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CO2 EMISSION REPORTING SCOPE 3
Sustainable Business Travel starts with visibility

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Sustainable Business Travel starts with visibility

To combat global warming, we have to make different choices than we have made recently. The current economy focuses on the use of fossil fuels and creates a mountain of waste of valuable raw materials, which is inefficient and especially harmful to our living environment. In the 2015 Paris climate agreement, 195 countries signed to be CO_2 neutral by 2050. To achieve that goal, we must act today. In practice I see that it is difficult for companies to make other choices, because on what do you base the choices? That requires insight.

Business travel now causes over 13 megatons of CO_2 per year in the Netherlands, the same as the CO_2 emissions from natural gas of more than 4.5 million households. Electric transport must offer the alternative for short distances, but distances within Europe are still often done by plane.

To make more conscious choices, Raphide has developed a platform in collaboration with NS International where CO_2 emissions from flying and international train traffic are compared. Within this platform, a company can offer employees who frequent business travel insight into the CO_2 emissions caused by the choice. In addition to CO_2, price and travel time are also important criteria in a choice. All these indicators are shown for a desired trip to be booked. Own company policy can be linked to the platform, as well as approval from the responsible manager. An important step in the convenience and in providing insight into the balance between price and CO_2.

From academic research and practice, I see how complex it is to initiate a change towards more sustainable behavior. I have seen in practice that nudging helps. Make it a competition within your company who makes the most sustainable choices, which department has the highest percentage of travel CO_2 neutral in Europe and reward

these efforts. It is not always easy to realize changes, but this tool can make this easier and more over fun and connect to a common goal.

More and more companies report on their CO_2 emissions in their annual report, which is not always easy to measure. This tool offers a thorough record to report the CO_2 emissions of business travel, in accordance with the Greenhouse Gas Protocol, part of Scope 3. The transparency in the calculations helps to give auditors insight into the principles and thus strengthen the reporting and audit process.

The information about price, journey time and CO_2 emissions will make more conscious choices possible via the Raphide platform. I believe in this transparency and simplicity. Hopefully, this platform will set an example for many other sectors to shape a more sustainable world together with insight.

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[1] CE Delft, 2018: CO_2-effect of Anders Reizen, www.ce.nl

https://www.nyenrode.nl/faculteit-en-onderzoek/faculteitsleden/p/diane-zandee

CO_2-uitstoot rapportage Scope-3

Organizations are tumbling over each other with good climate plans and bold statements about reducing their ecological footprint. Many of these sincere intentions linger in the poaching spirit of organizations and the stubborn priorities of everyday life. Nobody said change is easy. Still, most organizations want to work with their climate intentions. It is important to focus on concrete matters.

Greenhouse Gas Protocol

Business travel falls under the Scope-3 emissions in the classification of the Greenhouse Gas Protocol. Scope-1 concerns the direct emissions caused by an organization and Scope-2 the indirect emissions caused by the purchase of, for example, electricity, heat and so on. Scope-3 concerns CO_2 emissions caused by business activities of another organization. This concerns emissions from sources that are not in the possession of the own organization and on which it has no direct influence. For many organizations, the reporting obligation is limited to Scope-1 and 2, with the residual category Scope-3 dangling behind it. Often unjustified.

It is true that the bulk of the emissions are caused by activities that fall under the first two categories. But, for many companies in the service sector, the categories are irrelevant or difficult to influence. This automatically puts Scope-3 at the forefront. Depending on the organization, business travel can make up a large part of this third category. The good news is that there are gains to be made here.

Measuring is knowing

As so often it is a matter of doing it. Start by measuring the emissions caused by business travel, set a goal and take action and make choices that achieve this goal. So, it starts with measuring. Measuring is knowing.

But how do I do this?

The discussion about measurement ends up in the quicksand of definitions, measurement methods and the question of what is or is not included in the calculation. Sources are often not reliable because the carrier or travel organization has an interest in an optimistic presentation of the facts. Nobody will approach the trade association of the cigarette industry for a good calculation method to determine the increased risk of lung cancer due to smoking. It is no different for business trips. What is needed is a simple method based on independent sources. And a method that can also be used for both rail and air traffic.

Raphide approach

The Raphide approach is characterized by transparency, simplicity, independence and applicability for both train and air travel. The environmental impacts are calculated on the basis of two simple factors:

1. Distance
2. Emissions per kilometer traveled.

To start with the latter, for the emissions per kilometer traveled, Raphide uses the website www.co2emissiefactoren.nl. This Website is an initiative of Milieu Centraal, Stimular, SKAO, Connekt and the Dutch government. The list is updated annually by a broad panel of experts as part of the "Green Deal Initiative". The goal of the Green Deal is to draw up one broadly supported and scientifically substantiated list of CO_2 emission factors for organizations. In short, a current and independent source that is supported by the Dutch government. The Website delivers well-to-wheel emissions in CO_2 kilograms per kilometer traveled. The assumption here is that the CO_2 emissions are a good approximation for the emissions.

CO_2 emission factors

Raphide uses the following CO_2emission factors:

1. International train, whichever rate we use for the single business trips within national borders
2. Regional plane (distances up to 700 km)
3. European plane (distances between 700 and 2,500 km)
4. Intercontinental plane (distances greater than 2,500 km).

Calculating the distance traveled is less simple. Neither train nor plane travel a linear route. Also, there is the difficulty that the same route is not always chosen. Trains can be diverted or use a different route depending on the train choice. Planes divert due to crowds, availability of runways and must follow certain corridors. In short, the straight-line distance that is often used leads to a systematic underestimation of the actual distance traveled. For this we need to add a correction factor.

Flight distances

Let's start with the calculation of the flight distances:

1. Based on the Google Maps coordinates of airports and train stations; we calculate the straight-line distance as an arc that follows the earth's surface.
2. We correct this curve for the following factors:
a. The flight altitude that affects the length of the flown arc trajectory.
b. Taxiing at the airports, as this is an important element for travel time and the impact on the environment
3. We use the data available through the Flightaware website which provides, among other things:
    a. The actual distance traveled from the Earth's surface
    b. The departure and arrival times at the runway and gate
    c. Speed and altitude during the flight trajectory.

d. Plane type.

4. We took a representative sample of one hundred flights:
   - Five city pairs in Europe consisting of destinations that are mainly flown for business:
     i. Amsterdam Schiphol AMS - Frankfurt am Main FRA
     ii. Amsterdam Schiphol AMS - Paris Charles de Gaulle CDG
     iii. Amsterdam Schiphol AMS - Nice Côte d'Azur NCE
     iv. Amsterdam Schiphol AMS - Munich MUC
     v. Amsterdam Schiphol AMS - London Heathrow LHR.
   - We took flights in both directions for each city pair.
   - We have limited ourselves to one flight number for ten consecutive dates in the period between December 16, 2020 and January 1, 2021.
   - Although the selected flights are daily flights, several flights were canceled due to the holiday season and the COVID-19 crisis. Also, not all dates provided complete data. We skipped these dates and kept going until we had ten data sets for each city pair in both directions. The statistical analysis was performed on one hundred flights.
   - The flights were popular destinations that can also be reached by train.
5. These are the findings of our analysis:
   - The actual distance flown is on average 13.07% longer than the straight-line distance.
   - The average altitude during a stage was 9.9 kilometers, which leads to an increase of 0.16% in the actual flight trajectory.
   - The average taxi time per route on both sides of the journey together is 19 minutes. This is significant as the average flight time is only 59 minutes. The fuel consumption during taxi is high because planes are meant to fly, they require frequent stops and the engines do not reach their optimal thrust. The actual distance traveled on the ground is not available from public sources.

The NLR report of 2018 "Proxies spatial distribution of NOx and PM10 at Schiphol Airport" shows that the NO2 impact for taxiing amounts to 11.79% of the NO2 impact during the actual flight.

This results in a total correction of 25.02% for the straight-line distance.

Factor 1.25

The conclusion is that if we multiply the distance as the crow flies by a factor of 1.25, we get a good estimate of the actual flight distance for an environmental impact calculation.

Remarks:

1. The additions are calculated on the basis of the original one hundred percent basis and are not cumulative.
2. Assuming that the planes follow a perfect arc, changes in altitude during flight are ignored.
3. It is assumed that the relative NO2 impact for taxiing is equal to the relative CO_2 impact compared to the actual flight phase.
4. The calculations of the impact of taxiing are conservative as long-haul flights have not been included and the COVID-19 and holidays have reduced waiting times at the airports.

Train distances

The method for calculating the distances per train is:

1.We start again with the bird's eye view of the globe and again we take the Google Maps coordinates of the train stations.

2.We correct this as the crow flies for the following factors:

a. Railway lines do not follow a straight line either.

b. High-speed trains in particular run-on special tracks that are often longer than conventional routes.

3. We use the data available at the "Büro für Raumforschung, Raumplanung und Geoinformation" (RRG), Oldenburg, Germany, which provides the following:

a. The distances of the railway network.

b. The network distance is the shortest distance via the railway network.

c. But, there is no guarantee that the high-speed trains such as ICE, TGV and Eurostar will use the shortest track.

d. So, the tracks of high-speed trains tend to be flatter due to the extensive use of viaducts and tunnels, and often follow an even and straight route. We assume that the increase in distance is limited.

e. There is no public data available that allows an accurate calculation.

f. Still, we should compensate for this factor. We estimate this at almost five percent extra.

g. We took a representative sample of five routes corresponding to the city pairs used for air travel:

i. Amsterdam CS - Frankfurt am Main Hbf
ii. Amsterdam CS - Paris Gare du Nord
iii. Amsterdam CS - Nice-Ville
iv. Amsterdam CS - Munich Hbf
v. Amsterdam CS - London St. Pancras

These are the findings of our analysis:

- The actual distance traveled by rail is on average 35.16% longer than the straight-line distance.
- There is no easy way to prove that the high-speed trains follow the shortest network distance. These high-speed tracks are usually efficient.

- Still, a correction is needed. We estimate this surcharge at almost five percent and propose 4.84%.
- This results in a total increase factor of 40.00%.

Factor 1.40

The conclusion is that if we multiply the distance as the crow flies by a factor of 1.40, we get a good estimate of the actual train journey distance that can be used for an environmental impact calculation based on the distance traveled.

By multiplying these two elements, CO_2 load per kilometer and the corrected distance, we find the CO_2 load per route. This is the basis of the CO_2 accounting in Raphide.

CO_2 accounting

In principle, this CO_2 accounting could be used to calculate the CO_2 compensation. Yet, it is better to focus on avoiding or reducing emissions. Raphide does this by:

- Ask about the necessity of the proposed business trip as early as the application process.
- In addition to the financial cost, also include the CO_2 tax in the approval process, which enables managers to manage a CO_2 budget.
- For each travel choice, show the different transport options with their CO_2 impact.
- If desired, a notification can be generated in the travel proposal if the most optimal environmental choice has not been made or if the choice is not in line with the travel policy of the organization.

The CO_2 accounting also provides a report for the Scope-3 reporting. The CO_2 data can be processed and cumulated to:

- Period
- Organizational unit or department
- Employee
- Type of transport
- Distance traveled
- And so on.

The report can be created in PDF and Excel. The content of the PDF file cannot be changed, which means that a clear, system-generated report is established. The Excel file can be edited and offers the possibility to do further analyzes at your own discretion. In principle, reports can be made on all data available in the database. It is also possible to perform calculations on this data and display this in ratios and graphs. This depends on the wishes of the client.

The Raphide system has an audit log in which all transactions and mutations in the system are administered and can be viewed by authorized users. This records who changed what and when. This “accounting trail” is available for auditing and monitoring purposes.

Raphide has a budgeting system in which, just as for the financial budgets, budgets can also be used for CO_2 emissions. This can be done per department and for the organization as a whole. There is the option to send out notifications when the budget is exceeded.

For management information and control purposes, Raphide has a custom configurable dashboard on which statistics, for the current year and previous years, are displayed on:

- Total CO_2 emissions
- The CO_2 emissions per department
- The total CO_2 emissions per mode of transport
- The total distance traveled
- The distance traveled by means of transport
- The emission ratio, e.g., the weight of CO_2 per kilometer traveled.

Raphide

We conclude that Raphide:

- Use a transparent, simple and consistent calculation for the distance traveled that applies to both air and train journeys.
- Has a statistical method and real numbers-based correction for approximating the actual distance traveled
- Based on independent figures for CO_2 emissions per kilometer traveled. The website www.CO2emissiefactoren.nl is co-managed by the Dutch government and has authority.
- Register CO_2 emissions in an accounting system in an unambiguous and transparent manner.
- Have an audit log and accounting trail
- Has the option to budget for CO_2 emissions
- Offers the possibility to report unambiguously on CO_2 emissions in the context of Scope-3 reporting.
- Have a dashboard of statistics that allows managers to manage CO_2 emissions against their organization's environmental goals.

André Koch, Amsterdam, April 19th, 2021