EGDC Case study: Logic TMS

Case Study Methodology

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The European Green Digital Coalition (EGDC) is an initiative of companies, supported by the European Commission and the European Parliament, based on the request of the EU Council, which aims to harness the enabling emission-reducing potential of digital solutions to all other sectors.

The secretariat of the European Green Digital Coalition is managed by the consortium of the European Parliament Pilot Project for the EGDC, funded by the European Commission, namely the leading associations GeSI, the European DIGITAL SME Alliance, DIGITALEUROPE, ETNO and GSMA, working together with Carbon Trust, Deloitte, and Sustainable ICT Consulting.

This deliverable has been produced by the consortium of the European Parliament Pilot project for the EGDC.

Global Enabling Sustainability Initiative (Coordinator)

DIGITALEUROPE

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SUB-CONTRACTORS

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Sustainable ICT Consulting

1. Introduction

The European Green Digital Coalition (EGDC) is an initiative of companies, supported by the European Commission and the European Parliament, based on the request of the EU Council, which aims to harness the enabling emission-reducing potential of digital solutions on all other sectors.

The main aim of the EGDC is to maximise the sustainability benefits of digitalisation within the ICT sector, while supporting sustainability goals of other key sectors such as energy, transport, agriculture, and construction. The Coalition recognises the need for science–based methods to estimate the reduction and avoidance of greenhouse gas (GHG) emissions by specific ICT solutions across sectors. This will accelerate the sustainability and circular transitions of these sectors while contributing to an innovative, inclusive, and resilient society.

To support the EGDC, a set of case study calculators are developed to provide a practical example of calculating the net carbon impact of a green digital solution in line with the European Green Digital Coalition (EGDC) methodology. This work aims to support the members of the EGDC with Action 2 of the EGDC Declaration.

This case study methodology accompanies the Logic TMS case study calculator and provides further details, additional context and transparency around the case study calculator to ensure the outcomes of the case study are interpreted and used correctly.

Disclaimer for European Parliament Pilot Project – European Green Digital Coalition (EGDC) Case Studies

The following disclaimer is intended to provide clarity and context for the case studies prepared as part of the EP Pilot Project, which have showcased the net carbon impact of specific digital solutions using the EGDC ICT Methodology developed during the project:

1. Purpose of the Case Studies:

The case studies served multiple purposes, including:

- **Development of the Methodology:** They contributed to the development of the EGDC ICT Methodology. These case studies were conducted concurrently with the methodology's creation and served as a valuable testing ground for its initial formulation.
- **Application Examples:** They provided practical examples of how the methodology can be applied to real-life use cases. These case studies were essential in demonstrating the practicality and effectiveness of the methodology when applied to concrete situations.
- **Identification of Improvement Areas:** By conducting these case studies, we aimed to highlight parts of the calculation in need of improvement. They shed light on the challenges and limitations inherent in using available data and indicated the necessary steps to move towards best practices in assessing net carbon impacts.

2. Data Quality as a Key Determinant:

It is imperative to emphasize that data quality is a fundamental determinant of the quality and reliability of the case studies. The accuracy and completeness of the data used significantly influence the outcomes and findings of these case studies.
It is essential to acknowledge that the data available for each case study may differ in terms of accuracy, granularity, and coverage. As a result, the case studies may not necessarily represent the best practice application of the EGDC ICT Methodology. Instead, they reflect the application of the methodology at various stages of data availability.

3. Liability for Errors/Omissions:

While reasonable steps have been taken to ensure that the information contained within the case studies is correct, the EGDC gives no warranty and makes no representation as to its accuracy. We accept no liability for any errors or omissions that may be present in the case studies, methodology, or related information. Users and readers are advised to exercise their judgment and seek further clarification if needed, as the information provided may evolve over time and depend on external factors beyond our control.

4. Appropriate Use of the Case Study Calculators:

The case study calculators are intended for educational and informational purposes. They rely on certain assumptions and input data to generate results.
The results of the calculators are specific to the implementation of the ICT solution and may not be representative for other implementation contexts.
As such, it is imperative for users to refrain from directly extrapolating these results to ICT solutions or implementation contexts that may seem conceptually similar.
Instead, users are advised to use the calculators as a means to understand the practical application of the EGDC ICT Methodology, thereby equipping themselves with the knowledge required to develop customized calculators specifically tailored to their unique ICT solutions and implementation circumstances.

In conclusion, these case studies provide valuable insights into the calculation of the net carbon impact of digital solutions through the practical application of the EGDC ICT Methodology. However, it is vital to exercise caution when interpreting the results, considering the variances in data quality and the evolving nature of the methodology. The findings are indicative of the methodology's potential and its room for refinement as we work towards more accurate and comprehensive assessments of net carbon impacts.

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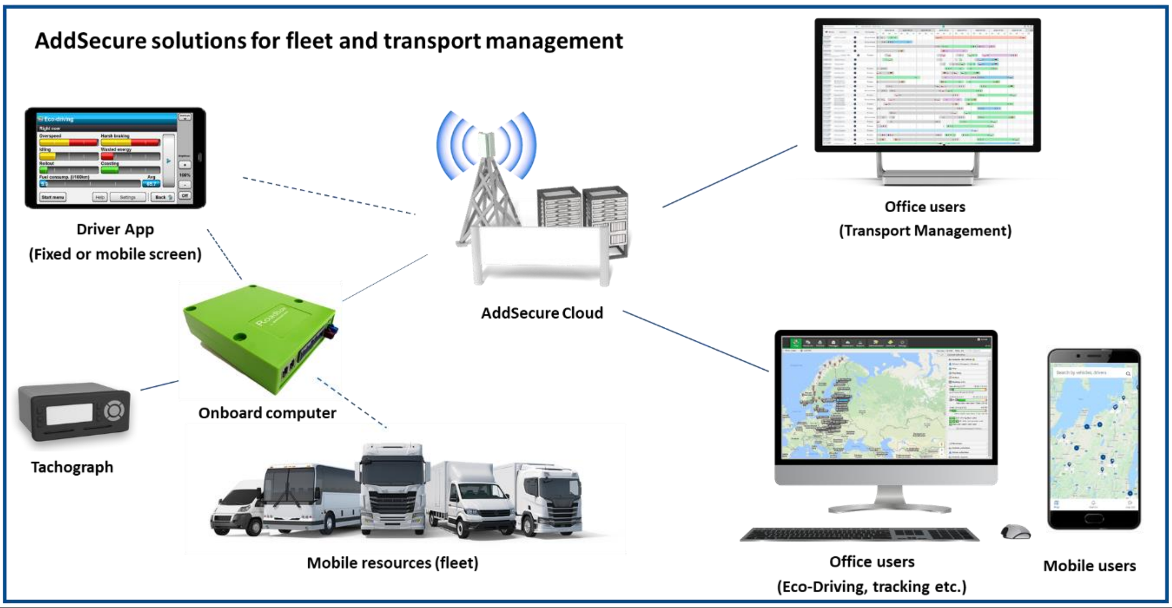
2. Methodology

Logic TMS	
Assessment Objective	The assessment is intended to determine to what extent the AddSecure fleet management solution can have a net positive impact on the transport sector when implemented in a specific context. Furthermore, the aim of the assessment was also to test the EGDC ICT Sector Guidance for Net Carbon Impact Assessments and identify sector-specific methodological considerations. The assessment is ex-post and considers the implementation of the solution in multiple contexts, namely in two different fleets operating across different European countries mostly in Central, Western and Southern Europe.
Solution Description	Logic TMS is a transport management system that combines a fleet's order management process with a cloud-based platform. This allows for real-time control and insights that help optimise fleet and fuel utilisation and order management. Using Artificial Intelligence, Logic TMS helps to calculate best route combinations, thus reducing fuel usage. This in turn reduces greenhouse gas emissions. The solution requires an understanding of how to actions the insights from the solution, both from the operators of the solution and the drivers of the vehicles. The solution is used in the freight transport sector across the European continent, with most fleets driving in Central, Western and Southern Europe.

	Logic TMS has the potential to be used across Europe for any type of transport vehicle where there is physical infrastructure allowing for it The solution requires an intermittent connection to the internet. This is provided by network providers across Europe. Furthermore, the ICT solution requires laptops, mobiles and in-vehicles interface devices for informing the operators of the solution and drivers of the vehicles.
Solution Boundary	The solution includes the following components: • Server energy usage • One black box with a SIM-card • Usage of 4G and 2G networks Laptops and/or mobile phone for accessing platform



Functional Unit	The function that the ICT solution is aiming to deliver is the efficient delivery of products. The unit quantity in this instance is the number of products or services delivered. The performance is the speed and efficiency with which the products or services are delivered within a year. The functional unit chosen is kilogrammes of CO_2 equivalent saved per 100 kilometres driven by fleet.

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	The unit of 100 kilometres was chosen to allow for a comparison across fleets of different sizes. It was considered to set the functional unit at CO_2 equivalent saved per vehicle. However, this was ruled out when it appeared that the number of fleet vehicles changed for both assessed clients. Due to the increased efficiencies, one fleet was able to reduce the number of vehicles to transport the same number of products. The other fleet was able to expand its business and increase its number of vehicles. Ideally, the functional unit would be set as the CO_2 equivalent saved per unit of products delivered (either in terms of value or weight). However, there was no data on the products transported. Moreover, it is likely the types of products differed across fleets and fleet vehicles. Both factors prevented it being included into the functional unit.
Assessment Boundary	The emission factors used to calculate the net carbon impact of the ICT solution cover all GHG emissions covered by the Kyoto Protocol and are reported in terms of CO2e. Furthermore, the well-to-tank emissions are also included in the emission factor. The time boundary for the assessment is over two 10-month periods (equalling 20 months). The geographical boundary for this assessment is EU-wide and had dominant presence in Germany, the Benelux countries and Poland. The calculation includes 356 diesel lorries across 2 fleets that deliver products across European countries. These included over sixty different types of lorries from Mercedes, DAF, Scania, Volvo, Renault and MAN.
Reference scenario	The reference scenario encompasses the lorry movements for two companies using Logic TMS, totalling 356 lorries, for 10 months in the initial year of deployment. This is compared against the 10 months in the following year. This data range is chosen because no data is available from before the solution, and because the Artificial Intelligence improves as it obtains more real-time data from the fleet.

	Measurements included, per lorry: - Total distance - Total fuel usage - Total fuel used when the lorry was not carrying freight It is not known what the countries of origin are for the two fleets. It is also not known if any solution was used in the reference scenario. As the market average across Europe is still to manage a fleet without a digital fleet management system, this is taken as the reference scenario. It is assumed the fleets in the reference scenario had no assessment of driving behaviour and no real-time data to support decision-making. Moreover, it is assumed they used a standard navigation system, including in-vehicle interface devices informing the operators of the solution and drivers of the vehicles.
Description of 1st order effects	**Digital components:** The server usage is hosted by Hetzner in Germany. It is estimated to amount to 0.22 kWh per vehicle per year, based on the overall energy consumption by the reference platform divided by the average number of active units in the reference scenario. Although the current server uses energy that is 100% CO_2-free hydropower-generated, emissions associated with electricity usage have been included in the reference scenario. It is assumed to come from the national grid where the fleet operates. When hardware is installed, every vehicle is equipped with one black box with a SIM-card. The black box consists of plastic and PCB. It weighs 55 grammes. The SIM-card weighs around 0.07 grammes and is made of plastic, silicon, gold and phosphorous. The GHG emissions associated with the energy consumption (use phase), production, transportation, and disposal have been included in the calculation. The SIM intermittently connects to 4G and 2G networks. The embodied emissions (incl. transport) and end-of-life emissions of the network, data centres, vehicle interfaces, and laptops, and mobiles are not considered as they are already in existence without the implementation of the solution in place.

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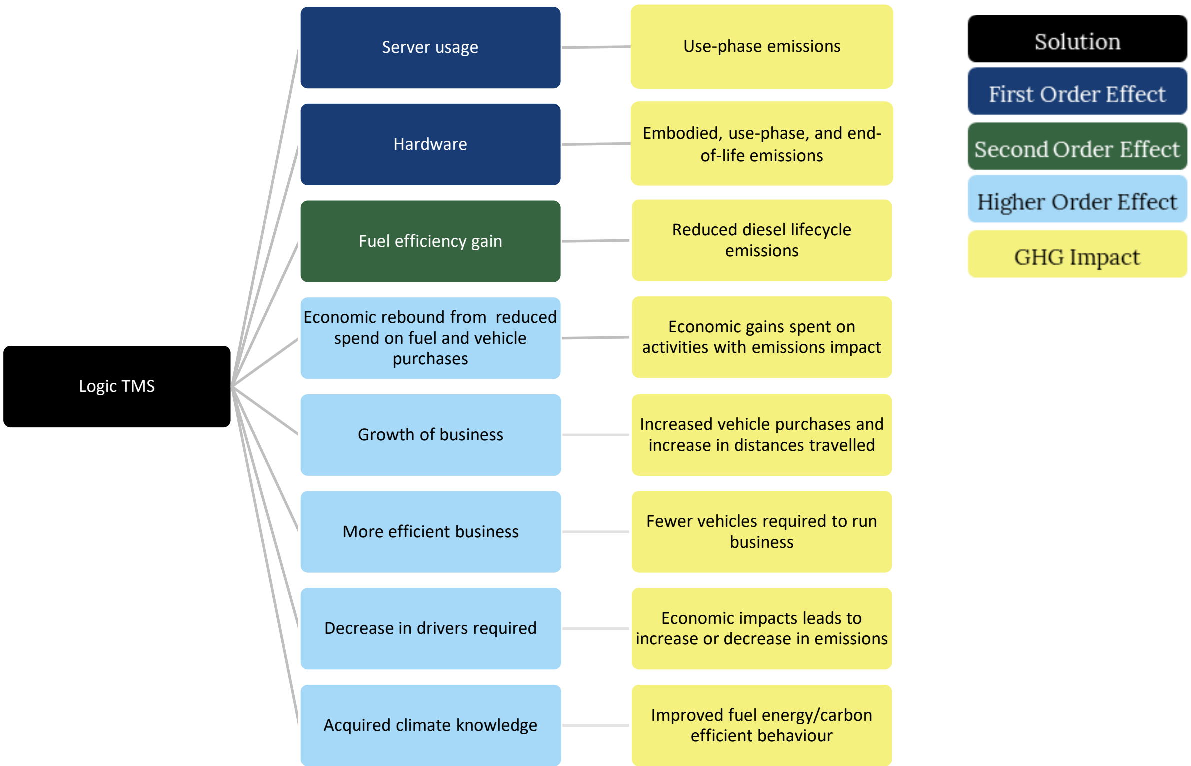
	It is assumed that an alternative navigation system was used in the reference scenario. Therefore, the lifecycle emissions of the vehicle interface and network emissions have been excluded from the calculation. The use-phase emissions of the laptops and mobile phones should be included into the calculation. However, due to a lack of data, these have been quantitatively excluded as it does not meet the 5% materiality threshold in terms of carbon savings.
Categorisation of digital technologies A=ICT Service B=Service specific building block C=Common ICT devices, services, infrastructure	**B** - Blackbox from Teltonika - SIM card – unknown provider **C** - Mobile network (2G/3G/4G) providers across Europe Further information on other third parties involved, such as manufacturers and suppliers cannot be given due to a lack of information.
Description of 2nd order effects	Logic TMS's AutoPlanner tool uses Artificial Intelligence to calculate the most efficient combination of routes for freight transporters. By reducing the distance driven without freight, fleets reduce their fuel usage, which cuts their GHG emissions. Additionally, the AutoPlanner improves overall driving patterns by identifying unnecessary fuel usage and bad driving habits, such as excessive idling and poor throttle usage, which on average cuts combustion (L/100km). This results in fewer litres of fuel required for the same distance.
Description of higher order effects	The optimisation of freight transport may help users grow their business, which increases the overall number of lorries on the road, overall fuel usage and thus GHG emissions. In the data provided this effect was observed in at least one company. Alternatively, the increased productivity may also prevent the acquiring of new fleet vehicles or allow

	for vehicles to be disposed of or sold. This reduces GHG emissions due to the need for less manufacturing of fleet vehicles. In the data provided this effect has also been observed in at least one company. Another higher order effect results from the decrease of drivers needed. The economic impacts associated with the lower income of these drivers could lead to an increase or decrease in GHG emissions. The reduction in costs of delivering products and the associated economic impacts could lead to an increase or decrease in GHG emissions. Finally, the acquired knowledge of climate and fuel efficiency can improve fuel usage in other areas, reducing emissions. These higher order effects are excluded as there is a high uncertainty around their impact, there is a relatively weak claim to causality, and there is very little data availability.
Mapping of all effects	



Description of calculation	**1st order effects:** The lifecycle and in-use emissions of the hardware components that are installed in the lorries have been included into the calculation. It is unclear how long the hardware should last. Taking a conservative approach, the production and disposal emissions have been calculated for the entire lifespan. The cloud-based server used to power the software consumes some electricity. No direct data from the server host could be obtained, but information from a similar AddSecure Fleet Management solution (FMS) served as a reference. Whilst the server was powered by renewable energy, this has been included in the calculations as a conservative approach. The electricity grid conversion factor used aligns to the top three geographies selected in the optional adjustments section.

	2nd order effects: The second order effects calculation captures the reduction in GHG emissions achieved through the solution, by optimising transport routes and improving driving patterns. Whilst Logic TMS is most often employed using software and hardware components, it is possible to use the solution with software only. In that case, AddSecure estimates that the associated GHG reduction is 20% lower than if used with software and hardware. That is because using only software gives customers the improvement in planning and the elimination of empty kilometres. However, if customers also use hardware, it allows them to measure and monitor additional driving behaviour, including driving style, and a more detailed view on fuel consumption. According to AddSecure it is very well possible 100% efficiency can be achieved without hardware but reducing it by 20% for software only is a conservative approach. To calculate the GHG savings from the solution, the calculator measures the average fuel efficiency and the proportion of empty kilometres, before and after the solution. By multiplying those numbers with the proportion of fleet vehicles in different European countries, respective distance reduction factors and combustion reduction factors were calculated for each of the countries where data exists, i.e. Germany, Poland, the Czech Republic, France, Austria, Italy, Switzerland and the Benelux countries. By multiplying the associated reduction factors with the provided kilometres driven without freight and the default fuel efficiency, the new overall distance and new fuel efficiency are calculated. The calculated new distance is then multiplied with the calculated new fuel efficiency to find the new consumption of fuel. The well-to-wheel emission factor of diesel is applied to calculate the associated reduction of GHG emissions.
Net Carbon Saving Impact of the Solution	*For 356 vehicles driving 15.7Mn km, using software and hardware using EU average reduction factors.* Total carbon saved for the 2 customers: **636 tCO2e / year** 1st order effects: **0.22 t CO2e / year** 2nd order effects: **636 t CO2e /year**

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	Saving per functional unit: **4.05 kg CO2e / 100km** *To calculate the carbon savings from the reference scenario, the total carbon saved reflects a scenario in which the total distance driven remains constant.*
Qualitative data uncertainty and sensitivity analysis	The data obtained is of relatively good quality which decreases the uncertainty around the results. Especially the data for the highly material second order effects scores well. The sensitivity analysis demonstrates that the first order effects have a very low sensitivity (<1%). The second order effects have a high sensitivity of around 5%. This reaffirms the importance that the data quality of the second order effects should be high. It should be noted that the analysis performed is not a quantitative uncertainty analysis. By providing a more granular view of data quality, which builds on the data quality assessment, this analysis highlights areas of uncertainty within the calculation using a qualitative assessment framework. It can however be used to feed into a quantitative uncertainty analysis using guidance from the Greenhouse Gas Protocol on Quantitative Inventory Uncertainty: https://ghgprotocol.org/sites/default/files/2022-12/Quantitative%20Uncertainty%20Guidance.pdf
Assumptions	It is assumed that: - Taking a conservative approach, only using software and not hardware reduces the solution's efficacy by 20%, in terms of fuel efficiency and distance driven without freight; - The solution is used with vehicles driving on diesel; - Energy consumed by the cloud server comes from the national grid as indicated by country selection; - The fleet has not used a similar solution before the use case and thus is not already optimised (market average); - Fuel reductions remain relatively constant across vehicle and journey types. The dataset provided did not allow for such an analysis.

Data sources	The data was collected by AddSecure over two 10-month periods (equalling 20 months) for fleets operating across Europe, with most fleet movements in Germany, the Benelux countries and Poland. Out of the three anonymised customers, one consumed 11% of its fuel on "empty" routes before the solution, compared with 32% and 30% for the other two. This indicated the fleet had already been using a similar solution and was already relatively optimised. Since the model is built on the assumption that the fleet is not already optimised, this client was omitted from the dataset. In conjunction with AddSecure, the decision was made to add the assumption that the calculator is most accurate for fleets that are not yet optimised. AddSecure data (not visualised due to data confidentiality): - Fuel consumption - Kilometres driven without cargo - Server usage (from Hetzner) - Weight blackbox and SIM Teltonika - Energy consumption blackbox UK GHG emission factors International electricity grid lifecycle emission factors from Carbon Footprint It is to be noted that the dataset does not allow for a test on statistical significance and as such the output from the calculator should be treated as indicative.

Input adjustments and key considerations for usage of results	Inputs for other fleets:
	- Kilometres driven per fleet per year
	- Size of fleet
	- Type of solution used
	    ○ Software only
	    ○ Software and hardware
	- Geography
	    ○ Individual EU countries
	    ○ Switzerland
	    ○ EU Average
	
	Override options
	- Fuel efficiency

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	- Proportion of kilometres driven without freight It is to be considered that the calculator does not include the option to select freight load, type of goods or type of journey, which affect fuel efficiency and the total number of fleet movements required. The data used for the calculator represents the average freight types and load for average journeys across 10 months. Moreover, the calculator does not allow for the selection of different types of vehicles, or different fuel efficiencies within the same fleet and uses average numbers for these too.
'Do no harm' criteria	The solution is not expected to cause significant harm in other ESG areas.
Key considerations for improvement	Within the scope of this work, there was no verification of the data undertaken and the calculator is based on the assumption the data provided by the solution is correct. Future calculators for fleet management systems may consider the following improvements. 1. Future calculators should include data on other fuel types, including gasoline and electricity. 2. Data on different journey and vehicle types may improve the reliability of the calculator and broaden its usability. 3. The limited data for provided for this solution does not allow for an analysis of when the AI has effectively optimised the fleet, i.e. whether this has already happened within the trial period or whether the point of optimisation is still to reach. 4. This solution offers clients the option to use the solution with software only, or with hardware and software. The assumption that only using software reduces the solution's efficacy by 20% is an assumption that should be tested against trial data. 5. Given this solution is AI-run, for future calculators it would be valuable to have better data on the first order emissions

	related to server usage. A best-case scenario would include more direct measurements of server usage. 6. Future calculators may include a baseline scenario whereby the fleet is already (partly) optimised to measure increase its usability for a wider range of fleets.

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