GN3 Study of Environmental Impact Inventory of Greenhouse Gas Emissions and Removals – NORDUnet

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Authors:	Jørgen Moth (NORDUnet); Gina Kramer (DANTE)

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1 Introduction

1.1 The Reporting Organisation

NORDUnet is a joint collaboration of the 5 Nordic National Research and Education Networks in Denmark (Forskningsnettet), Finland (Funet), Iceland (RHnet), Norway (Uninett) and Sweden (SUNET). It operates a world-class Nordic and International network and eInfrastructure service for the Nordic research and educational community.

NORDUnet is run by NORDUnet A/S, which employs approximately 30 people at the following locations:

NORDUnet A/S (main office)	NORDUnet NOC
Kastruplundgade 22	Tulegatan 11
DK-2770 Kastrup	SE-113 53 Stockholm
Denmark	Sweden

1.2 Report Creators

This GHG report has been prepared by:

Jørgen Moth

UNI-C Lyngby

DTU building 304

Matematiktorvet

DK-2800 Denmark.

Email: jorgen.moth@uni-c.dk

Telephone: +45 3587 8963

Transportation and electrical power consumption data for the report was provided by Jørgen Quist, Chief Network Operating Officer at NORDUnet. Lars Fischer, CTO at NORDUnet supervised the collection of data.

1.3 Reporting Period Covered

The reporting period covers the period from 1st of January to 31st December 2009. Therefore, all values will be estimated:

- Office heating values are based on 2008 values.
- Values for electricity consumptions are based and extrapolated from office electricity bills, short time power consumption measurements of equipment, and equipment specifications.
- Transportation values are based on employee estimates.

2 GHG Inventory

2.1 Organisational Boundaries

The GHG emissions of NORDUnet A/S are consolidated by the control approach. They comprise the direct and indirect emissions of the offices, data centres, and network links owned or leased by NORDUnet A/S, as well as the emissions produced by business and commuting travelling by the employees.

2.2 Direct GHG Emissions

NORDUnet A/S does not own any car or other transportation vehicle or any other source of direct emission of the GHGs listed below. Therefore, the direct CO2e emission is 0.

List of GHGs:

- Carbon dioxide (CO2)
- Methane (CH4)
- Nitrous oxide (N2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexaflouoride (SF6)

2.3 Treatment of Biomass CO2 Emissions in the GHG Inventory

N/A - NORDUnet does not cause any CO2 emissions from the combustion of biomass.

2.4 GHG Removals

N/A – NORDUnet does not have any GHG removals.

2.5 GHG Sources or Sinks Exclusion

N/A – no GHG sources or sinks have been excluded from the quantification.

2.6 Indirect GHG Emissions

Indirect GHG emissions are associated with the generation of imported electricity, heat or steam.

Table 2.1 details the energy consumption of NORDUnet A/S classified and itemised into:

- Office
- Data centres
- Backbone
- Transportation

The corresponding GHG emissions, totalling 231 tons CO2e, are calculated from published emission factors for each of the three contributing GHGs:

- CO2
- CH4
- N2O

NORDUnet A/S Climate Accounting							
Accounting item	**Units**	**Supplementary information**	**CO2 factor**	**CH4 factor**	**N2O factor**	**Emission**	**Subtotal**
						(kg CO2e)	(tons CO2e)
Office	kWh/year	Office space (m2)	(g/kWh)	(g/kWh)	(g/kWh)		
Kastruplundgade 22, Kastrup, DK							
Heating	131630	630	100			13163	
Electricity	36900		456	0.13	0.008	17019	

						0	
Tulegatan 11, Stockholm, S	130	130				0	
Heating						0	
Electricity	11000		0			0	
							30
Data centre power consumption	kWh/year		(g/kWh)	(g/kWh)	(g/kWh)	(kg CO2e)	
Oslo1	20915		0			0	
Oslo2	20915		0			0	
Helsinki1	20915		200			4183	
Helsinki2	20915		200			4183	
Reykjavik	9000		0			0	
Copenhagen1	86860		456	0.13	0.008	40061	
Copenhagen2	61533		456	0.13	0.008	28380	
Stockholm1	67800		0			0	
Stockholm2	39000		0			0	
							77
Backbone	kWh/year	Length (km)	(g/kWh)	(g/kWh)	(g/kWh)	(kg CO2e)	
Norway	12437	240	0			0	
Finland	1036	20	200			207	
Sweden	79802	1540	0			0	
Denmark	37828	730	456	0.13	0.008	17447	
Germany	16064	310	590			9478	
Total Backbone Length		2840				0	
						0	
Finland (1180 km sea cable)	4327	1180	200			865	
							28
Transportation	km/year	Of this commuting (km/year)	(g/km)	(g/km)	(g/km)	(kg CO2e)	
Bus	7,822	7082	90	0.012	0.001	708	
Taxi	13210	100	199	0.003	0.002	2638	
Own car	99010	87330	175	0.025	0.002	17441	
Train	101020	88940	42			4243	
S-tog/Metro	14790	13490	0	0.000	0.000	0	
Tunnelbana	21208	18928	0	0.000	0.000	0	
Flight <800 per trip	188190	32000	160	0.000	0.005	30427	
Flight >800 per trip	368110	0	100	0.000	0.003	37173	
							93
Grand Total (kg CO2e/year)						227615	**228**

Table 2.1: NORDUnet A/S energy consumption.

2.7 Base Years

This is the first GHG report from NORDUnet A/S, covering the full year 2009. Year 2009 will serve as historical base year as well as the base-year of the GHG inventory.

2.7.1 Base Year Changes and Recalculations

This report covers 2009 by extrapolating the emission values that are known at the time of writing, to a full year. If deemed necessary, a new version will be published to recalculate the inventory when the factual values for the whole of year 2009 are available.

3 Quantification Methodologies

Only recurrent emissions are covered. No effort has been made to include carbon emissions from buildings or producing facilities and products. No direct emissions are produced by NORDUnet, as NORDUnet owns no cars or other type of direct emission sources. The indirect emissions are calculated from:

- Office emissions from heating, air conditioning and electricity.
- Data centre emissions from electricity to computers, routers, switches and cooling equipment.
- Emissions from the backbone network, including PoP equipment and optical amplifiers along the fibre stretches.
- Employee business and commuting transportation emissions.

As NORDUnet presently does not provide measuring metres on most of its equipment and facilities, the emissions from the first three areas are calculated from the bills provided by the external energy providers. Where a bill includes values of the amount of energy being supplied, that value is used for the calculation of the carbon emission, using the emission factors from the information sources specified in section 3.2. Otherwise used energy is estimated from the cost value, based on energy prices from power and heating plants.

Emissions from the fourth area are calculated from information gathered from each employee, detailing their transportation in 2009. For each means of transportation, the distance travelled is multiplied by the matching GHG emission coefficients published from the public EU and national information sources specified in section 3.2.

3.1 Change to Quantification Methodologies

N/A – no previously quantification methodologies were changed.

3.2 GHG Emission and Removal Factors

The following factors were used in calculating emissions.

Electricity Emission Factors:

- Denmark: www.energinet.dk

- Norway: http://www.regjeringen.no/en/dep/oed.html?id=750
- Sweden: http://www.energimyndigheten.se/en/
- Finland: http://www.optimalpowersystems.com/stuff/electricity_in_finland_in_2050.pdf
- Iceland: http://www.os.is/
- Germany: http://www.umweltbundesamt.de/energie/archiv/co2-strommix.pdf
- EU overview: http://www.eea.europa.eu/themes/energy/indicators

Heating Emission Factors:

- Heating Kastruplundgade office: Miljødeklaration Fjernvarme - Tårnby Kommune
- Heating Tulegatan office: http://www.fortum.se (http://www.fortum.com/gallery/pdf/fv/Miljoredovisning_Fortum_Varme_Sthlm_light.pdf)

Transportation Emission Coefficients:

- General information: http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009
- Road transport information: http://www.hvorlangtpaaliteren.dk/
- Public transport Denmark: http://www.dsb.dk/Om-DSB/Miljo/Fakta-om-miljo/
- Public transport Sweden: http://sl.se/
- Flight CO2 calculator: http://www.sas.dk/da/Om-SAS-Danmark2/Miljo/CO2-beregner/

3.3 Accuracy of GHG Emission and Removals Data

The GHG information management procedures of NORDUnet A/S are still in their infancy. Most of the current data depends on information from the energy and heat suppliers and are not verified directly by in house measurements. However, NORDUnet A/S are confident that the GHG values calculated in this report present a reasonably accurate picture of NORDUnet's current emission impact.

3.4 ISO Compliance

This GHG inventory report has been prepared in accordance with part 1 of the ISO 14064 standard.

3.5 Verification Statement

This GHG report will be submitted for external verification. As this is NORDUnet's first GHG report and the internal GHG measuring procedures are still under development, it will be submitted for a limited assurance engagement only.

Glossary

CH4	Methane
CO2	Carbon dioxide
CO2e	Carbon Dioxide Equivalence
CTO	Chief Technical Officer
EU	European Union
GHG	Greenhouse gas
HFC	Hydrofluorocarbon
ISO	International Organization for Standardization
kWh	kilowatt-hour
N2O	Nitrous Oxide
NOC	Network Operations Centre
PFC	Perfluorocarbon
PoP	Point of Presence
SF6	Sulphur hexafluoride