
Tampere Region Low Carbon Pilots

May we present....

The Team

Check us out!



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Software Developer

Software development, data processing, research and reporting



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Business Designer

Questionnaire development, Interviewing participants, pilot process development, business potential.



Carolina Faria
Service Designer

Co-creating the pilot process, user interviews and testing and the UX/UI of the service.



Andy Matias
Service Designer

Pilot process ideation, goals and timeline. Participant Interviews, insights and user interface



The Concept:

Tracking CO₂ emissions of
household purchases

How did we do it?

The Pilot

At a general level, the service that we tested went like this:

1

Every Friday for 3 weeks, we receive images of the week's purchase receipts from the participants.

2

We run these images through our software which outputs an excel spreadsheet with the participants' emission factors to each item on the receipt, the emissions per receipt, the week's total emissions, and the category of emissions.

3

We make manual corrections for errors + find missing emission factors if needed.

4

We input data into a digital visualization prototype in Figma software

5

We send visualization of data (prototype made in Figma) to pilot participants

6

Capture feedback from participants in weekly questionnaires and 2 interviews.



The Tool

The software was built to support all different kinds of services which currently requires gathering of digital and paper receipts.

However, we have already implemented integrations to some commerces to avoid manual data gathering steps and to allow fully automated report generation.

Our tool can process receipts as digital pictures or documents.

To generate reports, receipts have to be imported to our tool by taking pictures or downloaded PDF documents.



Data Visualisation

User research, service design and UI design were a focus in this pilot. Particularly, we focused on how to visualise the emissions data we gathered based on the participants' purchases in 5 ways:

Weekly emissions

Seeing the total Co2 emissions of purchases throughout the week.

Weekly emissions over Time

Seeing how your emissions data compares to previous weeks.

Weekly emissions by Receipt

Seeing how your emissions are spread among the receipts

Personal Emissions by Item

Seeing the emissions related to individual items within receipts.*

Emissions by Category

Seeing how emissions are spread among various purchase categories like food, supplies, travel or service.

Personal Impact in comparison / with group

Anonymised comparison to other participants using the metric of items per emission.

*Due to the manual work required, we did not visualize this for participants.



Data Gathering

Because this is a pilot, there were several actions behind the scenes for Vincit to do before the digital prototype was ready to share with participants.

Uploading guidelines

Defining how participants should take care of receipts and take photos for the best results.

Defining follow-up questions to get further descriptions of all items.

Database searching

Finding adequate data sources based on the receipts we get from participants.

Data cleaning

During the pilot, checking that each receipt has been uploaded correctly, and put them into right categories.

Receipt data

Inputting receipt data in spreadsheets that are used by designers to create visual prototypes.

This is a weekly task for receipts of 7-8 people.

Technical aspects to consider for food delivery

A feasibility assessment to learn about Wolt's system before speaking to them to validate the idea and to identify challenges.



What did we want to get out of this?

Desirability

- Are participants interested to know their emissions? How much time would you give to tracking?
- What is driving eco purchases?
- Do national goals matter?
- How do users feel about seeing the collective impact?
- Testing week after week sentiment
- Would you continue to do this?
- What features are and could be attractive for future development?

Feasibility

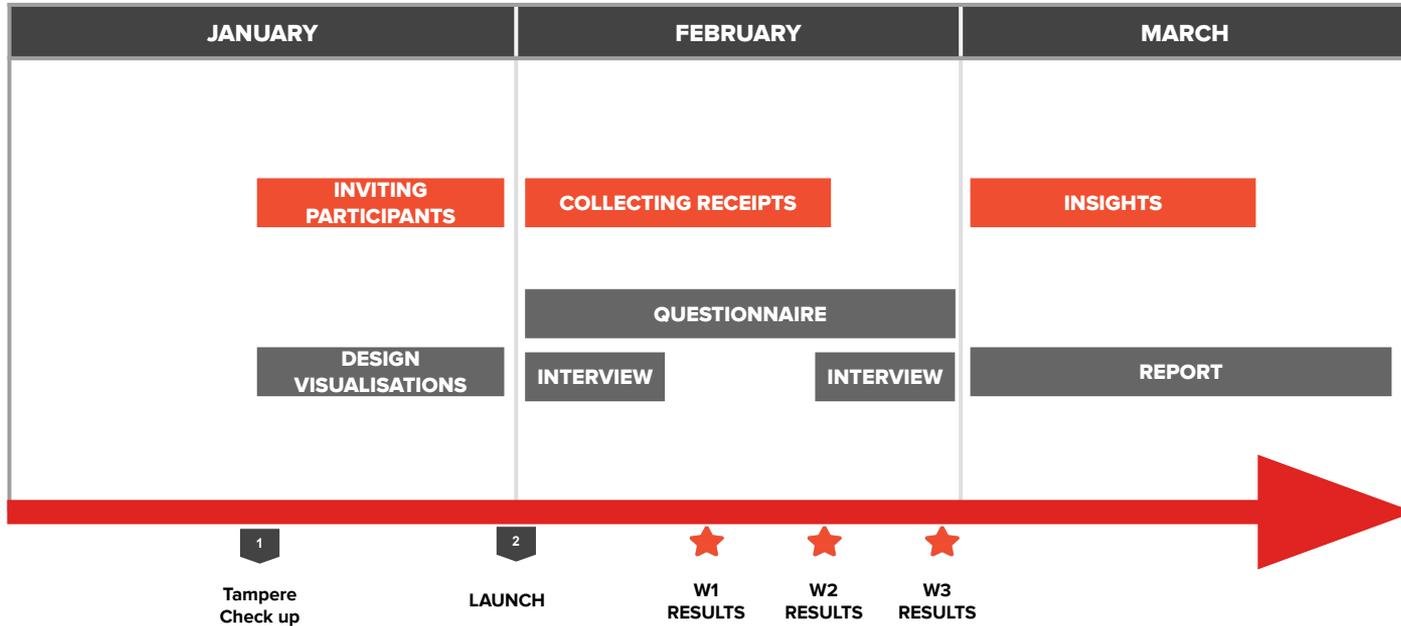
- How many gaps in data do we have, based on real-world purchases?
- How well does the technology read receipts and output accurate data?
- How to automate the service as much as possible for user convenience?

Viability

- Given user feedback, how can we productize the service?
- Can we gain insight on the smartest development paths for the technology?
- What business models could we leverage with the technology?



Pilot Timeline



Participants

The Participants

We relied on our own personal networks and aimed to work with 5-8 participants from a wide variety of backgrounds. In the end, we had 10 participants.

Age	Number of participants
20-30	4
30-40	2
40-50	1
50-60	2
60-70	1
Total	10

Sex	Number of participants
Female	5
Male	5
Other	0
Total	10



Participant motivation & challenge

Key motivation, wishes and challenges for pilot participants were collected in the 1st interview. Participants had different type of motivation and viewpoints on sustainability (e.g. planetary boundaries, animal rights, organic, sustainability in supply chain). Main wishes for carbon footprint tracking was to find practical, trustworthy data to help to easily make smarter purchasing decisions. Participants felt it is difficult and time consuming to find information currently.

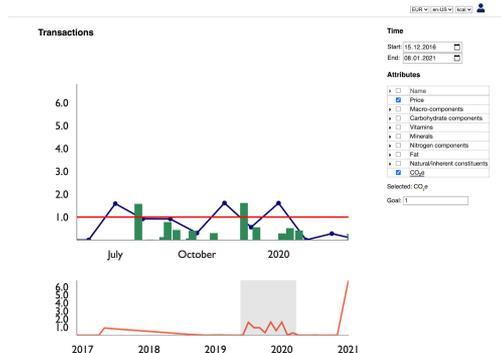
Participant	1	2	3	4	5	6	7	8	9	10
Motivation to measure carbon footprint	Respect planetary boundaries Choices should be easy to make Sustainability in personal choices (food, electronics, car sharing) Trusts labels and certifications	Respect planetary boundaries Take concrete actions in everyday life	Respect planetary boundaries Reduce waste Take concrete actions in everyday life	Respect planetary boundaries Sustainability and climate conscious in personal choices (food, clothing, electronics) Vegetarian	Personal choices, but also political decisions important Sustainable personal choices where possible, but not always key driver	Planetary boundaries as well as animal rights Important motivation both personally and professionally Sustainability and climate conscious	Respect planetary boundaries Sustainability in personal choices (recycling, less meat, clothing, no car)	Respect planetary boundaries Planetary boundaries as well as animal rights Vegetarian Sustainability in personal choices	Starting to consider sustainability. in choices Recycling and 2nd cycle purchases, buying local	Sustainability and climate conscious in personal choices (food, clothing, no car, electronics) Vegetarian
Wishes for carbon footprint tracking	Looking for practical trustworthy information Data and reasoning behind data Economic value as well	Looking for practical trustworthy information Data to make more informed choices	Wants information to help make sustainable choices (production country, recyclability)	Information on carbon footprint should be easily found	Information on carbon footprint should be easy to compare	Information to help make smarter choices	Hoping data on carbon footprint could help change awareness	Wish retail stores took care of sustainability for me without higher prices	Local production important	Information on carbon footprint that is easily accessible, e.g. scanning products with info
Challenges to make sustainable choices	Difficult and time consuming to find information on sustainability	Difficult to compare choices based on sustainability	Purchasing habits are difficult to change	Difficult to make conscious choices in everyday life Lack of time and energy	Wouldn't actively look for sustainability information as part of purchases	It's hard to make sustainable purchasing choices Lack of knowledge and information on sustainability	Climate conscious choices are not so difficult	Doesn't know carbon footprint of own choices like electricity, electronics	Restricted by options in the store unless you know a local producer	High price of sustainable choices Not enough option for local food in Finland



Prototype visualisations

The Software

Before the pilot, several key functions were already available in the software. Due to technology-driven approach, usability was low for the general public and expectations on consumer-facing digital services meant we would have to consider the user interface. To enhance usability and aesthetics, we used a prototyping tool called Figma.



Categories

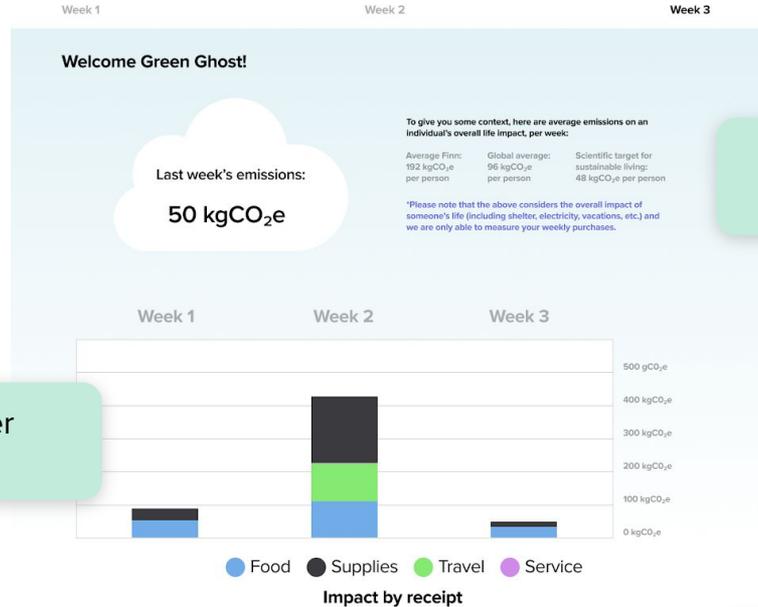
All	Name	Weight	Volume	Price	CO ₂ e
▶	Food	52.27	268.00	698.04	22.09
▼	Ingredient	42.10	267.00	575.33	20.21
▼	Vegetables	9.26	180.00	91.49	12.11
▼	Fruit vegetables	2.70	0	14.38	10.40
	Cucumber	0.99	0	2.96	4.97
	Tomato	0.87	0	8.33	4.34
	Aubergine	0.68	0	2.57	0.92
	Sweet pepper, red	0.16	0	0.52	0.17
▶	Onion-family vegetables	4.19	180.00	38.10	0.74
▶	Leaf vegetables	1.46	0	19.88	0.64
▶	Edible fungi	0.78	0	3.41	0.21
▶	Root vegetables and tubers	0.14	0	4.00	0.12
▶	Cabbages	0	0	8.90	0
▶	Canned vegetables	0	0	2.82	0
▶	Fruits	12.89	39.00	207.27	4.84
▼	Fish	2.27	0	27.24	1.07
▼	Fish	0.71	0	12.99	1.07
	Salmon fillet	0.71	0	7.74	1.07
	Flounder	0	0	5.25	0
▶	Fish products	1.56	0	14.25	0
▶	Potatoes	5.54	0	4.69	1.00
▶	Pulses and nuts	4.80	42.00	68.59	0.81
▶	Cereals	3.07	0	7.56	0.29
▶	Fat	0.14	0	1.49	0.11
▶	Milk	1.34	4.00	30.03	0.00
▶	Other ingredients	0.38	0	6.52	0
▶	Beverages	0.18	0	100.12	0
▶	Meat	1.43	0	16.14	0
▶	Products for special nutritional use	0	0	2.90	0
▶	Egg	0	2.00	0.40	0
▶	Spices	0.00	0	2.99	0
▶	Sugar and confectionery	0.80	0	7.90	0
▶	Dish	10.17	1.00	122.71	1.87
▼	Supplies	0.03	80.00	21.70	3.38
	Shopping bag, plastic	0	80.00	0.41	2.96
	Shopping bag	0.03	0	1.75	0.42
	Kitchen paper	0	0	1.89	0
	Hygiene	0	0	17.65	0
▶	Travel	1.00	15.00	2126.36	0



The visualisation

Using Figma, we designed a clickable prototype that sequenced the data as you scrolled down. We brought in elements of sky and clouds for aesthetic appearance.

Emissions over time



Overall emissions

Participants had a custom name to keep their privacy and make it more fun.

Emissions per receipt

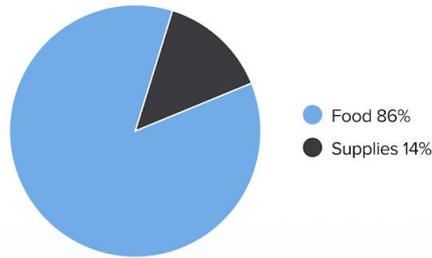
Date	Name	kgCO ₂ e
16.02.2021	Fish Shop	5,8
18.02.2021	Prisma Vaasa	18,6
21.02.2021	Prisma Vaasa	25,4



The visualisation

We broke emissions into categories and also built in some gamification aspects among all the participants, to see how emission tracking as a group could motivate participants.

This week's emissions by category



Overall emissions
by category

Leaderboard: Rating
of all participants
emissions

Your group's result this week 🏆

Name	Emissions / item
Green Ghost	1.56 kgCO ₂ e
Evil Carbon	2.48 kgCO ₂ e
Master Cook	3.17 kgCO ₂ e
Daddy Greens	3.24 kgCO ₂ e
Green Bean	3.25 kgCO ₂ e
The Reducetarian	5.29 kgCO ₂ e

Emissions / item = your items' average emissions



Learnings

Interview insights

At the end of the pilot, we interviewed the participants to gather more insights on their experience.

STRENGTHS OF THE APPROACH

- The prototype was simple and easy to read, data felt trustworthy and it felt **more concrete than general footprint tests**.
- Learnings on one's footprint will affect future shopping
- Some people thought it was helpful to **collect the receipts** and realise one's impact, others only took value from seeing the **visualisation**.
- For some participants, the **target** was motivating and gave a comparison to participants' emissions.
- For some participants, the **leader board** was motivating and created a sense of community.
- It was a **fun family activity** to gather receipts and see our impact by the end of the week.



WEAKNESSES OF THE APPROACH

- The **impact per receipt** is not helpful for people making purchases with a lot of items (e.g. family's supermarket shopping).
- The service handles a lot of **personal data** which raises concerns.
- The data would need more **comparisons** to understand what a certain amount of CO2 actually means.
- It would be useful to have **tips** on how to improve impact, as it was hard for some users to know how to take action.
- It was hard to remember to **keep the receipts**.
- For some participants, neither the **target** or **leader board** were motivating.
- Some **categories** were unclear.



Interview insights

LEARNINGS

Usage of service

- Recurring purchases, such as supermarket and daily commutes, do not need to be tracked over a long period, because participants get a good enough idea from tracking their footprint over a few weeks. Therefore, the service might not be used daily, but for **non-routine purchases**, such as clothes, electronic equipment.
- One interesting user group that would require further development is **families**, whose needs vary a lot depending on the number of people, demographics, etc.
- The service can be more easily used if **data** becomes **easier to read**. Further developments include identifying what ways to compare data are more useful to users.

Different usages identified

- everyday usage
- pre-purchase usage
- occasional usage for particular purchases
- family usage

Price

- 8/10 participants **would pay** for the service. However, people don't have an expectation for the price. Further testing might include creating a app store page with app description and price and see if people agree with it.

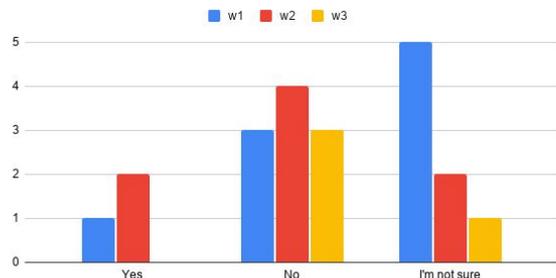
Questions:

- How does CO2 compensation affect the footprint?
- Where does waste come in?
- How to show the emissions of growing food yourself?



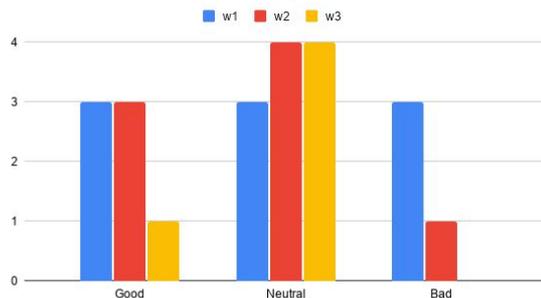
Questionnaire results

Will you change your purchase behaviour for next week's purchases based on last week's data?



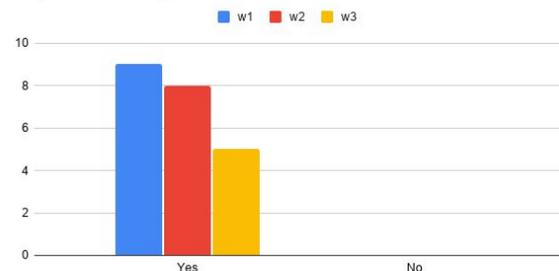
Responses on behavior changes tended toward “no” or “I’m not sure.” This response could depend on the amount of emissions from the last week, which is not analyzed here.

How does last week's data make you feel?



Sentiment toward the previous week's data tended toward “neutral” although the previous week's data could be dependent on how high or low the emissions were, which is not compared here.

Do you like having this data?

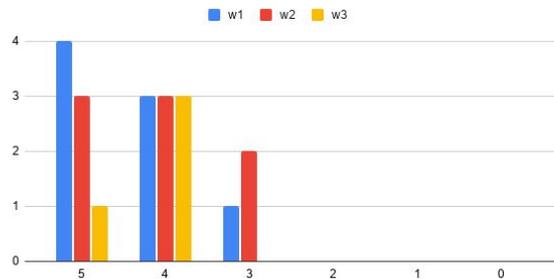


Although week 3 saw a drop in responses, every week respondents said they like to have this data 100% of the time.



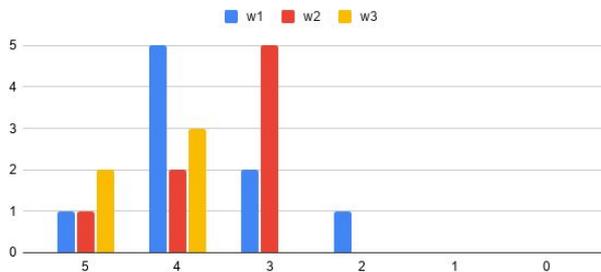
Questionnaire results

How useful was the weekly emissions section of the visualisation?



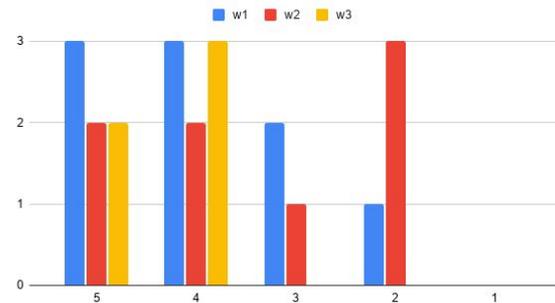
The week's total emissions seemed to be a strong section with all responses 3-5.

How useful was the emissions graph section of the visualisation?



The weekly emissions over time seems to have strengthened in usefulness which started out with a range of 2-5 and ending with range 4-5, albeit with lower response rate at the end.

How useful was the impact by receipt section of the service?

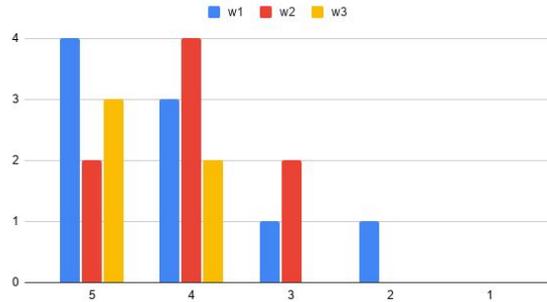


Impact by receipt section review was mixed but still tended toward the higher end of the rating.



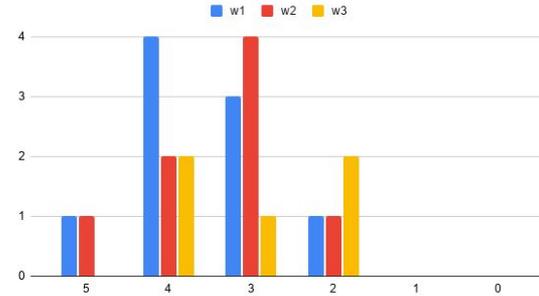
Questionnaire results

How useful was the categories chart section of the service?



The categories section was reviewed favorably with 4-5 as the highest response rate.

How useful was the leaderboard section of the service?



The leaderboard section had a low response rate for the rating of 5.



Questionnaire insights

What surprised you about your emissions data, if anything?

- “That the carbon emissions for transportation by ferry was so high. Still, very good to know!”
- “That the amount of CO2-emissions from the badminton racket I bought online was so big compared to the entire week’s food purchasing receipt.”
- “I was a little surprised about the amount of emissions of services.”
- “That the global average is so much higher than the scientific target for sustainable living.”
- “How much emission one hoodie causes.”
- “I was the "winner" (but wife did more shopping than me last week)”
- “I was surprised by how little I consumed during the week. Also it was interesting how high an impact one package of nyhtökaura and a bag of green beans had compared to other much bigger grocery purchases.”
- “The amount of kilos. Thing is I am not sure of the impact. So now, I know how many kilos I produced, but what does that mean? 5 kilos of CO2 will kill a plant, a dog? what does it do the world?”
- “That the photos were such a high carbon item”
- “Since the second week was very similar to the first one, I wasn’t surprised”
- “I’m surprised how much some services (e.g. seamstress services) and secondhand clothes are estimated to emit”



Questionnaire insights

Will you change your purchase behaviour for next week's purchases based on last week's data? If yes, why?

- “Last week was kind of an exception in my spending habits.”
- “Yes, but not because of the amount of carbon but because I notices what I am spending on. Most of my purchases are must have (according to me) but It makes re-think on what must have means to me. :D Thank you!!!”
- “Vacation are coming 😊”
- “Less shopping.”
- “Because most of my expenses are at grocery stores. I could plan my purchasing better. I wonder if the calculated emission also includes the pollution from the brick store. Or what does it include?”





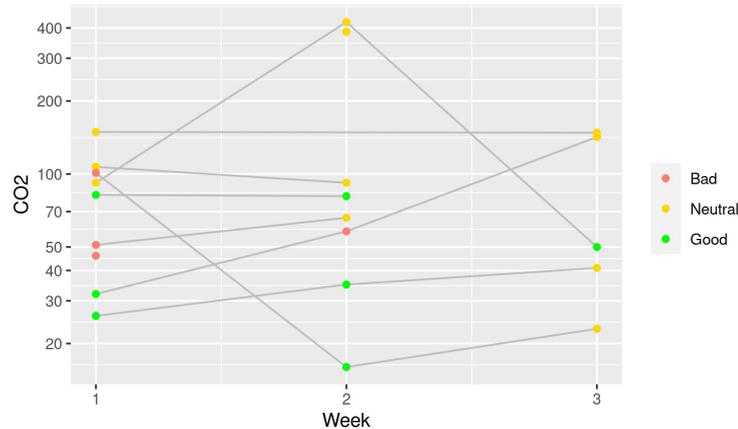
Ilmari Ahonen
Senior Data
Scientist

Questionnaire insights

Will your feelings on your emissions change your behavior toward more sustainable purchasing?

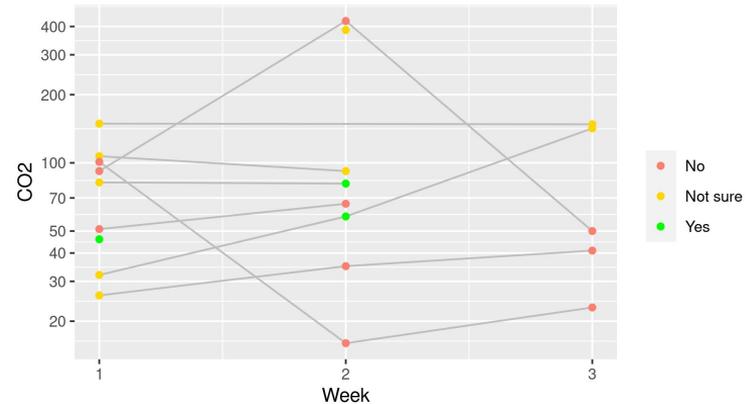
How does the last week's data make you feel?

Answers from the same subject are joined by lines



Will you change your purchase behaviour for next week's purchases based on last week's data?

Answers from the same subject are joined by lines



A statistical analysis* of the data revealed that there's a weak but statistically significant ($p=0.028$) association between the first question and the emissions in the direction that people tend to feel better about smaller emissions. No statistical link between the second question and the emissions was found with this sample size.

*Linear mixed effects regression



Limitations

Here are some limitations that we found on our approach in this pilot:

1

A **limited amount of questionnaire co-variance** was analysed due to the lack of time of the pilot. It would have been helpful to understand how different variables in the survey relate to each other.

2

Handling the participants' **data** proved to be more **time consuming** than expected. It took a lot of **manual work** that led us to reduce the number of participants in the last week.

3

The **short pilot time** was limiting to test the tool with participants over a longer period of time.

4

We focused this pilot on developing the design angle of the service. However we would have needed **more time allocation for software development**.

5

Some aspects of the **item-level emissions** require more **accuracy**. Also, we would need to find ways to compare durable and non-durable goods. For instance, item could have its estimated durability. However, this would have required more manual work that did not fit in our time frame.

6

We **lacked** a specialist in **lifecycle assessment**, who would have been helpful to better assess item-level data and handle databases.

7

It's quite evident that image processing, optical character recognition, natural language processing and emission factor database still need development **to become reliable enough** before it makes sense to invest time to implement report UI and visualizations.



The background is a solid dark blue color with several lighter blue, wavy, organic shapes that create a sense of movement and depth. These shapes are layered and curved, resembling stylized waves or flowing liquid.

**Opportunities for
the future**

Value proposition



Vegaani Skanneri is an app that scans food a product's barcodes and tells consumers if the food item is vegan.

But it does not track carbon emissions and is not able to inform users of their impact over time.



K-Ostokset measure things like domestic expenditure, carbon emissions and nutritional value...

But what use is it when you shop at Lidl or Alepa for fresh food and K-market for the more "exotic" items?



Nordea Wallet enables a general picture of carbon emissions of all purchases with your bank account.

But Nordea wallet users do not see how all their actions add up to meaningful impact and the data is quite generalised.

Comparing to the most relevant benchmarks, our carbon footprint service provides **highly accurate data** from **all purchases** and shows one's **impact over time** to enable **sustainable actions**.



Development Paths

1. Further development of current app

Users appreciate the possibility to see item-level data, and app could be further develop to a full library of detailed emission data

App could provide specific recommendations for alternative products with lower CO2 footprint

Users were interested in using this type of app for a specific measurement period to understand own carbon footprint, and then review after time (e.g. annually).

Potential customers: private customers, employer offering service for employees

Possible business models: Subscription based models (monthly or annual), sponsors from recommendations

2. Show emissions before purchase

Users were interested in seeing and comparing item-level CO2 data before purchases (in stores, online, on menus) to make more climate friendly choices

The app could include or even focus on this data

This data would allow users to do weekly/monthly or annual carbon budgeting and make purchasing decisions accordingly.

Potential customers: private customers, B2B customers interested in helping customers choose climate friendly options

Possible business models: Subscription based models (monthly or annual)

3. Integrate app functionalities to other services

Many users wished to collect purchase data from existing services such as credit card data or shop data

The service could be integrated into current services which already collects data on purchases such as food store apps, restaurant apps, bank mobile apps

Compared to current services offered, this solutions should offer full CO2 footprint of all purchases, and more detailed data than is currently available.

Potential customers: food retailers, restaurants, finance institutions

Possible business models: free for user service.



Further features for Path 1

Based on the questionnaire feedback and the interviews' insights, we identified relevant features that would develop the service further. These include:

- 1 Input one's **overall life emissions** in the service (electricity, house type), in order to compare our purchases to the overall life.
- 2 Include **tips**. App could provide specific recommendations for alternative products with lower CO2 footprint.
- 3 Show **how the service gathers the data** on the emissions.
- 4 Show **item level data**. Users appreciated the possibility to see item-level data, and app could be further developed to a full library of detailed emission data.
- 5 Include a **carbon budgeting shopping list**, that shows how to stay within people's carbon budget before going shopping.
- 6 Include **features for families**, for instance, choosing what family members participated in each purchase.



Insights on how to present carbon emissions in digital solutions

The pilot offered also **general insights** on important things to **consider when showing carbon emissions in digital solutions** and how to **motivate to decrease carbon footprint**.

- Users want **concrete data on their carbon footprint and practical help in making low carbon choices in everyday life**.
- Carbon footprint data of individual item was **more concrete than general footprint tests**. Users wanted more **comparisons** of carbon footprint (e.g. comparison to driving X km by car) to understand what a certain amount of CO2 actually means.
- Users wanted information on carbon footprint **before purchase**, to be able to compare options and help with carbon “budgeting”.
- It was **motivating to have a concrete target** (such as average Finns carbon footprint or carbon footprint of 1.5°C lifestyle)
- For some participants, the possibility to **compare carbon footprint against other users in the community was motivating**
- Looking at **weekly data** was inspiring and helpful to reflect the impact of own choices on carbon footprint.
- Users wanted **tips and recommendations** based on their data on how to improve impact.
- Data for **carbon footprint at item level is still difficult and time consuming to find** and collect at item level. How can companies collect and share this data?

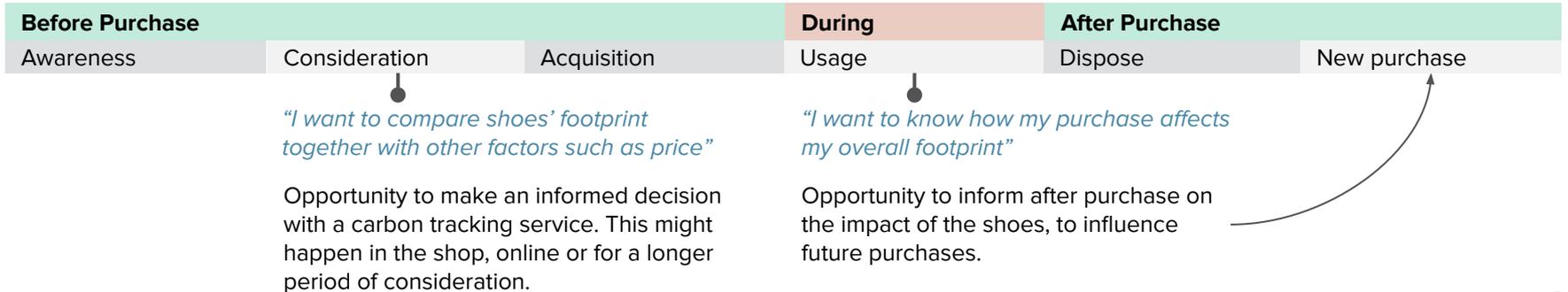


Motivation factors

EASY, ACCESSIBLE AND TRUSTWORTHY

All participants said they want easy, accessible and trustworthy information. These words have different meanings for different people, however during the pilot the view from several participants was that “easy” means not time consuming and “accessible” means the right information in the right time. “Trustworthy” means accurate and from reliable sources.

Right information at the right time



Data privacy

Data architecture

Data architecture of our tool spans two services: web application and backend service. Web application handles user data such as receipts and requests product categories and their attributes such as carbon footprint from backend service. Thus, web application can generate reports from user data.



Database / user data

Our backend service provides product category attribute data for all our users. User data for generating reports can be processed and stored in user device. Sometimes user data has to be shared between multiple devices and users. Then data can be stored to cloud with end-to-end and database encryption. Data privacy is maintained in the all use cases.



What do you think?

**Happy to hear
feedback and ideas
for the pilot.**

