Wilco Burggraaf
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A committed autodidact and tech enthusiast at heart, with over 20 years of hands-on development experience.

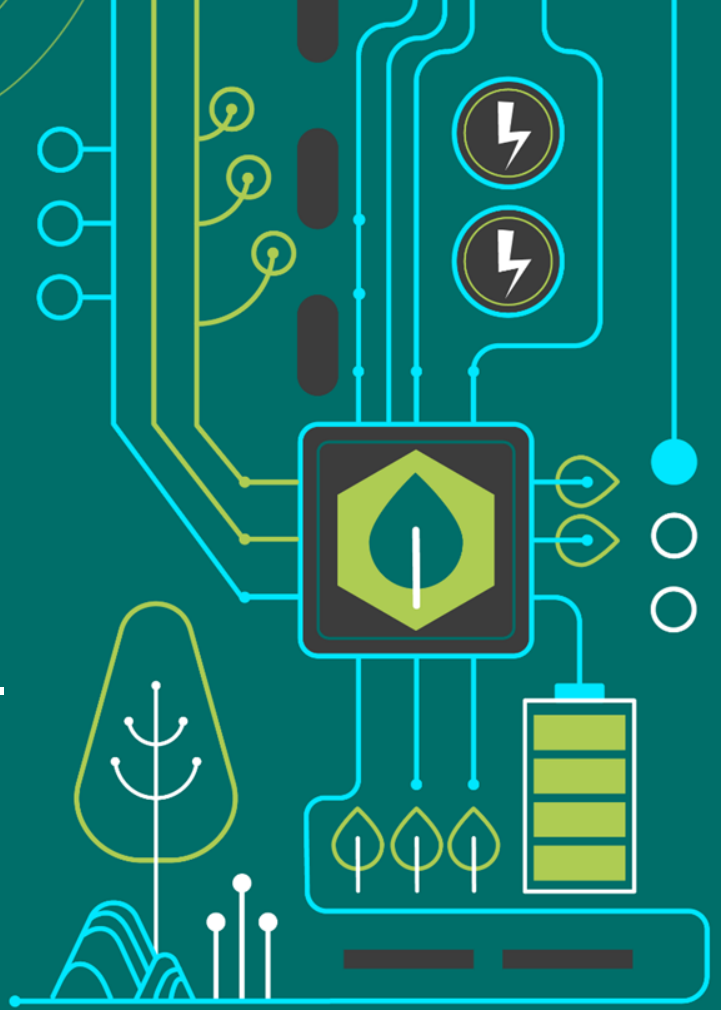
Deeply passionate about coding, green coding, robotics, 3D technology, APIs, and all aspects of software development.

nerd inside

Green Software Foundation

Carbon Hack 24

GSF's vision is to empower developers driving environmental change through software innovation.



What is Carbon Hack 24?

A global hackathon for developers.

Challenged participants using Impact Framework, to measure and calculate the environmental impact of software.

And it finished on the 8th of April.

What was the theme of Carbon Hack 2024?

Measurement.

GSF wanted participants to use the Impact Framework and measure carbon emissions, water consumption, or any other environmental impact.

Next...

Before we go into Impact Framework

Before we go into Impact Framework

What is the context behind Green Software?

Two broad ways of looking at software:

Software as part of the climate problem

Software as part of the climate solution

Before we go into Impact Framework

What is the context behind Green Software?

Green software aims to minimize its own carbon emissions and environmental impact.

While in occasion also contributing to reducing emissions and environmental impact or reusing / extending lifetime of existing hardware.

Before we go into Impact Framework

Why is (objective as possible) impact measurement so important?

Before we go into Impact Framework

Media headlines claim that
CO2 emissions from 30 minutes of Netflix is the same as driving almost 6.5 kilometers

The figures come from a July 2019 report by the Shift Project.

https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines

Before we go into Impact Framework

The July 2019 report said streaming was responsible for more than 300m tonnes of CO2 (MtCO2) in 2018, equivalent to emissions from France.

The Shift Project published a follow-up article in June 2020 to correct a bit/byte conversion error, revising the original “1.6kg per half hour” quote downwards by 8-fold to 0.2kg per half hour.

https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines

Before we go into Impact Framework

Beside measurement, we need peer reviewed validation process and the concept of Impact Framework helps with this.

Before we go into Impact Framework

"Because the energy efficiency of data centres and networks is improving rapidly – doubling every couple of years – energy use and emissions from streaming today should be substantially lower."

Important! Mindset of being part of the solution. This counts for software as well.

https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines

Before we go into Impact Framework

Allot of products we use everyday have a hidden Carbon Footprint and a hidden impact.

Before we go into Impact Framework

Hand soap
(approximately 100 grams)

Might have a carbon
footprint ranging from

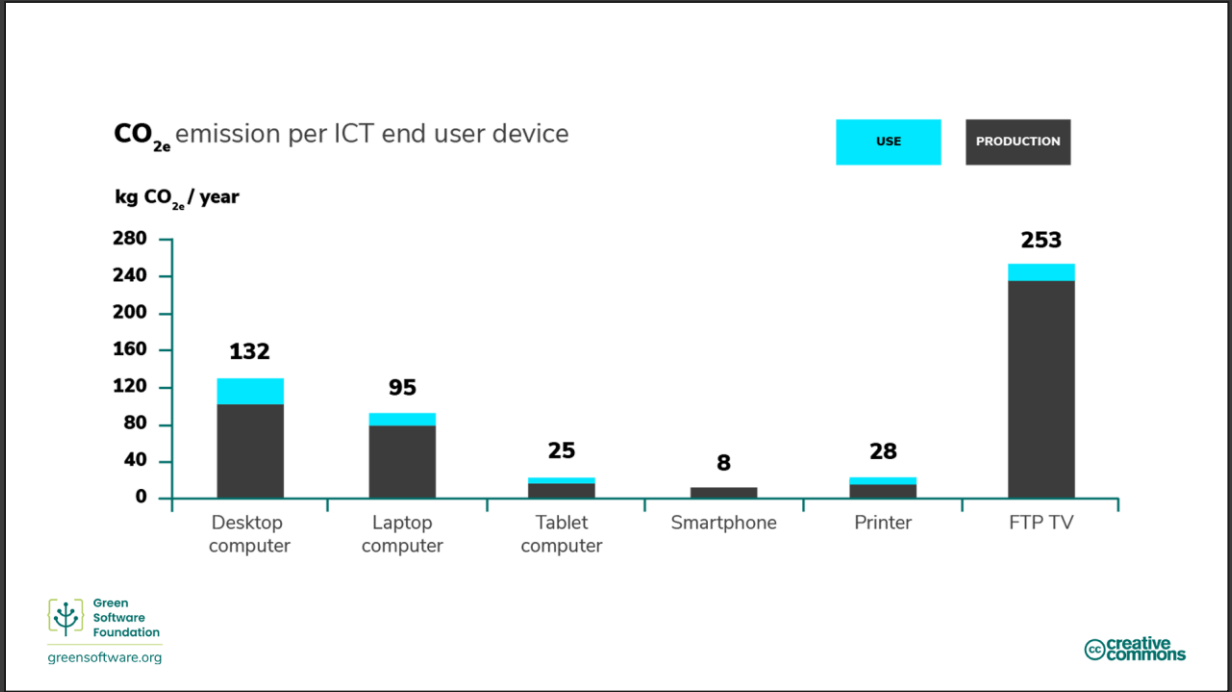
0.5 kg to 2 kg of CO_2

(Best Guess of ChatGPT,
please don't sue me! 😄)

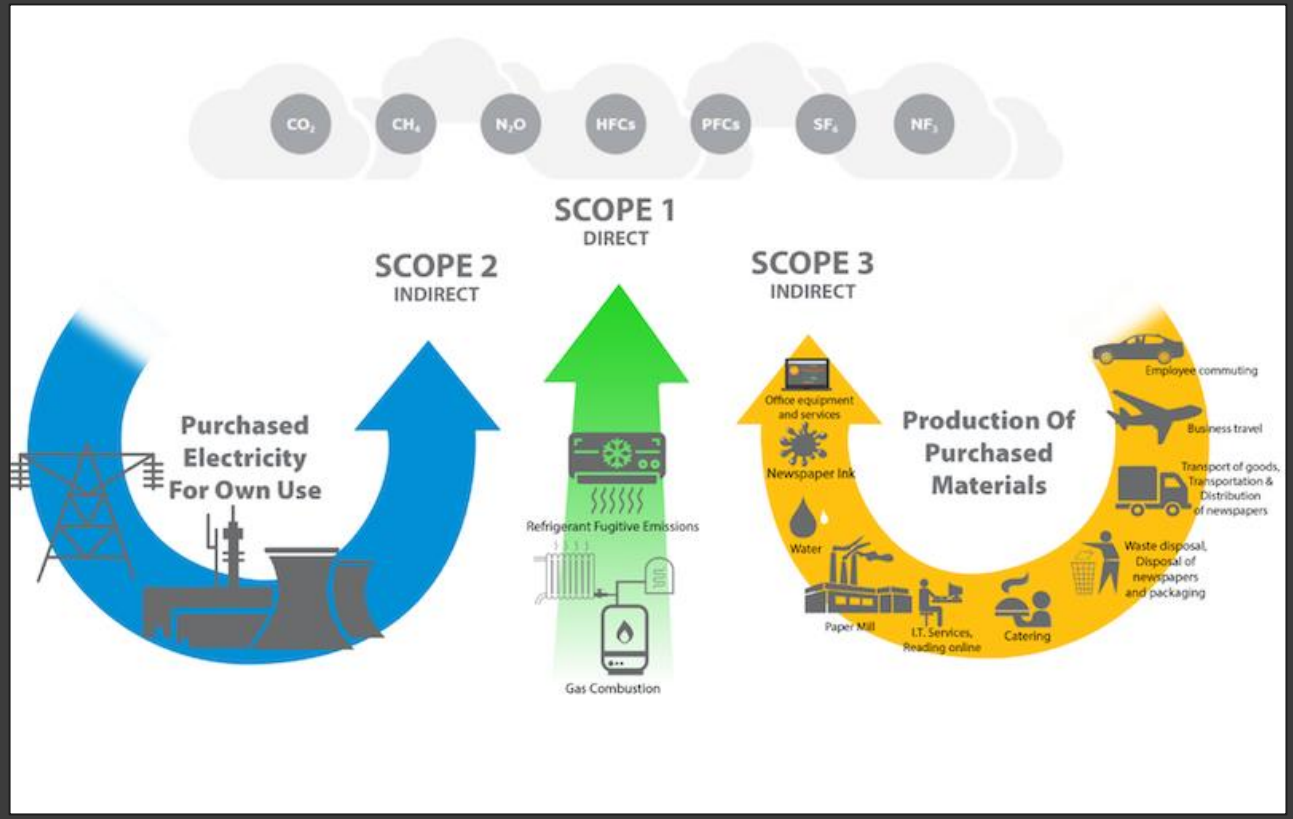
Before we go into Impact Framework

Embodied Carbon

- Raw Material Extraction
- Manufacturing Process
- Transportation and Distribution
- Product Use
- End-of-Life Management



Before we go into Impact Framework



https://www.compareyourfootprint.com/difference-scope-1-2-3-emissions/

Next...

Now to!

Impact Framework

Green
Software
Foundation

Impact
Framework

Meet the Team

Teun van Zon
Developer

Kees Zijlmans
Developer

Thom van Heeswijk
Developer

Wilco Burggraaf
Lead Dev

Green HighTech #Innovators

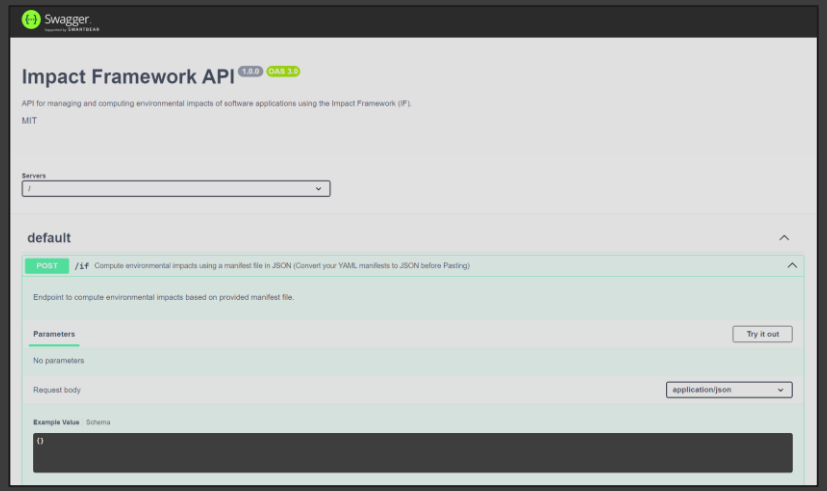
Our focus in the Carbon Hack 24?

The Team Built 4 new Impact Framework plugins:

- Handling Electric Vans embodied carbon, water impact, and waste impact observations.
- Processing weather impact on Electric Vans charging and logistics route planning observations.
- (2 in 1) Processing Electric Vans charging (strategies) and route logistics emissions measurements.

Our focus in the Carbon Hack 24?

The Team Refactored Impact Framework to an API
based on by us fabricated EV fleet sustainability case study:



Green Logistics the Example Ltd

Optimizing Electric Fleet Operations

A Data-Driven Case Study with the Green Software Foundation Impact Framework

* DISCLAIMER:
This case study is a hypothetical scenario showcasing the potential of our solution.

PDF

Chapter 3: The Engineer's Workflow – Data-Informed Decision-Making

Green Logistics understood that transitioning to an electric vehicle fleet held the promise of reduced emissions, but they recognized the complexities involved in achieving true sustainability. Traditional assessments often focus narrowly on tailpipe emissions, obscuring the significant environmental impacts associated with vehicle manufacturing, unpredictable weather influences, and the dynamic nature of the electricity grid. To address these challenges, they sought a solution that would empower their engineers with data-driven insights at every stage of fleet operations.

Their solution centers on a re-engineered approach to the Green Software Foundation's Impact Framework, transforming complex plugins into a suite of user-friendly simulators.

Let's explore the key steps an engineer takes when utilizing this innovative platform:

Step 1 - Vehicle Assessment: The Vehicle Assessment Simulator provides a straightforward interface for the engineer to input current vehicle data, including battery state of charge, mileage, and embodied carbon estimates. This initial data forms the foundation for all subsequent calculations.

Step 2 - Weather Impact Analysis: In the Weather Impact Simulator, the engineer selects a location and date/time range. Integrating with weather APIs, it displays both current conditions and forecasts, highlighting how temperature, wind, and precipitation might affect the EVs' range and battery health.

Step 3 - Charging Optimization: The EV Charging Optimizer Simulator allows the engineer to input charging requirements Crucially, it displays real-time grid composition data alongside predicted energy costs, empowering the engineer to align charging with peak renewable energy availability.

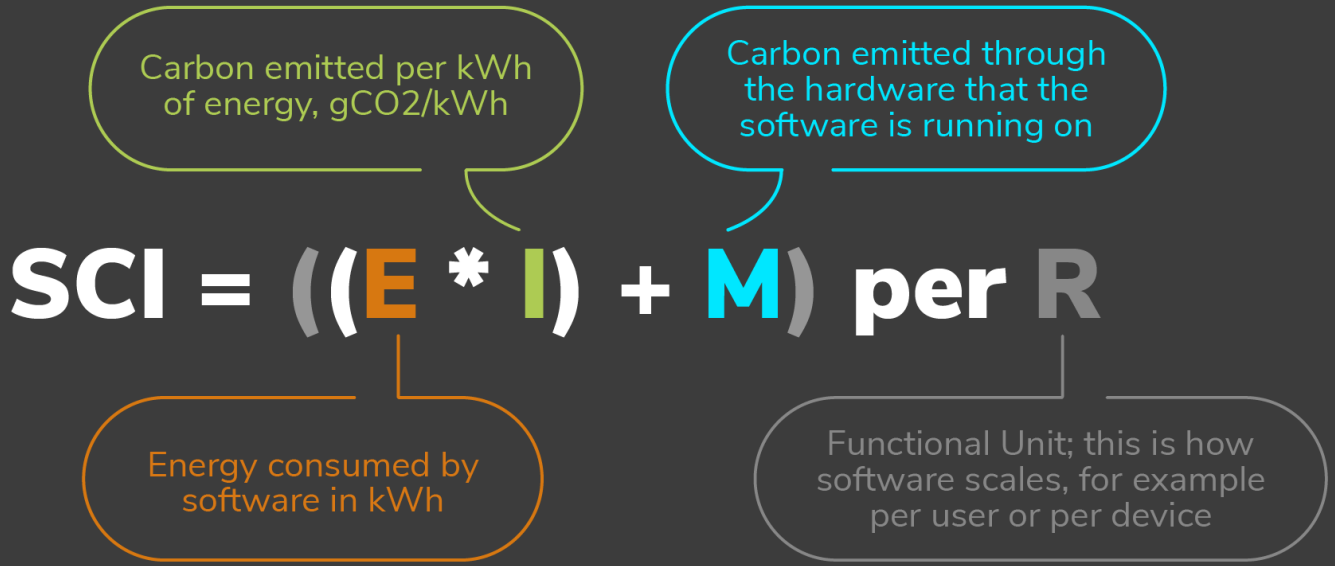
Step 4 - Route Efficiency Evaluation: The Route Efficiency Simulator accepts a planned route and leverages map and traffic APIs to model the trip under various conditions. The output highlights projected energy consumption and emissions, allowing the engineer to identify the most efficient routes.

Step 5 - Data Consolidation and Reporting Preparation (In Development): The central control panel doesn't simply perform calculations; it plays a pivotal role in maximizing the value of this data-driven approach. To facilitate seamless integration into Green Logistics' reporting tools, the platform will automatically aggregate metrics from each simulator. This will include embodied carbon data, weather impact analysis, charging optimization metrics, and route efficiency calculations - all consolidated into a central data store. Additionally, the control panel will transform this data into standardized formats like JSON, aligning with common reporting tools and eliminating the need for manual formatting. For advanced integration, an optional reporting API could even be exposed, allowing reporting tools to directly fetch the most up-to-date sustainability insights.

Oh! And we build a Simulator API
Although we couldn't completly finish it!

Beyond Carbon, innovating Impact Framework

Most people will be focusing on the SCI Plugin.



https://sci-guide.greensoftware.foundation/

DEMO TIME

QUICK DEMO

FOOD FOR THOUGHT

One simple example of an energy consumption related topic,

How many (Data / View) Model / Poco Mappers, Transformations, Adaptions, Repository CRUD's, Transportations,
are active in your code solution and are they always nessesary?