

Arup Netherlands  
**CO2 Performance ladder**  
Carbon footprint report 2015

Requirement 3.A.1 CO2 Performance ladder

Issue | 3 September 2015

This report is a draft version. After official external verification and corrections the report will be made final and communicated.

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# Document Verification



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# 1 Introduction

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At Arup, we aspire to have a positive influence on the world, so sustainability is at the heart of our work. We believe that delivering sustainable outcomes for both current stakeholders and future generations will make our business stronger in the long run.

To comply with Arup's global sustainability strategy, policy and regional plans, Arup Netherlands is committed to promote environmental awareness within its circle of influence. Measuring and reporting of our carbon footprint is a fundamental first step in our action cycle.

To comply with our 'CO2 Performance ladder' certification, our footprint is reported every half a year. This report is updated every period.

## 1.1 Arup Netherlands (Arup b.v.)

Established in Amsterdam in 2001, Arup in the Netherlands comprises consultants in all aspects of building and infrastructure design. The firm is active in three main sectors:

- Infrastructure design,
- Buildings and consultancy,
- Business services.

## 1.2 Organisational boundaries

Arup Netherlands is registered as Arup b.v. in the Dutch '*Kamer van Koophandel*'. To account for the carbon emissions related to Arup Netherlands, the organisational boundaries of Arup b.v. were determined according to the "GHG-protocol method" as described in the '*Handboek versie 2.2*' published by SKAO in April 2014.

Our business practice and financial capacity is contained within the boundaries of our organization. There are no sub-companies operating under the control of Arup b.v.

Arup b.v. is organized as a matrix with four cost-centres clustering projects by sector of practice and three functional leaders. The matrix is headed by the Group Leader. See figure 1.

## 1.3 Responsibility

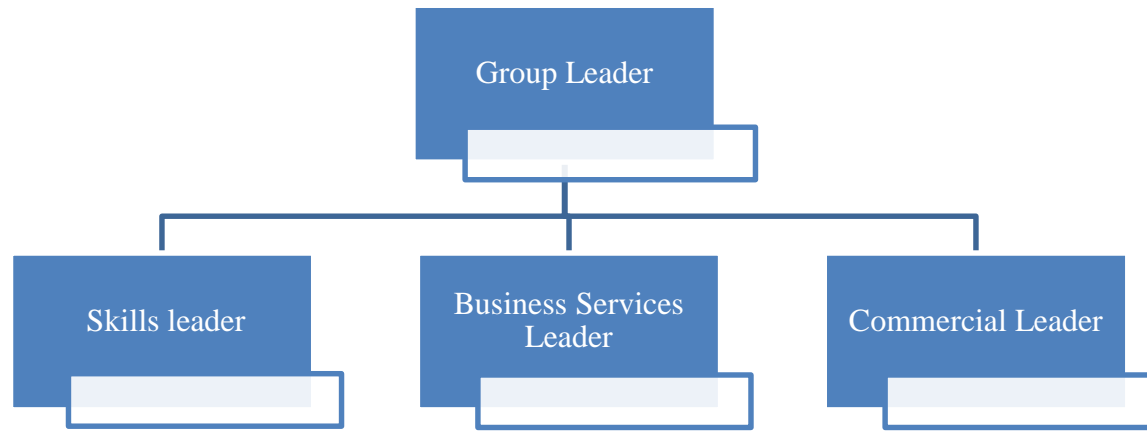


Figure 1: Management Executive team of Arup b.v.

## 1.4 Reporting method

The ISO norm 14064-1 is taken as a guideline for this report. The relevance, transparency, completeness, consistency, accuracy and transparency are key aspects on which the inventory of our footprint is evaluated and constantly improved.

## 1.5 Conformity ISO-14064-1 for footprint 2013

This report is written according to the requirements of ISO 146064-1 on GHG-emissions reporting. These reporting requirements are respected for both the footprints of 2013,2014 and the first half of 2015. The footprint of 2013 will be used for the verification by an external party (DNV.GL) of our procedure according to ISO 146064-1. This verification is valid during the certification period (2013-2016) assuming no modifications will be made to the initial (2013) footprint calculation method.

To enable the verification of this document, the reporting requirements of ISO-14064-1 are referenced in this report as follows :

<b>ISO- 14064-1</b>	<b>Report section/ Remark</b>
Description reporting organisation	1.1
Responsibility	1.3
Reporting period	1.6
Organisational boundaries	1.2
Direct emissions in ton CO2	3.1 scope 1
CO2 emission related to biomass	None
Direct GHG removals	None
Excluded GHG emissions	All scope 3 other than commuting and paper. Business travel with public transportation is considered scope 2.
Indirect emissions	3.1
Base year	2.3
Reference to base year data	3.1 and 3.2
Quantification methods and explanation	2.1
Change in quantification method	2.1.4

Reference literature conversion factors	SKAO handbook version 2.2 edition April 2014 SKAO handbook version 3.0 edition June 2015
Description influence uncertainties in quantification on accuracy	2.2
Declaration conformity ISO 14064-1; Statement on accuracy level and verification on the inventory	1.5 It will be certified with a limited level of assurance by DNV. GL.

## 1.6 Reporting period

This report contains two footprints calculated using two versions of the SKAO Handbook and each covering the following time-periods:

- January until December 2013
- January until June 2014.
- July until December 2014
- January until June 2015.

## 1.7 Operational boundaries

Arup b.v. is responsible for the carbon emission related to all activities and projects that are under its direct **operational control**<sup>1</sup>.

In terms of facility related GHG-emissions, two facilities were occupied by Arup b.v. with different levels of control and operational rights, depending on the rent conditions.

The facilities are listed below, specific to the type and function of each:

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<sup>1</sup> Operational Control: as defined in the 'Corporate Accounting and Reporting Standard', a company has operational control over an operation if the former or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation

Facility location	Type	Address
Amsterdam	Permanent facility	Naritaweg 118, Amsterdam
Groningen	Project office for P500 project	Boumaboulevard, Groningen

The consolidation method applicable over the GHG-emissions reporting period for each of the facility is as follows:

Facility location	Consolidation	Notes
Amsterdam	Equity share	<p>Arup b.v. rents 3 sections of office space within a multi-storey office building. Arup has limited operational control over the building.</p> <p>The energy suppliers were not chosen by Arup b.v.</p> <p>HVAC systems are centrally controlled for the whole building. Arup b.v. has limited control over the office climate.</p> <p>Furniture, lighting and all operational devices are property of Arup b.v.</p>
Groningen	Equity share	<p>Energy suppliers, furniture, lighting devices were not chosen by Arup b.v.</p> <p>Office specific devices such as computers and printers are property of Arup b.v.</p>



## 2 Method, Scope & Assumptions

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### 2.1 Quantification of GHG emissions

#### 2.1.1 Identification of GHG emission sources

Since our activities are design-related and without direct production activities, our energy consumption doesn't diverge from the standard average office. Travelling causes GHG emissions related to our business activities, either all modes of business travel or commuting travel. Next on the list of important missions is paper consumption.

The identification of our GHS emissions is further specified in detail in:

- Energy evaluation reports, according to SKAO handbook 3.0 (June 2015), specifying the energy types used in facilities, and consuming devices and services (lighting, IT, coffee machines, printers, etc.) ( Energy Audit report Amsterdam, October 2015, Energy Audit report Groningen September 2014, Energy Evaluation report October 2015)
- Mobility survey analysis reports indicating the modes of transport for our business travel and commuting. This mobility survey was done in July 2014. The outcome and results are kept under the responsibility of the office management team.
- Reports of the travel agency indicating business air travel booked as well as travel made by high –speed train.
- Records of declared travel expenses.
- Fuel consumption reports of lease companies used by Arup b.v..

## 2.1.2 Identifying energy consumption sinks

The energy consumption sinks are identified as a category of energy consumption in the facilities. The office keeps track of all electronic devices that are used through its IT unit.

## 2.1.3 Quantification method

The selected quantification method is a **combination of measurement and calculation.**

The measurement is related to:

- Monthly energy consumption for the building in which our office in Amsterdam is located.
- The actual average mileage of the leased cars was used up to the first half of 2014 to estimate the footprint of the business travel by lease cars. With effect from the second half of 2014 the calculations are based on the actual fuel consumption for each car. This is an improvement on the accuracy of our calculated footprint and complies with the recommendations made by the certified DNV.GL in October 2014 in '*Verificatie emissie inventaris 2013 Arup b.v.*', Barendrecht, 14 October 2014. (requirement 3.A.2 SKAO handbook 3.0 June 2015 and version 2.2 April 2012) .

The calculation method includes the following aspects:

- Facility-specific correlation in terms of calculating the share of Arup b.v. in the total energy consumption of the building based on the percentage of the surface occupied by Arup b.v. of the total surface of the building.
- (Generic) office facility related correlation for the site office in Groningen due to lack of facility-specific information.
- GHG activity data:
  - o Business travel by air administered by the travel agency,
  - o Commuting mileage done with lease cars,
  - o Business travel on public transport,

- Business travel in company lease cars, ,
  - Business travel by private cars, deduced from declared car mileage,,
- GHG activity data related to commuting by private cars or public transportation for 2014. We have assumed that the same figures apply in 2015. In 2016, we expect to update these data by means of a similar travel survey. Additionally we are preparing tests with electronic recording of expenses, allowing more reliable data collection (Concur)

#### 2.1.4 Change in quantification method

##### 1) Lease cars

The actual average **mileage** recorded by the company cars was used until the first half of 2014 to estimate the footprint of our business travel by lease cars. Starting the second half of 2014, the calculations are based on the actual **fuel consumption** recorded for each car. This is an improvement of the accuracy of our footprint and meets the recommendations made by the certified DNV.GL in October 2014 (requirement 3.A.2 SKAO handbook 3.0 June 2015 and version 2.2 April 2012). See recommendation on page 10 of the report ‘*Verificatie emissie inventaris 2013 Arup b.v.*’, 14 October 2014 .

##### 2) Commuting share in lease mileage

##### 3) Correction factor applied to Energy consumption Groningen/ Amsterdam per employee

#### 2.1.5 Identified GHS-emissions according to scope

This inventory reports on the carbon footprint according to the level of control by Arup b.v.. Direct emissions are fully under the control of the company. Indirect emissions are partially controlled (scope 2) or beyond immediate control of the company, but are part of the GHG emissions produced along its value-chain and are considered important enough to be taken into account (scope 3).

##### Direct emissions

Scope 1: Business travel by lease cars.

### **Indirect emissions**

Scope 2: Facility energy consumption, business travel (air, private car and public transport),

Scope 3 (up-stream): paper use, commuting travel done on public transport, private cars and lease cars.

## **2.1.6 Selection and Collection of Data for Calculated Quantification**

The main sources of data used to calculate the GHG emissions, are:

- Financial records of travel expenses by private cars.
- Records kept by the car-lease companies for actual mileage of the cars leased by Arup b.v and actual fuel/ energy consumption (starting the second semester of 2014).
- Mobility survey of 2014 (preferences of transport modes and frequency of use, average distances for commuters, frequency of travel and destinations)
- Surveys on types of private cars, types of fuel and consumption rates and classes. (2014)
- Air –travel data delivered in details by travel agency, mileage per trip, airline and cost.
- Travel by high-speed train by destination and cost recorded by the travel agency.
- Publically available data on distances by railway between two destinations (online-calculators).

The following table explains the data that was necessary for each of the calculation of each of the GHG emissions, collection of data and the assumptions taken upon each aspect in case of lack of more detailed information:

Aspect	Source data/ Assumption
Total surface facility	The area occupied by Arup b.v. is based on the rent contract, plus a portion of the shared space of the building as well calculated by the building owner/operator.
Number of employees	The number of employees working for Arup b.v. under direct employment contracts as well as under secondment conditions, both full- and part-time and free-lancers. Data delivered by Human Recourses. The data might have changed during the reporting period of each of the quantified footprints.
Lease cars mileage total	The lease cars have a maximum annual mileage. The actual mileage can be tracked through the lease company records. The information used in our calculation is taken as an average mileage per car based on the total actual mileage of all lease cars in 2013 and the first half of 2014. Starting the second half of 2014, the actual fuel/energy consumption per car is recorded and reported.
Facility energy consumption	The facility operated by Arup is part of a building managed by an external party (owner). The choice of energy provider is not ours to make. Energy use is measured separately for each unit. The consumption of each organisation is calculated based on these measurements and the relative share in common spaces and facilities (entrance hall, hall ways and lift).
Business air travel	The business air travel of Arup is managed by an external travel agency. The inventory accounts for business travel booked for Arup's employees or externals..

Business travel by private cars

The calculation of the carbon footprint due to business travel done with private cars is based on the mileage claimed on expense reports. The distribution of the mileage according to the car type and energy category is based on information resulting from a mobility survey done by Arup b.v. in July 2014 . The survey gives an indication of the type of private cars used for business travel according to the fuel used and their consumption rate. An equivalent conversion factor is calculated based on an average of all cars for each fuel type.

Business travel by public transportation

The business travel done on public transport is calculated from percentages of use of different transport modes for business travel. The starting point for quantification of mileage for each transport mode is the declared mileage by car and the total mileage done for business by lease cars.

Commuting travel

The emissions related to commuting travel is based on four main components:

- Distribution of commuting distances based on home address.
- Frequency of use of each transport mode for each distance-category /average distance based on a mobility survey in 2014
- Estimation of number of journeys for each employee based on occupancy level at the office.
- Survey on the standard commuting distances for lease car holders.

Occupancy level

Based on random counts on different days of the week and extrapolation of the daily occupancy level on a standard non-holiday week.

## 2.1.7 Calculation methods

### GHG emission

### Quantification method

Facility energy consumption Amsterdam

= Total measured energy (kWh/Gj) x % Arup floor space

Business air travel

= Total Mileage/ Category distance ( $\leq 700$  km,  $> 2500$  km, etc.)

Business travel by private cars

= Total declared mileage x Average Conversion factor / fuel type

Business travel by public transport

= Mileage done/ transport mode (TM) x conversion factor TM

Energy Groningen facility

= Energy consumption /work spot /month Amsterdam x Number of work spots Groningen/ month

Mileage/  $TM_i$

= Average commuting distance  $j$  x % commuters distance  $j$  who choose Transport Mode  $i$

Average Conversion factor / fuel type

$$\sum_i^n \text{conversion factor } car_i \times \text{use factor } car_i / \sum_i^n \text{use factor } car_i$$

## 2.2 Uncertainties

Aspect	Uncertainty/ influence
Accuracy of the survey outcome and its effects on extrapolation	The reply rates of survey was about 50 - 60%. So there is an uncertainty about the distribution of transport modes for business travel and commuting travel. The uncertainty related to this aspect influences the real distribution of distances travelled on each transport mode.
Business travel by private cars	The average car emission factor is calculated based on the data of cars belonging to employees who were present on the day of the survey and said to do business travel with that specific car. The number is considered to be valid because of the high occupancy of the office on that specific day.
Business travel by public transport	The response rate of the Mobility survey was 50 - 60%. %. Still, the outcome was considered accurate enough. Further random verifications on much smaller scale indicated that the outcomes were representative.
The energy consumption in the rented work sport in Groningen	Lack of building specific data was compensated by use of the data related to the consumption in the facility in Amsterdam as an indication. The <u>consumption/ month/ employee was multiplied by two</u> , due to the fact that; the heating system in Groningen was fully electric and because the office might be less energy efficient compared to the office in Amsterdam.
Commuting travel	Occupancy level per week is taken as indicator to take into account the fact that not all employees commutes every day due to limited working days per week/ or two weeks. This indicator is based on survey. The outcome is considered representative for the average week.



**Gas / electricity**

Due to the fact that Arup b.v. shares the office building with other companies the data provided by the building operator is based on the consumption data of the whole building. This introduces an uncertainty about the real consumption rates in our offices.

**Lease car**

The uncertainty due to averaging mileage of all cars has been improved by basing the calculations on actual energy/fuel consumptions registered during each reporting period.

The share of commuting travel in the total fuel consumption of lease cars

Based on the survey made in 2014 prior to the initial certification CO2 Performance ladder, it would seem that 12.5% of all travel done in lease cars is for commuting purposes. This share should be excluded from the related carbon emission category.

## 2.3 Base year:

- For scopes of emissions 1 and 2, the base year is 2013.
- For scopes 3, the reference year is 2014, in which reporting on this scope of emissions has started.

### 3 Footprint update and reference year

#### 3.1 Based on conversion factors SKAO 2.2 April 2014

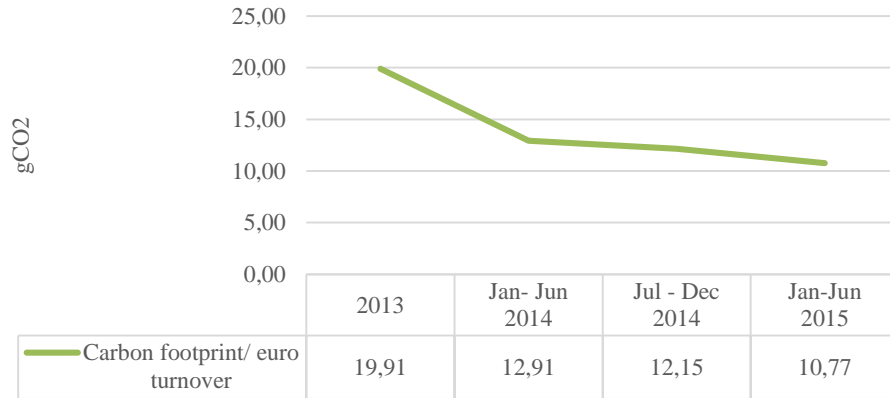
		2013	2014			2015
		Whole year	Jan- Jun	July - Dec.	whole year	1st sem.
Carbon footprint Scope 1 [ton CO2]	Business lease travel	67,8	52	58,2	110	53
Carbon footprint Scope 2 [ton CO2]	Business travel by private car	20,3	10,1	9,0	19	19,7
	Business air travel	108,2	87,6	132,0	220	95,3
	Business travel by public transportation	29,4	22,5*	20,0	42	24
	Electricity	52,4	44,8	56,9	102	56
	Heating	4,7	1,9	1,8	4	2,4
Carbon footprint [ton CO2]	Scope 1	68	52	58,2	110	53
	Scope 2	215	167	220	387	199
	Scope 1 & 2	283	219	277,78	497	252,26
Air travel [km]	< 700 km	146.212	12.184	66.146	78.330	87.723
	700 km >; <2500	227.698	18.975	417.424	436.399	218.861
	2500<	171.593	14.299	226.796	241.095	206.102
Business mileage [km]	Public Transport	393.982	353.976*	328.518	682.494	469.348
	private cars	108.266	51.565	57.271	108.836	108.885
	lease car	488.121	276.952	247.619	524.571	302538
Average number of employees	Employers number by end term	157	215	251	233	254
Turnover in Euros		€ 14.519.000	€ 17.324.000	€ 23.606.000	€ 40.931.000	€ 24.384.000

### 3.2 Based on carbon emission factors SKAO 3.0 June 2015

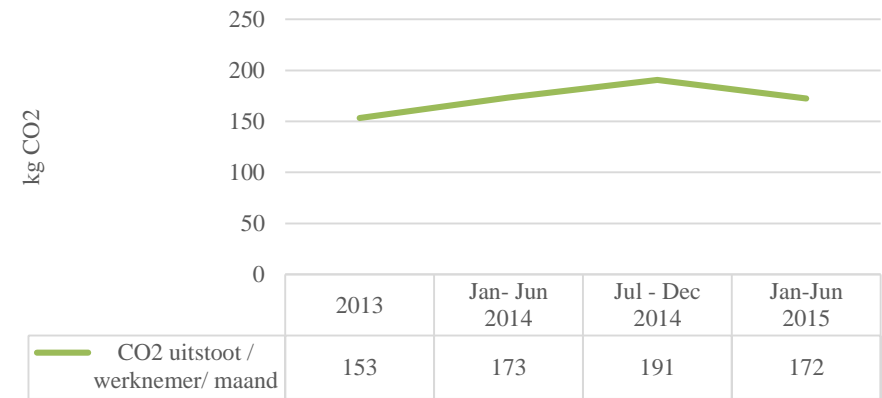
		2013	2014			2015
		Whole year	Jan- Jun	July - Dec.	whole year	1st sem.
Carbon footprint Scope 1 [ton CO2]	Business lease travel	68,9	52,9	60,2	113	57
Carbon footprint Scope 2 [ton CO2]	Business travel by private car	20,8	10,3	9,2	19	20,2
	Business air travel	114,2	91,7	136,5	228	100,1
	Business travel by public transportation	19,8	15,1	13,5	29	16
	Electricity	60,6	51,8	65,7	118	67
	Heating	4,7	1,9	1,8	4	2,4
Carbon footprint [ton CO2]	Scope 1	69	52,9	60,2	113	57
	Scope 2	220	171	226,7	398	205,5
	Total scope 1 & 2	289	224	286,9	511	262,7
Air travel [km]	< 700 km	146.212	12.184	66.146	78.330	87.723
	700 km >; <2500	227.698	18.975	417.424	436.399	218.861
	2500<	171.593	14.299	226.796	241.095	206.102
Business mileage [km]	PT	393.982	353.976	328.518	682.494	468.249
	private cars	108.266	51.565	57.271	108.836	108.885
	lease car	488.121	276.952	247.619	524.571	302538
Average number of employees	Employers number by end term	157	215	251	233	254
Turnover in Euros		€ 14.519.000	€ 17.324.000	€ 23.606.000	€ 40.931.000	€ 24.384.000

### 3.3 Comparison emissions scope 1 and 2 to base year 2013

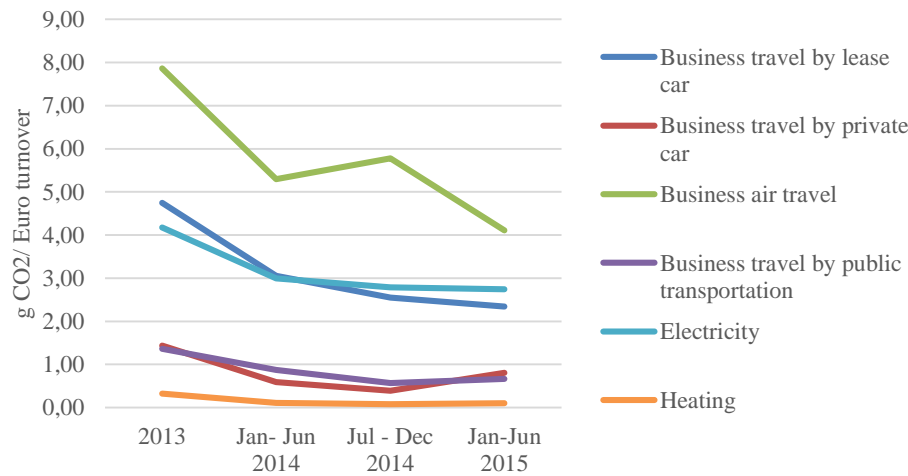
Carbon footprint/ euro turnover



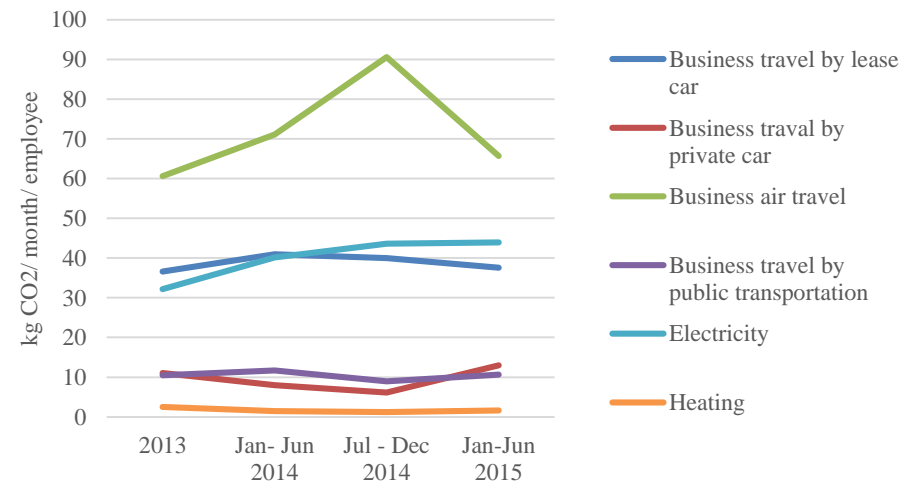
Carbon emission/ employee/ month



Carbon footprint gCO2/ Euro turnover



Average carbon footprint/ month/ employee



## 3.4 Reduction percentages carbon emissions scopes 1 & 2

### 3.4.1 Carbon footprint / employee

Carbon Footprint / employee		2014 compared to 2013	2015 compared to 2014
Carbon footprint Scope 1 [kg CO2]	Business travel by lease car	11%	<b>-7%</b>
Carbon footprint Scope 2 [kg CO2]	Business travel by private car	-36%	<b>84%</b>
	Business air travel	33%	<b>-19%</b>
	Business travel by public transportation	-2%	<b>3%</b>
	Electricity	30%	<b>5%</b>
	Heating	-46%	<b>20%</b>
Scope 1 & 2		19%	<b>-5%</b>

## 3.5 Analysis

### 3.5.1 Carbon footprint per employee

Based on footprint results per employee, a significant increase occurred in business air travel and electricity consumption in 2014. The first is explained by an immediate business need and lack of alternatives for that particular destination (Istanbul). The second is suspected to be due to higher temperatures during 2014. The higher need for cooling in combination with the relatively poor performance of the cooling system in the building has probably led to a higher electricity consumption. In the Energy Report for 2015 a ‘climate survey’ was announced to deal with this problem. No specific measurement has been done to support the above presented explanation for this increase in Energy consumption.

In 2015, business car travel showed an increase. In the yearly ‘Energy management plan & Evaluation’ report of 2015, the lease car fleet was analysed to identify the main source / reason for this increase. The least energy efficient cars were identified according to their importance/ participation in the total car travel related carbon emissions. Our lease car fleet did not increase in numbers. The mileage was higher than the previous year.

Figure 1: Average recorded temperatures in Netherlands

The global results based on the carbon footprint per employee show positive results over 2015 for air travel and lease car travel. Despite the increase in business car travel by private car and energy consumption, the overall performance is positive. -5% has been achieved on the total footprint of scopes 1 and 2. An alternative is to measure GHG against turnover shows a higher reduction -14 % per euro turnover. In this way the embedded carbon in each Euro of turnover is determined.

### 3.6 Performance and feasibility Reduction Goals

Aspect	Goal	Result / Progress by 21-08-2015
<b>Carbon reduction scopes 1 &amp; 2</b>	-3% 2015	<ul style="list-style-type: none"> <li>-5 % on carbon emission by employee per month in the first half 2015 compared to 2014, +19 % in 2014 compared to 2013.</li> <li>-14 % on carbon emission/ euro turnover</li> </ul>
<b>Communication carbon footprint</b>	Internal and external 2 x per year	100 % , completion, 1 <sup>st</sup> report published June 2015. Second plan done in September 2015. Publication online in September.
	Implementation Arup's Office Real-time	<b>Not accomplished.</b> Amsterdam participated in the 'Arup Hack-Day'. Action not finished due to lack of funds.

#### 3.6.1 Sensitivity to uncertainties business travel by public transport

The uncertainty about the real mileage made by business travel might lead to a fictive increase of the calculated carbon emissions if the business car travel increases. These two quantities are assumed to be linearly correlated. Only business car travel is measured and recorded. In order to estimate the effect of this uncertainty about the quantification of the total footprint of scopes 1 and 2, a scenario in which business travel is de-coupled from business car travel and is assumed to have remained constant over 2014 and 2014 on average by employee is calculated. The results show the difference between the two assumption is 2 % on the total 1 and 2 emissions.

### 3.7 improvement measures

- Record actual business travel made on public transport to reduce uncertainty. This uncertainty might have led to a fictive increase of the total footprint, since travel on public transport is assumed to be linearly related to business travel by car.
- Improve energy performance of lease cars. The lease car fleet can gradually improve in terms of energy efficiency by restricting new lease cars to the best alternatives with regard to fuel economy. The use of alternative energy sources can be further investigated.
- Incorporate declaration purpose of travel in lease car use to better relate the recorded mileage to business, private or commuting purposes.

### 3.8 Document maintenance

This document is updated with the half-yearly footprint calculations. Internal and external communication of the footprint is based on the outcome of measurements and calculation as described in this report.