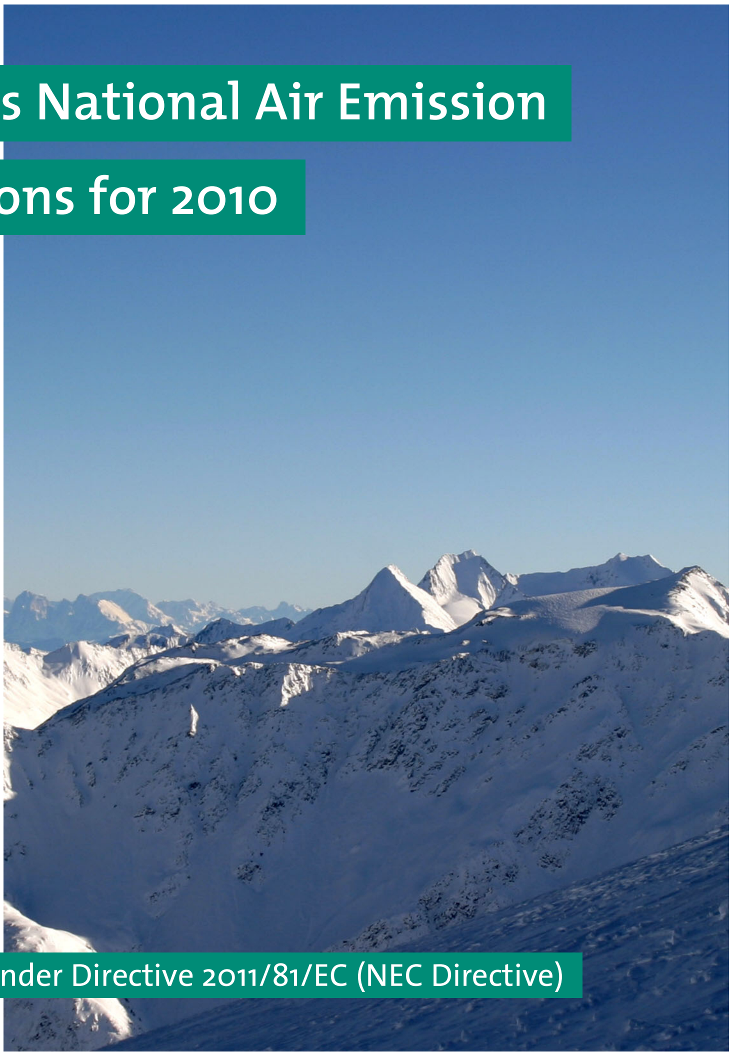
ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Austria's National Air Emission Projections for 2010



Submission under Directive 2011/81/EC (NEC Directive)

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

AUSTRIA'S NATIONAL AIR EMISSION PROJECTIONS FOR 2010

Submission under Directive 2001/81/EC (NEC Directive)

REPORT
REP-0342

Vienna 2011

Project management

Alexander Storch

Authors

Michael Anderl
Siegmund Böhmer
Michael Gössl
Traute Köther
Thomas Krutzler
Christoph Lampert
Stephan Poupa
Maria Purzner
Gudrun Stranner
Alexander Storch
Herbert Wiesenberger
Andreas Zechmeister

Editor

Brigitte Read
Maria Deweis

Layout and typesetting

Elisabeth Riss

Title photograph

© Umweltbundesamt/Gröger

Acknowledgment

The authors of this report want to express their thanks to all experts involved in the preparation of this report.

For further information about the publications of the Umweltbundesamt please go to:
http://www.umweltbundesamt.at/

Imprint

Owner and Editor: Umweltbundesamt GmbH
Spittelauer Lände 5, 1090 Vienna/Austria

This publications is only available on: http://www.umweltbundesamt.at/

ISBN 978-3-99004-145-1

TABLE OF CONTENTS

ZUSAMMENFASSUNG

Der vorliegende Report aktualisiert die österreichischen Emissionsprojektionen für die Luftschadstoffe Schwefeldioxid (SO_2), Stickoxide (NO_x), flüchtige organische Verbindungen ohne Methan (NMVOC) und Ammoniak (NH_3). Das dargestellte Emissionsszenario berücksichtigt bereits implementierte Maßnahmen, nicht aber Maßnahmen im Planungsstadium.

Das Szenario basiert auf denselben energiewirtschaftlichen Grundlagendaten von WIFO, Österreichischer Energieagentur, TU Wien und TU Graz, die für die Projektionen der Treibhausgas-Emissionsentwicklung herangezogen wurden (UMWELTBUNDESAMT 2011b). Da die verwendeten Grundlagendaten auf der Energiestatistik 2009 (letztes Datenjahr 2008) basieren, sind seitdem erfolgte Aktualisierungen der Energiestatistik nicht berücksichtigt.

In der EU-Richtlinie 2001/81/EG[1] werden für die untersuchten Luftschadstoffe Emissionshöchstmengen ab dem Jahr 2010 festgelegt. Nach der englischen Bezeichnung dieser Obergrenze (national emission ceilings, NEC) ist auch im Deutschen der Begriff „NEC-Richtlinie" und „NEC-Gase" üblich.

Artikel 7 in Verbindung mit Annex III der NEC-Richtlinie legt fest, dass für diese Luftschadstoffe Emissionsprognosen zu erstellen und jährlich zu aktualisieren sind. Dabei kommen die Verfahren, die im Rahmen des UNECE-Übereinkommens über weiträumige grenzüberschreitende Luftverunreinigung (1979 Convention on Long-Range Transboundary Air Pollution, LRTAP-Convention[2]) vereinbart wurden, zur Anwendung.

Zu beachten ist, dass die NEC-Richtlinie den Ländern die Wahl lässt, ob die Emissionen anhand der verkauften Treibstoffmengen oder anhand der tatsächlich im Inland verbrauchten Treibstoffmengen berechnet werden. Im Folgenden werden für Österreich beide Berechnungsmethoden wiedergegeben.

Nationale Gesamtemissionen

Die folgende Tabelle zeigt die aktualisierten Projektionen für 2010 im Vergleich zu den nationalen Gesamtemissionen für die Jahre 1990, 2005 und 2008 (UMWELTBUNDESAMT 2010b), gemäß dem UNECE-Übereinkommen über weiträumige grenzüberschreitende Luftverunreinigung (Stand: Dezember 2010).

[1] Richtlinie 2001/81/EG des Europäischen Parlaments und des Rates vom 23. Oktober 2001 über nationale Emissionshöchstmengen für bestimmte Luftschadstoffe

[2] http://www.unece.org/env/lrtap/full%20text/1979.CLRTAP.e.pdf

Tabelle A: Nationale Gesamtemissionen für 1990, 2005, 2008 und projizierte Emissionen für 2010 auf Basis der verkauften Treibstoffmengen (CLRTAP-Projektionen).

Luftschadstoff	**Emissions-Inventur 2010**			**projizierte Emissionen**
[kt/a]	**1990**	**2005**	**2008**	**2010**
NO_x	195,22	241,64	206,90	199,39
SO_2	74,37	27,54	22,44	20,90
NMVOC	273,84	167,81	163,37	158,89
NH_3	65,46	62,63	62,83	61,48

Diese nationalen Gesamtemissionen wurden auf Basis der in Österreich verkauften Treibstoffe errechnet. Dabei ist zu beachten, dass in Österreich in den letzten Jahren ein beachtlicher Teil der verkauften Treibstoffmenge im Inland getankt, jedoch im Ausland verfahren wurde (preisbedingter Kraftstoffexport im Fahrzeugtank).

Gemäß Artikel 2 der NEC-Richtlinie gilt diese für die Emissionen von Schadstoffen im Gebiet der jeweiligen Mitgliedstaaten. Die folgende Tabelle zeigt daher die nationalen Emissionsprojektionen exkl. Kraftstoffexport für einen Vergleich mit den Nationalen Emissionshöchstmengen der NEC-Richtlinie. Diese Emissionsmengen sind Österreichs offizielle Prognosewerte gemäß Artikel 8 (1) der NEC-Richtlinie.

Tabelle B: Nationale Emissionsprognosen exkl. Kraftstoffexport und Ziele für 2010 gemäß NEC-Richtlinie 2001/81/EC (NEC-Projektionen).

[kt/a]	**Emissionsprognosen 2010**	**Emissionshöchstmenge 2010 (Ziel NEC-RL)**
NO_X	144,76	103
SO_2	20,85	39
NMVOC	154,11	159
NH_3	61,30	66

Der Vergleich mit Tabelle A zeigt, dass der preisbedingte Kraftstoffexport für NO_X-Emissionen von maßgeblicher Bedeutung für die Zielerreichung ist.

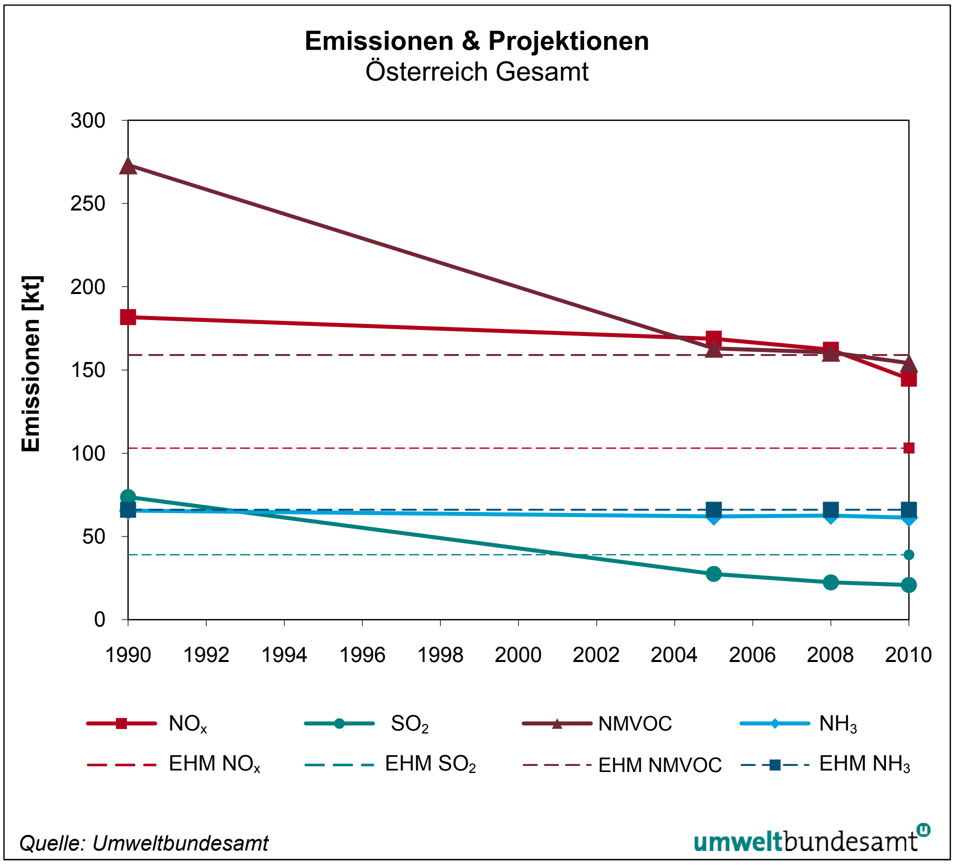


Abbildung A: Historische (1990–2008) und projizierte NEC-Emissionen exkl. Kraftstoffexport im Fahrzeugtank (2010) und Emissionshöchstmengen (EHM) gemäß NEC-Richtlinie 2001/81/EC (2010).

NO_x-Trend

Die Hauptquelle der nationalen NO_x-Emissionen ist der Sektor Energie mit einem Anteil von mehr als 95 %. Im Sektor Energie zählt der Straßenverkehr mit einem Anteil von 44 % an den Gesamtemissionen zu den Hauptverursachern im Jahr 2010.

Die nationalen NO_x-Emissionen wurden für 2010 mit 145 kt/a (exkl. Kraftstoffexport) beziffert, womit das NEC-Emissionsziel von 103 kt/a um über 40 kt überschritten wird.

Die Projektionen zeigen weiterhin eine beachtliche Reduktion der Emissionen bis 2030. Hauptverantwortlich hierfür sind die Modernisierung der Flotte, die geringeren spezifischen Emissionen von Pkw und schweren Nutzfahrzeugen der neuesten Abgasklasse sowie die – auf Basis der gesetzlich festgelegten Typprüfgrenzwerte – geschätzten, weiter sinkenden spezifischen NO_x-Emissionen von Kraftfahrzeugen der künftigen Abgasklassen.

Es sei allerdings angemerkt, dass in der Vergangenheit die realen Emissionen im Straßenverkehr nicht so stark gesunken sind wie die auf Typprüfgrenzwerten basierenden Emissionsprojektionen hatten erwarten lassen. Die Reduktion der NO_x-Emissionen ist auch auf den leicht steigenden Anteil der Elektromobilität bis 2020 zurückzuführen, wobei herkömmlich betriebene Pkw ersetzt werden.

SO_2-Trend

Die in der NEC-Richtlinie festgesetzte Emissionshöchstmenge für SO_2 von 39 kt/a wird in Österreich bereits seit mehreren Jahren unterschritten. Die Reduktion der SO_2-Emissionen in der Vergangenheit ergab sich hauptsächlich durch die Einführung von Emissionsgrenzwerten in der Energieerzeugung und durch die Reduktion des Schwefelgehaltes in Mineralöl-Produkten. Prognostiziert wird für das Jahr 2010 eine Unterschreitung der Emissionshöchstmenge von 39 kt/a SO_2 um 18 kt. Bis 2030 ist nur mit einem geringen Anstieg der SO_2-Emissionen zu rechnen.

NMVOC-Trend

Die Hauptquellen der nationalen NMVOC-Emissionen sind der Sektor Energie und der Sektor Lösemittel, wobei mehr als 50 % der Gesamtemissionen von Lösemittelanwendungen verursacht werden. Seit 1990 kam es zu einer deutlichen Reduktion der NMVOC-Emissionen in den genannten Sektoren. Im Lösemittelsektor konnten die Reduktionen aufgrund diverser legislativer Instrumente (Lösungsmittelverordnung, HKW-Anlagen-Verordnung sowie VOC-Anlagen-Verordnung) erzielt werden.

Die aktuelle Projektion geht von weiter sinkenden NMVOC-Emissionen bis 2010 aus. Ein leichter Anstieg der Emissionen aus der Verwendung von Lösemitteln bis 2010 kann durch die Emissionsminderungen in anderen Sektoren (z. B. Verbesserung von Antriebstechnologien im Verkehrssektor, Trend zu Zentralheizungen, niedrigere Emissionsfaktoren von Neuanlagen im Sektor Raumwärme) kompensiert werden. Anhand der vorliegenden Daten wird die NEC Emissionshöchstmenge von 159 kt NMVOC im Jahr 2010 leicht unterschritten werden.

Aufgrund der steigenden Lösemittelproduktion – Ursache von erhöhter wirtschaftlicher Aktivität –wird ein weiterer Anstieg der NMVOC-Emissionen bis 2030 erwartet.

NH_3-Trend

Die Hauptquelle der NH_3-Emissionen in Österreich ist der Sektor Landwirtschaft mit einem Anteil von mehr als 90 %. Seit 1990 ist ein leichter Rückgang zu verzeichnen.

Die Projektion zeigt, dass die für das Jahr 2010 festgesetzte Emissionshöchstmenge von 66 kt/a NH_3 um rd. 4 kt unterschritten wird.

Ab 2010 verlaufen die NH_3-Emissionen relativ konstant. Der leichte Anstieg im Sektor Landwirtschaft (bedingt durch den höheren Viehbestand) wird teilweise durch die Reduktion in den Sektoren Verkehr und Abfall kompensiert.

Vergleich zur Projektion 2009

Die Berechnung der Emissionsprojektionen im Energiebereich basiert auf einer aktualisierten Version des Projektes Energieszenarien (UMWELTBUNDESAMT 2011b). Der wesentliche Unterschied zur letzten Projektion stellt die Berücksichtigung der Wirtschaftskrise 2008 und 2009 dar, welche vor allem Auswirkungen auf das Jahr 2009 und 2010 zeigt. Zusätzlich starten die Projektionen für die weiteren Jahre auf einer signifikant niedrigeren Basis.

Des Weiteren wurde im Sektor Energiebereitstellung das Model Balmorel vom Modell TIMES abgelöst. Auch im Sektor Industrie kam ein neues makroökonomisches Modell (DEIO statt Prometheus) erstmals zum Einsatz.

NO_X- und SO_2-Projektion

Durch die Berücksichtigung der Wirtschaftskrise ergeben sich im Jahr 2010 vor allem in den Sektoren Energiebereitstellung und Verkehr geringere NO_x- und SO_2- Emissionen im Vergleich zu den Projektionen 2009. Auch im Sektor Kleinverbrauch ist mit geringeren Emissionen gegenüber der letzten Projektion zu rechnen. Hauptursache hierfür ist die fortgesetzte Reduktion des Heizöleinsatzes in den letzten Jahren, welche als neue Basis für die Projektion herangezogen wurde.

NMVOC-Projektion

Änderungen bei der Prognose der NMVOC-Emissionen ergeben sich im Sektor Lösemittel. Diese wurden, basierend auf überarbeiteten Daten der Import-Export Statistik (Außenhandelsbilanz) und der Produktionsstatistik sowie anlagenspezifischen Daten, aktualisiert. Anhand neuer Erhebungen in den relevanten Branchen wurden auch die technischen Annahmen zu Emissionsfaktoren sowie wirtschaftliche Annahmen überarbeitet.

Zusätzlich führen auch Revisionen von historischen Werten in der Energiebilanz insb. im Bereich Biomasse zu einem niedrigeren Level von NMVOC-Emissionen im Kleinverbrauch.

NH_3-Projektion

Das Umweltbundesamt beauftragte im Jahr 2010 das WIFO mit der Erstellung einer neuen Studie zur landwirtschaftlichen Produktion in Österreich (Betrachtungszeitraum 2010 bis 2030; SINABELL et al. 2011a). Die Ergebnisse zeigen eine Zunahme der Milchproduktion in Folge der Abschaffung der Milchquoten-Regelung in der EU. Im Gegensatz zum Vorjahresbericht wird der Emissionsberechnung ein leicht ansteigender Rinderbestand unterlegt.

Für das Jahr 2010 ist jedoch kaum ein Unterschied gegenüber den Projektionen 2009 erkennbar.

1 INTRODUCTION

This report presents the emission projections for 2010 "with existing measures", as required by Article 8 of the NEC Directive to be reported to the European Commission and the European Environment Agency. It includes background information to enable a quantitative understanding of the key socioeconomic assumptions used in the preparation of the projections.

For the purpose of comparison, this report also includes emission data from the 2008 National Air Emission Inventory as of December 2010 (UMWELTBUNDESAMT 2010b).

Legal background

After the UNECE Gothenburg Protocol to the Convention on Long-Range Transboundary Air Pollution had been signed on 1 December 1999[3], the EU agreed on national emission ceilings for sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3) and non-methane volatile organic compounds (NMVOC) for the year 2010.

Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants ("NEC Directive") implements national emission ceilings for these air pollutants[4].

Pursuant to Article 7 Member States are obliged to prepare and annually update national emission inventories and emission projections for 2010.

Pursuant to Art. 8(1), Member States have to report their emission inventories and projections to the Commission. The obligations have been transposed into national law by the Emission Ceilings Act – Air (*Emissionshöchstmengengesetz-Luft)*[5].

---

[3] Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to abate Acidification, Eutrophication and Ground-level ozone, http://www.unece.org/env/lrtap/full%20text/1999%20Multi.E.Amended.2005.pdf

[4] Directive 2001/81/EC of the European Parliament and the Council of 23 October 2001 concerning national emission ceilings for certain pollutants, OJ L309/22, 27 November 2001. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0022:0030:EN:PDF

[5] Bundesgesetz über nationale Emissionshöchstmengen für bestimmte Luftschadstoffe (Emissionshöchstmengengesetz-Luft, EG-L), BGBl. Nr. 34/2003

2 EMISSIONS

In the Guidelines[6] for reporting emission data under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) 2009, Article 15, Parties are given the choice of whether to report emissions on the basis of fuel used or fuel sold to the final consumer. It is recommended that they state clearly in their submissions the basis of their calculations. Table 1 shows national total emissions and projections under the UNECE LRTAP Convention, based on fuel sold.

Table 1: Austrian national total emissions for 1990, 2000, 2005, 2008 and projected emissions for 2010 after implementation of agreed policy for Austria in 1 000 tons per year, i.e. [kt/a], based on fuel sold (CLRTAP-Projections).

Pollutants	**Emission Inventory 2010**			**Emission Projection**
[kt]	**1990**	**2005**	**2008**	**2010**
NO_x	195.22	241.64	206.90	199.39
SO_2	74.37	27.54	22.44	20.90
NMVOC	273.84	167.81	163.37	158.89
NH_3	65.46	62.63	62.83	61.48

According to Article 2 of Directive 2001/81/EC (NEC Directive) the Directive covers "emissions in the territory of the Member States". If fuel prices are considerably different from those in neighbouring countries, fuel tends to be bought in the country where it is cheaper and consumed in another Member State (fuel exports in vehicle tanks). Austria has experienced a considerable amount of fuel export in vehicle tanks over the last few years; this needs to be taken into account when reporting emissions for Austria. Most of these fuels are currently used in heavy duty vehicles for long-distance traffic (inside and outside the EU). According to the Emission Reporting Guidelines, emissions from road vehicle transport should therefore be calculated and reported on the basis of fuel sold and, additionally, may be reported on the basis of fuel used. Austria reports its projected emissions calculated on the basis of both methods. Austria reports emissions without 'fuel exports' (according to Table 2) as Austria's official projection under Article 8 (1) of the NEC Directive.

Table 2: Austria's emission projections according to Directive 2001/81/EC and ceilings for 2010 in 1 000 tonnes per year, i.e. [kt/a], based on fuel used (NEC projections).

[kt]	**Emissions 2010 without 'fuel exports'**	**Ceilings 2010**
NO_X	144.76	103
SO_2	20.85	39
NMVOC	154.11	159
NH_3	61.30	66

A comparison with Table 1 shows that 'fuel export' is of relevance for the NO_X emissions ceiling only.

[6] http://www.ceip.at/fileadmin/inhalte/emep/reporting_2009/Rep_Guidelines_ECE_EB_AIR_97_e.pdf

2.1 Nitrogen Oxides NO_x

The main source of NO_x emissions in Austria, with a share of more than 90%, is fuel combustion. Here road transport accounts for the highest contributions of total NO_x emissions; up to 65% of total national emissions arise from road transport ("fuel export" included). Without taking "fuel export" into consideration, road transport accounts for a share of max 40% of the national total.

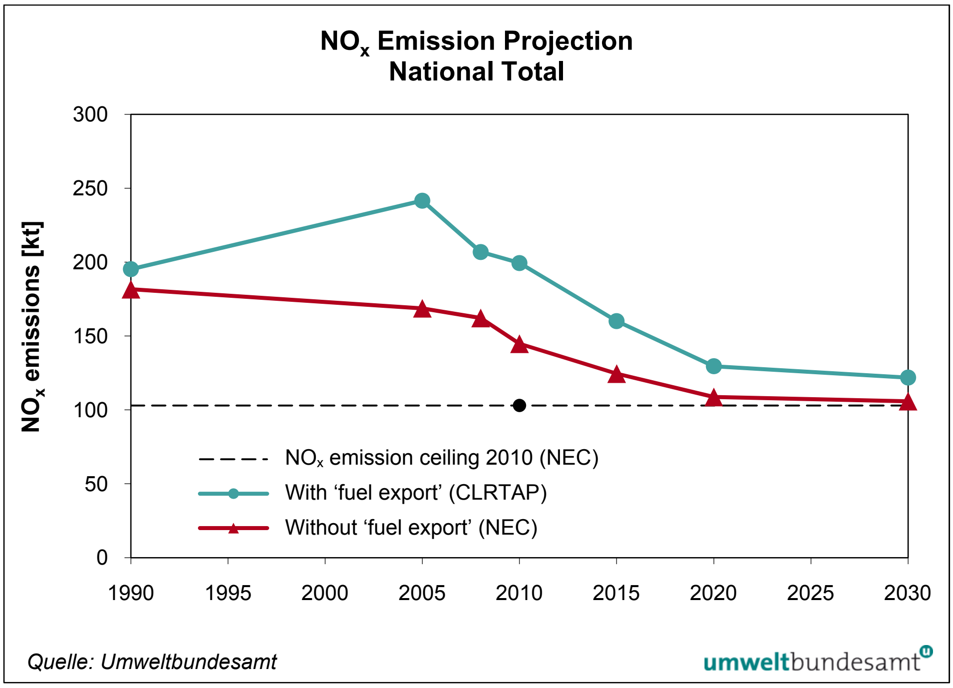


Figure 1: Historical (1990, 2005, 2008) and projected emissions (2010–2030) of NO_X in comparison to the national emission ceiling (2010).

Projections based on current legislation show a remarkable reduction of NO_x emissions, mainly due to a decrease of transport emissions.NO_x emissions from heavy duty vehicles and cars are thus projected to decrease. The main reasons for this decline are the modernisation of the vehicle fleet, measured lower specific emissions from cars and heavy duty vehicles of the latest emission class and the estimated – based on statutory emission limits – further decrease of specific emissions from motor vehicles of future emission classes.

It should, however, be noted that in the past real life emissions from road transport did not decrease as much as projected (on the basis of vehicle type approval limit values).

The decrease in NO_x emissions also results from a slight increase in the share of electro-mobility until 2020, which is assumed to substitute conventionally fuelled cars.

National total emissions are expected to decrease to 199 kt, emissions without 'fuel export' to 145 kt in 2010. However, emissions without 'fuel export' are still projected to significantly exceed the NEC emissions ceiling of 103 (by more than 40 kt) and emissions with "fuel exports" are expected to exceed the CLRTAP emission ceiling of 107 kt even more (by more than 90 kt in the year 2010).

Furthermore, NO_x emissions without "fuel exports" are projected to decrease to 106 kt in 2030, emissions with "fuel exports" to 122 kt.

Table 3: Austria's NO_x emission projection.

	NEC Gas Source Categories	**NO_x [kt]**						
		1990*	**2005***	**2008***	**2010**	**2015**	**2020**	**2030**
	National Total (fuel sold)	**195.22**	**241.64**	**206.90**	**199.39**	**160.15**	**129.58**	**121.89**
	National Total (fuel used)	**181.73**	**168.76**	**162.19**	**144.76**	**124.53**	**108.75**	**105.88**
1 A 1	Energy industries	17.74	15.33	13.44	12.02	11.26	9.92	9.49
1 A 2	Manufacturing Industries and Construction	32.84	32.66	33.55	33.90	34.96	37.14	43.94
1 A 3 b	Road Transport (with "Fuel export")	101.85	153.49	121.88	118.14	80.67	50.37	36.03
1 A 3 b	Road Transport (without "Fuel export")	88.36	80.61	77.18	63.51	45.06	29.55	20.02
1 A 3 a,c,d,e	Non-road transport	3.30	4.71	5.33	4.70	5.06	5.46	6.69
1 A 4	Other sectors	27.68	27.65	24.87	23.13	20.64	19.07	18.07
1 A 5	Other	0.07	0.09	0.08	0.08	0.08	0.09	0.10
1 B	Fugitive emissions	NA	NA	NA	NA	NA	NA	NA
2	Industrial Processes	4.80	1.75	1.59	1.71	1.70	1.72	1.77
3	Solvent and other product use	NA	NA	NA	NA	NA	NA	NA
4	Agriculture	6.85	5.92	6.09	5.66	5.72	5.76	5.76
4 B	Animal husbandry and manure management	5.42	4.86	4.84	4.57	4.66	4.73	4.90
4 D	Plant production and agricultural soils	1.35	0.99	1.17	1.03	1.00	0.97	0.80
4 F,G	Field burning and other agriculture	0.08	0.08	0.08	0.06	0.06	0.06	0.05
6	Waste	0.10	0.05	0.05	0.05	0.05	0.05	0.05

** Data source: Austrian Emission Inventory 2010*

IE … included elsewhere; NA … not applicable; NO … not occurring

2.2 Sulphur Dioxide SO_2

SO_2 emissions show a significant reduction from 1990 to 2008 mainly because of the implementation of emission limits in the power generation sector and the reduction of the sulphur content in mineral oil products.

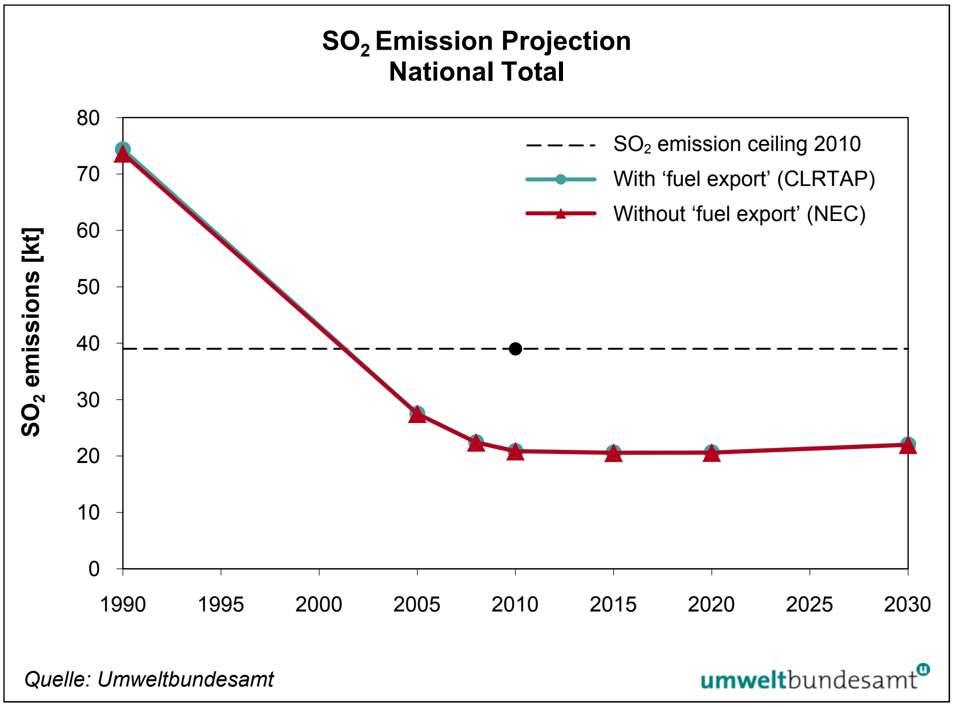


Figure 2: Historical (1990, 2005, 2008) and projected emissions (2010–2030) of SO_2 in comparison to the national emissions ceiling (2010).

No further relevant reductions in total SO_2 emissions are expected until 2010. Thus projections for 2010 (based on current legislation) lead to emissions 18 kt below the emissions ceiling of 39 kt.

Furthermore, only a slight increase of SO_2 emissions is expected until 2030.

Table 4: Austria's SO_2 emission projection.

	NEC Gas Source Categories	SO_2 [kt]						
		1990*	**2005***	**2008***	**2010**	**2015**	**2020**	**2030**
	National Total (fuel sold)	**74.37**	**27.54**	**22.44**	**20.90**	**20.63**	**20.65**	**22.05**
	National Total (fuel used)	**73.66**	**27.48**	**22.40**	**20.85**	**20.57**	**20.59**	**21.98**
1 A 1	Energy industries	14.04	6.84	3.16	2.34	2.07	1.88	1.67
1 A 2	Manufacturing Industries and Construction	17.91	10.62	10.56	10.81	11.56	12.49	14.86
1 A 3 b	Road Transport (with "Fuel export")	4.83	0.16	0.12	0.13	0.15	0.15	0.15
1 A 3 b	Road Transport (without "Fuel export")	4.12	0.10	0.09	0.09	0.09	0.09	0.08
1 A 3 a,c,d,e	Non-road transport	0.33	0.17	0.19	0.17	0.18	0.19	0.21
1 A 4	Other sectors	32.95	8.33	6.95	6.23	5.47	4.76	4.00
1 A 5	Other	0.01	0.01	0.01	0.01	0.02	0.02	0.02
1 B	Fugitive emissions	2.00	0.13	0.16	0.13	0.12	0.11	0.09
2	Industrial Processes	2.22	1.22	1.23	1.00	1.00	1.00	1.00
3	Solvent and other product use	NA	NA	NA	NA	NA	NA	NA
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 B	Animal husbandry and manure management	NA	NA	NA	NA	NA	NA	NA
4 D	Plant production and agricultural soils	NA	NA	NA	NA	NA	NA	NA
4 F,G	Field burning and other agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Waste	0.07	0.06	0.06	0.06	0.06	0.06	0.06

* *Data source: Austrian Emission Inventory 2010*

IE … included elsewhere; NA … not applicable; NO … not occurring

2.3 Non-Methane Volatile Organic Compounds (NMVOCs)

Emissions of non-methane volatile compounds show a considerable reduction from 1990 to 2008 due to decreasing solvent use as well as a positive impact of enforced laws and regulations. The main sources of NMVOC emissions in Austria are fuel combustion activities and solvent and other product use; the latter with a share of more than 50%.

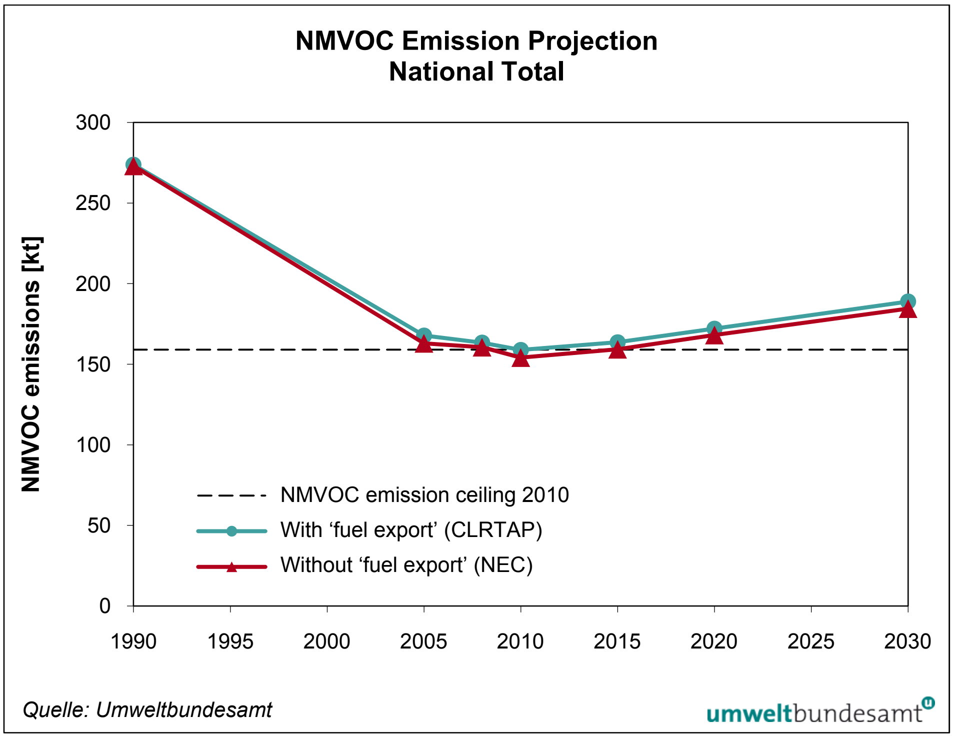


Figure 3: Historical (1990, 2005, 2008) and projected emissions (2010–2030) of NMVOC in comparison to the national emissions ceiling (2010).

NMVOC emissions are projected to decrease further by 2010. Improvements of engine technology for mobile sources and a trend towards central heating and lower emission factors of new boilers in the residential sector will lead to a slight fall below the emissions ceiling of 159 kt.

Due to increased solvent consumption as a result of increased economic activities, NMVOC emissions are expected to rise until 2030.

Table 5: Austria's NMVOC emission projection.

	NEC Gas Source Categories	NMVOC [kt]						
		1990*	**2005***	**2008***	**2010**	**2015**	**2020**	**2030**
	National Total (fuel sold)	**273.84**	**167.81**	**163.37**	**158.89**	**163.62**	**172.06**	**188.89**
	National Total (fuel used)	**273.11**	**162.97**	**160.53**	**154.11**	**159.24**	**168.11**	**184.51**
1 A 1	Energy industries	0.42	0.56	0.63	0.63	0.63	0.63	0.63
1 A 2	Manufacturing Industries and Construction	1.73	2.10	2.27	3.21	3.26	3.32	3.51
1 A 3 b	Road Transport (with "Fuel export")	69.56	24.80	17.78	15.98	12.97	10.94	9.89
1 A 3 b	Road Transport (without "Fuel export")	68.83	19.96	14.94	11.21	8.59	6.98	5.52
1 A 3 a,c,d,e	Non-road transport	1.17	1.25	1.23	1.07	1.00	0.95	0.94
1 A 4	Other sectors	61.28	41.17	35.33	29.78	25.56	23.16	21.66
1 A 5	Other	0.01	0.02	0.02	0.02	0.02	0.02	0.02
1 B	Fugitive emissions	12.13	2.86	2.25	2.23	2.16	2.07	1.97
2	Industrial Processes	11.10	4.71	4.74	4.74	4.74	4.74	4.74
3	Solvent and other product use	114.43	88.39	97.11	99.41	111.50	124.47	143.89
4	Agriculture	1.85	1.86	1.95	1.76	1.74	1.73	1.61
4 B	Animal husbandry and manure management	NA	NA	NA	NA	NA	NA	NA
4 D	Plant production and agricultural soils	NA	NA	NA	NA	NA	NA	NA
4 F,G	Field burning and other agriculture	1.85	1.86	1.95	1.76	1.74	1.73	1.61
6	Waste	0.16	0.09	0.07	0.06	0.05	0.03	0.02

* *Data source: Austrian Emission Inventory 2010*

IE … included elsewhere; NA … not applicable; NO … not occurring

2.4 Ammonia (NH_3)

Emissions of NH_3 have slightly decreased since 1990. The main source for ammonia is the agricultural sector contributing more than 90% of total NH_3 emissions. The trend follows the development of Austrian livestock numbers.

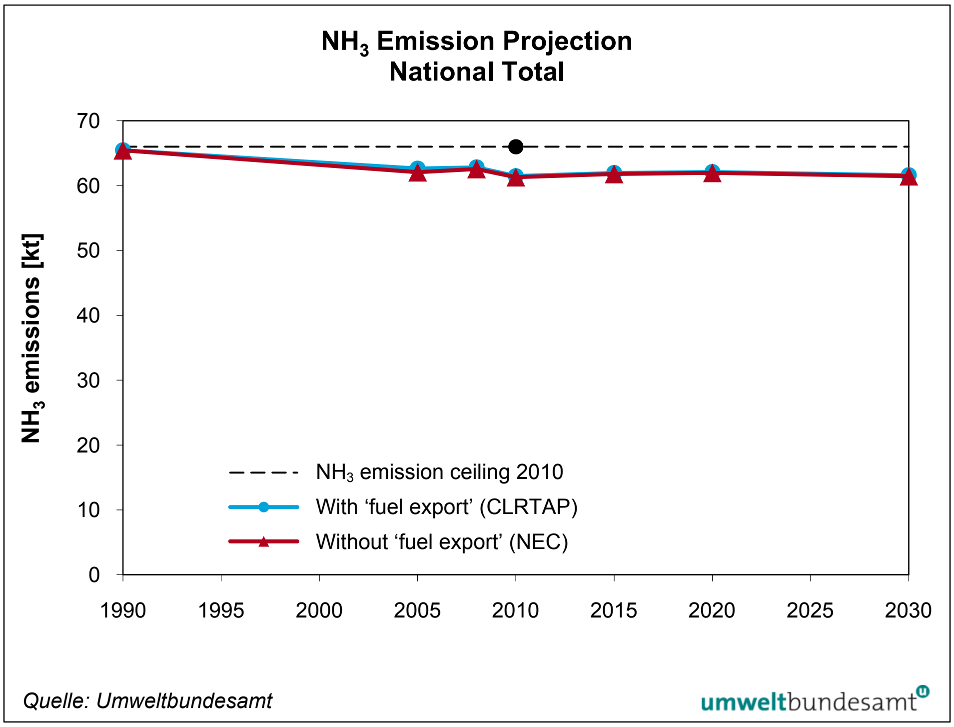


Figure 4: Historical (1990, 2005, 2008) and projected emissions (2010) of NH_3 in comparison to the national emissions ceiling (2010–2030).

NMVOC emissions are expected to decrease to levels about 4 kt below the national emission ceiling for 2010. Emissions will not change significantly after 2010. The projected minor increase in the sector "agriculture" (owing to increasing cattle numbers) will be partly compensated by emission reductions in the sectors road transport and waste.

Table 6: Austria's NH_3 emission projection.

	NEC Gas Source Categories	NH_3 [kt]						
		1990*	2005*	2008*	2010	2015	2020	2030
	National Total (fuel sold)	**65.46**	**62.63**	**62.83**	**61.48**	**61.96**	**62.11**	**61.62**
	National Total (fuel used)	**65.46**	**62.07**	**62.57**	**61.30**	**61.80**	**61.97**	**61.46**
1 A 1	Energy industries	0.20	0.32	0.40	0.40	0.40	0.40	0.40
1 A 2	Manufacturing Industries and Construction	0.34	0.42	0.49	0.50	0.50	0.50	0.50
1 A 3 b	Road Transport (with "Fuel export")	2.85	2.91	1.70	1.13	0.83	0.70	0.62
1 A 3 b	Road Transport (without "Fuel export")	2.85	2.35	1.44	0.96	0.68	0.56	0.46
1 A 3 a,c,d,e	Non-road transport	0.01	0.01	0.01	0.11	0.11	0.12	0.13
1 A 4	Other sectors	0.63	0.74	0.68	0.65	0.62	0.60	0.59
1 A 5	Other	0.00	0.00	0.00	0.01	0.02	0.02	0.02
1 B	Fugitive emissions	NA	NA	NA	NA	NA	NA	NA
2	Industrial Processes	0.27	0.07	0.08	0.08	0.08	0.08	0.08
3	Solvent and other product use	NA	NA	NA	NA	NA	NA	NA
4	Agriculture	60.80	56.87	58.05	57.16	57.94	58.53	58.18
4 B	Animal husbandry and manure management	55.21	51.63	51.93	51.63	52.58	53.29	53.65
4 D	Plant production and agricultural soils	5.12	4.68	5.55	4.97	4.85	4.73	4.08
4 F,G	Field burning and other agriculture	0.48	0.56	0.58	0.55	0.52	0.51	0.45
6	Waste	0.36	1.29	1.41	1.44	1.46	1.17	1.09

** Data source: Austrian Emission Inventory 2010*

IE … included elsewhere; NA … not applicable; NO … not occurring

3 RELATION TO DATA REPORTED EARLIER AND CHANGES

This chapter describes changes to Austria's National Air Emission Projection submitted to the European Commission under Directive 2001/81/EC (NEC Directive) in 2009 (UMWELTBUNDESAMT 2009b). The figures presented in this report replace data reported earlier by Austria under the NEC Directive of the European Union.

Emission projections of some sources have been recalculated on the basis of updated projections of activity data and emission factors. Methodological changes such as recalculations in the Austrian inventory are described on a sectoral basis in the sections below. These changes have also led to recalculations of the emission projections, as the methods are applied consistently for the calculation of historical and forecast emissions. Projections of activity data are in line with the "with existing measures" scenario of Austria's updated GHG projections reported under Decision 280/2004/EC (UMWELTBUNDESAMT 2011a).

Where emissions are considered to remain constant until 2010 (see chapter 5), projected emissions have been updated on the basis of emissions in the year 2008 (included in the Austrian inventory 2010) (UMWELTBUNDESAMT 2010c).

3.1 Energy - Stationary fuel combustion

The calculation of emission projections in energy sectors is based on the energy scenarios described in the submission to the Monitoring Mechanism (UMWELTBUNDESAMT 2011a).

1 A 1 – Energy Industries

1 A 2 – Manufacturing Industries and Construction

1 A 4 – Other Sector

The economic crisis and corresponding different price-based assumptions have led to adaptations of all energy models in general. Taking the recession into consideration has resulted in major changes in emissions for the years 2009 and 2010. Projections for the following years start from a significantly lower level. Additionally, a new model has been used for the projection of the production of heat and power. Instead of the model Balmorel, a model based on TIMES (AEA 2011) has been used for this projection. For the projection of the manufacturing industries a new macroeconomic model has been used. Instead of the model Prometheus the DEIO model (WIFO 2011) has been used for this projection. The data set of the previous projection was based on the year 2003.

In the "Other" sector, activity data (energy consumption) for the last inventory years (serving as a basis for the projections and the model calibration) have further decreased in comparison to the last submission.

The method for emission calculations and the emission factors have both remained the same.

3.2 Energy - Mobile fuel combustion

1 A 3 a – Aviation

The economic downturn resulted in a decrease in energy demand between 2008 and 2009 by 13%. The projection for energy consumption in the aviation sector up to 2030 is based on a forecast by the Austrian Institute of Economic Research (WIFO) for jet fuel.

1 A 3 b – Road Transportation

Biofuels

The forecast for the use of biofuels up to 2030 has been estimated based on the Energy Strategy Austria (BMWFJ & BMLFUW 2010), present circumstances (initiatives, promotion, current infrastructure etc.) as well as on foreseeable developments on national and international level.

Electro mobility

The development of electro mobility up to 2030 has been estimated on the basis of a study by the Umweltbundesamt for one of the biggest energy suppliers in Austria (UMWELTBUNDESAMT 2010a). The estimated scenario is based on ideal political, economic, technical and market circumstances for the introduction of electric vehicles.

3.3 Solvents

Projections for NMVOC emissions from Solvent and Other Product Use were updated on the basis of revised activity data from import-export statistics (balance of trade) and production statistics provided by Statistik Austria as well as plant specific data. Technical assumptions concerning emission factors and economical assumptions were also revised on the basis of updated surveys in the relevant sectors.

3.4 Agriculture

Activity data generated by the PASMA model were updated (SINABELL et al. 2011a). In contrast to the data used in previous projections (SINABELL & SCHMID 2005) the new model results indicate that the declining trend in the numbers of cattle (cows) will come to an end and that the number of dairy cows will stabilise at a higher level.

A comprehensive description can be found in Austria's Informative Inventory Report (IIR) 2011 (UMWELTBUNDESAMT 2011d).

3.5 Waste

Revisions with respect to the projections submitted 2009 have been carried out for:

6 A – Waste Disposal on Land:

- Methodological changes in the GHG inventory (serving as a basis for NMVOC and NH_3 emission calculations): deposited waste types are taken into account, the number of years considered in the FOD (First Order Decay) Model, slightly revised parameters (DOC, CH_4 recovery).
- Different assumptions for the future development of deposited waste amounts.

6 D – Other Waste:

- Revised (historical) activity data have been considered in this inventory.
- Different assumptions for future amounts of biogenic and green waste and waste undergoing mechanical-biological treatment.

4 SOURCES OF DATA

Model calculations are based on custom-made methodologies for the individual sectors. Emissions from Fuel Combustion and Industrial Processes are based on the National Energy Balance of Statistics Austria and on a macro-economic model (DEIO) of the Austrian Institute of Economic Research (WIFO 2011), supported by calculations carried out with the bottom-up models TIMES (AEA 2011) ERNSTL (TU WIEN 2011) and GLOBEMI & GEORG (HAUSBERGER 2011).

Projections for Agriculture were calculated by the Austrian Institute for Economic Research (SINABELL ET AL. 2011a) in cooperation with Umweltbundesamt.

Projections for Solvents were calculated by IIÖ in cooperation with Umweltbundesamt. Waste projections were modelled by Umweltbundesamt.

A detailed description of the models is provided in a report entitled "GHG Projections and Assessment of Policies and measures in Austria", submitted to the European Commission and the European Environment Agency (UMWELTBUNDESAMT 2011a).

The following table presents the main data sources used for the activity data in this report as well as information on who carried out the actual calculations:

Table 7: Main data sources for activity data and emission values

Sector	Data Sources for Activity Data	Emission Calculation
Energy	National Energy Balance of Statistics Austria, macro-economic model of the Austrian Institute of Economic Research (WIFO), bottom-up models TIMES (AEA), ERNSTL (Vienna University of Technology) and GLOBEMI & GEORG (Graz University of Technology)	Umweltbundesamt (energy providers, manufacturing industries, residential and commercial sector) Graz University of Technology (transport sector)
Industry	Austrian Institute for Economic Research (macroeconomic model DEIO)	Umweltbundesamt
Solvent	Statistics Austria; Institut für industrielle Ökologie (Institute for industrial ecology) (bottom-up model)	Umweltbundesamt
Agriculture	Austrian Institute for Economic Research (agriculture model PASMA) (SINABELL et al. 2011a)	Umweltbundesamt
Waste	Historical values: Landfill database, EDM (solid waste deposited) Projected values: expert judgement on future amounts of solid waste expected to be disposed on landfills (based on recent and expected developments)	Umweltbundesamt

5 METHODOLOGY

5.1 General Approach

Where reasonable and applicable, emissions were calculated and projected on the basis of the methodology used in the Austrian Inventory. The Austrian Inventory is based on the SNAP (Selected Nomenclature for sources of Air Pollution) nomenclature and has to be transformed into the current reporting format as required under the LRTAP convention, the NFR (Nomenclature For Reporting) format. Projections were thus also calculated on the basis of the SNAP nomenclature and subsequently transformed to the NFR format.

For all sectors, reduction measures were identified and emissions were projected by specifically designed models. The methodology used for the projections of the key driving forces and emission calculations is described in the respective chapters. Consistency between sector models was ensured by regular expert meetings which addressed overlaps and possible gaps.

For this report all measures implemented before 2nd February 2010 are considered in the "with existing measures" scenario. Emissions from energy related sectors (NFR 1.A) are calculated on the basis of the energy forecast 2011 (UMWELTBUNDESAMT 2011b).

5.2 General socio-economic assumptions

Data used for general socio-economic assumptions, which form the basis of the Austrian emission projections, can be found in Table 8. Further assumptions for key input parameters can be found in UMWELTBUNDESAMT 2011a.

Table 8: Key input parameters of emission projections.

Year	2010	2015	2020	2025	2030
GDP [billion € 2008]	279.78	305.92	339.70	376.66	420.41
Population [1 000]	8 388	8 556	8 726	8 877	9 021
Stock of dwellings [1 000]	3 662	3 851	4 042	4 227	4 401
International coal prices [€/GJ]	5.71	7.18	8.61	10.40	12.56
International oil prices [€/GJ]	10.41	13.09	15.70	18.97	22.91
International gas prices [€/GJ]	8.33	10.47	12.56	15.17	18.33

5.3 Stationary Fuel Combustion Activities (NFR 1 A)

This chapter describes the methodology used for emission projections for stationary fuel combustion in the NFR sectors 1 A 1, 1 A 2 and 1 A 4.

A model was used which is based on TIMES and provides fuel-specific activity data for Energy Industries (i.e. Electricity and Heat Production including Waste Incineration). These data were multiplied by established fuel-specific emission factors which were the same as those used in the Austrian Inventory. Emission factors for unspecified fuels (e.g. for refinery fuel gas, refinery coke) or wastes (e.g. municipal solid waste, hazardous waste) were derived from plant-specific data.

The methodology applied for the emission factors is described in the Austrian Inventory Report (UMWELTBUNDESAMT 2011d).

As regards the only refinery operated in Austria, the installation of an SNOX plant in November 2007 has significantly reduced emissions of SO_2 and NO_x. Since no other changes are expected in the next few years, emission projections have been based on current levels.

For oil and gas exploration and storage, the historical trends of the past have been prolonged.

Figures on energy demand have been split up into the sub-sectors of the Austrian air emission inventory.

5.3.1 Energy Industry (NFR 1 A 1)

This chapter describes the methodology used for emission projections for stationary fuel combustion in energy and transformation industries.

SO_2 and NO_x

Projected emissions were calculated by multiplying projected energy data (UMWELTBUNDESAMT 2011b) by the respective emission factors. The latter were determined for power plants and waste incineration facilities on a plant-specific basis for each fuel type taking into account expansions, the commissioning of new plants and the closing down of existing facilities.

A detailed description of the methodologies used can be found in the cited literature UMWELTBUNDESAMT 2003a, b, c, BMLFUW 2004 and UMWELTBUNDESAMT & BMLFUW 2002.

NMVOC and NH_3

NMVOC and NH_3 emissions are assumed to remain constant at 2008 levels (UMWELTBUNDESAMT 2010b). This simple approach has been chosen because their share in the total emissions is less than 1%.

5.3.2 Manufacturing Industry and Combustion (NFR 1 A 2)

This chapter describes the methodology for emission projections for stationary fuel combustion in the manufacturing industry. A methodological description of emission projections for mobile sources in NFR 1 A 2 is given in chapter 5.4.

SO_2 and NO_x

For the estimation of SO_2 and NO_x, both sectors NFR 1 A 2 and 2 have been assessed together (UMWELTBUNDESAMT 2003a, c, UMWELTBUNDESAMT 2007 and UMWELTBUNDESAMT 2009a). The following industrial sectors have been identified as the major sources:

- production in the cement, glass, magnesia, lime and other mineral industry,
- iron and steel production,
- pulp and paper production,
- process emissions of the chemical industry,
- wood processing industry,
- food industry,
- production of non-ferrous metals,
- other sectors of the manufacturing industries.

Projected emissions were calculated by applying the trend of energy consumption (UMWELTBUNDESAMT 2011b) and incorporating recent data from environmental impact statements on facility expansions and the opening and closing down of facilities.

NMVOC and NH_3

The NMVOC and NH_3 emissions are assumed to remain constant at 2008 levels (UMWELTBUNDESAMT 2010b). This simple approach has been chosen because their share in total emissions is less than 2%.

5.3.3 Other Sectors (NFR 1 A 4)

This chapter describes the methodology used for emission projections for stationary fuel combustion in the small combustion sector (1 A 4 a Commercial/Institutional, 1 A 4 b Residential (households), and 1 A 4 c Agriculture/Forestry/ Fishing). A methodological description of emission projections for mobile sources in NFR 1 A 4 is given in chapter 5.4.

Activities

To calculate energy consumption for stationary sources separately for the subsector residential and commercial, a comprehensive model for buildings (ERNSTL) is used. The input for the sector "agriculture" came from the macroeconomic model DEIO. A detailed description of these models can be found in UMWELTBUNDESAMT 2011a, TU WIEN 2011 and WIFO 2011.

Emissions

Based on the energy demand for stationary sources in the subsectors 1 A 4 a, 1 A 4 b and 1 A 4 c, SO_2, NO_x, NMVOC and NH_3 emissions were calculated. A full description of the methods and emission factors used for these calculations can be found in the Austrian Informative Inventory report (UMWELTBUNDESAMT 2011d).

Separate emission factors have been used for:

- Fuel type (e.g. coal, natural gas, heating and other oil, residual fuel oil, LPG, wood log & wood briquettes, wood chips and wood pellets).
- Heating type (central heating, heating systems for apartments and stoves).
- Different technologies (e.g. new biomass boilers – wood gasification, condensing gas and heating oil boilers).

5.4 Mobile Fuel Combustion Activities (NFR 1 A)

In this chapter the methodology used for estimating emissions from the sector NFR 1.A.3 (Transport) and from mobile sources under NFR 1 A 2 f, 1 A 4 and 1 A 5 is described.

5.4.1 Road and Off-road Transport (NFR 1A 3)

The calculation of transport emissions is based on different models:

The following input parameters are used for road/off-road emission projections:

- **Transport demand model**

  The transport demand data used here (which is the basis for emission modelling) is the result of calculations and forecasts made by a team of experts who also compiled the Austrian "Environmental Balance of Transport" 2006/2008. The Environmental Balance of Transport is a multidisciplinary inter-modal analysis of transport demand in Austria since 1950 and its impact on the environment, human health and climate.

  Transport volumes for road and rail are based on an amalgamation as well as an analytical synthesis of official background statistics relevant for travel and freight transport demand by Statistik Austria. Available information was used such as population data, motorisation rates, vehicle fleet sizes, economic and income development statistics. Transport volumes for all other modes (i.e. inland waterways, local buses and trams) were derived from data collected by official Austrian bodies such as Statistik Austria, the Austrian Federal Ministry of Economy, Family and Youth (BMWFJ) or the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management.

- **GLOBEMI - Emission model road (NFR *1 A 3 b*)**

  For the calculation of road emissions the GLOBEMI model is used (HAUSBERGER 1998, HAUSBERGER 2010, HAUSBERGER 2011). GLOBEMI has been developed for the calculation of emission inventories in larger areas. Input parameters are, amongst others, the vehicle stock of each category (cars, light duty vehicles, …) split into layers according to the propulsion system (SI, CI, …), engine volume or vehicle mass, the emission factors of the vehicles according to the year of their first registration and the number of passengers per vehicle and tonnes payload per vehicle. Furthermore, the model delivers an assumption for the fuel export effect.

- **GEORG – Emission model off road (NFR 1 A 2 f, 1 A 3 c, 1 A 3 d, 1 A 4 b, 1 A 4 c, 1 A 5)**

  The energy consumption and off-road emissions in Austria are calculated with the model GEORG (**G**razer **E**missionsmodel für **O**ff **R**oad **G**eräte) (PISCHINGER 2000). The GEORG model has a fleet model part which simulates the actual age and size distribution of the vehicle stock via age- and size-dependent drop-out rates (probability that a vehicle will be scrapped by the next year). With this approach the stock of each category of mobile sources is calculated on the basis of the year of the vehicle's first registration and the propulsion system (gasoline 4-stroke, gasoline 2-stroke, diesel > 80 kW, diesel < 80 kW).

5.4.2 Aviation (NFR 1 A 3 a)

The projection of energy consumption in the aviation sector up to 2030 is based on a forecast by the Austrian Institute of Economic Research (WIFO) for jet fuel.

Based on the WIFO forecast the average annual growth rate of energy consumption is assumed to be 1.34 % in the current scenario.

5.4.3 Other transportation – pipeline compressors (NFR 1 A 3 e)

The projection of energy demand for pipeline transport up to 2030 is based on expert judgments obtained during several interviews with Austrian pipeline operators.

5.5 Fugitive Emissions (NFR 1 B)

SO_2 and NMVOC

SO_2 and NMVOC emissions projections from Fugitive Emissions are based on emission/activity data ratios for 2004–2008, as well as on projected activity data such as natural gas and crude oil exploration and natural gas and gasoline consumption according to (WIFO 2011). Emission reduction measures such as the introduction of vapour recovery units at depots and service stations were implemented in 2003 already and no further reductions are expected.

Emissions from solid fuel transformation (coke ovens) are included in 1 A 2 a.

Coal production was abandoned in 2005.

A detailed description of the methodology for emission estimations can be found in the Austrian Informative Inventory Report 2010 (UMWELTBUNDESAMT 2011d).

NO_x and NH_3

NH_3 emissions are not relevant for this category. According to the Austrian air emission inventory NO_X emissions from flaring in oil refineries are included in category 1 A 1 b.

5.6 Industrial Processes (NFR 2)

The forecast for developments in industrial production has been based on macro-economic data for the sub-sectors (UMWELTBUNDESAMT 2011b), taking into account known predictions about expansions in iron and steel production and the opening of new installations and the decommissioning of old facilities for sulphuric acid production.

NO_x and NMVOC emissions from 2 D 1 Pulp and Paper are reported together with energy-related emissions under 1 A 2 f Other.

SO_2 and NO_x

The methodology used for calculating SO_2 und NO_x is described in Chapter 5.3.2.

NMVOC and NH_3

NMVOC and NH_3 emissions were assumed to remain constant at the levels of 2008 (UMWELTBUNDESAMT 2010b). This simple approach has been chosen because their share in total emissions is less than 3%.

5.7 Solvent and Other Product Use (NFR 3)

NMVOCs

Emission projections are calculated by multiplying emissions of the latest inventory year (2008; submission 2010) by the rate of population growth until 2030.

The basis for the data of the Austrian air emission inventory (OLI) 2010 (data basis 2008) has been provided by surveys (WINDSPERGER et al. 2002a, 2002b, 2004; WINDSPERGER & SCHMID-STEJSKAL 2008) as well as import-export statistics (foreign trade balance) and production statistics provided by Statistik Austria.

To determine the quantity of solvents used in Austria for the various applications, a bottom-up and a top-down approach were combined. The top-down approach provided the total quantities of solvents used in Austria. The shares of solvents used in different applications and the solvent emission factors were calculated on the basis of the bottom-up approach. By linking the results of the bottom-up and the top-down approach together, the quantities of solvents used per year and the solvent emissions for the different applications were obtained.

The quantity of solvents is disaggregated on SNAP level 3 according to the solvent model and the forecast is made in correlation with the GDP growth forecast (at current prices) of the corresponding NACE Codes rev.1.1., as provided by the macroeconomic model from WIFO (WIFO 2011).

The emission factors used for the forecast were the same as in 2008 , because the positive impact of enforced laws and regulations in Austria is expected to be only minimalin subsequent years. Emission factors are calculated by solvent use per substance category at NACE-level-4 for all industrial sectors and are based on information from surveys in households and industry as well as structural business statistics.

NO_x, SO_2 and NH_3

According to the Austrian inventory there is no occurrence of NO_x, SO_2 and NH_3 emissions from solvent use.

5.8 Agriculture (NFR 4)

Agricultural activities and emissions are projected for sources of ammonia (NH_3), nitric oxide (NO_X), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2).

5.8.1 Methodology

Emissions are calculated on the basis of the methodology used for the Austrian Air Emission Inventory. A comprehensive description can be found in the Austrian Informative Inventory Report (IIR) 2011 (UMWELTBUNDESAMT 2011d).

Input parameters for activity data projection have been obtained from the Positive Agricultural Sector Model Austria (PASMA), developed by the Austrian Institute of Economic Research (WIFO) (SINABELL ET AL. 2011a).

The model maximises sectoral farm welfare and is calibrated on the basis of historical crop, forestry, livestock, and farm tourism activities by using the method of Positive Mathematical Programming (PMP). This method assumes a profit-maximizing equilibrium (e.g. marginal revenue equals marginal cost) in the base-run and derives coefficients of a non-linear objective function on the basis of observed levels of production activities.

Economic assumptions

Several assumptions, basically on input prices, were made to run the model above. Prices were derived from OECD-FAO outlooks on agricultural markets (OECD-FAO 2010). Other exogenous economic assumptions for Austria (like the GDP or population size) are not explicitly essential for the model used for this analysis because the partial equilibrium model of the agricultural sector mainly depends on input and output prices. Input prices were assumed to be consistent with recent forecasts for the Austrian energy sector (UMWELTBUNDESAMT 2011b). Since production is driven by resource availability, prices and technological development, and since Austrian agriculture is an integrated part of the common market, carry-over effects from European demand patterns are noticeable and determine the results.

The forecast period in this study is until 2030. For the period beyond 2019 OECD-FAO forecasts are not available.The assumption is therefore that after 2019, prices will follow the inherent trend.

Technological progress

Information on storage facilities on Austrian farms was obtained from the Austrian farm survey from 1999. Other assumptions, in particular technical progress in plant and animal production are based on (SINABELL & SCHMID 2005). Deviating from this source, estimates of increasing milk yields per dairy cow have been somewhat reduced according to the estimates discussed in an expert panel in January 2011.

Policy measures

For the projections (scenario 'With Existing Measures') the following policy measures are considered implemented:

- implementation of the CAP health check reform 2008 (mainly abolition of milk quotas);
- special attention is given to the Austrian way of implementation (maintenance of the premiums for suckling cows – including heifers);
- given the uncertainties over the flow of funds through the "modulation" mechanism it is assumed that the amount that Austrian farmers who might be beneficiaries receive will be the same as the amount that other farms lose through this measure;
- land is maintained in good agricultural and ecological condition ("cross compliance";
- the programme for rural development is maintained in an unmodified way;
- introduction of a regional decoupled farm premium (instead of the historical premium model).

5.8.2 Activity data

This chapter gives an overview of the PASMA scenario results.

Livestock projections

- the number of cattle is likely to increase, a result which would change the declining trend which has been observed over decades; the reason being that milk production is likely to increase after the abolition of the milk quota (2015), which would involve an increase in the dairy cattle herd;
- the number of suckling cows is less affected, because premiums per head will be coupled to production even after the reform in Austria; a given share of heifers qualifies for such premiums as well, therefore the number of suckling cows and heifers will remain relatively constant;
- since farmers will receive coupled premiums either for suckling cows or heifers while other premiums for cattle will be abandoned, the population of suckling cows will not necessarily increase – the reason being that the model takes account of the profitability of the whole cattle production simultaneously – with the implication that the value of calves will drop;

- as a consequence of lower prices for pork and poultry and lower feeding costs, outputs of these products will not be expanded – this being a consequence of the modelling approach which prevents an expansion of an activity if the relation between product prices and production costs deteriorates; this result is consistent with prior observations (SINABELL & SCHMID 2005);

Milk Production

PASMA results show that milk production in Austria will increase after the abolition of the milk quota in 2015. The expected milk prices will be high enough to make milk production the most competitive livestock activity in Austria.

Organic Farming

Organic farming will not increase significantly because it is assumed that premiums of the agro-environmental programme will stay in place and prices of organic products will be higher while opportunity costs will be lower after the implementation of the reform.

Synthetic Fertiliser Use

Within PASMA, the use of mineral fertiliser is calculated in two ways: First, consumption of urea is given exogenously, based on a linear trend of past observations. Second, the level of all other nutrient inputs is determined with a model based on nutrient balances.

Forecasts for the use of mineral fertiliser reflect the consequences of land use (e.g. more legumes (pulses) where organic farming is expanding) and changes in the livestock herd (manure). Technical progress in crop production eventually leads to less fertiliser being needed to produce the same amount of output. The PASMA results show that the decreasing trend in mineral fertiliser application will continue.

Agricultural Cropland

The area size of arable land will decrease mainly as a result of the secular trend of competition for land from urbanisation and traffic infrastructure.

Crop production will decline due to the limited area available and the increase in output prices will not be sufficient (compared to rising input costs) to make significant expansion economically viable.

Grassland

The size of grassland will be reduced considerably; the category declining at the fastest rate being extensive grassland – because of its low productivity it will be less economical to use in the light of increasing energy costs.

5.8.3 Emission calculation

Emissions are calculated on the basis of the revised methodology used for the Austrian inventory 2010 which includes new management options and new emission factors (AMON & HÖRTENHUBER 2008).

N excretion values

The feed intake parameters applied here are the same as those applied in the national air emission inventory (UMWELTBUNDESAMT 2011d). Austria-specific N excretion values of dairy cows have been calculated on the basis of projected milk yields.

Animal Waste Management Systems

The projected animal waste management system (AWMS) distribution corresponds to the AWMS data used in the 2009 inventory. The data is based on a comprehensive investigation of Austria's agricultural practices in 2005 (AMON et al. 2007).

A comprehensive description of the methodologies used for emission calculation can be found in 'Austria's Informative Inventory Report 2011' (UMWELTBUNDESAMT 2011d).

5.9 Waste (NFR 6)

NMVOCs and NH_3 from Waste Disposal

NMVOC and NH_3 emissions are calculated on the basis of their content in the emitted landfill gas (after consideration of gas recovery). For NMVOCs a concentration of 300 vol.% is assumed, for NH_3 a concentration of 10 vol.% in the landfill gas.

For the calculation of emissions arising from solid waste disposal on land the IPCC (Intergovernmental Panel on Climate Change) Tier 2 method – a method recommended for the calculation of landfill emissions on national level – is applied, consisting of two equations: first, calculating the amount of methane accumulated up to the year of the inventory; second, calculating the emitted methane after subtracting the recovered and oxidised methane amounts. As far as available, country-specific parameters are used (e.g. the recovered landfill gas). More detailed information as well as the parameters themselves can be found in Austria's National Inventory Report (UMWELTBUNDESAMT 2011c).

Projections for landfill gas emissions are calculated on the basis of predictable future trends in waste management as a result of the implementation of legal provisions at federal government level (Landfill Ordinance, Ordinance on the mechanical biological treatment of waste which is currently being prepared). Under the Landfill Ordinance, only pre-treated waste has been allowed to be deposited since 2009. Consequently, only the following landfill fractions have been taken into account for the projections:

(1) residues (stabilised waste) from the mechanical biological treatment of residual wastes; this fraction is expected to decrease
(2) the landfill fraction from the mechanical treatment of waste.

A detailed description of the methodology used for the calculation of projections for CH_4 emissions can be found in Austria's projection of greenhouse gases, submitted to the European Commission under the EU Monitoring Mechanism (UMWELTBUNDESAMT 2011a).

NO_x, SO_2, NMVOC and NH_3 from Waste Incineration

Because of their low contribution to the total emissions (below 1% for all gases), the emission levels of the year 2008 have been applied for this forecast. A detailed description of the methodology used for emission estimations can be found in the Austrian Informative Inventory Report 2009 (UMWELTBUNDESAMT 2011d).

NH_3 emissions from mechanical-biological treatment and composting of waste

Emissions are calculated separately for

- waste treated in mechanical-biological treatment plants and
- composted waste

by multiplying the respective emission factors by the waste amounts. For the projections, the same emission factors were used as those in the annual inventory (UMWELTBUNDESAMT 2011d, UMWELTBUNDESAMT 2011c).

With regard to the activity data on composted waste, it is assumed that the amount of bio-waste collected separately and home composting will increase/ decrease according to demographic developments over the forecast period. Municipal garden and park waste is expected to stay constant.

With regard to the amount of waste treated in mechanical-biological treatment plants in Austria, the following assumptions have been made:

- Until 2015, the amounts of waste treated in mechanical biological treatment plants will remain the same (as in 2009) as no further facilities are planned.
- From 2015 onwards, amounts of waste treated in mechanical biological treatment plants are expected to decrease as it is assumed that plants will close down in view of stricter regulations on waste air purification.
- In 2020 only 25% of the amounts currently treated will be subjected to mechanical-biological treatment. By 2030, no waste is expected to be treated in this way anymore. At the same time, other treatment methods such as dry stabilisation will probably gain importance.

6 REFERENCES

AMON, B.; FRÖHLICH, M.; WEIßENSTEINER, R; ZABLATNIK, B. & AMON, T. (2007): Tierhaltung und Wirtschaftsdüngermanagement in Österreich. Endbericht Projekt Nr. 1 441. Auftraggeber: Bundesministerium für Land- und Forstwirtschaft, Umwelt- und Wasserwirtschaft, Wien.

AMON, B. & HÖRTENHUBER, S. (2008): Revision der österreichischen Luftschadstoff-Inventur (OLI) für NH_3, NMVOC und NO_x; Sektor Landwirtschaft. Universität für Bodenkultur, Institut für Landtechnik im Auftrag vom Umweltbundesamt. Wien.

AUSTRIAN ENERGY AGENCY – AEA (2011): Baumann, M.; Kirchner, G. & Lang, B.: Energiewirtschaftliche Inputdaten für die Klimastrategie 2020 und EU Monitoring Mechanism 2011, Wien.

BMLFUW – Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (2004): Nationaler Zuteilungsplan für Österreich gemäß § 11 EZG, Wien.

BMWFJ & BMLFUW – Federal Ministry of Economy, Family and Youth/Federal Ministry of Agriculture and Forestry, Environment and Water Management (2010): Eckpunkte der Energiestrategie Österreich. Wien, 2010.

HAUSBERGER, S. & MACHER, T. (2008): Emissionen sonstiger mobiler Quellen Österreichs gemäß CORINAIR-Methodik für die Jahre 1990 bis 2007. Endbericht im Auftrag des Umweltbundesamt. Institut für Verbrennungskraftmaschinen und Thermodynamik der TU-Graz. Graz. (unpublished).

HAUSBERGER, S. (1998): GLOBEMI – Globale Modellbildung für Emissions- und Verbrauchsszenarien im Verkehrssektor; Institute for Internal Combustion and Thermodynamics. University of Technology Graz; Volume 71; Graz.

HAUSBERGER, S. (2010): Straßenverkehrsemissionen und Emissionen sonstiger mobiler Quellen Österreichs – gemäß CORINAIR-Methodik – für die Jahre 1990 bis 2009. FVT – Forschungsgesellschaft für Verbren-nungskraftmaschinen und Thermodynamik mbH. Erstellt im Auftrag des Umweltbundesamtes GmbH. Graz 2010.

HAUSBERGER, S. (2011): Update der Emissionsprognose Verkehr Österreich bis 2030. Erstellt im Auftrag des Klima- und Energiefonds. Graz 2011.

OECD-FAO (2010): Agricultural Outlook 2010. OECD & Food and Agriculture Organization of the United Nations.

PISCHINGER, R. (2000): Emissionen des Off-Road Verkehrs im Bundesgebiet Österreich für die Bezugsjahre 1990 bis 1999. Institut für Verbrennungskraftmaschinen und Thermodynamik TU Graz.

SINABELL F. & SCHMID E. (2005): Austrian Agriculture 2005–2020. Consequences of Measures to Mitigate Greenhouse Gas Emission. Österreichisches Institut für Wirtschaftsforschung (WIFO), Wien.

SINABELL F.; SCHÖNHART, M.; SCHMID E. (2011a): Austrian Agriculture 2005–2030. Consequences of Measures to Mitigate Greenhouse Gas Emission. Österreichisches Institut für Wirtschaftsforschung (WIFO) und BOKU Wien.

SINABELL, F.; J. BOCK-SCHAPPELWEIN, CH. MAYER, M. KNIEPERT, E. SCHMID, M. SCHÖNHART, G. STREICHER (2011b): Indikatoren für die Auswirkungen des Programms der Ländlichen Entwicklung 2007/2013 in Österreich. Studie des Österreichischen Instituts für Wirtschaftsforschung im Auftrag des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien.

TU WIEN (2011): Kranzl, L.; Müller, A.; Hummel, M. & Hass, R.: Energieszenarien bis 2030: Wärmebedarf der Kleinverbraucher. Endbericht. Energy Economics Group (EEG). Technische Universität Wien, Wien.

UMWELTBUNDESAMT & BMLFUW (2002): State of the Art for Waste Incineration Plants. Schriftenreihe, Bd. 24/2002. BMLFUW, Wien.

UMWELTBUNDESAMT (2003a): Böhmer, S.; Wiesenberger, H.; Krutzler, T.; Szednyj, I.; Poupa, S. & Schindler, I.: NO_x-Emissionen: Minderungspotenziale in ausgewählten Sektoren und Szenarien 2010. Berichte, Bd. BE-233. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2003b): Böhmer , S.; Schindler, I.; Szednyj, I. & Winter, B.: Stand der Technik bei kalorischen Kraftwerken und Referenzanlagen in Österreich. Monographien, Bd. M-162. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2003c): Wiesenberger, H.; Böhmer, S.; Szednyj, I.; Krutzler, T.; Poupa, S. & Schindler, I.: Abschätzung der SO_x-Emissionen im Jahr 2010 für Energie (SNAP 01) und Industrie (SNAP 03, 04). Berichte, Bd. BE-232. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2007): Szednyj, I. & Brandhuber, D.; Stand der Technik zur Kalk-, Gips- und Magnesiaherstellung. Reports, Bd. REP-0128. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2009a): Gallauner, T. & Böhmer, S.; Stand der Technik bei Öl- und Gasraffinerien – Referenzanlagen in Österreich. Reports, Bd. REP-0245. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2009b): Anderl, M.; Böhmer, S.; Gössl, M; Köther, T.; Krutzler, T.; Lenz, K.; Muik, B.; Pazdernik, K.; Poupa, S.; Schachermayer, E.; Schodl, B.; Sporer, M.; Storch, A.; Wiesenberger, H.; Zechmeister, A. & Zethner, G.: GHG projections and assessment of policies and measures in Austria. Reports, Bd. REP-0227. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2010a): Winter, R.: Biokraftstoffe im Verkehrssektor 2010 – Zusammenfassung der Daten der Republik Österreich gemäß Art.4, Abs.1 der Richtlinie 2003/30/EG für das Berichtsjahr 20098, im Auftrag des BMFLUW, Wien, 2010.

UMWELTBUNDESAMT (2010B): Anderl, M.; Göttlicher, S.; Köther, T.; Pazdernik, K.; Poupa, S., Purzner, M.; Stranner, G. & Zechmeister, A.: Austria's Annual Air Emission Inventory 1990–2009, Submission under the National Emission Ceilings Directive 2001/81/EC. Reports, Bd. REP-0304, Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2010c): Anderl, M.; Köther T.; Muik, B.; Pazdernik K.; Stranner, G.; Poupa, S. & Wieser, M.: Austria's Informative Inventory Report 2010. Reports, Bd. REP-0218. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2011a): Anderl, M.; Braun, M.; Böhmer, S.; Gössl, M.; Köther, T.; Krutzler, T.; Pazdernik, K.; Purzner, M.; Poupa, S.; Sporer, M.; Storch, A.; Stranner, G.; Wiesenberger, H.; Weiss, P.; Zechmeister, A. & Zethner, G.: GHG Projections and Assessment of Policies and Measures in Austria. Reporting under Decision 280/2004/EC. Reports, Bd. REP-0331. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2011b): Krutzler, T. et al: Energiewirtschaftliche Inputdaten und Szenarien als Grundlage zur Erfüllung der Berichtspflichten des Monitoring Mechanisms. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2011c): Anderl, M.; Freudenschuß, A.; Friedrich, A.; Göttlicher, S.; Köther, T.; Kriech, M.; Kuschel, V.; Lampert, C.; Pazdernik, K.; Poupa S.; Purzner, M.; Schodl, B.; Stranner, G.; Schwaiger, E.; Seuss, K.; Weiss, P.; Wieser, M.; Zechmeister, A. & Zethner, G.: Austria's National Inventory Report 2011. Reports, Bd. REP-0308. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2011d): Köther, T.; Anderl, M.; Pazdernik, K.; Poupa, S. Purzner, M., Stranner, G. & Zechmeister, A.: Austria's Informative Inventory Report 2011. Submission under the UNECE Convention on Long-range Transboundary Air Pollution. Reports, Bd. REP-0307. Umweltbundesamt, Wien.

WIFO (2011): Kratena, K. & Meyer, I.: Energy Scenarios 2030. Projecting Austrian Greenhouse Gas Emissions. WIFO, Wien.

WINDSPERGER, S. & SCHMID-STEJSKAL, H. (2008): Austria's Emission Inventory from Solvent use 2009. Institut für Industrielle Ökologie (IIÖ). Studie im Auftrag des Umweltbundesamt. Wien. (unpublished).

WINDSPERGER, S.; STEINLECHNER, H.; SCHMIDT-STEJSKAL, H.; DRAXLER, S.; FISTER, G., SCHÖNSTEIN, R. & SCHÖRNER, G. (2002a): Gegenüberstellung und Abgleich der Daten von Top-down zu Bottom-up für Lösungsmittel im Jahr 2000. Institut für Industrielle Ökologie (IIÖ) und Forschungsinstitut für Energie und Umweltplanung, Wirtschaft- und Marktanalysen GmbH (FIEU). Studie im Auftrag des Lebensministeriums und Bundesministeriums für Wirtschaft und Arbeit. Wien.

WINDSPERGER, S.; STEINLECHNER, H.; SCHMIDT-STEJSKAL, H.; DRAXLER, S.; FISTER, G., SCHÖNSTEIN, R. & SCHÖRNER, G. (2002b): Verbesserung von Emissionsdaten (Inventur und Projektion bis 2010 für den Bereich Lösungsmittel in Österreich. Institut für Industrielle Ökologie (IIÖ) und Forschungsinstitut für Energie und Umweltplanung, Wirtschaft- und Marktanalysen GmbH (FIEU). Studie im Auftrag des Lebensministeriums und Bundesministeriums für Wirtschaft und Arbeit. Wien.

WINDSPERGER, S.; STEINLECHNER, H.; SCHMIDT-STEJSKAL, H.; DRAXLER, S.; FISTER, G., SCHÖNSTEIN, R. & SCHÖRNER, G. (2004): Studie zur Anpassung der Zeitreihe der Lösungsmittelemissionen der österreichischen Luftschadstoffinventur (OLI) 1980–2002. Institut für Industrielle Ökologie (IIÖ) und Forschungsinstitut für Energie und Umweltplanung, Wirtschaft- und Marktanalysen GmbH (FIEU). Studie im Auftrag des Umweltbundesamt. Wien.

ANNEX 1: NATIONAL PROJECTION ACTIVITY DATA FROM REPORTING TEMPLATE (UNECE/EMEP 2009)

Table 9: Assumption on general economic parameters

	Unit	2010	2015	2020	2030
1. Gross Domestic Product	Value (billion €)	279.78	305.92	339.70	420.41
2. Population	Thousand people	8 388	8 556	8 726	9 021
3. International coal prices	€ per GJ	5.71	7.18	8.61	12.56
4. International oil prices	€ per GJ	10.41	13.09	15.70	22.91
5. International gas prices	€ per GJ	8.33	10.47	12.56	18.33

Table 10: Assumptions for the energy sector

	Unit	2010	2015	2020	2030
Total gross inland consumption					
1. – Oil (fossil)	Petajoule (PJ)	550.05	559.51	553.32	527.70
2. – Gas (fossil)	Petajoule (PJ)	335.53	337.53	363.19	444.74
3. – coal	Petajoule (PJ)	124.17	113.27	113.52	113.33
4. – biomass without liquid biofuels (e.g. wood)	Petajoule (PJ)	IE	IE	IE	IE
5. – liquid biofuels (e.g. bio-oils)	Petajoule (PJ)	IE	IE	IE	IE
6. – solar	Petajoule (PJ)	IE	IE	IE	IE
7. – Other renewable (wind, geothermal etc)	Petajoule (PJ)	349.77	372.77	388.54	413.35
Total electricity production by fuel type					
8. – Oil (fossil)	GWh	1 345	1 247	1 150	1 019
9. – Gas (fossil)	GWh	12 994	10 467	11 291	17 852
10. – coal	GWh	3 724	3 266	3 237	3 288
11. – Renewable	GWh	46 184	49 751	51 499	52 441

Table 11: Assumptions for the industry sector

	Unit	2010	2015	2020	2030
12. – Growth of the industrial sector in GDP	growth rate (%) per year				
Metals	%	0.04	0.04	0.04	0.04
Mineral industries	%	1.56	1.56	1.56	1.56
Paper and print	%	-0.20	-0.20	-0.20	-0.20
Chemistry	%	2.17	2.17	2.17	2.17
Others	%	2.08	2.08	2.08	2.08

Table 12: Assumptions for the transport sector (excl. fuel export)

		Unit	2010	2015	2020	2030
15.	Passenger person kilometres	million km	101.327	107 406	115 826	137 341
16.	The growth of freight tonne kilometres	million tonne	61.196	67 127	73 270	86 685

Table 13: Assumptions for buildings (in residential and commercial or tertiary sector)

		Unit	2010	2015	2020	2030
21.	The number of dwellings (permanently occupied)	1 000	3 662	3 851	4 042	4 401

Table 14: Assumptions in the agriculture sector

		Unit	2010	2015	2020	2030
23.	Beef cattle	1 000 heads	1 481	1 484	1 487	1 480
24.	Dairy cows	1 000 heads	533	541	550	544
25.	Sheep	1 000 heads	310	306	301	294
26.	Pigs	1 000 heads	2 965	2 945	2 925	2 790
27.	Poultry	1 000 heads	12 551	12 456	12 361	11 695
28.	Mineral fertiliser	t N	104 095	101 143	98 192	81 157

Table 15: Assumptions in the waste sector

		Unit	2010	2015	2020	2030
31.	Municipal solid waste disposed to landfills	tonnes	0	0	0	0
33.	Municipal solid waste disposed composted*	tonnes	148 000	148 000	37 000	0

* *residues from biological and mechanical-biological treatment plants - disposed of at landfills (no biogenic waste is landfilled directly)*

ANNEX 2: ADDITIONAL KEY INPUT PARAMETERS

Residential, Commercial & Other Sectors

Table 16: Underlying energy price development for projections "with existing measures" – residential and commercial sectors in cent/kWh.

residential sector		2010	2015	2020	2025	2030
coal	cent/kWh	3.68	3.59	3.98	4.25	4.54
wood log and wood briquettes	cent/kWh	3.56	3.64	3.75	3.88	4.02
wood chips	cent/kWh	3.08	3.15	3.24	3.36	3.48
wood pellets	cent/kWh	4.46	4.56	4.7	4.86	5.03
natural gas	cent/kWh	7.09	7.32	7.68	8.1	8.56
heating and Other Gas Oil (HEL 2007)	cent/kWh	7.88	8.23	8.77	9.41	10.1
distr. heat Vienna	cent/kWh	4.15	4.25	4.41	4.59	4.78
distr. heat Other	cent/kWh	5.37	5.5	5.7	5.93	6.18
distr. heat biomass	cent/kWh	4.77	4.89	5.06	5.27	5.49
commercial sector		**2010**	**2015**	**2020**	**2025**	**2030**
coal	cent/kWh	3.07	2.99	3.32	3.54	3.78
wood log and wood briquettes	cent/kWh	2.97	3.03	3.13	3.23	3.35
wood chips	cent/kWh	2.57	2.63	2.7	2.8	2.9
wood pellets	cent/kWh	3.72	3.8	3.92	4.05	4.19
natural gas	cent/kWh	5.91	6.1	6.4	6.75	7.13
heating and Other Gas Oil (HEL 2007)	cent/kWh	6.57	6.86	7.31	7.84	8.42
distr. heat Vienna	cent/kWh	3.46	3.54	3.68	3.83	3.98
distr. heat Other	cent/kWh	4.48	4.58	4.75	4.94	5.15
distr. heat biomass	cent/kWh	3.98	4.08	4.22	4.39	4.58

Table 17: Assumptions on subsidy rates in percent – with existing measures.

subsidy rates [%]	2010	2015	2020	2025	2030
wood log and wood briquettes	20	20	20	20	20
wood chips	20	20	20	20	20
wood pellets	23	23	23	23	23
distr. heat Vienna	15	15	15	15	15
distr. heat Other	15	15	15	15	15
distr. heat biomass	23	23	23	23	23
solarthermie	20–25	20–25	20–25	20–25	20–25
renovation measures (insulation and window)	5–15	5–15	5–15	5–15	5–15

Table 18: Assumptions for the number and size of buildings, and the number of permanently occupied dwellings – with existing measures.

Number of buildings		**2010**	**2015**	**2020**	**2025**	**2030**
residential buildings with one or two apartments	number	1 480 340	1 528 027	1 569 913	1 601 558	1 626 402
residential buildings with more than two apartments	number	196 468	202 839	208 437	212 671	215 999
commercial buildings	number	149 790	162 400	176 118	184 171	192 606
Size of buidlings		**2010**	**2015**	**2020**	**2025**	**2030**
residential buildings with one or two appartments	million m² gross floor area	250	258	265	271	275
residential buildings with more than two apartments	million m² gross floor area	162	168	174	178	181
commercial buildings	million m³ gross floor volume	164	177	191	200	209
Number of permanently occupied dwellings		**2010**	**2015**	**2020**	**2025**	**2030**
residential buildings with one or two apartments	number in 1 000	1747	1801	1848	1883	1910
residential buildings with more than two apartments	number in 1 000	1915	2050	2194	2344	2491

Agriculture

Table 19: Assumptions for macro-economic variables in the European Union, 2010–2019 (Source: OECD-FAO 2010; UMWELTBUNDESAMT 2011b).

		2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
real GDP	%	1.0	1.8	2.3	2.2	2.2	2.2	2.2	1.7	1.7	1.7
price deflator	%	0.5	0.6	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Population	%	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
GDP deflator	%	0.5	0.6	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
world oil price	USD/ barrel	80.0	82.7	85.7	88.8	92.1	95.4	98.9	102.5	106.2	110.1

Prices were derived from OECD-FAO outlooks on agricultural markets (see OECD-FAO 2010). Projections of the EU Commission (CEC 2010) show very similar assumptions about future developments of key economic indicators.

Umweltbundesamt GmbH
Spittelauer Lände 5
1090 Wien/Österreich

Tel.: +43-(0)1-313 04
Fax: +43-(0)1-313 04/5400

office@umweltbundesamt.at
www.umweltbundesamt.at

The report "Austria's National Air Emission Projections 2010" presents emission projections reported under Directive 2011/91/EC (the NEC directive), for which emission ceilings for 2010 are defined. It includes projections for the air pollutants NO_x, SO_2, NMVOC and NH_3 for the years 2010, 2015, 2020 and 2030.
The projections for NO_x show a remarkable reduction of emissions until 2030. For SO_2 no further significant reductions are expected. NMVOC emissions are projected to increase after 2010. For ammonia a further decrease of emissions in 2010 followed by a relatively constant trend is reported.
A comparison with the national emission ceiling for 2010 shows compliance for the pollutants SO_2, NMVOC and NH_3. According to the current projections, the NO_x emissions are expected to exceed the emission ceiling considerably.
The results are based on a scenario which accounts for all measures implemented before 2nd February 2010 ("with existing measures" scenario).

EMAS
Geprüftes Umweltmanagement
REG.NO. AT- 000484

ISBN 978-3-99004-145-1