TOWARDS A CENTR MODEL FOR SUSTAINABILITY METRICS:

METHODOLOGICAL RECOMMENDATIONS AND BENCHMARK OF CARBON FOOTPRINT APPROACHES OF CENTR MEMBERS DNS BELGIUM, EURID, AFNIC AND THE SWEDISH INTERNET FOUNDATION

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1. INTRODUCTION

The aim is:

- to compare between the different sustainability metrics used by the four Council of European National Top-Level Registries (CENTR) members DNS Belgium (Belgium), AFNIC (France), The Swedish Internet Foundation (Sweden) and EURid (Belgium) to clear out specific commonalities and differences;
- to establish a common base-set of metrics that can be used for comparing CENTR members or assist other CENTR members into action.

The comparison is based on recent reports on environmental impact assessments of DNS Belgium, EURid, AFNIC and The Swedish Internet Foundation.

Main aspects taken in account in the comparison are: the scope and system boundaries, the impact categories and criteria-sets, the functional units and key performance indicators.

2. COMPARATIVE METHODOLOGY

The assessment of the benchmark of carbon footprint approaches is conducted through the following steps:

2.1. Analysis

The carbon footprint approach of the four organisations that are currently in use are each analysed for the following aspects:

1. Scope and system boundaries: the specific range of the organisation's activities that are taken into account for assessing the carbon footprint (scope 1, 2 and 3);
2. Impact categories and criteria-set: the activities (e.g. direct energy consumption, waste, mobility, product purchases) for which the carbon footprint is charged, determining the intended accuracy of Scope 3 emissions (indirect emissions);
3. Functional unit and KPI's: the suitable comparison basis to objectively compare the footprint with other similar organisations (e.g. footprint on an annual basis). In case of unclarity Ecolife will take contact for adding specific detailed information.

2.2. Benchmark

Ecolife will establish a benchmark of the four approaches. As mentioned, the main aspects taken into account in the comparison are: the scope and system boundaries, the impact categories and criteria-sets, the functional units and key performance indicators.

In an insightful comparison table the specific commonalities and differences between the approaches are being explained.

2.3. Recommendations

Based on the findings of the comparison we formulate recommendations for establishing a uniform carbon footprint methodology, a common scope and base-set of metrics that can be used for comparing CENTR members or assist other CENTR members into action.

3. APPROACH PER ORGANISATION

3.1. Scope and system boundaries

The aim of this study is to establish a method to quantify the carbon footprint of 1 domain name across CENTR members. Therefore it can be considered to use the ISO 14067 standard for establishing the carbon footprint of products. However, almost the entire carbon footprint of domain names is generated by the running of the CENTR organisations, for which the carbon footprint is described in ISO 14064. In order to establish a common ground carbon footprint method for the CENTR organisations, it is essential that all major contributors to generating emissions are considered. The set of important contributors is obtained by analysing the carbon footprint calculations of the CENTR organisations, as described in section 3.2, and further elaborated in section 4.

The carbon footprint consists of the on-site direct emissions of an organisation and indirect emissions outside the location of the organisation. Those indirect emissions can be caused by energy consumption both onsite and elsewhere. According to ISO standards, the carbon footprint is subdivided into three scopes, of which only Scope 1 and Scope 2 are obligatory to report in the carbon footprint analysis.

Scope 1 (direct GHG emissions) consists of all the direct greenhouse gas emissions onsite or by the cars the organisation or company owns. This involves its' own fuel consumption for heating, machinery and mobility, as well as possible leaks of cooling gases from cooling installations.

Scope 2 (electricity indirect GHG emissions) consists of the indirect greenhouse gas emissions as a result of the direct consumption of purchased electricity onsite. These indirect emissions are emissions at the electricity power plants.

Finally, Scope 3 (other indirect GHG emissions) contains all other indirect emissions, related to the production of purchased products (goods and services), the processing of waste, commuting, transport and business travel (excluding own company cars, which are included in scope 1). Based on data from many organisations that have conducted comprehensive assessments of their Scope 3 emissions, it is evident that Scope 3 GHG are by far the largest component of most organisations' carbon footprint.

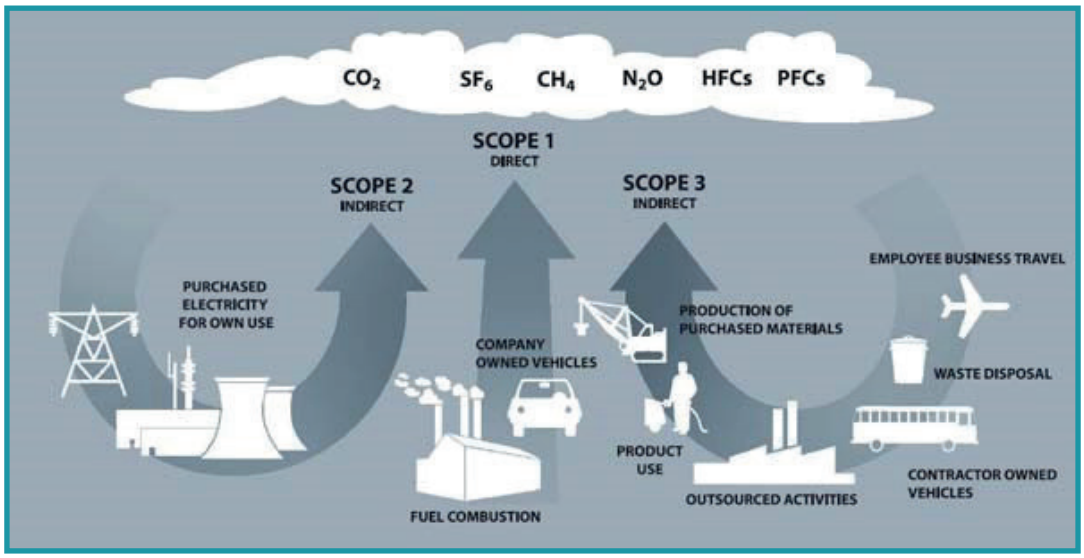

Figure 1: ISO scopes

DNS Belgium and AFNIC have included scopes 1, 2 and 3 according to ISO standards, and are as complete as data collection for each organisation allows.

In the calculation method of The Swedish Internet Foundation, it is chosen to step away from ISO standard scope definition, and instead focus on what is deemed to be important for the industry in which The Swedish Internet Foundation operates. Although the method is good for calculation of the carbon footprint of a single company, it is difficult to compare different companies using this approach.

EURid has focussed on Scope 1 and Scope 2, including only the paper use and mobility from Scope 3. Furthermore, EURid states also taking into account the use stage and end of life of the domain names. Use stage is treated as maintenance of the systems. This is not detailed in the other organisation carbon footprint analyses, but is included in the energy used, so therefore all organisations include the use stage of the domain names. The end of life considers 40 days quarantine of each domain name when it is deleted for the end user to retrieve the name if desired. Lastly, a cut-off criteria of 1% is defined that allows omission of certain processes of minor importance, which leads to a more concise report, focussing on the important contributors.

3.2. Impact categories and criteria set

Due to the nature of carbon footprint analysis, in which the organisation is free to choose which impact categories are being analysed - if Scope 1 and Scope 2 are accounted for - there are differences between each analysis. The table below shows the impact categories and activity categories that have been taken into account for each of the carbon footprint calculations of the four CENTR members.

The table clearly shows what impact categories are considered as important for the branch in which the CENTR organisations operate. It should be noted that the exclusion of an impact category can also be due to the fact that there is no activity in the relevant activity category for an organisation, e.g. if no direct emissions are produced for heating.

Impact category		DNS Belgium	AFNIC France	The Swedish Internet Foundation	EURid Europe
Energy	Electricity office	X	X	X	X
	Electricity data centre	X	X	X	
	Heating	X	X	X	X
Waste	Household waste and waste for incineration	X			
	Plastic, metal and carton (recycling)	X			
	Glass (recycling)	X			
	Paper (recycling)	X	X		
	Additional information (batteries, etc)		X		
Inputs	Printing paper	X	X	X	X
	Incoming mail	X	X		
	Meals		X		
	Services	X	X		
Mobility (commuting)	Car	X	X	X	X
	Train	X	X	X	
	Bus	X	X	X	

Business travel	Airplane travel	X	X	X	X
	Car	X	X	X	X
	Train	X	X	X	X
Capital goods	Buildings	X	X		
	Parking area		X		
	ICT-hardware	X	X	X	
	Cars	X	X		X
Transportation	Cargo ship				
	Truck		X		
Refrigerants	Cooling systems				X

Table 1: Impact categories considered per organisation

From the impact category selection of each organisation, the main conclusions for the benchmark footprint calculation are:

- Energy: Each organisation reports the energy use impact category for office operation and heating requirements. DNS Belgium, AFNIC and The Swedish Internet Foundation also report the energy use for the data centres used across the world.
- Waste: Waste treatment is partly or fully neglected in most of the carbon footprint analyses due to its minor impact.
- Inputs: The inputs that have been considered for the carbon footprint calculations of each organisation vary greatly. AFNIC reports full expenses made as a company in the inputs. For the other companies it only considers paper use or small office equipment's to run the office. Paper use is reported in great detail in each organisation, because efforts have been done in the past in order to reduce the amount of paper used.
- Mobility (commuting): Mobility is shown to be the most important contributor to the carbon footprint. Commuting is not considered in the EURid carbon footprint calculation in full, which potentially excludes a big part of the carbon footprint. Private travel with company cars is included in the DNS Belgium carbon footprint.
- Mobility (Business): As the mobility for business travels is an important part of the carbon footprint of the CENTR organisations, each company reports full business travels.
- Capital goods: As the CENTR organisations operate large amount of IT equipment, DNS Belgium, AFNIC and The Swedish Internet Foundation take into account the carbon footprint of the IT equipment into the calculation. Office space and car parking are also included included. Different countries have different policies about providing cars to the employees, and these are therefore treated differently among CENTR organisations. EURid omits Capital goods from the carbon footprint calculation
- Transportation: Transportation is limited to mail, and only reported by AFNIC.
- Refrigerants: Refrigerants from air conditioning systems are reported as the emission gases from leakages and end of life can have a great impact on the environment. Only EURid analysis considers Refrigerants impact category

3.3. Functional unit

Each organisation reports the absolute CO_2eq emission value. DNS Belgium, The Swedish Internet Foundation and AFNIC report the carbon footprint per Full Time Employee (FTE). DNS Belgium, The Swedish Internet Foundation and also EURid use 1 domain name as functional unit.

4. METHODOLOGY COMPARISON

4.1. Scope and system boundaries

Following the analysis of the four organisation's carbon footprint in section 3.2, it is suggested that the ISO scope definition according ISO 14064 is followed; including scope 1, 2 and the relevant activity categories for the registry management of scope 3. The impact category selection should be based on the important contributors within the registry management branch.

Data centres are an important contributor to the carbon footprint of the registration of domain names. The production of data centres and their operation, i.e. electricity use on the global location, should be taken into account for the carbon footprint calculation.

4.2. Impact categories and criteria-set

Each impact category has several consumption activities. For example, the impact category 'energy' consists of the consumption of fuels (e.g. natural gas) and electricity (e.g. from bio-mass). The impact category 'business travel' consists of travel by car, train, bus and airplane.

The footprint of a consumption activity is always the product of the consumption amount (e.g. kWh, kg, km or euro) and the footprint intensity (kg CO2e per kWh, kg, km or euro).

Comparison of the Carbon footprint calculations of the four CENTR organisations has allowed to compile the important impact category set for the comparison of Carbon footprint of the CENTR companies.

Impact category		Unit
Energy	Electricity office	kWh/year
	Electricity data centre	kWh/year
	Heating	kWh/year; litres fuel
Inputs	Paper	kg/year
Waste	Paper	kg/year
Mobility (commuting)	Car	Car km/year, by type of car
	Train	Passenger km/year
	Bus	Passenger km/year
Business travel	Airplane travel (exclude EU-ETS flights from compensation)	km/year, by type of flight (long, medium, short)
	Car	litres fuel
	Train	km/year
Capital goods	Buildings (optional, but required for compensation)	m^2 floor surface area
	Parking area (optional, but required for compensation)	m^2 parking area
	ICT-hardware	Euro, or number of computers and ICT-equipment
	Company cars	Amount of cars converted in weight kg
Refrigerants	Cooling systems	Cooling power (kW)

Table 2: Impact category selection

4.3. Functional unit

Ecolife proposes the use of two functional units,

1. In order to quantify CO_2eq emissions per domain name, and allowing to set sustainability goals for a domain name across CENTR members, the use of one domain name as functional unit should be used as a standard for comparison of carbon footprint between organisations.
2. For compensation purposes, the total CO_2eq emissions expressed in total weight (e.g ton) should be used as functional unit.

4.4. Activity data description

In the following sections, more detail is provided on each impact category and activity category, assumptions to be used and unit description.

4.4.1. Energy

Each organisation reports the energy use impact category for office operation and heating requirements. The electricity use of the data centres should also be included in the carbon footprint, as it is a vital aspect of operating domain names.

In order to compare the carbon footprint of the CENTR companies adequately, it is suggested to use European average emissions generated per kWh electricity purchased as the electricity emission factor, both for grey and renewable energy. A standard emission factor for datacentres should also be agreed among CENTR organisations to take into account, it is suggested to use a conversion of GigaByte used to CO_2 emissions.

Energy: Electricity

Description	The direct energy emissions from electricity (ISO scope 2) consist of the emissions at the power plants and result from the use of electricity (kWh).
Scope	Electricity consumption at all offices and data centres used.
Assumptions	• All electricity is purchased at the European average energy mix, unless otherwise mentioned. • Electricity from Renewable sources will be bought at the European average renewable energy mix • An emission factor should be agreed for electricity used by datacentres, expressed in CO_2 / GigaByte
Calculation equations	• Footprint purchased electricity = footprint intensity electricity (kg CO_2/ kWh) x kWh purchased electricity. • Footprint electricity use data centres = Amount of GigaByte used in data centre capacity x emission factor (CO_2 / GigaByte)

Energy: Heating

Description	The direct energy emissions from natural gas (ISO scope 1) result from the use of natural gas (kWh) for heating and appliances.
Scope	All offices. Heating by fuel such as natural gas as well as heat pumps.
Assumptions	Include all the natural gas and other fuels consumed for heating of office buildings.

Calculation equations	• Footprint Heating by fuel = footprint intensity fuel (kg CO_2/kWh primary energy) x kWh primary energy (thermal energy of natural gas). • Footprint other Heating = footprint intensity electricity (kg CO_2/kWh) x kWh purchased electricity for heating.

4.4.2. Waste

Waste treatment has a negligible carbon footprint for generic office work, and can therefore be neglected for the CENTR organisations' carbon footprint. However, the waste treatment of amount of paper used, as described in section 4.4.3 Input, should also be taken into account into the carbon footprint in order to get the overall carbon footprint of the paper use.

Waste: Paper use

Description	The indirect emissions (ISO scope 3) for inputs are emissions from the production of all materials that end up in the direct waste.
Scope	Volume of paper used (in kg). Including printing paper, envelopes, notebooks, flipcharts etc. Excluding incoming post.
Assumptions	It should be specified if the paper waste is recycled when put in waste.
Calculation equations	Footprint of paper waste = amount of paper (kg) purchased which is put in the waste x footprint intensity to waste treatment of the thrown paper (kg CO_2/kg material).

4.4.3. Inputs

In order to compare the carbon footprint among the company's the inputs should not be considered, because the inputs considered vary greatly between companies, and the impact category is very sensitive tot data collection methodology.

Catering services are also excluded from the carbon footprint, because there may be differences in how the companies organise lunch for the employees.

The only input to consider is paper use, which each organisation reports in detail because efforts have been done in the past to reduce the amount of paper used.

Inputs: Paper use

Description	The indirect emissions (ISO scope 3) for inputs are emissions from the production of all materials that end up in the direct waste.
Scope	Volume of paper used (in kg). Including printing paper, envelopes, notebooks, flipcharts etc. Excluding incoming post.
Assumptions	• Paper is assumed to be new, unless mentioned to be from recycled sources. • It should be specified if the paper waste is recycled when put in waste.
Calculation equations	• Footprint of production = amount of paper (kg) purchased which is not recycled when put in the waste x footprint intensity to produce the new material (kg CO_2/kg material). • Footprint of production = amount of paper (kg) purchased which is recycled when put in the waste x footprint intensity to produce the recycled material (kg CO_2/kg material).

4.4.4. Mobility (commuting)

Mobility is shown to be the most important contributor to the carbon footprint and should be taken into account for comparison between the carbon footprint of the organisations. Private travel (included in the DNS Belgium carbon footprint, excluded in the others) should be excluded.

The policies about car use differ between different countries, it is therefore suggested to exclude company cars owned by the company from the capital goods, but instead include the production of fuel and of cars in the Mobility footprint averaged per km car travelled, for all displacements performed for work purpose.

Transporting people: employee commuting

Description	The emissions (ISO scope 3) for employee commuting are direct emissions of vehicles and indirect emissions of fuel production, vehicles and transport infrastructure.
Scope	Vehicle kilometres with (electric) cars, motorbikes and electric bikes, passenger kilometres with bus/tram/subway and train. The frequency of working from home office should be taken into account. Car km's should be reported by type of car, i.e. electric car, small or fuel economic car (<120 grCO_2/km), medium car (between 120 and 180 gr/km) and large car (>180 gr/km). It should be specified if electric cars are charged at company electricity net, and the total amount of electricity used for recharging cars on company electricity net.
Assumptions	• A full-time employee is assumed to travel the national average amount of times a year the home-work distance. • The home-work distance is calculated based on the list of addresses of employees, or a relevant mobility questionnaire. • The emission factor for the distance travelled by car shall include the indirect emissions for production of fuel and production of car, averaged per travelled km.
Calculation equations	• The total distance travelled per ride per transport mode for an employee = distance per working day (based on the postal code of home address and campus site) x percentage of employees per transport mode for the corresponding distance category. • For carpooling, the distance travelled by an employee is divided by 2. • The total distance travelled per year per transport mode for an employee = total distance travelled per ride per transport mode x 2 rides per day x national average working days x percentage employment rate. • Footprint = distance travelled by transport mode (km) x footprint intensity of transport mode (kg CO_2/km).

4.4.5. Mobility (business travel)

Business travel is another big contributor to the carbon footprints of CENTR organisations. All flights should be taken into account, also the flights which fall under the European Emission Trading System, in order to map the total carbon footprint of the business travel and compare

adequately the carbon footprint of CENTR organisations.

The policies about car use differ between different countries, it is therefore suggested to exclude company cars owned by the company from the capital goods, but instead include the production of fuel and of cars in the Mobility footprint averaged per km car travelled, for all displacements performed for work purpose.

European flights should be taken into account for the calculation of the carbon footprint, even if they fall under the European Emission Trading System, but these flights should not be compensated considering that they are already compensated under the EU-ETS mechanism.

Transporting people: employee business travel

Description	The emissions (ISO scope 3) for employee business travel are direct emissions of the vehicles and indirect emissions of fuel production, vehicles and transport infrastructure.
Scope	Domestic and international travel with cars, busses, trains and airplanes. For company cars, fuel data (litres of gasoline and diesel used) should be used. If fuel data includes private transport, an assumption should be made to estimate the total business travel, excluding the private travel. If fuel data is not available, vehicle.km can be used by type of car. For flights, km's should be reported by category long (>3000 km), medium (3000 - 1000 km) or short (<1000 km) flight, and specified if business or economy class. Otherwise distances are calculated using co-ordinates of airports of cities of destination. Flights that fall under the European Emission Trading system should be included.
Assumptions	• The Stratospheric water vapor effect factor 2 is used for flights. • The emission factor for the distance travelled by car shall include the indirect emissions for production of fuel and production of car, averaged per travelled km.
Calculation equations	• Footprint cars = fuel use (litre) /footprint intensity of fuel (kg CO_2/litre). • Footprint per transport mode (other than cars) = distance travelled (km) x footprint intensity of transport mode (kg CO_2/km).

4.4.6. Transportation

Transportation is only reported by AFNIC and is limited to incoming/outgoing mail. The resulting carbon footprint is negligible. For comparison of CENTR organisations and can therefore be neglected.

4.4.7. Capital goods

As the companies operate large amount of IT equipment, it is suggested to take into account the carbon footprint of the IT equipment into the calculation, by value of IT equipment which is most comparable. Office space and car parking could be included.

Company cars are included from the capital goods, even though not all organisations own company cars. However, different organisations treat commuting and business travel different, and provision of company cars. In order to make an adequate comparison between the

carbon footprint of the CENTR organisations, if company cars are not used by the company, the production of cars is calculated in the use of cars per km, in the respective mobility impact categories, instead of calculating a separate carbon footprint for the possession of the cars. In this way the carbon footprint will be comparable between CENTR organisations, irrespective of company car policy.

The carbon footprint for infrastructure (buildings and parking areas) can be taken into account optionally for the calculation of the emissions per domain name, even though the carbon footprint of infrastructure (buildings and parking areas) is not included in many carbon footprinting standards, we suggest to consider and measure it for four reasons. First, infrastructure usually has a non-negligible share of the total footprint. Second, using a common conversion factor (kg CO_2 per m^2 floor area) for all buildings of CENTR partners, it is easy to estimate this footprint because the input data (m^2 floor area) are easily available and have to be collected only once. Third, most offices are located in urban environments, which means that efficient use of space becomes an important policy. Including the carbon footprint of buildings and carparks can stimulate a more efficient use of space. Fourth, the past emissions from the construction and maintenance of the used infrastructure are usually not yet compensated. Calculating the carbon footprint of infrastructure allows to compensate these emissions as well. Regarding compensation, it is suggested to include the emissions of infrastructure, as it is Ecolife's view that this is necessary for a company to declare it is climate neutral, for the reasons expressed above.

Capital goods: buildings

Description	The indirect emissions (ISO scope 3) for buildings are the emissions from the construction and renovation of buildings.
Scope	All offices
Assumptions	The buildings are assumed to be made of concrete. The depreciation period is 40 years, unless otherwise specified.
Calculation equations	Footprint of buildings = surface area (m^2) x footprint intensity of average office or education building in concrete (kg CO_2/m^2) / depreciation period.

Capital goods: roads and car parks

Description	The indirect emissions (ISO scope 3) for parking area are emissions from the construction and renovation of the area.
Scope	Total paved area (excluding buildings).
Assumptions	The roads and parking area are assumed to be made of bitumen. The depreciation period is 40 years, unless otherwise specified.
Calculation equations	Footprint of parking area = surface area (m^2) x footprint intensity of TC2 ('normal' parking area) bitumen (kg CO_2/m^2) / depreciation period.

Capital goods: IT

Description	The indirect emissions (ISO scope 3) for IT are emissions from the production of IT equipment.

Scope	The number (or purchased amount) of photocopiers, printers, laptops, desktops, screens and servers. The reported unit should be chosen the same for all CENTR organisations, e.g. all members should report the number of IT equipment in use, or all members should report the total cost of the IT equipment.
Assumptions	The depreciation period of computers and screens is 3 years, for photocopiers and printers 5 years, unless otherwise specified.
Calculation equations	• Footprint of IT equipment = number of items x footprint intensity (kg CO_2/item) / depreciation period. • Footprint of IT equipment = Cost x footprint intensity (kg CO_2/euro) / depreciation period.

Capital goods: vehicles

Description	The indirect emissions (ISO scope 3) for vehicles are emissions from the production of cars.
Scope	All service vehicles (company cars, vans, small trucks, trailers).
Assumptions	The depreciation period of cars is 5 years. A car weights on average 1,5 tonnes, a truck (van, trailer) 5 tonnes.
Calculation equations	Footprint of vehicles = number of vehicles x average weight of vehicle (ton/car) x footprint intensity of average car (kg CO_2/ton) / depreciation period.

4.4.8. Refrigerants

Refrigerants from air conditioning systems are reported as the emissions of fluorinated greenhouse gases from leakages and end of life. These refrigerant gases have a high global warming potential. Although refrigerants usually only have a small contribution to the climate impact of offices, they are included in most carbon footprinting standards. Therefore, we suggest to include refrigerants in the CENTR carbon footprinting methodology. As data centres require more cooling, refrigerants can have a strong contribution to the carbon footprint of data centres and therefore should be taken into account, using a uniform conversion factor (kg CO_2-equivalents per kWh or gigabyte) for all CENTR partners.

Refrigerants

Description	The direct, non-energy emissions (ISO scope 1) consist of leaks of greenhouse gases (Kyoto halocarbons) of cooling installations during operation.
Scope	List of 170 cooling installations for air conditioning.
Assumptions	• The cooling installations use six Kyoto halocarbon cooling gases: R22, R134a, R404a, R407c, R410a and R507. • Refrigerants for datacentres should be uniformly agreed at a CO_2/GigaByte among CENTR organisations

Calculation equations	• Footprint (per type of cooling gas) = cooling power (kW) x expected emissions during operation per cooling power (kg cooling gas/kW) x footprint intensity of cooling gas (kg CO_2-equivalents/kg cooling gas). • Expected emissions during operation per cooling power (according to the Bilan Carbone® module) = 0,3 kg cooling gas per kW cooling power x 10% annual leakage. • Footprint refrigerants for datacentres = power consumption of datacentres x CO_2/ GigaByte rate agreed among CENTR organisations

4.5. Emission factors

In order to compare the carbon footprint between each organisation, standardised emission factors should be used. Only when the carbon footprint of each CENTR organisation is using the emission factors from the same source, they will be accurately comparable.

The EcoInvent database (www.ecoinvent.org) contains a full set of emission factors, and it is updated regularly with new life cycle analysis results. The emission factors from this database can be used for the benchmarking of the carbon footprint of CENTR organisations.

Another example of a standardised set of emission factors that can be used for the calculation of the carbon footprint is the industry standard Bilan Carbone® calculation method. The Bilan Carbone® methodology (www.associationbilancarbone.fr), developed by the Association Bilan Carbone® (ABC), is used in many Western European countries and can be considered as the reference methodology for calculating the carbon footprint of companies and regions. The Bilan Carbone® methodology conforms to the ISO standards and the Greenhouse Gas Protocol.

The Bilan Carbone® method is especially suitable for comparing organisations from different countries, as it takes into account the difference in energy production and average commuting emissions for each country. In the instance where Bilan Carbone® omits an emission factor of a product or activity, CENTR organisations should agree on the use of an additional emission factor for this product or activity.

5. RESULT COMPARISONS

5.1. Carbon footprint results for the CENTR organisations

The table below shows the results of the carbon footprint analyses of the CENTR organisations for reference year of 2018.

	DNS Belgium	AFNIC France	The Swedish Internet Foundation	EURid Europe
Total footprint (2018)	213 tons CO_2e	867 tons CO_2e	178 ton CO_2e	135 tons CO_2e (+ 21 tons for aircraft)
Footprint per domain name (2018)	130 grams CO_2e	252 grams CO_2e	80 grams CO_2e	37 grams CO_2 (+ 6 grams for aircraft)

Table 3: Comparison of carbon footprint of four CENTR members for year 2018

5.2. Result analysis

The large differences between the reported CO_2eq values, 37 to 252 gram CO_2eq per domain name, are mainly due to the difference in the selection of impact categories between the CENTR members involved.

The results are therefore not comparable. The main differences between the CENTR organisation carbon footprint calculation approaches are:

	Impact categories	Emission factors
DNS Belgium	• Energy use • Waste • Inputs • Mobility (Commuting) • Incl. private transport • Mobility (Business Travel) • Capital goods	Bilan Carbone®
AFNIC France	• Energy use • Waste • Inputs • Mobility (Commuting) • Mobility (Business Travel) • Capital goods • Transport	Bilan Carbone®

The Swedish Internet Foundation	• Energy use
	• Inputs
	  • Only paper use
	• Mobility (Commuting)
	• Mobility (Business Travel)
	• Capital goods
	  • Only IT equipment
		Relevant Emissions Factors selected from reference studies

EURid Europe	• Energy use
	  • Excluding Data centres
	• Inputs
	  • Only paper use
	• Mobility (commuting)
	• Mobility (Business Travel)
	• Refrigerants
		IPPC 2017

Table 4: Overview of differences in impact categories and emission factors

By using the standardised impact category selection as described in section 4, and a standard emission factors set, a comparison between the carbon footprint of the CENTR organisations will become feasible.

6. RECOMMENDATIONS

Ecolife recommends the use of **two carbon footprint indicators**.

- The first measures the amount of carbon emissions (kg CO_2eq) per domain name. This indicator can be used for internal policy, e.g. to set emission reduction targets, and external communication. It is in line with e.g. ISO-standards and hence excludes some impact categories such as the footprint of infrastructure (the construction and maintenance of buildings and parking areas), but includes European flights (as this impact category is suitable for policy).
- The second footprint indicator measures the total amount of carbon emissions of the organisation (not per domain name), and can be used for carbon offsetting (CO_2-compensation). This indicator excludes European flights, because these carbon emissions are already paid for in the EU-ETS system, but includes infrastructure, because past emissions related to construction are still important contributors to climate change and can be compensated.

By using a **standard impact category selection** as described in section 4.2 and in the table below, the carbon footprint results of the CENTR organisations can be validly compared because the same emission data are included. The emission data included is selected on the ISO scope definitions, as well as on the previous analyses by the CENTR organisations to identify the important impact categories.

Impact category		Unit
Energy	Electricity office	kWh/year
	Electricity data centre	kWh/year
	Heating	kWh/year; litres fuel
Inputs	Paper	kg/year
Waste	Paper	kg/year
Mobility (commuting)	Car	Car km/year, by type of car
	Train	Passenger km/year
	Bus	Passenger km/year
Business travel	Airplane travel (exclude EU-ETS flights from compensation)	km/year, by type of flight (long, medium, short)
	Car	litres fuel
	Train	km/year
Capital goods	Buildings (optional, but required for compensation)	m^2 floor surface area
	Parking area (optional, but required for compensation)	m^2 parking area
	ICT-hardware	Euro, or number of computers and ICT-equipment
	Company cars	Amount of cars converted in weight kg
Refrigerants	Cooling systems	Cooling power (kW)

Table 5: Impact category selection

It is suggested to use **a standardised set of emission factors**, such as found on EcoInvent or Bilan Carbone®. Only if the standardised emission factor set misses the relevant emission factor, an additional agreed emission factor between CENTR members should be used.

The **domain name should be used as a functional unit** due to the nature of the CENTR business. If desired, FTE can used as a functional unit in addition, because it is a commonly used functional unit for the running of an office.

Regarding **compensation**, all emissions should be taken into account except for the European flights that fall under the European emission trading scheme EU-ETS mechanism, as well as the energy consumption of datacentres and emissions generated by the refrigerants of datacentres. The office space and car parks should be included in the carbon footprint to be compensated, even if it is not included in the carbon footprint calculated per domain name. In Ecolife's view, this is necessary for a company to declare its climate neutrality.

7. PRESENTATION ECOLIFE

Ecolife is the centre of expertise for footprinting and ecological behavioural change. Ecolife supports governments, organisations and companies to achieve their ecological objectives.

Ecolife develops tools and scans for impact measurement and coaches change processes within organisations with its' different stakeholders. Ecolife develops sustainable campaigns and organises sustainability workshops.

- Footprinting: Impact assessment of organisations and events: We offer insight into the environmental impact of your organisation and activities and show how you can create sustainable quick wins and longer term wins. We support you to get started with these results, focused on longer term environmental targets.
- Coaching: Inspiring and guiding organisations: We inspire and guide local authorities and organisations to clarify their sustainability mission, to implement sustainable actions and measures, all through involving staff and different stakeholders in the process.
- Supporting campaigns: We develop awareness campaigns together with staff and stakeholders to put sustainability on the map even more and better within your organisation.
- Workshops on sustainability: We have a range of workshops to help target groups get acquainted with themes as climate change, energy and water saving and waste prevention.

Ecolife has an extensive expertise in ecological impact measurement through instruments as carbon, ecological and water footprints. Ecolife ties in with international networks as Global Footprint Network and Water Footprint Network.

In 2011 Ecolife acquired Bilan Carbone® certification through the Association Bilan Carbone (ABC). Ecolife uses the latest Bilan Carbone® version which contains the most recent parameters compatible with ISO 14064 and the GreenHouseGas (GHG) protocol.

The calculations are made in accordance with the Bilan Carbone® methodology. The Bilan Carbone® method is a standardised method for mapping the carbon footprint of an organisation. This carbon footprint measures the direct and indirect emissions of greenhouse gases (CO_2, N_2O, CH_4 and fluorine gases). The direct emissions consist of own emissions, mainly from transport and heating. Indirect emissions relate to electricity consumption, purchase and waste management.

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