



# **counting emissions and removals**

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**greenhouse gas inventories under the UNFCCC**

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The objective of this brochure is to inform delegates and policy-makers on the on-going intensive work by Parties and the UNFCCC secretariat to ensure the quality and credibility of GHG inventories.

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## Importance of inventories

The objective of the United Nations Framework Convention on Climate Change (UNFCCC) is to stabilize greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous human-induced interference with the climate system. The ability of the international community to achieve this objective is dependent on an accurate knowledge of emissions trends, and on our collective ability to alter these trends.

Reliable GHG inventories are essential, both at national and international level, for:

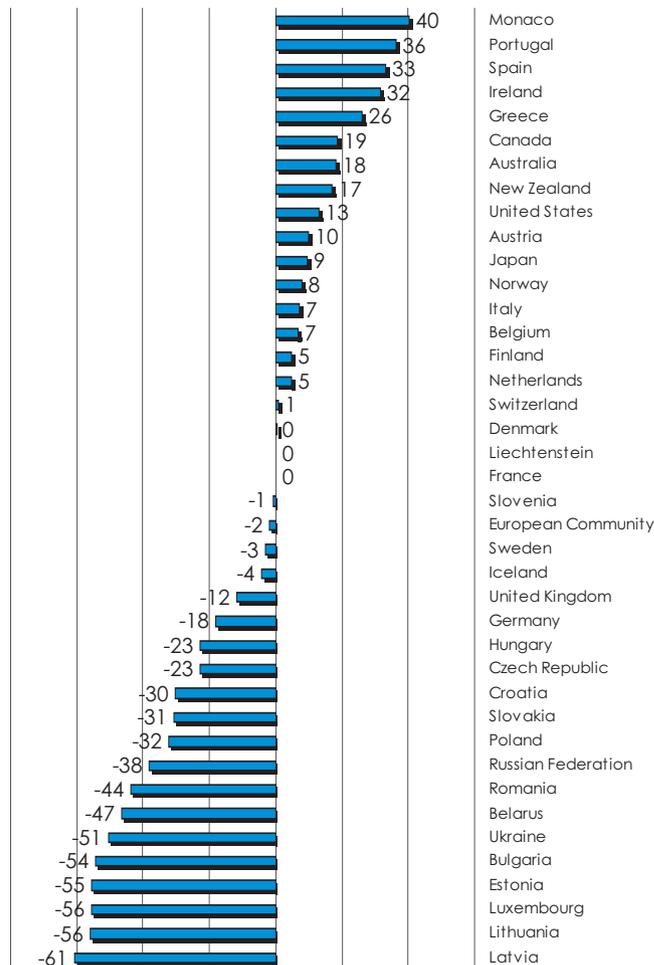
- assessing the international community's collective and individual efforts to address climate change and progress toward meeting the ultimate objective of the Convention
- evaluating mitigation options
- assessing the effectiveness of policies and measures
- making long-term emission projections
- providing the foundation for emission trading schemes.

Under the Kyoto Protocol, GHG inventories of Parties included in Annex I to the Convention (Annex I Parties) will be the basis for assessing compliance in meeting emission targets, and will be essential for participation in the Kyoto mechanisms (emissions trading, joint implementation, clean development mechanism).

The UNFCCC secretariat helps to ensure that authoritative GHG information is available for the Conference of Parties (COP) by:

- facilitating the reporting of GHG inventories by Parties and the technical review of inventories of Annex I Parties
- maintaining the GHG information system covering inventory data from reporting Parties
- publishing information on GHG emissions and trends.

## Change in aggregate GHG emissions 1990–2001 (per cent)



Source: Report on the national GHG inventory data from Annex I Parties (FCCC/SBSTA/2003/14)

## Reporting

### The inventory – essential link between science and policy-making

The quality and credibility of GHG inventories rely on the integrity of the science underpinning the methodologies, the completeness of reporting and procedures for compilation of data. To promote the provision of credible and consistent GHG information, the COP has developed standardized requirements for reporting national inventories.

Under the UNFCCC, all Parties are required to provide national GHG inventories. Although inventory requirements differ across Parties, they are similar in that they are based on IPCC methodologies, and aim to produce a full and accurate accounting of GHG emissions.

### Annex I Parties must provide annual national GHG inventories

covering emissions and removals of direct GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs and SF<sub>6</sub>) from six sectors, and for all years from the base year or period to the most recent year.

Under the UNFCCC reporting guidelines for Annex I Parties, inventory submissions are in two parts:

- Common reporting format (CRF) – a series of standardized data tables containing mainly numerical information and submitted electronically.
- National Inventory Report (NIR) – a comprehensive description of the methodologies used in compiling the inventory, the data sources, the institutional structures and quality assurance and control procedures.

Well-constructed annual inventories should include sufficient documentation and data to enable understand the underlying assumptions and calculations of all the emissions estimates.

### The IPCC GHG inventory methodologies

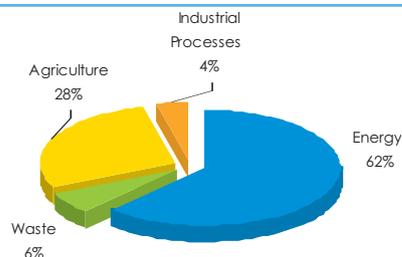
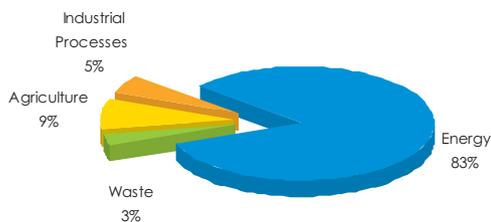
The UNFCCC inventory reporting guidelines are based on the methodologies and reporting formats of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* for both Annex I and non-Annex I Parties.

The *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (IPCC good practice guidance) completed in 2000, complements the 1996 methodologies in all inventory sectors except Land-Use Change and Forestry (LUCF). Use of the IPCC good practice guidance in the preparation of national GHG inventories promotes transparency, time-series consistency, comparability and completeness. It assists Parties in prioritizing the use of limited inventory resources through the identification of "key source categories", and encourages long-term improvements in inventory quality through uncertainty analysis and the use of quality assurance and quality control procedures.

In 2004, the IPCC good practice guidance for Land Use, Land Use Change and Forestry will be available.

**Parties not included in Annex I of the Convention (non-Annex I Parties) report GHG inventories as part of the national communication.** The inventories cover emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and to the extent possible emissions of HFCs, PFCs, and SF<sub>6</sub>. As of November 2003, 99 non-Annex I Parties have reported national inventories.

The new guidelines for the preparation of national communications from non-Annex I Parties, adopted in 2002, ask Parties for a more detailed reporting of their GHG inventories. The secretariat has developed a "user manual" to facilitate the use of the guidelines. Emission profiles of non-Annex I Parties that have submitted inventories are different from those of Annex I Parties as evident from the figures below.



Annex I Parties (2001)

Non-Annex I Parties (1994 or closest)

# Review

## The Annex I inventory review process increases Parties' confidence in the quality of these inventories and helps to ensure credible information on the implementation of the UNFCCC

Following completion of the trial period (2000-2002) for inventory reporting and review, annual review of individual inventories of each Annex I Party became mandatory in 2003. UNFCCC inventory review guidelines, adopted in 1999 and revised in 2002, ensure that the reviews are conducted consistently in a technically sound manner. Annual review ensures that adequate consideration is given to recalculations and emission trends over time.

## The review of GHG inventories is a data intensive process which comprises three stages

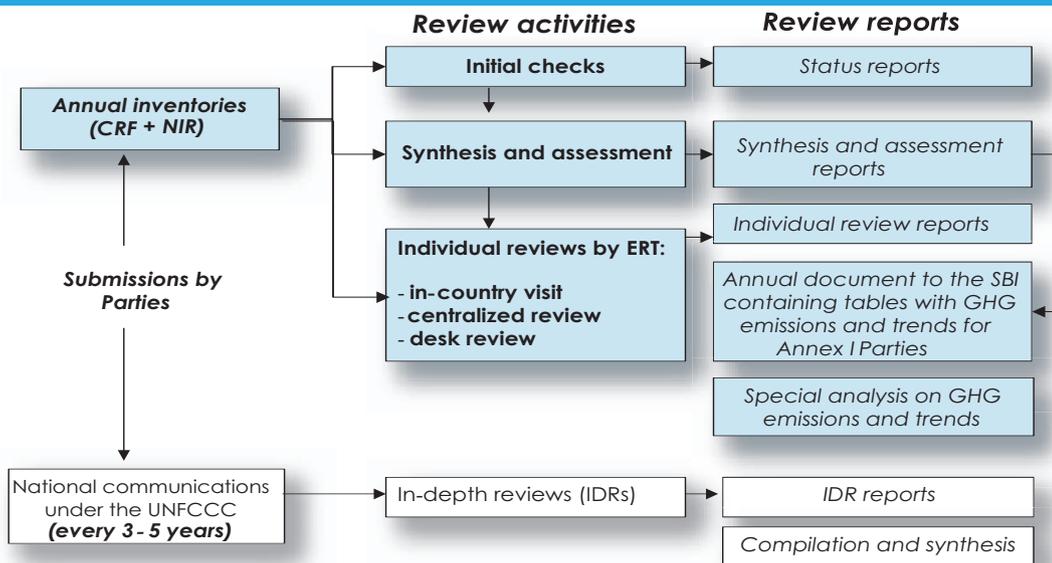
Each stage complements the previous one, and ensures that the process as a whole provides a thorough and technical assessment of the inventory and of conformity with the UNFCCC and IPCC guidelines. Each stage of the review is finalized with a review report which is published on the secretariat web site.

**Initial check:** immediate quality assurance check to verify that the inventory submission is complete and in the correct format.

**Synthesis and assessment:** Part I compiles and compares basic inventory information, such as emission trends, activity data and implied emission factors, across Parties and over time. Part II provides a 'preliminary assessment' of the inventory of individual Parties. The identification of potential problems in this assessment is an important input to the individual review stage.

**Individual review:** international teams of sectoral inventory experts examine the data, methodologies and procedures used in preparing the national inventory. Reviews are conducted as a *centralized review*, where 5-8 inventories are reviewed by an expert review team (ERT) convened at the secretariat; a *desk review*, where 3-5 inventories are reviewed by experts based in their home country; or an *in-country review*, where a single inventory is reviewed by an ERT in the Party under review. This is the most important and detailed review stage.

## Overview of review process for Annex I Parties



## Review

### Participation of experts nominated by Parties helps to ensure that the review results are objective, credible and recognized by Parties

The annual inventory review process requires the participation of about 100 skilled experts a year. Members of expert review teams are selected by the secretariat to ensure coverage of all inventory sectors, and to achieve an overall balance in the participation of experts from Annex and non-Annex I Parties, as well as geographical balance among them. Two lead reviewers, one each from an Annex I and a non-Annex I Party, guide the work of the teams.

Participation of experts nominated by Parties to the UNFCCC roster also helps build inventory capacity across all Parties. Reviewed Parties receive technical feedback from other experts that enables them to further improve their inventories. Likewise, experts who participate in reviews gain knowledge of inventory practices of other countries, which they can take home and apply to their own inventories.

As of 2003, about 150 individual experts, from 73 different Parties, have participated in GHG review activities.

### GHG inventory review training programme

To ensure the availability of a pool of skilled experts, and to promote representation of experts from a broader group of Parties, the secretariat has developed the GHG inventory reviewer training programme. As of 2004, the basic course of this programme will be offered annually to about 30 new experts in a primarily web-based learning environment. Subject to the availability of resources, a seminar component will also be included.

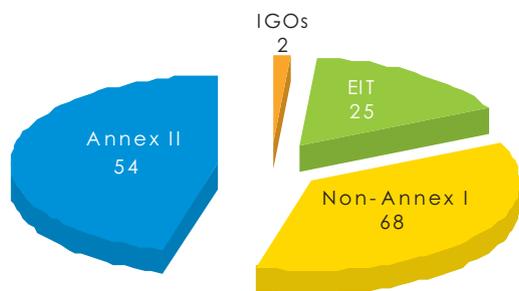
The course covers the UNFCCC reporting and review guidelines for Annex I GHG inventories, and cross-cutting aspects of the IPCC good practice guidance. Separate modules cover each individual IPCC inventory sector. Trainees gain hands-on experience with real inventory materials and are taught by experienced expert reviewers.

Additional courses for review under the Convention and Kyoto Protocol are under development or planned. All courses will be made available to nominated experts year-round through e-learning.

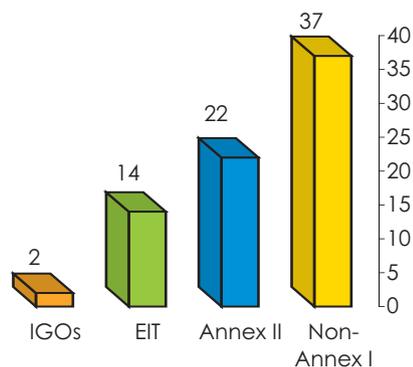
### Secretariat support of the Annex I inventory review process

- Preparation of status reports and synthesis and assessment reports
- Selection, coordination and logistical support to expert review teams
- Liaison with Parties
- Provision of analyses, software and reference tools to assist reviewers
- Guidance on review procedures and report templates to ensure consistency in the reviews
- Technical assistance
- Training for new experts.

Number of experts in 2000–2003 reviews



Number of Parties contributing review experts



## Improvements

### The quality and credibility of national GHG inventories of Annex I Parties have greatly improved over the past several years

Inventory improvements are due both to national level factors and to the establishment of a more rigorous reporting and review process under the Convention:

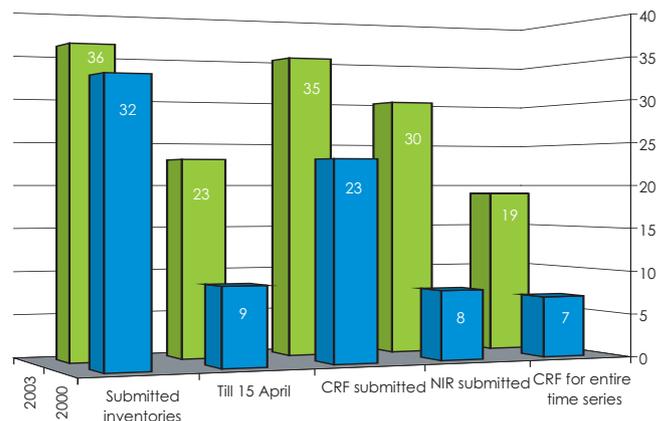
- National inventory experts have become more experienced and have more practice in the preparation of inventories
- Annual preparation of inventories has led to development of better institutional structures and procedures
- Attention to inventories at the international levels has helped to focus attention and resources on inventories at the national level
- Revised guidelines for GHG inventories have encouraged more detailed reporting and use of IPCC good practice guidance
- Recommendations from the technical review process have identified areas for improvement.

### Methodological improvements are evident from Parties:

- Implementation of the IPCC good practice guidance
- Increasing use of higher tier methods
- Increased use of country-specific data, based on peer reviewed studies
- Provision of more detailed description of methodologies uses, emission factors, and activity data in the NIR
- Correction of methodological errors identified in previous reviews.

Years	Reviewed submissions					ERT
	Initial check	Synthesis/assessment	Individual reviews			
			Desk	Centralized	In-country	
2000	23	23	3	6	4	6
2001	29	30	15	7	4	8
2002	32	27	4	5	3	5
2003	35	32	3	16	8	12

### Improvements in GHG inventory reporting



### Inventory preparation is a long-term process of continual improvement

Although much progress has already been achieved, further improvements in the preparation and reporting of Annex I inventories are necessary. Annex I Parties are making ongoing, and significant changes to their national inventories. Over time, it is expected that the number of inventory problems will further decrease and the quality of national inventories will further improve. Because of the technical complexity and extensive data requirements of preparing a national GHG inventory, improvements take time (practice makes perfect). Some Parties have only recently submitted their first inventory (and some others have yet to do so). Even those countries with well-developed inventory systems are still making improvements. The GHG review process will continue to be instrumental in promoting the further improvement of national GHG inventories.

## Greenhouse gas information system

**The secretariat's GHG database and software tools are vital in producing authoritative GHG information for the COP and ensuring that the large number of annual inventories can be processed in a cost-effective, timely and rigorous manner**

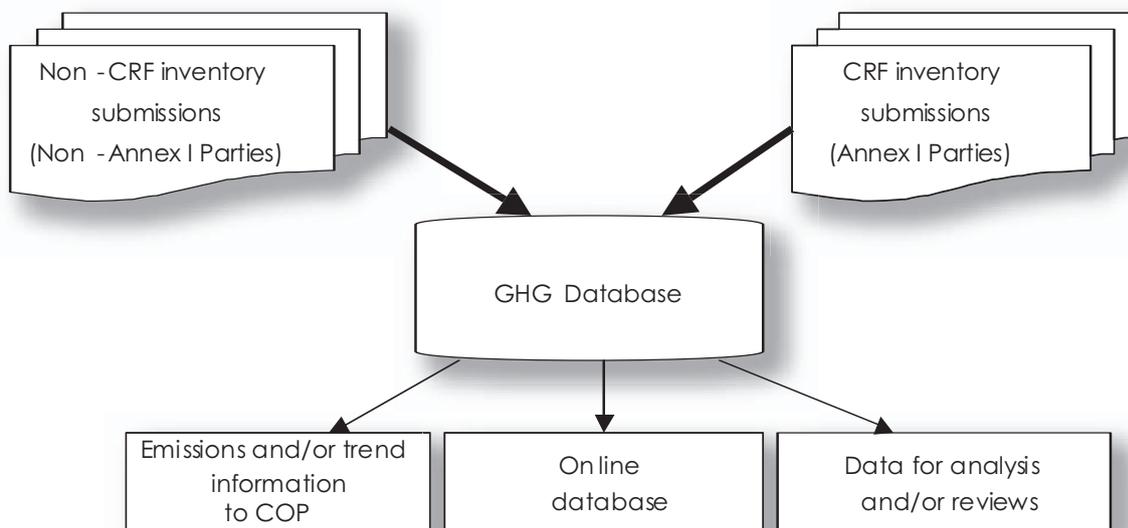
Designed and developed by the secretariat to meet a range of needs, the Greenhouse Gas Information System (GHGIS):

- Contains detailed inventory information for more than 140 Parties at many different levels of aggregation in a comprehensive database
- Relies on complex data reporting, processing and maintenance software, with built-in quality control procedures
- Enables provision of accurate information on GHG emission trends to the COP and subsidiary bodies
- Incorporates powerful analytic tools and search engines that enable cross-country comparisons and time-series data for supporting the review process
- Provides a user-friendly on-line interface ([ghg.unfccc.int](http://ghg.unfccc.int)) to allow searching and retrieval of inventory information by gas, sector and Party.

The GHGIS will be further enhanced to better integrate GHG information from Annex I and non-Annex I Parties and to accommodate the evolving requirements for inventory reporting and the needs of the Parties for data analyses and graphic capabilities.

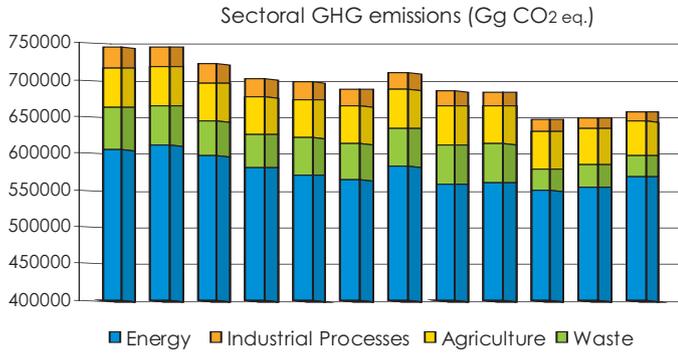
The GHGIS allows data to be searched and presented at various levels of detail and in different combinations, presented in the following pages. Such data can be used in a wide range of analyses.

### Greenhouse gas information system

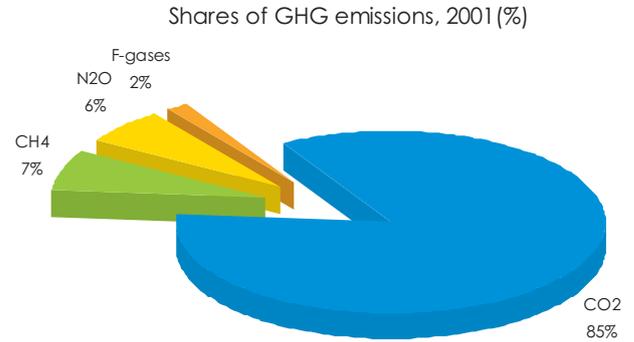


# Data examples at national level

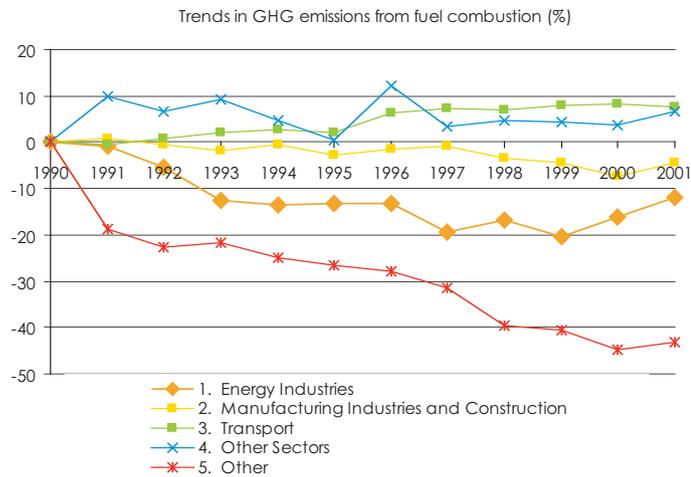
## by sector



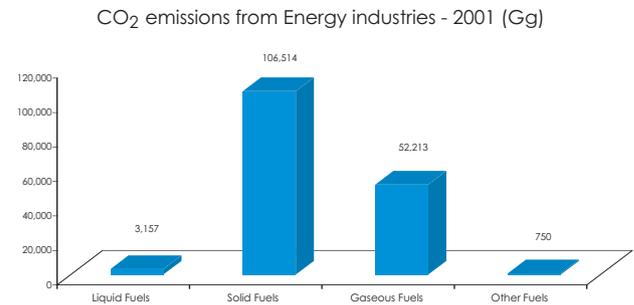
## by gas



## over time

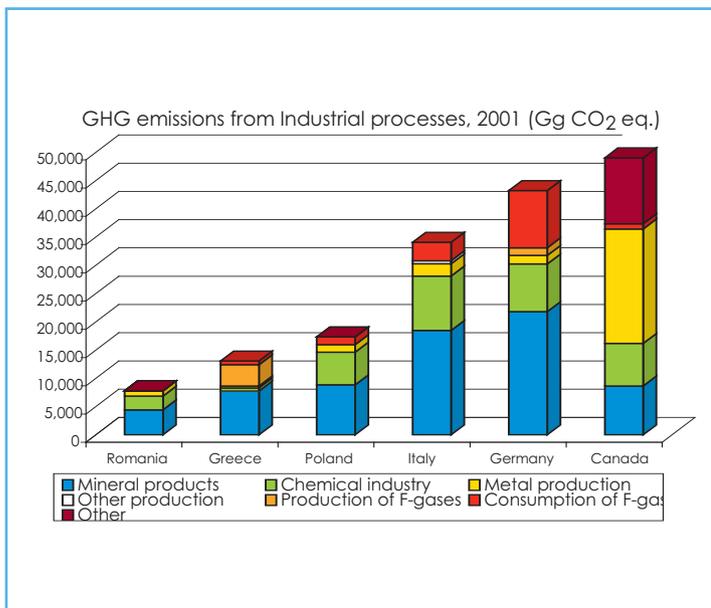


## by fuel



# Cross-country comparison/aggregation

by sector



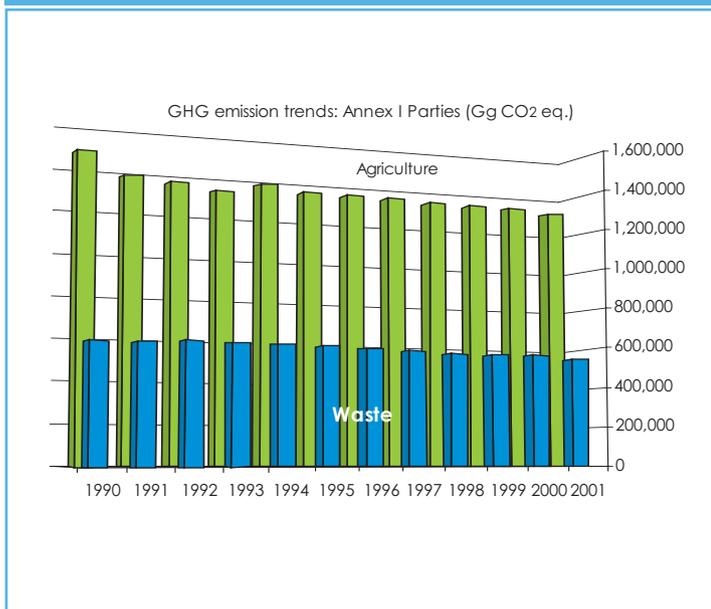
for specific inventory element

Enteric fermentation, CH<sub>4</sub> (2001)

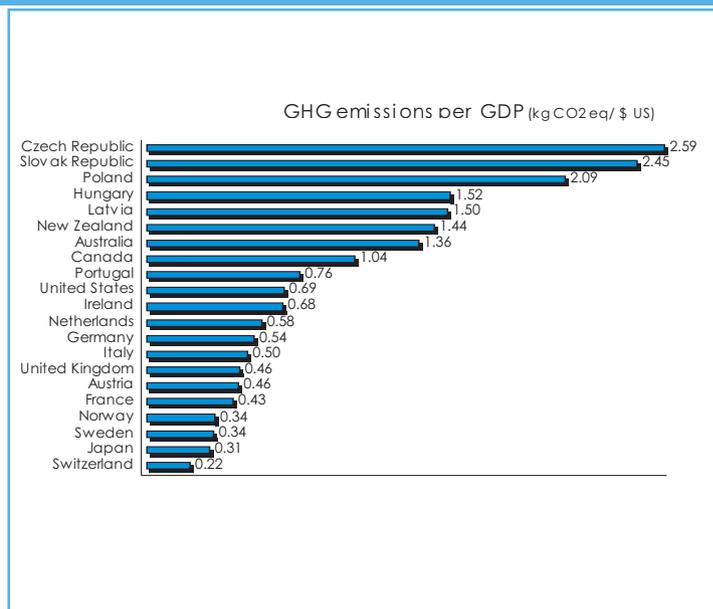
Key source	Share of national total (%)	Cattle					
		Activity data (population size)			Dairy cattle	Non-dairy cattle	
		CRF <sup>a</sup> (thousands of head)	FAO <sup>b</sup>	Difference (%)	CH <sub>4</sub> IEF (kg CH <sub>4</sub> /head/yr)		
IPCC default EF <sup>c</sup>					56 - 118 <sup>d</sup>	44 - 56 <sup>d</sup>	
Netherlands	L, T	3.1	4,047	4,047	0.0	81	46
New Zealand	L	32.0	9,521	9,281	-2.6	75	56
Norway	L, T	3.1	977	987	1.0	100	48
Poland	L	2.3	5,734	5,734	0.0	90	38
Portugal	L, T	3.1	1,414	1,414	0.0	100	48
Romania	L	3.6	2,740	2,870	4.5	81	56
Slovakia	L	2.2	645	645	0.0	100	57
Spain	L, T	3.8	6,375	6,164	-3.4	106	57
Sweden	L, T	4.1	1,651	1,652	0.0	127	56
Switzerland	L, T	4.7	1,611	1,611	0.0	104	42
United Kingdom	L	2.6	10,602	10,600	0.0	117	43
United States	L, T	1.7	101,592	97,277	-4.4	99	44

L - level assessment, T - trend assessment, IEF - implied emission factor

aggregated data for a group of Parties



in combination with socio-economic data



## Online GHG Database

[ghg.unfccc.int](http://ghg.unfccc.int)

## Annex I Parties reporting and review

- 2003 GHG inventory submissions
- Reporting and review guidelines (FCCC/CP/2002/8)
- Review training (FCCC/SBSTA/2003/10/Add.1 and Add.2)
- 2000–2003 review reports (status reports, synthesis and assessment reports, individual review reports)  
[unfccc.int/program/mis/ghg](http://unfccc.int/program/mis/ghg)
- Report on GHG inventory data from 1990–2001 (FCCC/SBSTA/2003/14 and FCCC/WEB/2003/3)  
[unfccc.int/resource/docs/2003/sbsta/14.pdf](http://unfccc.int/resource/docs/2003/sbsta/14.pdf)

## Non-Annex I Parties reporting

- National communications
- Compilation and synthesis of initial national communications  
[unfccc.int/issues/commonann1.html](http://unfccc.int/issues/commonann1.html)
- Guidelines for the preparation of national communications (FCCC/CP/2002/7/Add.2)  
[unfccc.int/resource/docs/cop8/07a02.pdf](http://unfccc.int/resource/docs/cop8/07a02.pdf)

## IPCC Guidelines and IPCC Good Practice Guidance

[ipcc.ch/pub/guide.htm](http://ipcc.ch/pub/guide.htm)

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## Summary

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The UNFCCC secretariat supports the preparation of high quality inventories by Parties and facilitates analyses of information on GHG emissions and removals. The secretariat:

- Imports, processes and archives in a central database GHG emissions data submitted by Parties
- Organizes the annual review of Annex I Party inventories
- Provides authoritative information on GHG emissions and trends for the COP, subsidiary bodies, and the public.

The secretariat's efforts to provide credible and authoritative GHG information for the UNFCCC process is dependent on the preparation and reporting of high quality GHG inventories at the national level and on the on-going support of the secretariat by Parties.

## Contact information

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The Methods, Inventories and Science programme has the responsibility for GHG inventory data processing and management within the secretariat. For further information, please contact:

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