs and availability are well understood and that necessary resources are made available to ensure that official statistics make a significant contribution to emission inventories.

  - o *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - o *Start:* Immediately
  - o *Duration:* on-going
  - o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- **Clarify the role of the statistical office in providing statistics for the national GHG inventory (2.3) –** At the moment, the NSO's role in the development of the national GHG inventory is unclear to the NSO. The data users in the Ministry of Energy tend to see no role for the NSO other than the provision of basic activity data. Discussion is required to clarify both that the NSO has a role and what this role is; this will help ensure that duplication of effort is avoided.

  - o *Responsible agency / partner agencies:* NSO Ministry of Energy
  - o *Start:* Immediately
  - o *Duration:* on-going
  - o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers in the Ministry of Energy.

- **Support the efforts at strengthening the quality of GHG inventories in line with the IPCC's guidelines on quality control and quality assurance (2.4) –** Since the country is not an Annex I country, there is no obligation to apply the IPCC's QA/QC guidelines in the national inventory process. Nonetheless, doing so would be an

  - o *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - o *Start:* Immediately or as soon as possible
  - o *Duration:* on-going

effective way of determining where weaknesses exist in the national inventory and the data that feed into it.

- **Seek closer collaboration between the statistical community and international organizations working on climate issues (3.1)** – The NSO currently is not involved in any international discussions related to climate change and has very limited capacity to do as a result of budget constraints. Following these discussions, even after the fact if there is no possibility to attend international meetings themselves, would be simple way for the NSO be increase its understanding of needs for climate change-related statistics.

- **Follow up on the outcomes of the UNFCCC conferences of the parties to the convention (3.3)** – The Ministry of Energy does not always implement recommendations coming from UNFCCC conferences when estimating the country's emissions. While the capacity to implement these recommendations is very limited, selecting those that are most relevant to the national situation and ensuring they are implemented will result in an improved national inventory.

- **Involve NSOs at the outset of work to respond to new data needs from the UNFCC (3.4)** – The default currently is for inventory compilers in the Ministry of Energy to attempt to meet new data needs themselves rather than engaging the NSO to provide those data. This results in missing opportunities where the NSO could more quickly and efficiently meet new needs.

- **Existing international networks of NSOs could facilitate the exchange experience (3.5)** – Similarly, the NSO does not currently collaborate with other NSOs on climate change-related data issues, resulting in missed opportunities to learn from NSOs with greater experience in the area. Though the NSO's limited capacity for international cooperation means that opportunities to gain experience from other NSOs is limited, there are ways in which exchanges of experience can be facilitated (e.g., by leveraging funds from international organizations with development mandates)

o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

o *Responsible agency / partner agencies:* NSO and International organizations (UN, OECD, World Bank)
o *Start:* Immediately
o *Duration:* on-going
o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them.

o *Responsible agency / partner agencies:* Ministry of Energy and NSO
o *Start:* Immediately
o *Duration:* on-going
o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

o *Responsible agency / partner agencies:* Ministry of Energy and NSO
o *Start:* Immediately
o *Duration:* on-going
o *Expected result:* Improved understanding of climate change issues and the contribution that official statistics can make to addressing them

o *Responsible agency / partner agencies:* NSO, NSOs of other countries and international organizations
o *Start:* Immediately
o *Duration:* on-going
o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

Other activities related to data for the compilation of the national emissions inventory are either costlier and/or more time consuming to implement and/or have lower potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Fill gaps related to, among others, the agriculture, forestry and other land use sector (1.3.3)** – Official statistics related to forests are especially weak currently, resulting in reduced accuracy of the estimates from land-use and land-use change in the national inventory.

  - *Responsible agency / partner agencies:* NSO and Ministry of Natural Resources
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* Improved forest data resulting in improved estimates of emissions from land-use change.

- **Improve the timeliness of activity data (1.3.5)** – Activity data are often out of date when they are published because of delays in survey collection and processing. Means should be explored to provide activity data for key sectors – especially the energy-intensive utility, mining, mineral processing and chemicals industries – on a timelier basis.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* on-going
  - *Expected result:* Improved timeliness of activity data for mining and mineral processing.

- **Build longer and more consistent time series of official statistics (1.3.6)** – There are concerns about breaks in the time series of activity data as a result of changes in survey methods and simply from failure in some survey cycles to complete data processing and publication. Methods should be investigated to fill the gaps in key series to produce a more accurate and consistent set of activity data. Priority should be given to the energy-intensive utility, mining, mineral processing and chemicals industries.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* One year
  - *Expected result:* Methodology developed to smooth the time series of activity data from 1990 to the current period for the utility, mining, mineral processing and chemicals industries.

Table 1.1

Development priorities related to data for greenhouse gas emission inventories – Country 1

CES Recommendations related to data for greenhouse gas emission inventories	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
	Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
1 NSOs must improve data and statistics required for GHG inventories				
1.1 Enhance awareness in the NSS of how official statistics are/could be used for GHG inventories	1	2	2	Start as soon as possible
1.2 Ensure that GHG inventory calculations use existing official statistics as much as possible	1	2	2	Start as soon as possible
1.3 Improve the quality of official statistics used for GHG inventories, as follows:				
1.3.1 Improve coherence of GHG inventories and official statistics where possible	1	2	2	Start as soon as possible
1.3.2 Improving the quality of energy statistics in particular	2	2	1	Start as soon as possible
1.3.3 Fill gaps related to, among others, the agriculture, forestry and other land use sector	3	3	2	Start within three years
1.3.4 Improve data on waste and the production of heat and electricity for own use and from renewable energy sources	2	2	1	Start as soon as possible
1.3.5 Improve the timeliness of activity data	3	3	3	Start within three years
1.3.6 Build longer and more consistent time series of official statistics	3	3	3	Start within three years
1.4 Draft, together with the agencies responsible for GHG inventories, a prioritized list of national data gaps and a road map on data development	NA	NA	NA	Already complete
	2.0	**2.4**	**2.0**	
2 NSOs, especially in UNFCCC Annex I Parties to UNFCCC, should be proactive in reaching out to national agencies responsible for greenhouse gas inventories and, ideally, they should be considered official institutions in the national systems of greenhouse gas inventories				
2.1 Facilitate collaboration between the statistical system and national inventory system	1	2	1	Start now
2.2 Create a national working group between the NSO, the GHG inventories agencies and others	1	2	2	Start as soon as possible
2.3 Clarify the NSO's role in providing statistics and assist, as needed, in GHG inventory calculations	1	1	1	Start now
2.4 Support efforts at strengthening the quality of GHG inventories in line with the IPCC's guidelines	1	2	2	Start as soon as possible
	1.0	**1.8**	**1.5**	
3 The international statistical community, including national statistical systems and international statistical organizations, should take an active role in contributing to the global GHG inventory system				
3.1 Seek closer collaboration between the statistical community and international organizations	1	1	2	Start now
3.2 Actively engage, at national level, with the national representatives of UNFCCC forums	NA	NA	NA	No action needed
3.3 Follow up on the outcomes of the UNFCCC conferences of the parties to the convention	1	1	1	Start now
3.4 Involve NSOs when countries need to respond to new data needs from the convention	1	1	2	Start now
3.5 Existing international networks of NSOs could facilitate the exchange experience	1	1	2	Start now
	1.0	**1.0**	**1.8**	

2.2.2 Priorities for developing other climate change-related statistics and indicators – Country 1

Background: Beyond the need to improve data for the compilation of the national emissions inventory, much needs to be done to improve the scope, reliability and consistency of statistics relating to climate change more broadly, and to develop data for the set of key climate change-related indicators. The Ministry of Natural Resources began publishing regular environmental assessment reports recently but found that the data gaps prevented climate change from being addressed to any extent in these reports. Key data gaps relate to mitigation activities and the potential economic impacts of climate change across sectors.

Analysis of priorities: In spite of their importance, only a few actions related to non-inventory data needs are recommended for implementation right away or as soon as possible (see Table 1.2 below). Due to the cost and time required to implement them, most are recommended for implementation in the next two to three years or beyond.

- **Create national forums or events for discussions between users and producers of climate change statistics (4.1)** – This is consistent with the recommendations above to increase the dialogue between producers and users of climate change-related statistics to ensure that needs are understood and met as efficiently as possible.

  - *Responsible agency / partner agencies:* NSO and Ministries of Energy and Natural Resources
  - *Start:* Immediately
  - *Duration:* On-going
  - *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them.

- **Review statistical programs and data collections from the viewpoint of the data needs of climate change analysis and indicators (5.1)** – As noted, the NSO is forced to work with very limited financial and human resources. It has no formal environmental statistics program and only one staff member who informally works on climate change-related statistics. As a result, the scope for actually expanding statistical programs to address the needs of climate change analysis is low. Nonetheless, climate change needs to be among the user needs that are considered when the NSO reviews its statistical programs. Even if new investments cannot be made at the moment, there is value in at least compiling a list of areas where new data could be usefully produced.

  - *Responsible agency / partner agencies:* NSO and Ministries of Energy and Natural Resources
  - *Start:* Immediately or as soon as possible
  - *Duration:* On-going
  - *Expected result:* Greater responsiveness of official statistics to the needs of climate change analysis

- **Address the difficulties in matching data from different statistical domains (5.2)** – The main concern here relates to the need to reconcile energy use data for the manufacturing sector from the NSO's energy surveys with data from its five-year manufacturing census. At the moment, the results from these sources are quite different and the reason for the difference is not well understood.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* Improved quality of the NSO energy statistics

As noted above, most activities related to non-inventory data needs are either costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit.

- **Promote the use of existing official statistics (4.2)** - At the moment, the use of official statistics to analyze climate change-related issues is limited. This is partly because the NSO does not produce a great deal of relevant data but also because some data that are relevant are not well known among the climate change analyst community.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* As soon as possible
  - *Duration:* On-going
  - *Expected result:* Increased use of official statistics in inventory compilation

- **Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels (4.3)** – In principle, this is a sound idea. In practice, the NSO's capacity to disseminate statistics is limited by an outdated and frequently inoperable on-line system. Costly and time-consuming improvements to this system would have to be completed before additional climate change-related statistics could be added to it; no such improvements are currently planned.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* Improved access to climate change-related statistics for the general public and researchers

- **Improve access to microdata for researchers working on climate change (4.4)** – The NSO maintains relatively few microdata that are relevant to researchers working on climate change, so this activity is not expected to have a significant impact on the quality of their research. The one exception is the energy surveys. Access to the microdata from these surveys could permit researchers to better understand the breakdown of energy use in large firms.

  - *Responsible agency / partner agencies:* NSO, Ministry of Energy, universities
  - *Start:* Three years or beyond
  - *Duration:* On-going
  - *Expected result:* Greater use of official statistics by climate change analysts in the public and academic sectors

- **Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change (5.3)** – The geo-referencing of all data to support spatial analysis related to climate change is a good idea in principle, the but the NSO has no capacity to undertake this.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* Spatially referenced data

- **Produce statistics for new geographical areas (5.4)** – Land-use data by ecoregion would be helpful in better understanding emissions from land-use change in principle, though the NSO has not capacity to produce such data currently.

  - *Responsible agency / partner agencies:* NSO and Ministry of Natural Resources
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* New data on land use by ecoregion to support improved estimation of emissions from land-use change

- **Improve data for analyzing drivers of climate change (6.1)** – Implementation of the SEEA-CF is not currently being explored in the country. Basic environmental statistics are a more urgent priority for improvement. If and when implementation of the SEEA can become a priority, the focus should be on energy use accounts.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Five years
  - *Expected result:* Development of SEEA-based energy use accounts and regular publication of energy-related indicators (*e.g.*, energy use per unit of GDP by industry)

- **Develop statistics to address climate change adaptation (6.3)** – At the moment, the country does not measure efforts to adapt to climate change. A survey to measure investment in infrastructure to protect the economy and society against the negative effects of climate (which are expected mainly to be felt in two large coastal cities as a result of sea-level rise) would be ideal but is currently well beyond the means of the NSO.

  - *Responsible agency / partner agencies:* NSO and ministries of Natural Resources and Planning
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* New statistics measuring the level of investment in infrastructure to protect against the negative effects of climate change.

- **Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems (6.4)** – The NSO has no capacity to measure natural systems and currently has no plans to begin doing so. Basic environmental statistics must be first improved.

  - *Responsible agency / partner agencies:* NSO and Ministry of Natural Resources
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* New statistics measuring the quantity and quality of key ecosystems

Table 1.2

Development priorities related to other climate change-related statistics and indicators – Country 1

CES Recommendations related to other climate change-related statistics and indicators	Cost to implement Rating 1= low 2=medium 3=high	Time to implement Rating 1= low 2=medium 3=high	Impact on data quality if implemented Rating 1= high 2=medium 3=low	Recommended timeframe for implementation
4 NSOs must improve the contribution of official statistics to climate change analysis by, among other things, facilitating access to existing statistics				
4.1 Create national forums or events for discussions between users and producers of climate change statistics	1	2	1	Start now
4.2 Promote the use of existing official statistics and indicators	1	2	3	Start within two years
4.3 Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels	3	3	2	Start within three years
4.4 Improve access to microdata for researchers working on climate change	2	2	2	Start within two years
	1.8	**2.3**	**2.0**	
5 The usefulness of existing environmental, social and economic statistics for climate change analysis should be improved				
5.1 Review statistical programs and data collections from the viewpoint of the data needs of climate change analysis and indicators	1	2	2	Start as soon as possible
5.2 Address the difficulties in matching data from different statistical domains	1	2	2	Start as soon as possible
5.3 Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change	3	3	2	Start within three years
5.4 Produce statistics for new geographical areas	3	3	2	Start within three years
	2.0	**2.5**	**2.0**	
6 NSOs should consider development of new statistics based on a review of the key data needs of climate change policy makers and analysts in their country				
6.1 Improve data for analyzing drivers of climate change	3	3	2	Start within three years
6.2 Develop statistics on the use of economic instruments	NA	NA	NA	No action needed
6.3 Develop statistics to address climate change adaptation	3	3	1	Start within three years
6.4 Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems	3	3	2	Start within three years
	3.0	**3.0**	**1.7**	

2.2.3 Priorities for developing statistical infrastructure and capacity – Country 1

Background: The country has made efforts to establish appropriate political, institutional and legal frameworks to meet the commitments stemming from its status as a party (non-Annex I) to the UNFCCC. Legislative changes would help specify the responsibilities of various agencies in the collection of environment and climate change-related data and define the type and scope of data to be collected. The NSO currently publishes no environmental data in its statistical yearbooks and its professional capacity to provide such data is currently very low. In general, the capacity of agencies and experts working in the area of environment in the country should be strengthened and their mutual communication and coordination improved.

Analysis of priorities: Several actions to improve statistical infrastructure and develop professional capacity are recommended for implementation right away or as soon as possible (see Table 1.3 below).

- **Identify and address the obstacles to linking statistics across domains (7.2)** – Better communications are required between the NSO and the Ministry of Energy in order to address the obstacles preventing better integration of data from the NSO's energy surveys into the national energy balances.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* By Immediately or as soon as possible
  - *Duration:* Six months
  - *Expected result:* The obstacles preventing better integration of data from the biennial manufacturing survey are identified and a plan is put in place to address them.

- **Familiarize NSO staff with GHG inventory methodologies (8.2)** – At the moment, only one junior technical employee of the NSO has any familiarity with inventory methods; her involvement in climate change statistics is informal and come on top of her formal duties related to economic statistics. Additional staff should be given training to familiarize them with these methods.

  - *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
  - *Start:* Immediately or as soon as possible.
  - *Duration:* 6 months
  - *Expected result:* Additional NSO staff are trained to familiarize them with emission inventory methods.

- **Ensure the effective transfer of knowledge and skills among NSOs internationally (8.4)** – As noted above, the NSO currently engages very little in international discussions and exchanges as a result of budget constraints. Engaging with other NSOs on the topic of climate change-related statistics, especially if funding can be obtained from international development organizations, should be considered among other priorities for these kinds of exchanges.

  - *Responsible agency / partner agencies:* NSO and International organizations (UN, OECD, World Bank)
  - *Start:* Immediately or as soon as possible
  - *Duration:* on-going
  - *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them.

- **Assign a person or group with the responsibility for ensuring the quality and availability of climate change-related statistics (9.1)** – This is a high priority, as responsibility for this has sat informally with one NSO staff member in recent years. Ideally, the person tasked with this should be the person already informally fulfilling this role in the economic statistics department.

  - *Responsible agency / partner agencies:* NSO and Ministry of Energy
  - *Start:* Immediately
  - *Duration:* on-going
  - *Expected result:* A staff member in the economic statistics department is assigned the task of ensuring the quality and availability of climate change-related statistics.

- **Define and clarify, if needed, the division of work and responsibilities between the different producers of climate-change related statistics and GHG inventories (9.3)** – At the moment, the NSO is uncertain what is expected of it with regard to climate change-related statistics and other agencies are unsure what, if anything, can be expected of the NSO.

  - *Responsible agency / partner agencies:* NSO and ministries of Energy, Natural Resources and Planning
  - *Start:* Immediately or as soon as possible
  - *Duration:* on-going
  - *Expected result:* The NSO and other agencies are clearer in regard to their own and each other's responsibilities with respect to climate change-related statistics.

The remaining actions related to infrastructure and capacity are costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Consider new approaches to preserving confidentiality (7.3)** – As noted in point 4.4 above, a new approach to preserving the confidentiality of business survey data could permit the NSO to share micro-data from the energy surveys with the Ministry of Energy and others for the purposes of compiling the national energy balance.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* A new method of preserving confidentiality of business survey micro data while providing access for researchers is developed.

- **Build knowledge and understanding of the natural sciences among NSO staff (8.1)** – At a minimum, a small group of employees within the NSO should have the necessary understanding of the natural sciences in order for the agency to respond effectively to the demand for climate change-related statistics.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* New staff are hired by the NSO with backgrounds in the natural sciences

- **Develop knowledge, methodologies and tools for producing and using geo-referenced data across the statistical system (8.3)** – Geo-referencing data is not likely to result in significant improvement in the quality of the data available for climate change analysis. The exception are population statistics, which will be the target of a geo-referencing effort.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* Population data are geo-referenced so that they may be aggregated according to non-standard geographic units that are better suited to climate change analysis (e.g., watershed basins)

- **Modify, in the longer term, the NSO's organizational structure (9.2)** – Plans call for a unit responsible for environmental statistics to be established once

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years

sufficient funds can be earmarked for this purpose. Negotiations to obtain these funds will be undertaken at the time of the next review of the national statistical law (in two years' time).

- **Earmark sufficient resources for the development of environmental statistics and climate change-related statistics (9.4) –** See previous point.

o *Expected result:* A new unit devoted to environmental statistics is created within the NSO

o *Responsible agency / partner agencies:* NSO
o *Start:* Three years or beyond
o *Duration:* Two years
o *Expected result:* The new environmental statistics unit is appropriately funded

Table 1.3

Development priorities related to statistical infrastructure and capacity – Country 1

CES Recommendations related to infrastructure and capacity	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
	Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
7 Existing classification systems, registers, definitions, statistical frameworks, products and services need to be reviewed to see that needs related to climate change analysis are appropriately addressed				
7.1 Give consideration in future revisions of international statistical standards and classifications to the data needs of climate change analysis	2	2	2	Start within two years
7.2 Identify and address the obstacles to linking statistics across domains	1	2	2	Start as soon as possible
7.3 Consider new approaches to preserving confidentiality	1	3	2	Start within two years
7.4 Consider the inclusion of explicit references to environmental statistics, including climate change-related statistics, in statistical laws	NA	NA	NA	No action needed
	1.3	**2.3**	**2.0**	
8 Statisticians should gradually develop new partnerships, expertise and ability to adopt new methodologies for producing climate change-related statistics				
8.1 Build knowledge and understanding of the natural sciences among NSO staff	2	3	2	Start within three years
8.2 Familiarize NSO staff with GHG inventory methodologies	1	2	2	Start as soon as possible
8.3 Develop knowledge, methodologies and tools for producing and using geo-referenced data across the statistical system	2	3	1	Start within two years
8.4 Ensure the effective transfer of knowledge and skills among NSOs internationally	1	2	2	Start as soon as possible
	1.5	**2.5**	**1.8**	
9 Organizational changes may be needed in NSOs, the national statistical system and the national system for greenhouse gas inventories to support the production of climate change-related statistics				
9.1 Assign a person or group with the responsibility for ensuring the quality and availability of climate change-related statistics	1	2	1	Start now
9.2 Modify, in the longer term, the NSO's organizational structure	2	2	2	Start within two years
9.3 Define and clarify, if needed, the division of work and responsibilities between the different producers of climate-change related statistics and GHG inventories	1	2	2	Start as soon as possible
9.4 Earmark sufficient resources for the development of environmental statistics and climate change-related statistics	2	2	1	Start as soon as possible
	1.5	**2.0**	**1.5**	

3 Example Road Map - Annex I country with intermediate capacity to measure climate change

3.1 Current climate conditions – Country 2

Climate change is expected to moderately impact this example country. The country has a continental climate with four distinct seasons. Summers are generally warm and winters are cold to very cold. The country receives precipitation more or less evenly throughout the year, with spring and fall being slightly wetter. Winter precipitation is mainly in the form of rain in low-lying areas and snow at higher elevations (all parts of the country are mountainous to some extent).

Over the past decades, increased climate variability has been noted across its entire territory. The historical pattern of relatively balanced precipitation throughout the year has tended toward greater extremes. Periods without significant precipitation are lasting longer and individual precipitation events with significant precipitation (i.e., sufficient to cause localised flooding) are becoming more common. Though unusual based on historical norms, this change has no led to significant environmental, economic or social disruption. Air pollution is not generally a problem in the country, as much of its energy needs are met by hydro and nuclear power. Diesel engines in automobiles and other road vehicles are common but strict emissions control standards are applied.

The country is moderately vulnerable to climate change threats. The economy is dominated by service industries like tourism (mainly during the summer months along its substantial coastline) and a burgeoning high-tech sector. There is also a significant mineral extraction industry that includes coal (mostly exported) and, increasingly, shale gas. The economic role of climate-sensitive industries, such as agriculture and forestry, is limited as much food is imported and commercial forestry is not permitted. Hydro power production is potentially at risk from disruption to rainfall patterns, though long-term models do not predict changes of a magnitude that would have serious consequences for surface water runoff.

Currently, 79 per cent of greenhouse gas emissions originate from the energy sector, followed by agriculture with a share of 10 per cent, industrial processes with an 8 per cent share of emissions and waste management with a 3 per cent share. In addition to hydro and nuclear power, the energy sector of is based on natural gas and refined petroleum products, all of which are imported. Opportunities for reducing emissions mainly relate to increasing energy efficiency, solar/wind power and electrification of the transport sector. Domestic coal use has all but been phased out and no major rivers remains to be damned for hydro power. A ban has been placed on construction of new nuclear power plants. Emissions could rise in the future once the country's nuclear plants reach the end of their lives if they are replaced with natural gas power plants.

3.2 Assessment of priorities for climate change-related statistics – Country 2

An assessment of the current situation of climate change-related statistics in the country, is a good starting point for drafting a road map on climate change-related statistics. An assessment tool,

prepared based on the approaches of the diagnostic tool[6] designed for the implementation of the System of Environmental Economic Accounts (SEEA) and the Environment Statistics Self-Assessment Tool (ESSAT), is provided as Annex I. Some of the questions of the assessment tool are helpful for preparing the launch of the work on the road map. Some questions may help guide the preparation of the road map together with stakeholders.

In this section of the road map, the country's priorities for the development of climate change-related statistics are outlined in three areas with the aid of the Excel-based prioritization tool:

A. The development of data required for the compilation of the national greenhouse gas inventory
B. The development of data required for other climate change analysis, such as the set of key climate change-related indicators
C. The development of statistical infrastructure and capacity required to produce climate change-related statistics

3.2.1 Priorities for developing data for greenhouse gas emission inventories – Country 2

Background: The country produces an annual national inventory report as required by its status as an Annex I party to the UN Framework Convention on Climate Change. The Ministry of Environmental Protection is the responsible institution for the inventory. Data required for inventory compilation are obtained mainly from the NSO, which has limited resources to devote to climate-change-related statistics, and the ministries of energy, agriculture and environmental protection. The national forest research institute provides the data required to estimate emissions from land use and forests. Data from a national emissions trading program are also used. A database is maintained by the Ministry of Environmental Protection with activity and other data and emission factors. The database automates the calculation of emissions and their export to the UNFCCC common reporting format.

A number of data gaps exist and should be filled. Until 2005, the NSO conducted an annual census of the manufacturing industry, which provided an excellent basis for obtaining activity data. Beginning in 2006, the census was replaced with a biennial sample survey of the manufacturing sector as a cost-saving measure. As a result, the reliability of activity data declined significantly. Data on land use change are also inadequate. The NSO has no focal point for climate-change related data, which results in inefficiencies in obtaining the data required for the national inventory report; inventory compilers often deal with new individuals at the NSO each time data are requested, preventing any meaningful institutional learning.

Analysis of priorities: Analysis of priorities in producing data for GHG inventories shows that there are several actions that should be undertaken right away or as soon as possible (see Table 2.1 below).

- **Enhance awareness in the NSO of how official statistics are or could be used for GHG inventories (1.1)** - This awareness is low at the moment, restricted to just a handful of technical-level employees within the NSO. Awareness should be raised at more senior levels of the NSO to ensure climate change-related

  o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
  o *Start:* As soon as possible
  o *Duration:* on-going

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[6] The SEEA Diagnostic Tool, see Annex II: unstats.un.org/unsd/envaccounting/ceea/meetings/ninth_meeting/UNCEEA-9-6d.pdf

statistics are considered alongside other statistics when official decisions are made.

- **Facilitate collaboration between the statistical system and national inventory system (2.1)** – currently, collaboration is *ad hoc* and should be made more consistent; for example, by appointing a focal point within the NSO responsible for managing collaboration with national inventory compilers.

- **Create a national working group between the NSO, the GHG inventories agencies and other relevant organizations (2.2)** – A formal working group would ensure that data needs and availability are well understood and that necessary resources are made available to ensure that official statistics make a significant contribution to emission inventories.

- **Clarify the role of the statistical office (2.3)** – At the moment, the NSO's role is unclear, both to the NSO and to data users. Clarifying this will ensure that duplication of effort is avoided.

- **Seek closer collaboration between the statistical community and international organizations working on climate issues (3.1)** – The NSO currently is not involved in any international discussions related to climate change. Following these discussions would be simple way for the NSO be increase its understanding of needs for climate change-related statistics.

- **Actively engage, at national level, with the national representatives delegated to the relevant UNFCCC forums (3.2)** – The national experts that attend UNFCCC meetings on behalf of the country do not routinely consult with the NSO before or after such meetings. Doing so would be a simple means of

- o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers.

- o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
- o *Start:* Immediately
- o *Duration:* on-going
- o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- o *Responsible agency / partner agencies:* NSO and ministries of Environmental Protection, Agriculture, Energy, Forests
- o *Start:* Immediately
- o *Duration:* on-going
- o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
- o *Start:* Immediately
- o *Duration:* on-going
- o *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- o *Responsible agency / partner agencies:* NSO and International organizations (UN, OECD, World Bank)
- o *Start:* Immediately
- o *Duration:* on-going
- o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

- o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
- o *Start:* Immediately
- o *Duration:* on-going
- o *Expected result:* Improved understanding of climate change issues

ensuring that NSO concerns are raised in the international context.

- **Follow up on the outcomes of the UNFCCC conferences of the parties to the convention (3.3)** – The country does not always implement recommendations coming from UNFCCC conferences. While not all such recommendations can be implemented, selecting those that are most relevant to the national situation and ensuring they are implemented will result in an improved national inventory.

  - o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
  - o *Start:* Immediately or as soon as possible
  - o *Duration:* on-going
  - o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

- **Involve NSOs at the outset of work to respond to new data needs from the UNFCC (3.4)** – The default currently is for inventory compilers to attempt to meet new data needs themselves rather than engaging the NSO to provide those data. This results in missing opportunities where the NSO could quickly and efficiently meet new needs.

  - o *Responsible agency / partner agencies:* NSO and Ministry of Environmental Protection
  - o *Start:* Immediately
  - o *Duration:* on-going
  - o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

- **Existing international networks of NSOs could facilitate the exchange experience (3.5)** – Similarly, the NSO does not currently collaborate with other NSOs on climate change-related data issues, resulting in missed opportunities to learn from NSOs with greater experience in the area.

  - o *Responsible agency / partner agencies:* NSO and NSOs of other countries
  - o *Start:* Immediately
  - o *Duration:* on-going
  - o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

- **Support the efforts at strengthening the quality of GHG inventories in line with the IPCC's guidelines on quality control and quality assurance (2.4)** – The IPCC's QA/QC guidelines are not currently applied in the national inventory process. Doing so would be an effective way of determining where weaknesses exist in the national inventory and the data that feed into it.

  - o *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  - o *Start:* Immediately or as soon as possible
  - o *Duration:* on-going
  - o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

The above are simple actions with the potential to improve the ability of the NSO to meet the needs of data compilers quickly and at low cost. Many of them relate simply to improving the communication and collaboration between the NSO and the national inventory compilers.

Other activities related to data for the compilation of the national emissions inventory are either costlier and/or more time consuming to implement and/or have lower potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Ensure that GHG inventory calculations use existing official statistics as much as possible (1.2)** – Currently, there are opportunities to use official statistics in inventory compilation that are not being exploited because of poor coordination between the NSO and inventory compilers.

  - *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  - *Start:* Within two years
  - *Duration:* on-going
  - *Expected result:* Greater use of official statistics in inventory compilation and enhanced collaboration between the NSO and inventory compilers

- **Improve coherence of GHG inventories and official statistics where possible (1.3.1)** – The national inventory is not fully coherent with official statistics due to, among others, the treatment of emissions from transportation. A bridge table explaining the reason for this incoherence to users should be prepared.

  - *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  - *Start:* Within two years
  - *Duration:* on-going
  - *Expected result:* Greater transparency regarding the differences between official statistics and the national inventory and the underlying reasons

- **Fill gaps related to, among others, the agriculture, forestry and other land use sector (1.3.3)** – Official statistics in these areas are weak currently, resulting in reduced accuracy of the related estimates in the national inventory.

  - *Responsible agency / partner agencies:* NSO / Ministry of Agriculture and Ministry of Natural Resources
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* Improved land-use data resulting in improved estimates of emissions from land-use change

- **Improve data on waste and the production of heat and electricity for own use and from renewable energy sources (1.3.4)** – Data on the management of solid waste are inadequate, resulting in reduced accuracy of estimated emissions from landfills and waste incineration. A survey of waste management companies should be designed to fill this gap.

  - *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* Improved data on the management of municipal solid waste (e.g., quantities of waste landfilled, recycled and incinerated by type) result in improved estimates of emissions from waste management

- **Improve the timeliness of activity data (1.3.5)** – Activity data are only available every second year following the abandonment of the manufacturing census. Means should be explored to provide activity data for key manufacturing industries on an annual basis; for example, small targeted surveys sent to

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* on-going
  - *Expected result:* Improved timeliness of activity data, resulting in improved estimates of emissions

selected firms every second year between the principal manufacturing survey.

- **Build longer and more consistent time series of official statistics (1.3.6)** – There are concerns about breaks in the time series of activity data as a result of the shift from the manufacturing census to the biennial sample survey. A method should be investigated to smooth these time series to produce a more accurate and consistent set of activity data.

  o *Responsible agency / partner agencies:* NSO
  o *Start:* Three years or beyond
  o *Duration:* One year
  o *Expected result:* Methodology developed to smooth the time series of activity data from 1990 to the current period

Table 2.1

Development priorities related to data for greenhouse gas emission inventories – Country 2

	CES Recommendations related to data for greenhouse gas emission inventories	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
		Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
1	**NSOs must improve data and statistics required for GHG inventories**				
1.1	Enhance awareness in the NSS of how official statistics are/could be used for GHG inventories	1	1	3	Start as soon as possible
1.2	Ensure that GHG inventory calculations use existing official statistics as much as possible	1	2	3	Start within two years
1.3	Improve the quality of official statistics used for GHG inventories, as follows:	3	3	2	Start within three years
1.3.1	Improve coherence of GHG inventories and official statistics where possible	1	2	3	Start within two years
1.3.2	Improving the quality of energy statistics in particular	2	2	1	Start as soon as possible
1.3.3	Fill gaps related to, among others, the agriculture, forestry and other land use sector	3	3	1	Start within three years
1.3.4	Improve data on waste and the production of heat and electricity for own use and from renewable energy sources	2	2	3	Start within three years
1.3.5	Improve the timeliness of activity data	3	3	3	Start within three years
1.3.6	Build longer and more consistent time series of official statistics	3	3	3	Start within three years
1.4	Draft, together with the agencies responsible for GHG inventories, a prioritized list of national data gaps and a road map on data development	NA	NA	NA	Already complete
		2.1	**2.3**	**2.4**	
2	**NSOs, especially in UNFCCC Annex I Parties to UNFCCC, should be proactive in reaching out to national agencies responsible for greenhouse gas inventories and, ideally, they should be considered official institutions in the national systems of greenhouse gas inventories**				
2.1	Facilitate collaboration between the statistical system and national inventory system	1	1	1	Start now
2.2	Create a national working group between the NSO, the GHG inventories agencies and others	1	2	1	Start now
2.3	Clarify the NSO's role in providing statistics and assist, as needed, in GHG inventory calculations	1	1	1	Start now
2.4	Support efforts at strengthening the quality of GHG inventories in line with IPCC's guidelines	1	1	3	Start as soon as possible
		1.0	**1.3**	**1.5**	
3	**The international statistical community, including national statistical systems and international statistical organizations, should take an active role in contributing to the global GHG inventory system**				
3.1	Seek closer collaboration between the statistical community and international organizations	1	1	1	Start now
3.2	Actively engage, at national level, with the national representatives of UNFCCC forums	1	1	2	Start now
3.3	Follow up on the outcomes of the UNFCCC conferences of the parties to the convention	1	1	3	Start as soon as possible
3.4	Involve NSOs when countries need to respond to new data needs from the convention	1	1	1	Start now
3.5	Existing international networks of NSOs could facilitate the exchange experience	1	1	2	Start now
		1.0	**1.0**	**1.8**	

3.2.2 Priorities for developing other climate change-related statistics and indicators – Country 2

Background: The country devotes relatively few resources to environmental statistics and the NSO is facing pressures to reduce costs and respondent burden. Given this, there are relatively few activities recommended to address the development of climate change-related statistics other than those related to the national emissions inventory or to the data needed for the set of key climate change-related indicators. Those activities that are recommended are suggested for implementation in the longer term rather than immediately.

Analysis of priorities: Just three actions related to non-inventory data needs are recommended for implementation right away or as soon as possible (see Table 2.2 below).

- **Create national forums or events for discussions between users and producers of climate change statistics (4.1)** – This is consistent with the recommendations above to increase the dialogue between producers and users of climate change-related statistics to ensure that needs are understood and met as efficiently as possible.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Immediately
  o *Duration:* On-going
  o *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

- **Promote the use of existing official statistics (4.2)** - At the moment, the use of official statistics to analyze climate change-related issues is limited. This is partly because the NSO does not produce a great deal of relevant data but also because some data that are relevant are not well known among the climate change analyst community.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Immediately or as soon as possible
  o *Duration:* On-going
  o *Expected result:* Increased use of official statistics in inventory compilation

- **Review statistical programs and data collections from the viewpoint of the data needs of climate change analysis and indicators (5.1)** – As noted, the NSO is facing pressure to reduce costs and respondent burden, so the scope for expanding statistical programs to address the needs of climate change analysis is low. Nonetheless, climate change needs to be among the user needs that are considered when reviewing statistical programs. Even if new investments cannot be made at the moment, there is value in at least compiling a list of areas where new data could be usefully produced.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Immediately or as soon as possible
  o *Duration:* On-going
  o *Expected result:* Greater responsiveness of official statistics to the needs of climate change analysis

Most activities related to non-inventory data needs are either costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels (4.3) –** In principle, this is a sound idea. In practice, the NSO's capacity to disseminate statistics is limited by an outdated on-line system. Improvements underway to this system must be completed before additional climate change-related statistics could be added to it.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Three years or beyond
  o *Duration:* On-going
  o *Expected result:* Improved access to climate change-related statistics for the general public and researchers

- **Improve access to microdata for researchers working on climate change (4.4) –** The NSO maintains relatively few microdata that are relevant to researchers working on climate change, so this activity is not expected to have a significant impact on the quality of their research. The one exception is the biennial manufacturing survey. Access to this survey's microdata could permit researchers to better understand the breakdown of energy use in large firms.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Three years or beyond
  o *Duration:* On-going
  o *Expected result:* Greater use of official statistics by climate change analysts

- **Address the difficulties in matching data from different statistical domains (5.2)** – The main concern here relates to the need to reconcile energy use data from the biennial manufacturing survey with data from the national energy balance, which is compiled by the Ministry of Energy.

  o *Responsible agency / partner agencies:* NSO / Ministry of Energy
  o *Start:* Within two years
  o *Duration:* Two years
  o *Expected result:* Improved quality of the national energy balance

- **Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change (5.3)** – Given the relatively early stage of development of environmental statistics in the country, spatial analysis capabilities are low within the NSO. The main priority here would be to geo-reference data on population to assist with climate change vulnerability assessment.

  o *Responsible agency / partner agencies:* NSO
  o *Start:* Three years or beyond
  o *Duration:* On-going
  o *Expected result:* Improved usefulness of population data for assessing climate change vulnerability

- **Produce statistics for new geographical areas (5.4) –** Land use data by ecoregion would be helpful in better understanding emissions from land-use change.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Energy, Natural Resources and Forestry
  o *Start:* Three years or beyond
  o *Duration:* Two years
  o *Expected result:* New data on land use by ecoregion to support improved estimation of emissions from land-use change

- **Improve data for analyzing drivers of climate change (6.1)** – Implementation of the SEEA-CF is at the exploratory stage in the country. The plan is to prioritize environmental accounts that will meet climate change-related data needs; specifically, an energy use account.

  - *Responsible agency / partner agencies:* NSO / Ministry of Energy
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* Development of a SEEA-based energy use account and regular publication of energy-related indicators (e.g., energy use per unit of GDP by industry)

- **Develop statistics on the use of economic instruments (6.2)** – The country has a carbon emission trading system that is administered by the Ministry of Energy. The NSO currently does not exploit the administrative data collected by the system but will do so in the future.

  - *Responsible agency / partner agencies:* NSO / Ministry of Energy
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* Improved national energy balance through the integration of administrative data from the national emission trading system

- **Develop statistics to address climate change adaptation (6.3)** – At the moment, the country does not measure efforts to adapt to climate change. A new survey to measure investment in infrastructure to protect the economy and society against the negative effects of climate (which are expected mainly to be felt in two large coastal cities as a result of sea-level rise) is planned.

  - *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Natural Resources, Forestry and Energy
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* New statistics measuring the level of investment in infrastructure to protect against the negative effects of climate change.

- **Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems (6.4)** – The NSO has very limited capacity to measure natural systems. The plan is therefore to collaborate with the Ministry of Environmental Protection to measure the state of key coastal ecosystems (important in attracting tourists) using survey methods provided by the NSO and ecological expertise provided by the Ministry of Environmental Protection.

  - *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  - *Start:* Within two years
  - *Duration:* Three years
  - *Expected result:* New statistics measuring the quantity and quality of key coastal ecosystems

Table 2.2

Development priorities related to other climate change-related statistics and indicators – Country 2

	CES Recommendations related to other climate change-related statistics and indicators	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
		Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
4	NSOs must improve the contribution of official statistics to climate change analysis by, among other things, facilitating access to existing statistics				
4.1	Create national forums or events for discussions between users and producers of climate change statistics	1	2	1	Start now
4.2	Promote the use of existing official statistics and indicators	1	1	3	Start as soon as possible
4.3	Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels	2	2	3	Start within three years
4.4	Improve access to microdata for researchers working on climate change	2	2	3	Start within three years
		1.5	**1.8**	**2.5**	
5	The usefulness of existing environmental, social and economic statistics for climate change analysis should be improved				
5.1	Review statistical programs and data collections from the viewpoint of the data needs of climate change analysis and indicators	1	2	2	Start as soon as possible
5.2	Address the difficulties in matching data from different statistical domains	1	2	3	Start within two years
5.3	Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change	3	3	3	Start within three years
5.4	Produce statistics for new geographical areas	3	3	3	Start within three years
		2.0	**2.5**	**2.8**	
6	NSOs should consider development of new statistics based on a review of the key data needs of climate change policy makers and analysts in their country				
6.1	Improve data for analyzing drivers of climate change	3	3	2	Start within three years
6.2	Develop statistics on the use of economic instruments	2	2	3	Start within three years
6.3	Develop statistics to address climate change adaptation	2	3	3	Start within three years
6.4	Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems	2	2	2	Start within two years
		2.3	**2.5**	**2.5**	

3.2.3 Priorities for developing statistical infrastructure and capacity – Country 2

Background: Regarding statistical infrastructure and capacity, the NSO already adheres to international best practices in terms of concepts, methods, classifications, etc. and employs a highly professional workforce. However, its limited activity in the domain of environmental statistics means that its infrastructure and capacity are not well suited to the development of climate change-related statistics. There is an urgent need to increase the capacity of the NSO to respond to demands for climate change-related data; currently, this capacity is weak and uncoordinated.

Analysis of priorities: Several actions to improve infrastructure and develop capacity are recommended for implementation right away or as soon as possible (see Table 2.3 below).

- **Familiarize NSO staff with GHG inventory methodologies (8.2)** – At the moment, only one junior technical employee of the NSO has any familiarity with inventory methods. Two additional staff will be given training to familiarize them with these methods.

  o *Responsible agency / partner agencies:* NSO / Ministry of Environmental Protection
  o *Start:* Immediately
  o *Duration:* 6 months
  o *Expected result:* Two additional NSO staff are trained to familiarize them with emission inventory methods.

- **Assign a person or group with the responsibility for ensuring the quality and availability of climate change-related statistics (9.1)** – This is a high priority, as responsibility for this has shifted among several NSO staff (most of whom have no knowledge of inventory methods) in recent years.

  o *Responsible agency / partner agencies:* NSO
  o *Start:* Immediately
  o *Duration:* Two months
  o *Expected result:* A senior staff member is assigned the task of ensuring the quality and availability of climate change-related statistics.

- **Define and clarify, if needed, the division of work and responsibilities between the different producers of climate-change related statistics and GHG inventories (9.3)** – At the moment, the NSO is uncertain what is expected of it with regard to climate change-related statistics and other agencies are unsure what can be expected of the NSO. There is an urgent need to clarify this.

  o *Responsible agency / partner agencies:* NSO / ministries of Environmental Protection, Agriculture, Natural Resources, Forestry and Energy
  o *Start:* As soon as possible
  o *Duration:* 6 months
  o *Expected result:* Clarification of the roles and responsibilities of the NSO *vis à vis* climate change-related statistics.

The remaining actions related to infrastructure and capacity are costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Identify and address the obstacles to linking statistics across domains (7.2)** – Better communications are required between the NSO and the Ministry of Energy in order to address the obstacles preventing better integration of data from the biennial manufacturing survey into the national energy balances.

  o *Responsible agency / partner agencies:* NSO
  o *Start:* Within two years
  o *Duration:* Six months
  o *Expected result:* Obstacles preventing data integration from the survey of manufacturing are identified and a plan is put in place to address them

- **Consider new approaches to preserving confidentiality (7.3)** – A new approach to confidentiality of business survey data could permit the NSO to share micro-data from the biennial manufacturing survey with the Ministry of Energy for the purposes of compiling the national energy balance.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* A method of preserving confidentiality of business survey micro data while providing access to legitimate research is developed

- **Consider the inclusion of explicit references to environmental statistics, including climate change-related statistics, in statistical laws (7.4)** – At the moment, the national statistical law makes no reference to environmental data of any type. The law is reviewed once every ten years. At the next review (in two years' time), consideration will be given to making environmental statistics an explicit part of the NSO's mandate.

  - *Responsible agency / partner agencies:* Parliament / NSO
  - *Start:* Within three years
  - *Duration:* Two years
  - *Expected result:* A new national statistical law giving the NSO the explicit mandate to collect environmental statistics

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- **Build knowledge and understanding of the natural sciences among NSO staff (8.1)** – At a minimum, a small group of employees within the NSO must have the necessary understanding of the natural sciences in order for the agency to respond effectively to the demand for climate change-related statistics.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* New staff are hired by the NSO with backgrounds in the natural sciences

- **Develop knowledge, methodologies and tools for producing and using geo-referenced data across the statistical system (8.3)** – As noted in point 5.3 above, spatial analysis capabilities are low within the NSO and will likely remain so until other more urgent priorities for capacity development are dealt with.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* NSO's capacity to use and produce use geo-data is increased.

- **Modify, in the longer term, the NSO's organizational structure (9.2)** – Eventually, a unit responsible for environmental statistics should be established if sufficient funds can be earmarked for this purpose. Negotiations to obtain these funds should be undertaken at the time of the next review of the national statistical law.

  - *Responsible agency / partner agencies:* NSO / Parliament
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* A new unit devoted to environmental statistics is created within the NSO

- **Earmark sufficient resources for the development of environmental statistics and climate change-related statistics (9.4)** – See previous point.

  - *Responsible agency / partner agencies:* NSO / Parliament
  - *Start:* Three years or beyond
  - *Duration:* Two years
  - *Expected result:* A new unit for environmental statistics is established and appropriately funded.

Table 2.3

Development priorities related to statistical infrastructure and capacity – Country 2

	CES Recommendations related to infrastructure and capacity	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
		Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
7	Existing classification systems, registers, definitions, statistical frameworks, products and services need to be reviewed to see that needs related to climate change analysis are appropriately addressed				
7.1	Give consideration in future revisions of international statistical standards and classifications to the data needs of climate change analysis	2	2	2	Start within two years
7.2	Identify and address the obstacles to linking statistics across domains	1	2	2	Start as soon as possible
7.3	Consider new approaches to preserving confidentiality	1	3	2	Start within two years
7.4	Consider the inclusion of explicit references to environmental statistics, including climate change-related statistics, in statistical laws	2	3	2	Start within three years
		1.5	2.5	2.0	
8	Statisticians should gradually develop new partnerships, expertise and ability to adopt new methodologies for producing climate change-related statistics				
8.1	Build knowledge and understanding of the natural sciences among NSO staff	2	3	2	Start within three years
8.2	Familiarize NSO staff with GHG inventory methodologies	1	2	2	Start as soon as possible
8.3	Develop knowledge, methodologies and tools for producing and using geo-referenced data across the statistical system	2	3	1	Start within two years
8.4	Ensure the effective transfer of knowledge and skills among NSOs internationally	1	2	2	Start as soon as possible
		1.5	2.5	1.8	
9	Organizational changes may be needed in NSOs, the national statistical system and the national system for greenhouse gas inventories to support the production of climate change-related statistics				
9.1	Assign a person or group with the responsibility for ensuring the quality and availability of climate change-related statistics	1	2	1	Start now
9.2	Modify, in the longer term, the NSO's organizational structure	3	3	2	Start within three years
9.3	Define and clarify, if needed, the division of work and responsibilities between the different producers of climate-change related statistics and GHG inventories	1	2	2	Start as soon as possible
9.4	Earmark sufficient resources for the development of environmental statistics and climate change-related statistics	3	3	1	Start within three years
		2.0	2.5	1.5	

4 Example Road Map - Annex I country with advanced capacity to measure climate change

4.1 Current climate conditions – Country 3

Climate change is expected to significantly impact this example country. The country is large, with a continental climate, four distinct seasons and a short coastline where most of the population lives. Summers are generally warm to hot and winters are cold to very cold. The country receives precipitation more or less evenly throughout the year, with spring and fall being slightly wetter. Winter precipitation is mainly in the form of snow in all parts of the country except the extreme south. Precipitation falls unevenly over the territory, with the southern part of the country being dry to very dry and the north receiving considerable precipitation, especially near the coastline.

Over the past decades, increased climate variability has been noted across the entire territory. The dry southern region has become drier, with frequent periods of drought that are historically unprecedented. Total annual precipitation in the north has not changed significantly though its distribution has tended toward fewer, more intense storms. These are increasingly causing flooding in coastal areas where the majority of the country's population lives, with accompanying environmental, economic and social costs. Air pollution from industry, utilities and road transportation is significant problem in large cities, all of which are found on the coast. Almost all of the country's electricity needs are met by coal-fired electric power generation plants. Diesel engines in automobiles and other road vehicles are common but strict emissions control standards are applied.

The country is particularly vulnerable to climate change threats. The population is concentrated along the coastline, which is under threat from sea-level rise in the longer term and vulnerable to localized flooding due to the increased frequency of intense storms in the shorter term. The economy is dominated by manufacturing, though agriculture, forestry, commercial fishing and recreation all make significant contributions and are under threat from disruptions in rainfall. Coal production for domestic use and export is also economically important.

Currently, 88 per cent of greenhouse gas emissions originate from the energy sector, followed by agriculture with a share of 5 per cent, industrial processes with a 4 per cent share of emissions and waste management with a 3 per cent share. In addition to coal for electricity generation, the energy sector of is based on natural gas and refined petroleum products, all of which are imported. Nuclear and renewable energy sources provide negligible shares of energy production. Opportunities for reducing emissions mainly relate to replacement of ageing coal-fired electric power plants with modern natural gas-fired plants and solar/wind power. There is opposition to this from the country's power coal industry however.

4.2 Assessment of priorities for climate change-related statistics – Country 3

An assessment of the current situation of climate change-related statistics in the country, is a good starting point for drafting a road map on climate change-related statistics. An assessment tool, prepared based on

the approaches of the diagnostic tool[7] designed for the implementation of the System of Environmental Economic Accounts (SEEA) and the Environment Statistics Self-Assessment Tool (ESSAT), is provided as Annex I. Some of the questions of the assessment tool are helpful for preparing the launch of the work on the road map. Some questions may help guide the preparation of the road map together with stakeholders.

In this section of the road map, the country's priorities for the development of climate change-related statistics are outlined in three areas with the aid of the Excel-based prioritization tool:

A. The development of data required for the compilation of the national greenhouse gas inventory
B. The development of data required for other climate change analysis, such as the set of key climate change-related indicators
C. The development of statistical infrastructure and capacity required to produce climate change-related statistics

4.2.1   Priorities for developing data for greenhouse gas emission inventories – Country 3

<u>Background</u>: The country produces an annual national inventory report as required by its status as an Annex I party to the UN Framework Convention on Climate Change. The NSO and Ministry of Energy share responsibility for the emissions inventory. Data required for inventory compilation are obtained mainly from the NSO, which is large, modern and well-funded. The NSO has long had a program devoted to environmental and energy statistics. Within this program, a focal point for climate change-related statistics has existed for several years. Additional data are obtained from the ministries of Energy, Agriculture and Natural Resources.

All necessary data for the compilation of the emissions inventory are available and the inventory is considered one of the most accurate among Annex I countries. It is consistently delivered ahead of schedule and with additional detail beyond that mandated by the UNFCCC.

<u>Analysis of priorities</u>: Analysis of priorities in producing data for GHG inventories shows that only a few actions are required to improve the quality of the national inventory, as most relevant actions have already been undertaken by the country (see Table 3.1 below).

- **Improve data on waste and the production of heat and electricity for own use and from renewable energy sources (1.3.4)** – Data on the management of solid waste are inadequate, resulting in reduced accuracy of estimated emissions from landfills and waste incineration. A survey of waste management companies should be designed to fill this gap.

  - *Responsible agency / partner agencies:* NSO / Ministry of Natural Resources
  - *Start:* Within two years
  - *Duration:* Three years
  - *Expected result:* Improved data on the management of municipal solid waste (e.g., quantities of waste landfilled, recycled and incinerated by type) result in improved estimates of emissions from waste management

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[7] The SEEA Diagnostic Tool, see Annex II: unstats.un.org/unsd/envaccounting/ceea/meetings/ninth_meeting/UNCEEA-9-6d.pdf

- **Seek closer collaboration between the statistical community and international organizations working on climate issues (3.1)** – Given its international reputation for conceptual and methodological leadership, the NSO could make a major contribution to international discussions on climate change-related statistics. At the moment, it is not engaged in these discussions however.

  - *Responsible agency / partner agencies:* NSO / International organizations (UN, OECD, World Bank)
  - *Start:* Immediately
  - *Duration:* on-going
  - *Expected result:* International discussions on climate change-related statistics would benefit from the knowledge, skills and resources the NSO could bring to the table.

- **Existing international networks of NSOs could facilitate the exchange experience (3.5) –** Similarly, the NSO does not currently collaborate with other NSOs on climate change-related data issues, resulting in missed opportunities to learn from NSOs with greater experience in the area.

  - *Responsible agency / partner agencies:* NSO / NSOs of other countries
  - *Start:* Immediately
  - *Duration:* on-going
  - *Expected result:* Improved understanding of the issues related to climate change and the contribution that official statistics can make to addressing them

Table 3.1

Development priorities related to data for greenhouse gas emission inventories – Country 3

		CES Recommendations related to data for greenhouse gas emission inventories	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
			Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
1		NSOs must improve data and statistics required for GHG inventories				
	1.1	Enhance awareness in the NSS of how official statistics are/could be used for GHG inventories	NA	NA	NA	No action needed
	1.2	Ensure that GHG inventory calculations use existing official statistics as much as possible	NA	NA	NA	No action needed
	1.3	Improve the quality of official statistics used for GHG inventories, as follows:	NA	NA	NA	No action needed
		1.3.1 Improve coherence of GHG inventories and official statistics where possible	NA	NA	NA	No action needed
		1.3.2 Improving the quality of energy statistics in particular	NA	NA	NA	No action needed
		1.3.3 Fill gaps related to, among others, the agriculture, forestry and other land use sector	NA	NA	NA	No action needed
		1.3.4 Improve data on waste and the production of heat and electricity for own use and from renewable energy sources	2	2	2	Start within two years
		1.3.5 Improve the timeliness of activity data	NA	NA	NA	No action needed
		1.3.6 Build longer and more consistent time series of official statistics	NA	NA	NA	No action needed
	1.4	Draft, together with the agencies responsible for GHG inventories, a prioritized list of national data gaps and a road map on data development	NA	NA	NA	Already complete
			2.0	**2.0**	**2.0**	
2		NSOs, especially in UNFCCC Annex I Parties to UNFCCC, should be proactive in reaching out to national agencies responsible for greenhouse gas inventories and, ideally, they should be considered official institutions in the national systems of greenhouse gas inventories				
	2.1	Facilitate collaboration between the statistical system and national inventory system	NA	NA	NA	No action needed
	2.2	Create a national working group between the NSO, the GHG inventories agencies and others	NA	NA	NA	No action needed
	2.3	Clarify the NSO's role in providing statistics and assist, as needed, in GHG inventory calculations	NA	NA	NA	No action needed
	2.4	Support efforts at strengthening the quality of GHG inventories in line with IPCC's guidelines	NA	NA	NA	No action needed
			-	-	-	
3		The international statistical community, including national statistical systems and international statistical organizations, should take an active role in contributing to the global GHG inventory system				
	3.1	Seek closer collaboration between the statistical community and international organizations	1	1	3	Start as soon as possible
	3.2	Actively engage, at national level, with the national representatives of UNFCCC forums	NA	NA	NA	No action needed
	3.3	Follow up on the outcomes of the UNFCCC conferences of the parties to the convention	NA	NA	NA	No action needed
	3.4	Involve NSOs when countries need to respond to new data needs from the convention	NA	NA	NA	No action needed
	3.5	Existing international networks of NSOs could facilitate the exchange experience	1	1	2	Start now
			1.0	**1.0**	**2.5**	

4.2.2 Priorities for developing other climate change-related statistics and indicators – Country 3

Background: The country devotes considerable resources to environmental statistics (though relative to economic and social statistics, its environmental statistics program is small) and the NSO is held in high regard by both the public and the government. Demand for improved statistics to understand the economic, environmental and social consequences of climate and the possibilities for adapting to them is increasing. The government has recently allocated new funding to the NSO to meet these demands.

Analysis of priorities: Several actions related to non-inventory data needs are recommended for implementation right away or as soon as possible (see Table 3.2 below), including the implementation of the set of key climate change-related indicators.

- **Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels (4.3) –** The NSO has an excellent reputation for effective and user-friendly online dissemination systems. To date, only a few non-NSO data have been released via this system. Increasing its use for climate change-related statistics would provide an effective and low-cost method of improving public access to these data.
  - *Responsible agency / partner agencies:* NSO / ministries of Energy and Natural Resources
  - *Start:* Immediately
  - *Duration:* On-going
  - *Expected result:* Improved access to climate change-related statistics for the general public and researchers

- **Improve access to microdata for researchers working on climate change (4.4) –** The NSO maintains a great deal of microdata that are potentially relevant to researchers working on climate change. At the moment, it has no effective mechanism for granting researchers access to these data while ensure respondent confidentiality. Creating such a mechanism would greatly improve the utility of these data for climate change analysis.
  - *Responsible agency / partner agencies:* NSO
  - *Start:* Immediately
  - *Duration:* 2 years
  - *Expected result:* Greater use of official statistics by climate change analysts

- **Address the difficulties in matching data from different statistical domains (5.2)** – The main concern here relates to the need to reconcile transportation data from the national energy balance with data from the energy flow accounts (which are constructed following the principles of the national accounts). The energy balance treats transportation as an activity undertaking by many sectors of the economy whereas the energy flow accounts see transportation as a variety of industries that provide services to other sectors.
  - *Responsible agency / partner agencies:* NSO
  - *Start:* Immediately
  - *Duration:* One year
  - *Expected result:* Creation of a bridge table explaining the difference in transportation energy use between the national energy balance and the energy flow accounts.

Other activities related to non-inventory data needs are either costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet compilers' needs. They should be undertaken in the next two to three years as resources permit:

- **Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change (5.3)** – The NSO has significant capacity for spatial analysis that is used for its population census. To date, this capacity has not been used to geo-reference environmental data. Doing so would enhance their relevance for climate change analysis; in particular, analysis of economic and social vulnerability to climate change

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* Improved usefulness of environmental statistics for assessing climate change vulnerability

- **Produce statistics for new geographical areas (5.4)** – At the moment, most environmental statistics are produced only at the national level. Publishing sub-national estimates using ecologically relevant spatial boundaries (such as watersheds) would make the data more relevant for climate change analysis. As with point 5.3 above, priority should be given to data that are relevant to assessing economic and social vulnerability to climate change.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* New sub-national environmental data to support improved assessment of climate change vulnerability

- **Develop statistics to address climate change adaptation (6.3)** – At the moment, the NSO has few data relevant to national efforts to adapt to climate change. It has conducted an environmental protection expenditure survey for many years that measures current and capital expenditures related to efforts to reduce the impact of the economy on the environment. This survey could be readily adapted to measure expenditures related to adapting the economy to protect it against threats from a changing environment.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* New statistics measuring the level of investment in infrastructure to protect against the negative economic and social consequences of climate change.

- **Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems (6.4)** – As in nearly all countries, the measurement of biodiversity and ecosystems remains at the frontier of environmental statistics for the NSO. The NSO has very little direct experience in measuring natural systems. The plan is therefore to collaborate with the Ministry of Natural Resources to measure the state of key forest ecosystems (important to the country's economy and to maintaining ecological resilience to climate change) using survey methods provided by the NSO and ecological expertise provided by the Ministry of Natural Resources.

  - *Responsible agency / partner agencies:* NSO / Ministry of Natural Resources
  - *Start:* Three years or beyond
  - *Duration:* Three years
  - *Expected result:* New statistics measuring the quantity and quality of forest ecosystems

Table 3.2

Development priorities related to other climate change-related statistics and indicators – Country 3

CES Recommendations related to other climate change-related statistics and indicators	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
	Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
4 NSOs must improve the contribution of official statistics to climate change analysis by, among other things, facilitating access to existing statistics				
4.1 Create national forums or events for discussions between users and producers of climate change statistics	NA	NA	NA	No action needed
4.2 Promote the use of existing official statistics and indicators	NA	NA	NA	No action needed
4.3 Provide access to climate change-related statistics and indicators (including scientific data collected by others) using NSOs' dissemination channels	2	2	1	Start as soon as possible
4.4 Improve access to microdata for researchers working on climate change	2	2	1	Start as soon as possible
	2.0	**2.0**	**1.0**	
5 The usefulness of existing environmental, social and economic statistics for climate change analysis should be improved				
5.1 Review statistical programs and data collections from the viewpoint of the data needs of climate change analysis and indicators	NA	NA	NA	No action needed
5.2 Address the difficulties in matching data from different statistical domains	1	2	1	Start now
5.3 Geo-reference all relevant data to support analysis of the spatial dimension of data linked to climate change	3	3	1	Start within three years
5.4 Produce statistics for new geographical areas	3	3	1	Start within three years
	2.3	**2.7**	**1.0**	
6 NSOs should consider development of new statistics based on a review of the key data needs of climate change policy makers and analysts in their country				
6.1 Improve data for analyzing drivers of climate change	NA	NA	NA	No action needed
6.2 Develop statistics on the use of economic instruments	NA	NA	NA	No action needed
6.3 Develop statistics to address climate change adaptation	2	3	1	Start within two years
6.4 Consider how to contribute to the on-going efforts to monitor biodiversity and ecosystems	2	3	2	Start within three years
	2.0	**3.0**	**1.5**	

4.2.3 Priorities for developing statistical infrastructure and capacity – Country 3

Background: Regarding statistical infrastructure and capacity, the NSO already adheres to international best practices in terms of concepts, methods, classifications, etc. and employs a highly professional workforce. It is an international leader in the development of environmental statistics and has a number of innovations to its credit within the domain. At the same time, environmental statistics remain relatively underdeveloped in comparison to economic and social statistics and additional investment is required to bring the environmental statistics program more into line with its economic and social counterparts.

Analysis of priorities: Several actions to improve infrastructure and develop capacity are recommended for implementation right away or as soon as possible (see Table 3.3 below).

- **Consider new approaches to preserving confidentiality (7.3)** – See point 4.4 above.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Immediately
  - *Duration:* 2 years
  - *Expected result:* Greater use of official statistics by climate change analysts

- **Earmark sufficient resources for the development of environmental statistics and climate change-related statistics (9.4)** – At the moment, the share of the NSO's budget devoted to environmental statistics is just 5 per cent. This is sufficient to keep a staff of 15 full-time professionals employed. In comparison to the importance of environmental issues – including climate change – for the nation, this level of resourcing is inadequate and should be increased.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Immediately
  - *Duration:* Two years
  - *Expected result:* The environmental statistics unit is increased from 15 to 30 full-time staff and the output of statistics is approximately doubled.

The remaining actions related to infrastructure and capacity are costly and/or time consuming to implement and/or have low potential to improve the ability of the NSO to meet the need of climate change analysts. They should be undertaken in the next two to three years as resources permit:

- **Consider the inclusion of explicit references to environmental statistics, including climate change-related statistics, in statistical laws (7.4)** – At the moment, the national statistical law makes no reference to environmental statistics, though it does provide a provision for the NSO to collect statistics in areas considered to be "of national importance". Until today, this has been sufficient for the NSO to justify its program on environmental statistics. However, the NSO's mandate in this area would be firmer if the national statistical law included an explicit reference to environmental statistics. There is no specified review cycle for the statistical law in the country but the NSO intends to suggest modification of the law to include environmental statistics the next time the national parliament decides to review the law.

  - *Responsible agency / partner agencies:* Parliament / NSO
  - *Start:* As soon as possible (next time parliament decides to review the statistical law)
  - *Duration:* Two years
  - *Expected result:* A new national statistical law giving the NSO the explicit mandate to collect environmental statistics

- **Modify, in the longer term, the NSO's organizational structure (9.2)** – At the moment, the NSO staff responsible for environmental surveys are organizational separate from those responsible for environmental accounts. The former are part of the overall department responsible for economic surveys and the latter are part of the national accounts department. While this arrangement works well, it is generally considered that collaboration and efficiency would be improved if the two units were consolidated. This should ideally be accomplished by bringing the units together under the direction of the head of the economic statistics department. In doing so, the good relations with the national accounts department must be retained, as many environmental statistics are used in the compilation of the environmental accounts, which, in turn, feed into the national accounts through the national balance sheet and other accounts.

  - *Responsible agency / partner agencies:* NSO
  - *Start:* Within two years
  - *Duration:* Two years
  - *Expected result:* A new consolidated devoted to environmental statistics under the direction of the economic statistics department is created within the NSO.

Table 3.3

Development priorities related to infrastructure and capacity – Country 3

	CES Recommendations related to infrastructure and capacity	Cost to implement	Time to implement	Impact on data quality if implemented	Recommended timeframe for implementation
		Rating 1= low 2=medium 3=high	Rating 1= low 2=medium 3=high	Rating 1= high 2=medium 3=low	
7	Existing classification systems, registers, definitions, statistical frameworks, products and services need to be reviewed to see that needs related to climate change analysis are appropriately addressed				
7.1	Give consideration in future revisions of international statistical standards and classifications to the data needs of climate change analysis	NA	NA	NA	No action needed
7.2	Identify and address the obstacles to linking statistics across domains	NA	NA	NA	No action needed
7.3	Consider new approaches to preserving confidentiality	1	3	3	Start within three years
7.4	Consider the inclusion of explicit references to environmental statistics, including climate change-related statistics, in statistical laws	1	3	1	Start as soon as possible
		1.0	**3.0**	**2.0**	
8	Statisticians should gradually develop new partnerships, expertise and ability to adopt new methodologies for producing climate change-related statistics				
8.1	Build knowledge and understanding of the natural sciences among NSO staff	2	3	1	Start within two years
8.2	Familiarize NSO staff with GHG inventory methodologies	1	2	1	Start now
8.3	Develop knowledge, methodologies and tools for producing and using geo-referenced data across the statistical system	2	3	3	Start within three years
8.4	Ensure the effective transfer of knowledge and skills among NSOs internationally	NA	NA	NA	No action needed
		1.7	**2.7**	**1.7**	
9	Organizational changes may be needed in NSOs, the national statistical system and the national system for greenhouse gas inventories to support the production of climate change-related statistics				
9.1	Assign a person or group with the responsibility for ensuring the quality and availability of climate change-related statistics	1	2	1	Start now
9.2	Modify, in the longer term, the NSO's organizational structure	2	3	1	Start within two years
9.3	Define and clarify, if needed, the division of work and responsibilities between the different producers of climate-change related statistics and GHG inventories	1	2	1	Start now
9.4	Earmark sufficient resources for the development of environmental statistics and climate change-related statistics	3	3	1	Start within three years
		1.8	**2.5**	**1.0**	

Annex I. Assessment tool for climate change-related statistics

This assessment tool is based on a diagnostic tool designed originally for the implementation of the United Nations' System of Environmental-Economic Accounts (SEEA) 8 and on the Environment Statistics Self-Assessment Tool (ESSAT)9. There are many synergies between these tools and if one or the other has already been completed by a country, it will provide a good starting point for drafting a road map on climate change-related statistics. Some of the questions may be helpful for preparing the launch of the work on a road map. Some questions may only be possible to answer during the process of drafting a road map together with stakeholders.

Area 1: Stakeholders and institutional arrangements

Who are the main stakeholders in environmental and climate change policy?

This includes not only the producers of the data but also the potential users of the data and other interests that could benefit from improved information. Groups that may be considered include:

- Central government agencies
- Environment and natural resource government agencies
- Universities (specific institute or centre)
- NGOs and private associations

It is also important to describe policy development processes, interdepartmental mechanisms, strategies and plans in place to monitor the achievement of climate policy goals and assess effectiveness of decision making and actions.

Area 2: Policy priorities

Climate change-related statistics can inform a variety of climate policy and climate reporting needs, including:

1. emissions: GHG emissions and their human cause
2. drivers: human causes of climate change that deal with sources of emissions
3. impacts: impacts of climate change on human and natural systems
4. mitigation: efforts of humans to avoid the consequences
5. adaptation: efforts to adapt to the consequences

Does your country have a climate policy or a related environmental policy in place (especially covering the above five areas of climate change)?

If yes, what kind of an approach is in place and what are the current outcomes?

If no, what would be the likely policy priorities consideration the climate situation in your country?

Area 3: Information and knowledge

What are the main data sources related to the policy priorities and what is their availability?

Depending on the priority, this could include statistics derived from the Framework for the Development of Environment Statistics (FDES) and SEEA as well as other statistics:

Statistics and SEEA Accounts needed	Emissions	Drivers	Impacts	Mitigation	Adaptation
FDES AND OTHER STATISTICS					
Energy	x	x		x	
Air emissions	x				
Agriculture	x	x	x		x
Forestry	x	x			x
Mining	x	x			
Waste	x	x			
Transport	x	x			
Land cover	x	x			
Physical conditions			x		
Water			x		x
Biodiversity			x		
Land			x		x
Extreme events and disasters			x		
Health			x		
Economy, National Accounts				x	x
SEEA ACCOUNTS					
Physical flow accounts for energy		x		x	
SEEA Agriculture, Forestry and Fishery		x	x		
Physical flow accounts for water			x		x
Asset accounts for water			x		
Environmental activity accounts and other transactions related to the environment		x		x	x
Accounting for air emissions	x				
Asset accounts for land		x	x		
Accounting for soil resources			x		
Experimental ecosystem accounts			x		x

Which institutions are responsible for the production of the key statistics?

Is there a coordination mechanism to jointly address development needs?

Area 4: Main uses of statistics

What are the main uses of the climate change-related statistics? This could include:

- informing the public on the drivers and impacts of climate change
- designing and assessing national policies
- building a set of climate change-related indicators or sustainable development indicators
- measuring effectiveness of climate action

Is there is a national forum or event where producers and users of climate information meet and discuss issues and priorities for the country?

Area 5: Resources and constraints

What is the approximate amount of financial and human resources assigned to the work on these statistics?

What are the constraints or capacity gaps affecting the development of climate change-related statistics?

This may include consideration of recent technical assistance activities in the country, priority areas for capacity building, funding sources for the development work and its latest results.

Area 6: Opportunities

What opportunities are there for users, government and producers from developing new statistics or improving capacity?

What related international statistical initiatives may be useful, such as the Expert Forum for the producers and users of climate change-related statistics?

Consider also opportunities for highlighting work or its potential at national and international forums and the potential to share resources across countries.

Area 7: Recommendations for priority actions

Given the outcome of the road map, including policy priorities, availability of capacity and stakeholder interest, what are the highest priority areas for implementation?

The prioritization tool, included in the example road maps, is very useful for focusing the work to improve climate change-related statistics.