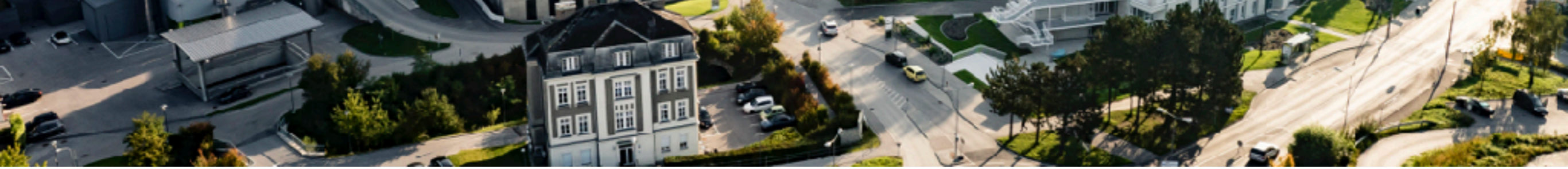




Science or Science Fiction: How to make research more sustainable?

Jeroen Dobbelaere
NACH-LABS October 2023



Outline

- **Introduction**
- **How to engage people for sustainability**
- **From idea to action**
- **Future projects**

From Research, ...

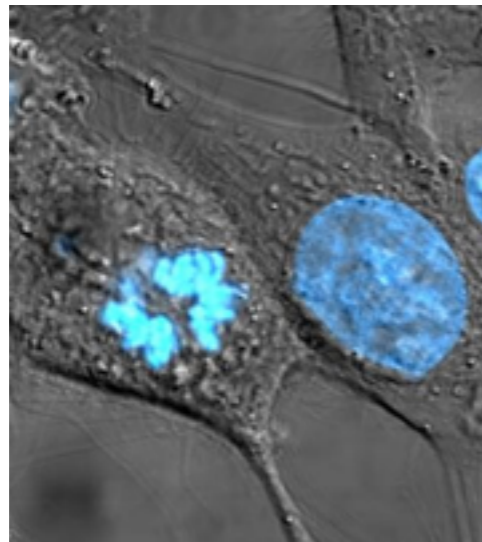
Cell division and cell communication



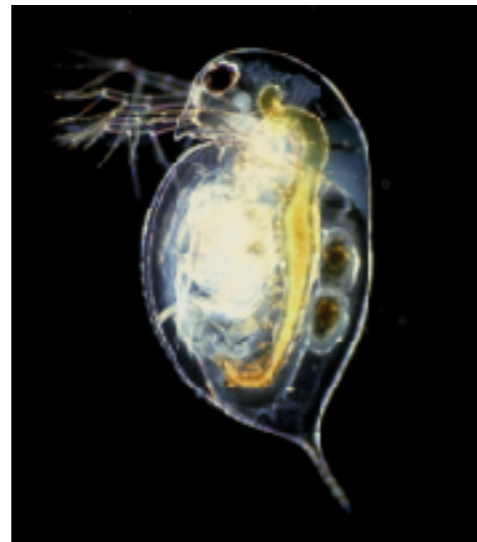
C. elegans



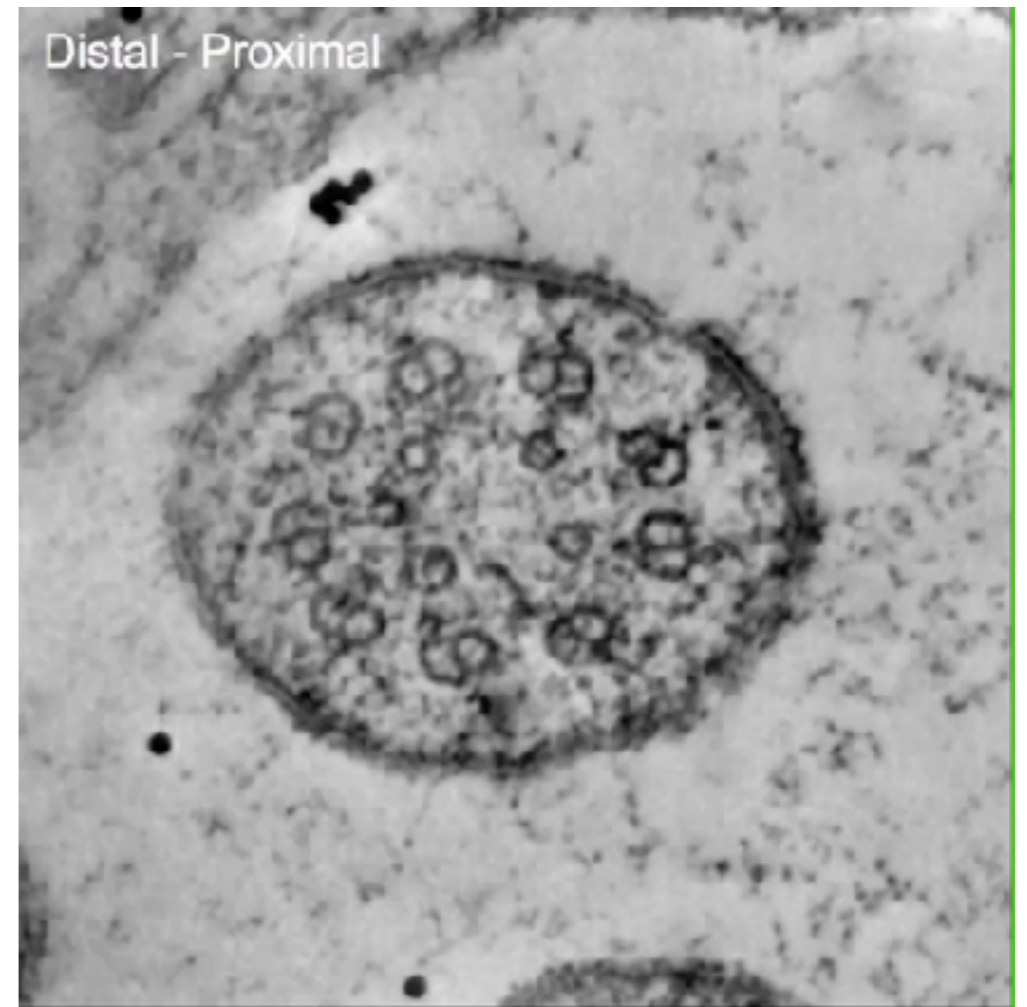
Drosophila



Cells



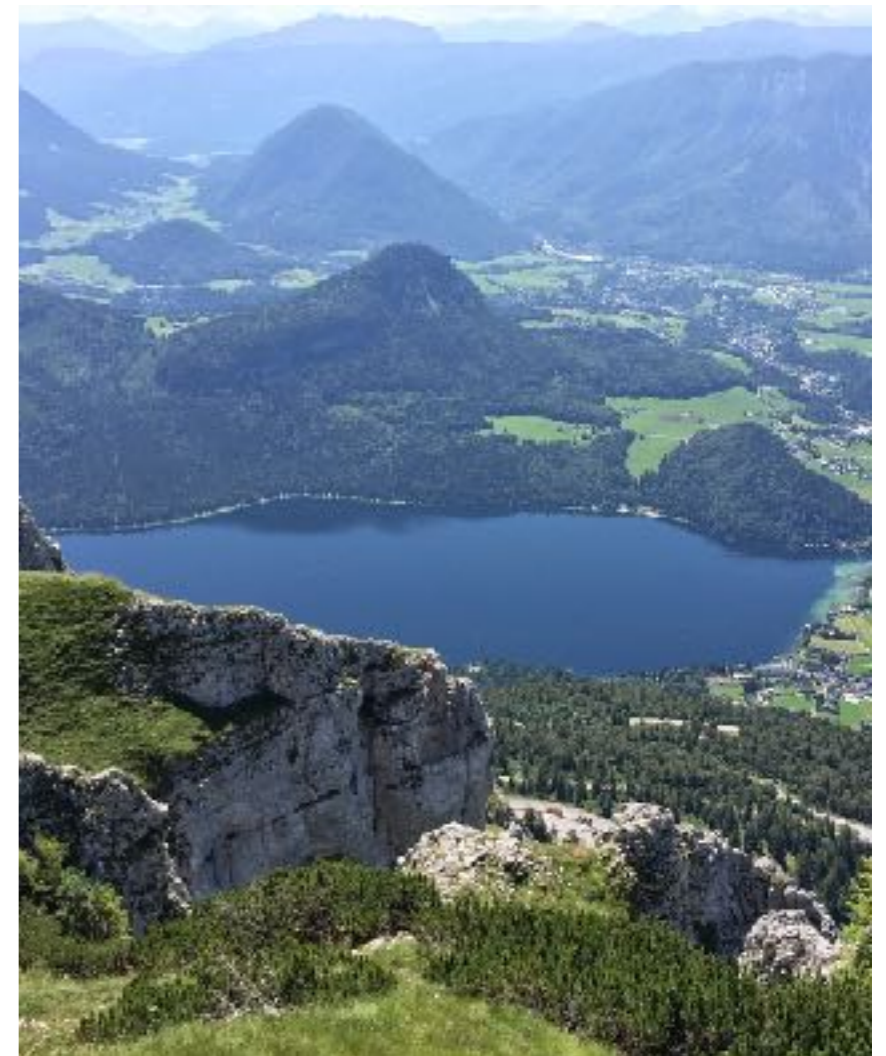
Daphnia



... over climate ambassador, ...

Climate@
MaxPerutzLabs

- Cycling
- Urban Gardening
- Climbing and Mountain Walking



... to sustainability manager ...



Sustainability@ISTA



Website: <https://ista.ac.at/en/sustainability/>
Twitter: https://twitter.com/IST_sustainable
Email: jeroen.dobbelaere@ist.ac.at



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Science and
Technology
Austria

... and some fun projects



How to harness AI for a better future?

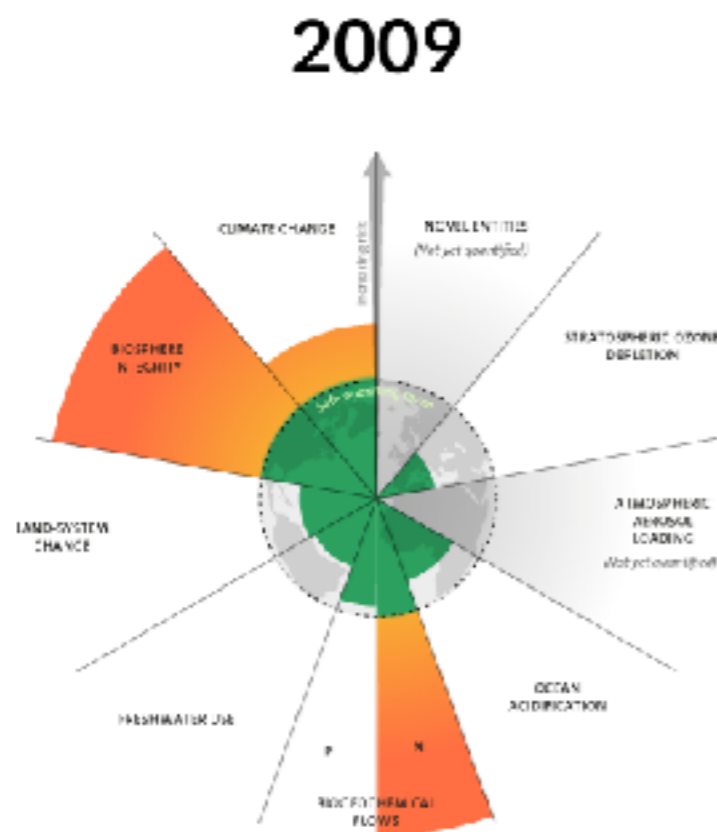
We are in the midst of a watershed moment regarding the need for sustainable transformation. Technology, and artificial intelligence in particular, can prove pivotal in our efforts to solve the sustainability puzzle. However, there is a significant gap between the sustainability and tech sectors, resulting in inefficiencies, missed opportunities and escalating risks for both people and the planet. Aligning these sectors' goals and impact measures is the key to a sustainable future for all of us.

Authored by a diverse team of experts – global sustainability specialist Alice Schmidt, the impact-driven entrepreneur Claudia Winkler, AI expert Florian Schuetz and the life scientist Jeroen Dobbelaere – *Fast Forward* bridges the divide between sustainability and technology while tackling the important questions posed by individuals, organisations and societies worldwide since ChatGPT's public release. Offering a variety of current real-life examples, the authors make a compelling case for the imperative of ethical and responsible AI. They highlight how these principles are instrumental in harnessing AI's transformative capacity to revolutionize our approach to sustainability and create health, wealth, and well-being for all.

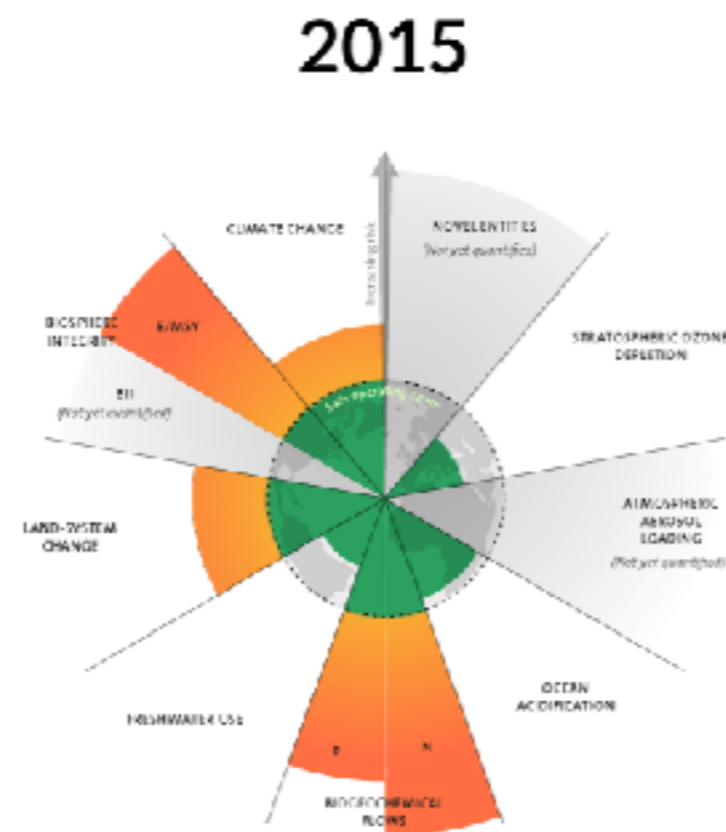
GET THE BOOK

<https://www.sustainability-puzzle.org/fast-forward.html>

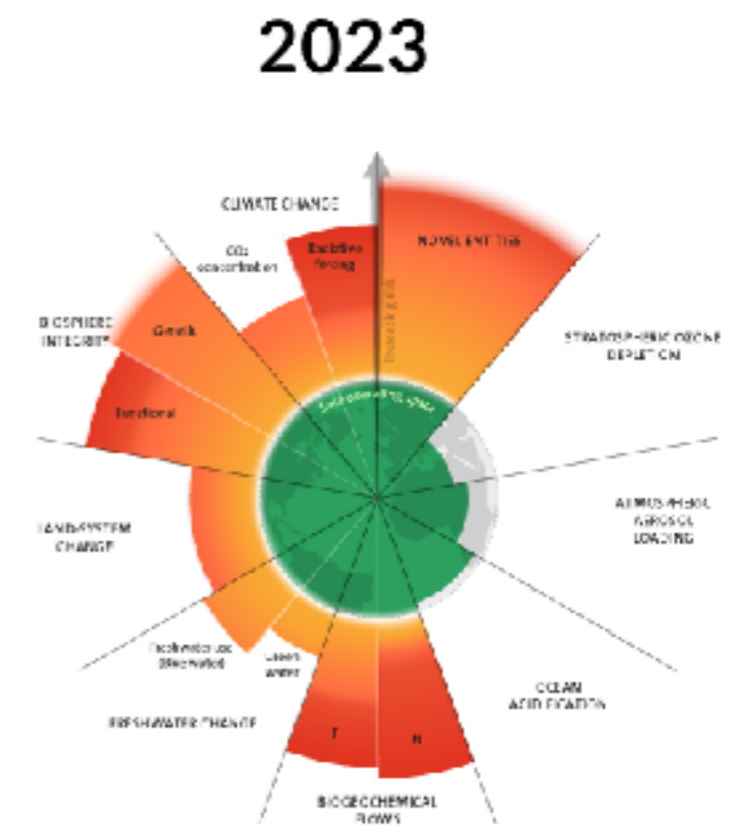
Climate change: Planetary Boundaries



3 boundaries crossed



4 boundaries crossed



6 boundaries crossed

How to engage people



How to engage people

Work with the tools you have

As a scientist we are:

- 1. Critical thinkers**
- 2. Experts in data analysis**
- 3. Great teachers**
- 4. Good in grant and paper writing**
- 5. Used to present data**
- 6. Experts in getting and giving feedback**

Data analysis: Survey 2020



IMP

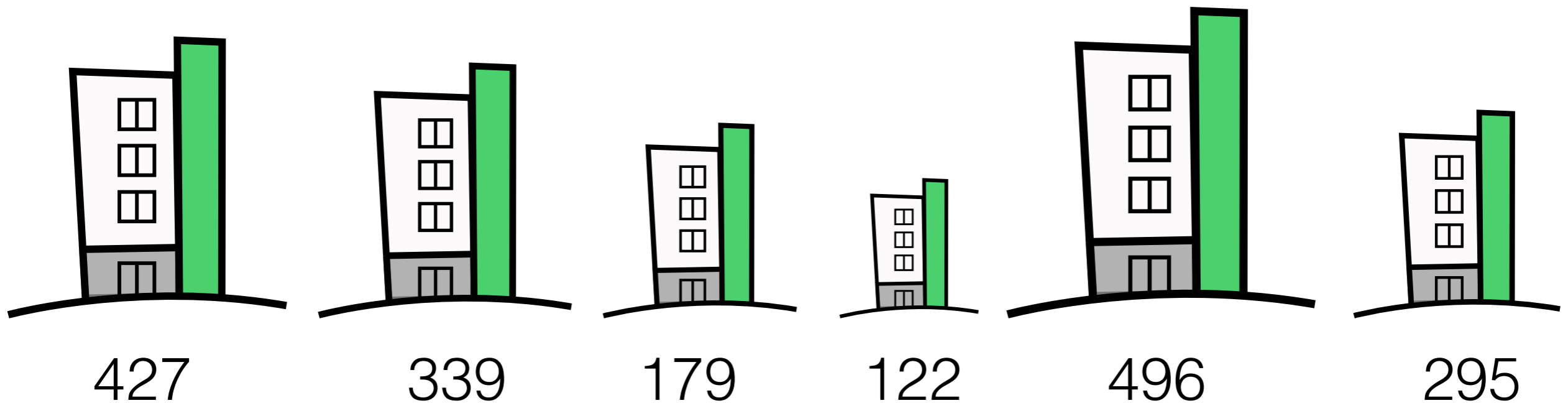
IMBA

GMI

VBCF

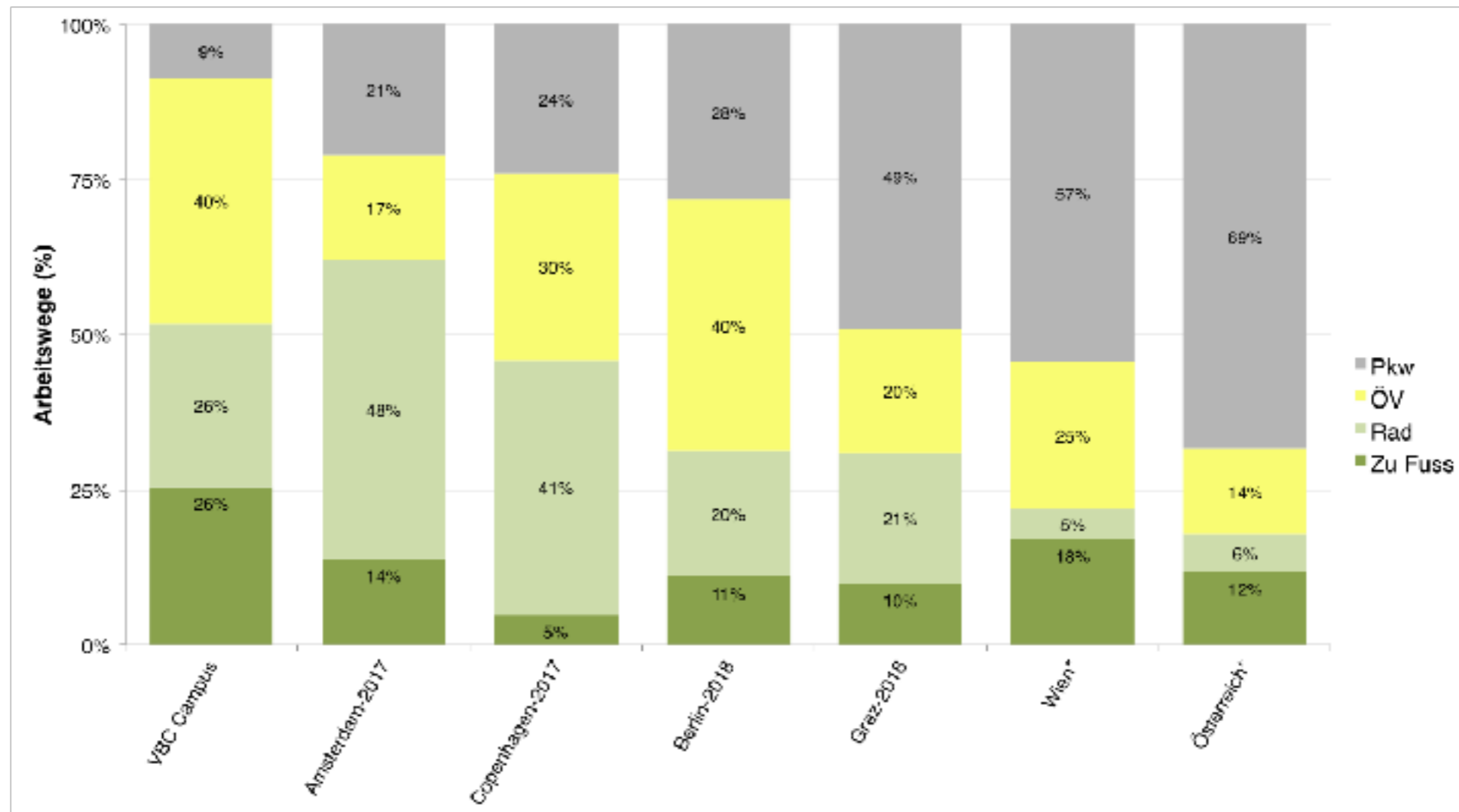
Perutz

Companies



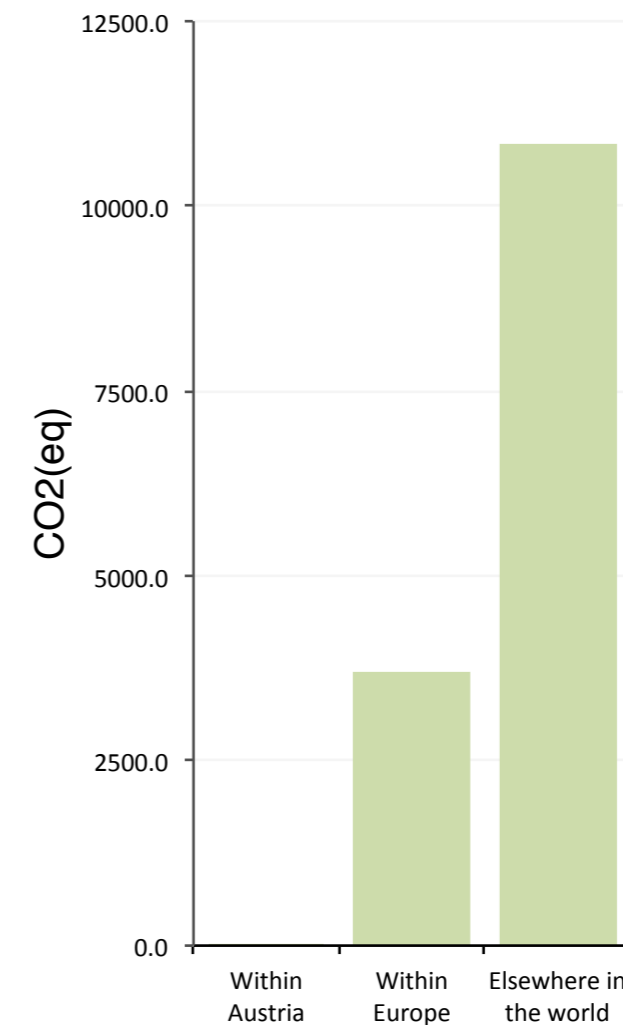
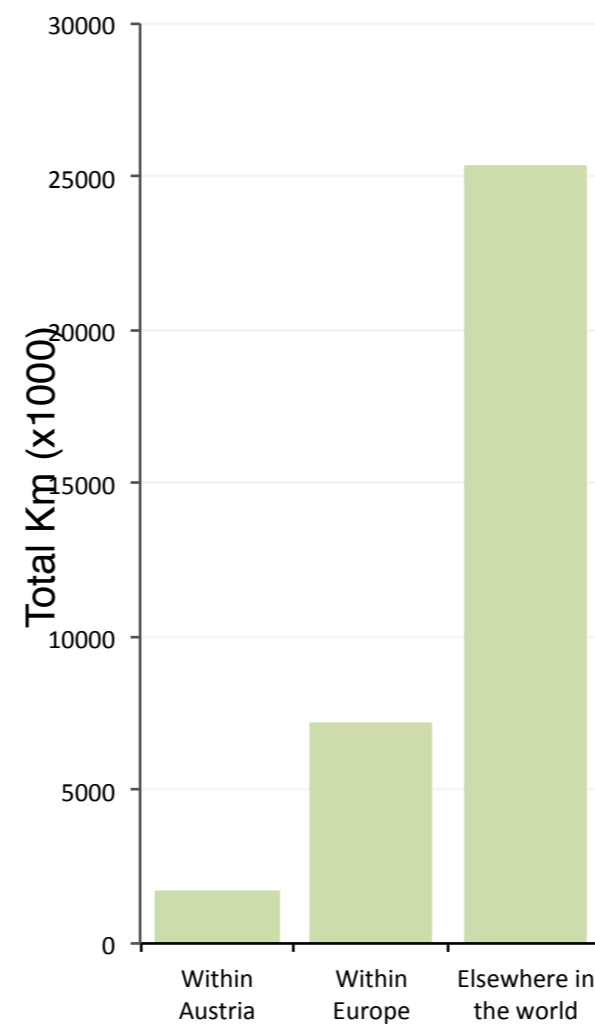
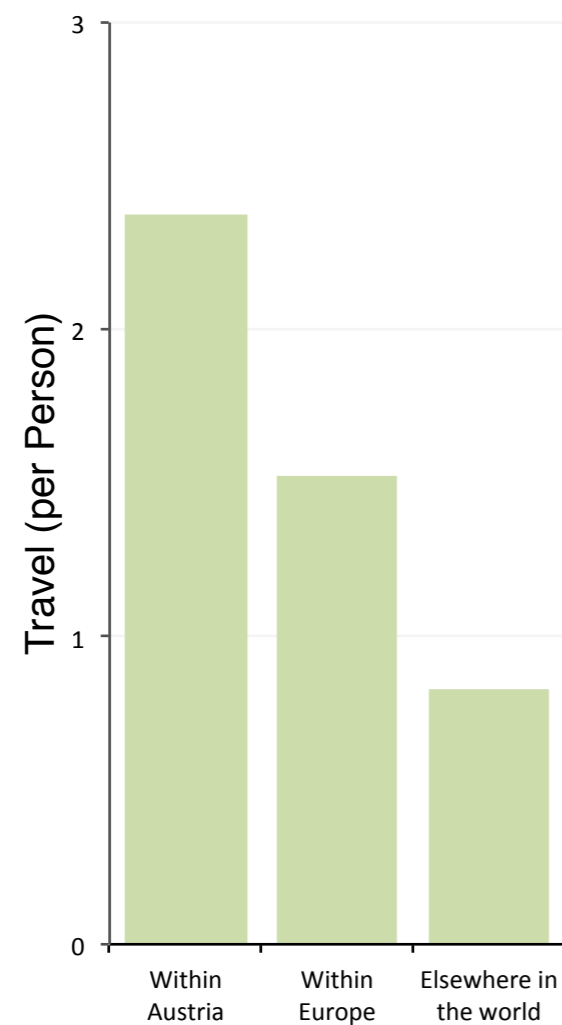
Data analysis: Survey 2020

Modal Split



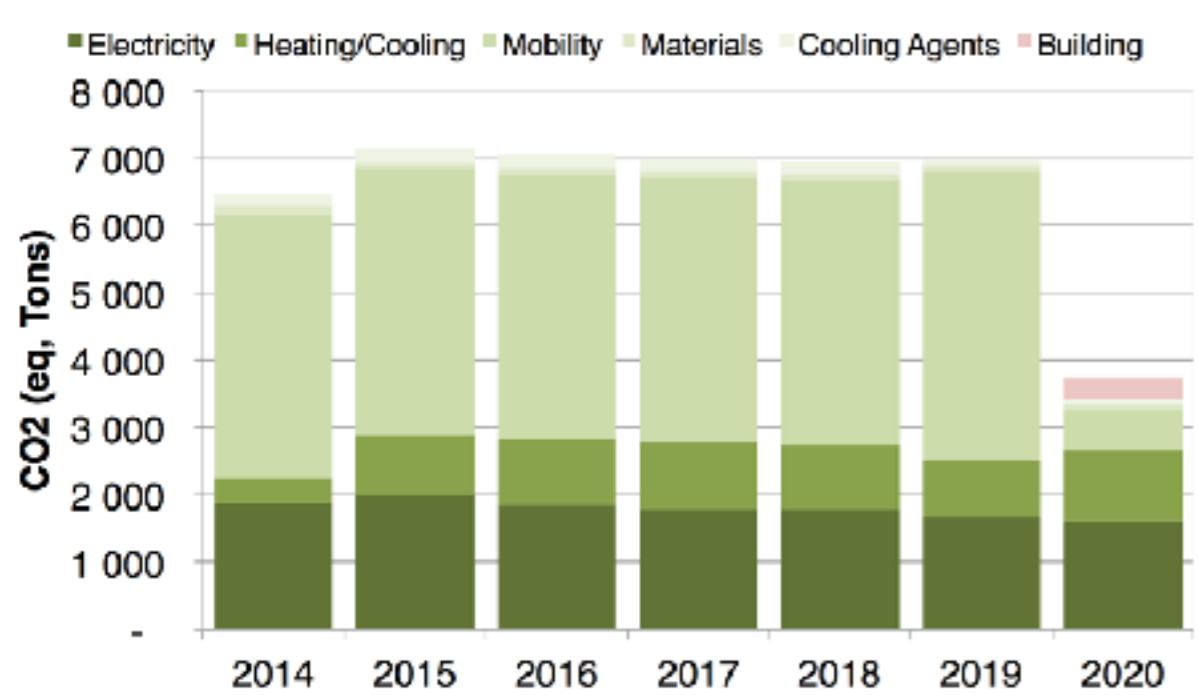
Data analysis: Survey 2020

How many business trip do you take every year?

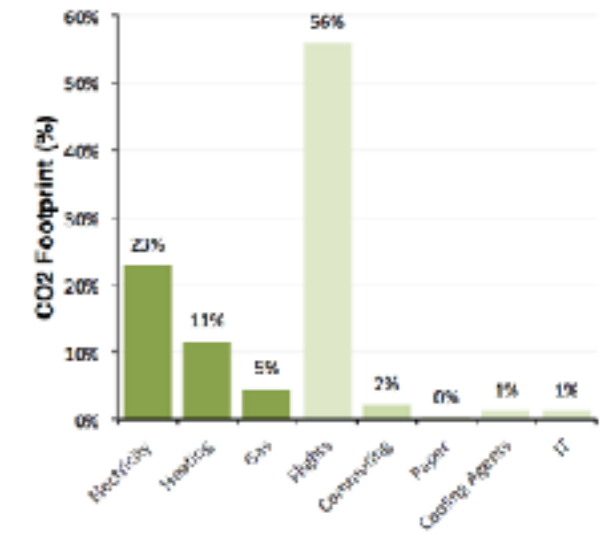
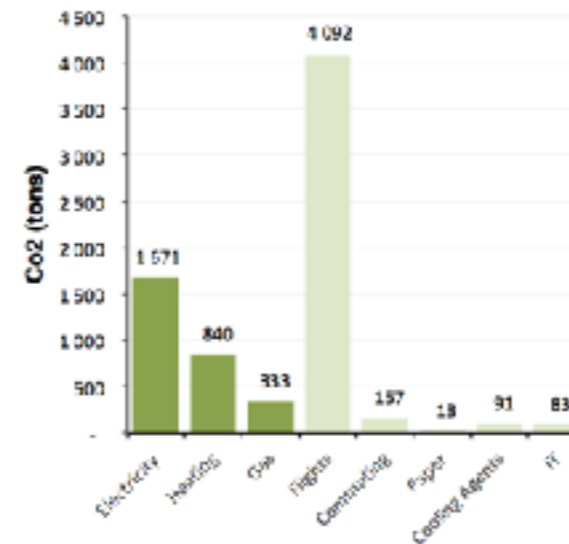


Collaboration with Boku, TUGraz, ETH and University of Edinburgh

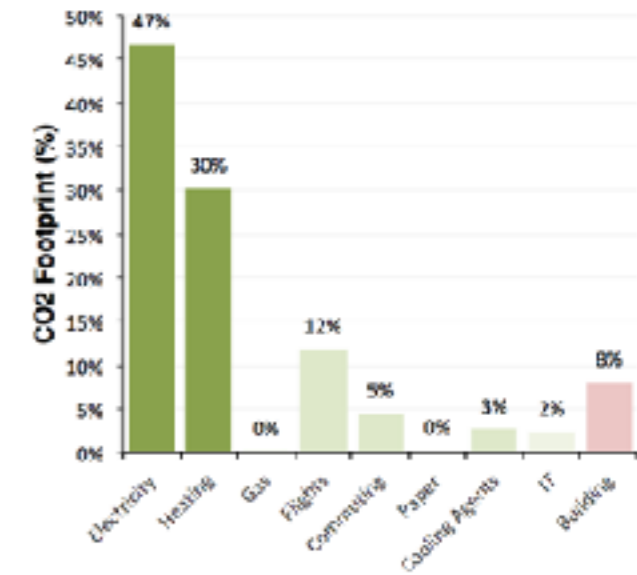
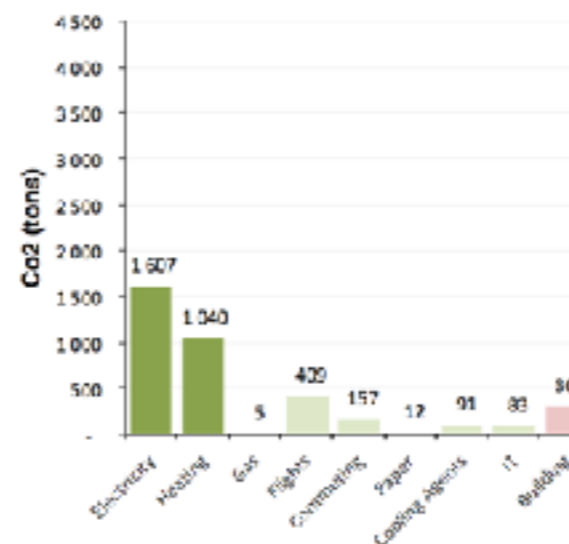
Data analysis: CO2 Footprint



2019 7315 tons/year



2020 3739 tons/year



Teaching



Teaching

ISTA

Climate Cafe

Understanding Quantitatively Environmentally Important Aspects of Society and Science

University of Vienna

Science or Science Fiction: How to make research more sustainable?



Questions: jeroen.dobbelaere@ist.ac.at

Publications

- 3 [The paradox of the life sciences How to address climate change in the lab](#)



[Winter, N](#), [Marchand, B](#) and [Dobbelaere, J](#)

Mar 6 2023 | Feb 2023 (Early Access) | [EMBO REPORTS](#) 24 (3)

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15

[References](#)

[Related records](#)

- 4 [Achieving sustainable transformation in science - green grassroots groups need nurturing from the top](#)



[Dobbelaere, J](#), [Heidelberg, JB](#) and [Borgeermann, N](#)

Sep 2022 | [JOURNAL OF CELL SCIENCE](#) 135 (17)

Climate change is the greatest challenge of our time, and drastic climate action is needed urgently across industries and sectors to prevent the worst in terms of consequences. Although academic research brings great benefits to society, it leaves behind a considerable environmental footprint at the same time. This is particularly true for lab research within the life sciences. To reduce the cl ... [Show more](#)

[Free Full Text From Publisher](#) ***

7

[References](#)

[Related records](#)

- 5 [Preaching water while drinking wine: Why universities must boost climate action now](#)



[Borgeermann, N](#), [Schmidt, A](#) and [Dobbelaere, J](#)

Jan 21 2022 | Jan 2022 (Early Access) | [ONE EARTH](#) 5 (1) , pp.18-21

Although universities have been leading climate science for decades, most have not taken drastic climate action in their own operations. Sustainable transformation of the university sector requires accounting for all scopes 1-3 emissions and setting science-based reduction targets. It is high time for universities to practice what they preach and move back to the frontline of climate action. ... [Show more](#)

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4

[Citations](#)

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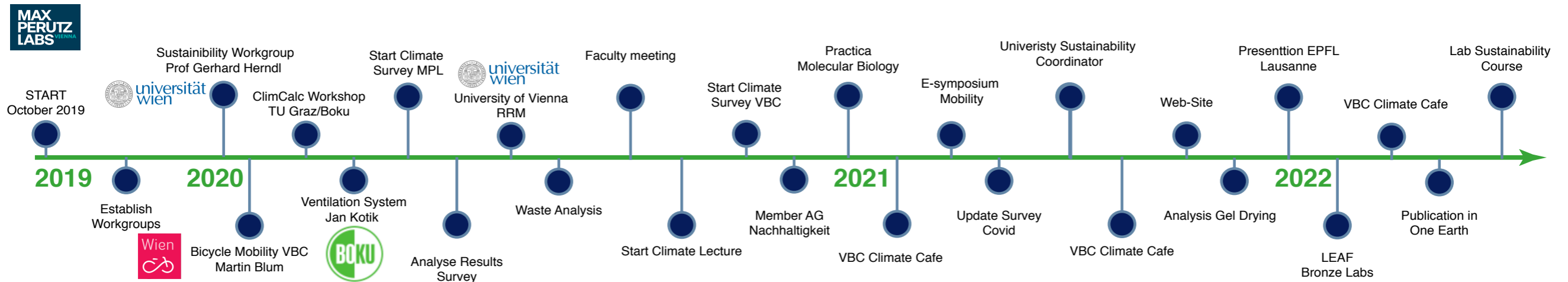
[References](#)

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Sustainability Award 2022



Climate@MaxPerutzLabs



Team



From idea to action



@Benoit Nicolet

One way plastics

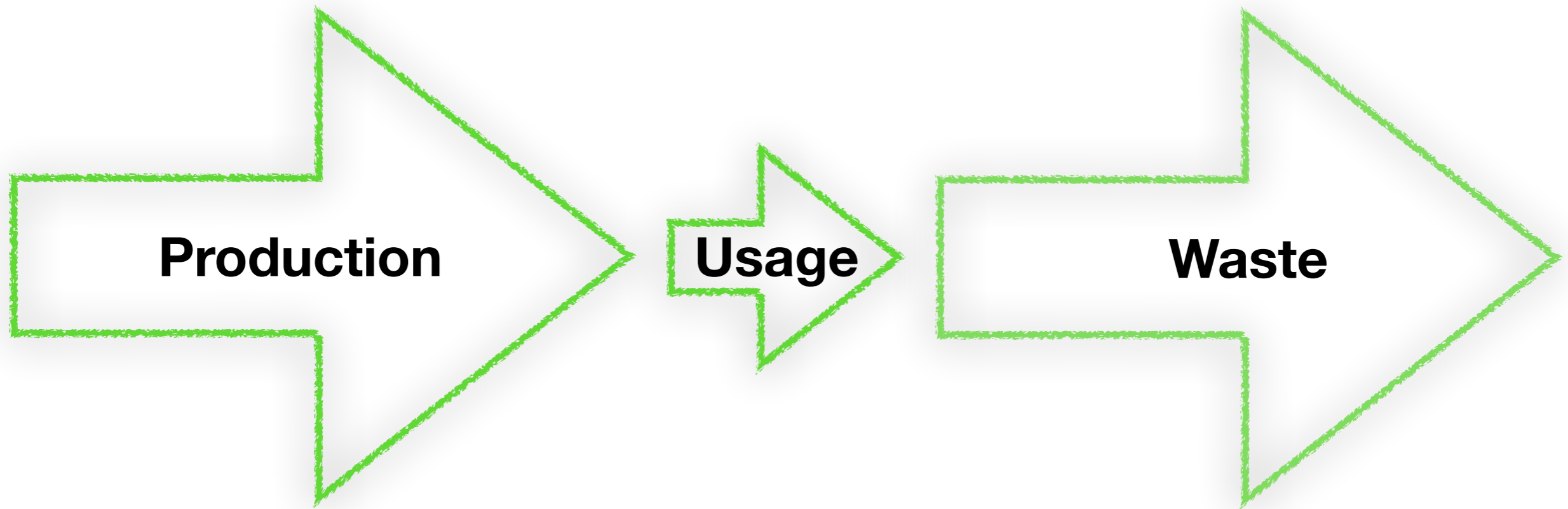
Around the BBC



Garbology: What our waste says about us

BBC Future

One way plastics



7.0 kg CO₂/kg Consumables

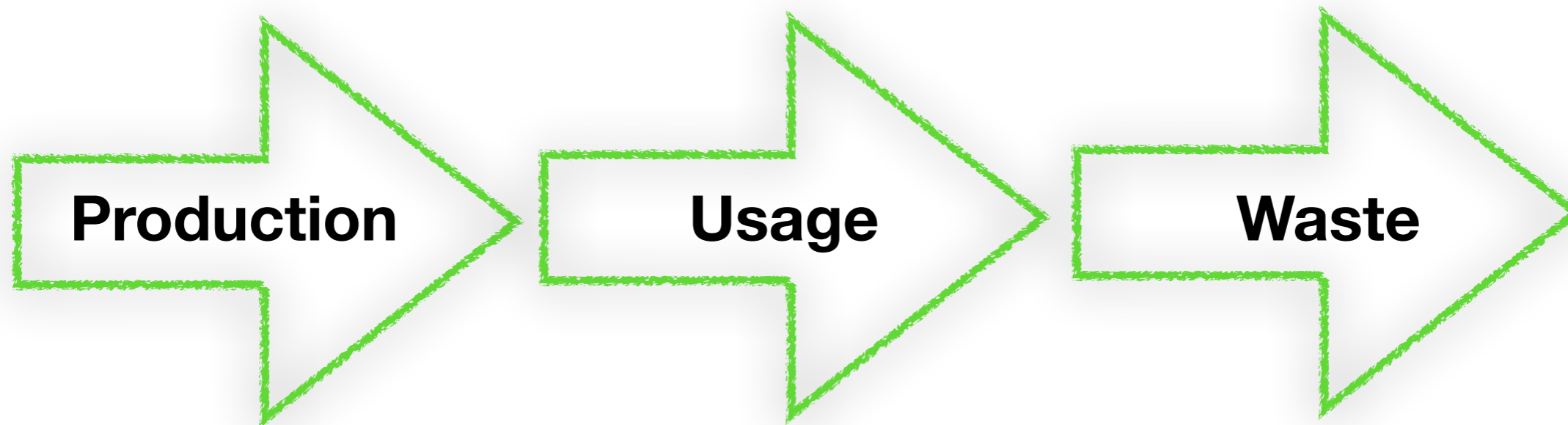
0.495 kg CO₂/kg waste

**315 tonnes of CO₂
(45 tonnes consumables)**

**22.7 tons of CO₂
(45 tonnes waste)**

+/- 335 tonnes of CO₂ = 10% of our footprint

One way plastics



- **Optimise amounts**
- **Increase glass use**
- **Combined purchasing**



- **Glass use**
- **Recycle plastics**
- **share reagents and equipment**



- **Plastic recycling**
- **Optimise protocols**
- **Raise awareness**

One way plastics

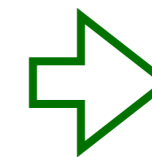
Recyclable Plastic ~ 11.5 tons/year



29 Tons/Year



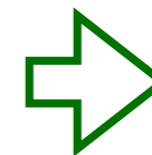
Polypropylene



6 Tons/Year



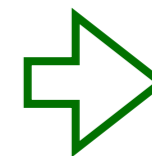
Polystyrene



3.2 Tons/Year



PET



2 Tons/Year



HDPE



0.4 Tons/Year



max_perutz_labs • Follow



max_perutz_labs "Window takeover" by climate@MaxPerutzLabs reminding us of the ecological impact of science. What can we do to change our practices for the use of plastic disposables?

Refuse: buy products with less packaging and plastic contents

Reduce: look for alternatives like glass

Reuse: use the plastic multiple times, when possible

Repurpose: find ways to reuse plastics for other applications

Recycle: Single-use plastic is mostly made from fossil oil and creates huge amounts of waste.

Every year tons of single-use plastic are used at research institutions



35 likes

3 MARCH

Log in to like or comment.

Other Project

Flight Policy

Bicycle travel

Academia - Company collaborations

Future Projects



Future Projects

Institute Level: ISTA

EMBL

Crick

Make-up of our total 2022 carbon footprint



Scope 1 Emissions This covers emissions which are emitted on our sites (eg. gas boilers, steam generators)
Scope 2 Emissions This covers upstream emissions from energy we purchase from a third party (eg. gas, electricity, district heating, data centre power)
Scope 3 Emissions Emissions generated by the goods and services we purchase split into the following categories: Agriculture products Business travel Capital goods Construction & refurbishment Food & drink Glass and plastic products Legal, consultancy and other business activities Medical and precision instruments Office machinery & Computers Organic Chemicals Purchased goods and services (PG&S) Upstream leased assets Upstream transportation and distribution

Sustainability Strategy - timeline and targets

	2023/24	2025/26	2027/28
ENERGY	5% reduction in energy consumption across all areas of the building	10% reduction in energy consumption across all areas of the building	15% reduction in energy consumption across all areas of the building
WASTE	5% reduction of operational waste	75% recycling rate (non-clinical)	30% reduction in edible food waste
		10% reduction of operational waste	80% recycling rate (non-clinical)
		50% reduction in edible food waste	15% reduction of operational waste
			85% recycling rate (non-clinical)
			80% reduction in edible food waste
		ZERO operational waste to landfill	
WATER	2% reduction in water use per person	1% reduction in water use per person	6% reduction in water use per person
NATURE	Increase accessible green space within the building Support sustainable eating choices in the canteen and internal meetings Monitor indoor air quality keeping CO2 levels below 900 ppm for 95% of occupied hours post-office hours Continue supporting outdoor spaces to promote biodiversity		
TRAVEL	5% reduction in carbon emissions from work related travel	95% of staff to commute by sustainable transport sustained	15% reduction in carbon emissions from work related travel
		10% reduction in carbon emissions from work related travel	95% of staff to commute by sustainable transport sustained
			15% reduction in carbon emissions from work related travel
			95% of staff to commute by sustainable transport sustained
MATERIALS	Establish a baseline for CO2 emissions for procurement	Establish a baseline for CO2 emissions associated with catering	Reduction CO2 emissions to procurement of products, % tbc
		Reduction CO2 emissions associated with catering, % tbc	Reduction CO2 emissions to procurement of products, % tbc
			Reduction CO2 emissions associated with catering, % tbc
			Reduction CO2 emissions to procurement of products, % tbc
		Zero single-use plastics for catering	
		Reduce non-essential single use plastics and packaging throughout the Crick	

Future Projects

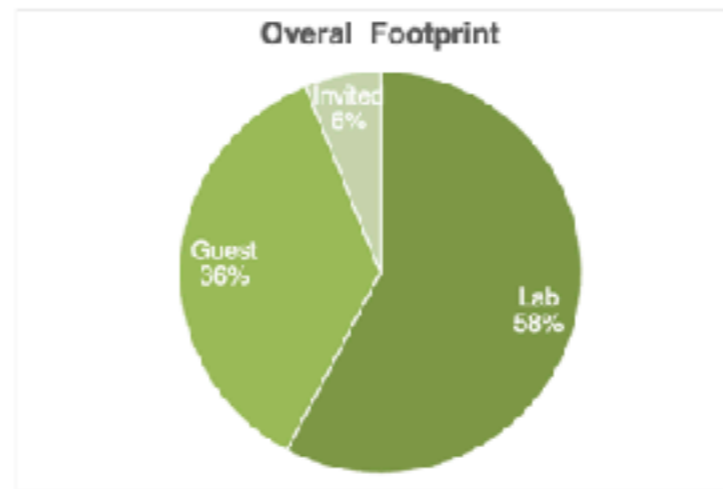
Ambassador Labs

Overall Footprint	Co2eq (Tons)	%	/FTE	# Trips	Km	%
Lab	14,639579	58%	1,1415061	8	42429	59%
Guest	9,312385	36%	0,7193373	4	6521	9%
Invited	1,562989	6%	0,1202299	4	23225	32%
Total	25,714953		1,9797733	16	72175	

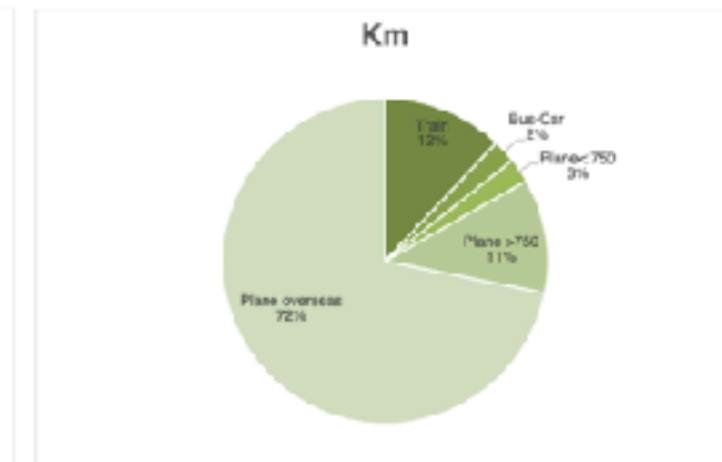
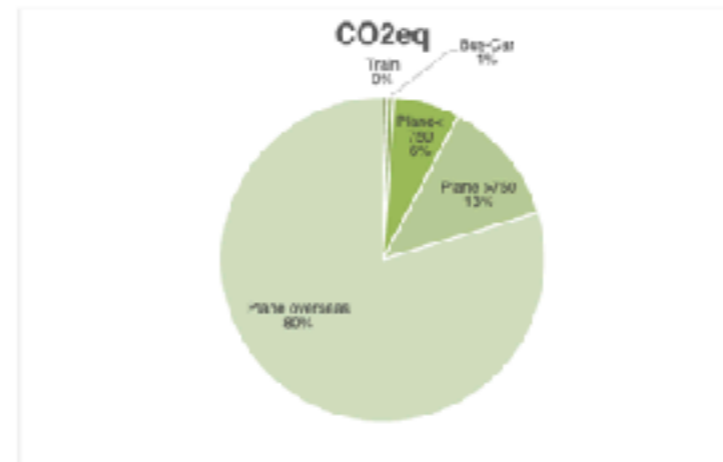
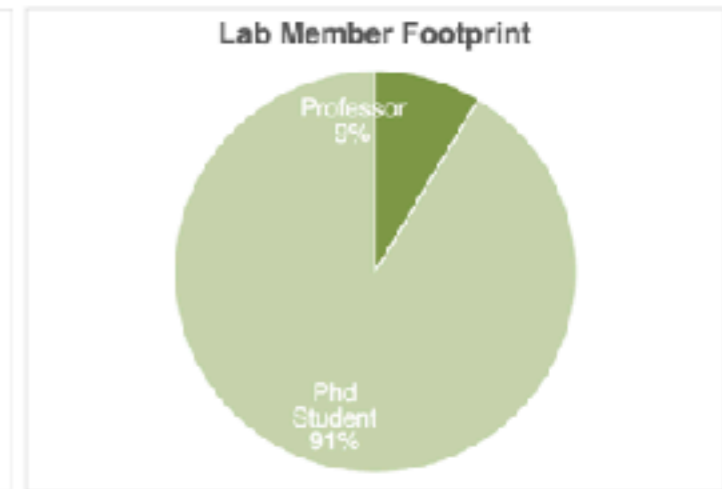
Lab Member Footprint	Co2eq (Tons)	%	/FTE
Professor	1,27	9%	0,0073487
Postdoc	0,00	0%	0
Phd Student	13,57	91%	1,0439574
Other	0,00	0%	3,418E-17
Total Lab	14,639579		1,1415061

Online In Person	#	%
All trips	16	100%
Lab Trips	8	50%
Online Meetings	0	0%
Total meetings	16	

Mode	#	CO2eq	Km	%CO2eq	%Km
Train	16	0,112526	8596	0%	12%
Bus-Car	4	0,182560	1606	1%	2%
Plane<750	4	1,692610	1754	7%	2%
Plane>750	6	3,242160	8208	13%	11%
Plane overseas	9	20,489095	51861	80%	72%
All single trips	39	25,714953	72175		

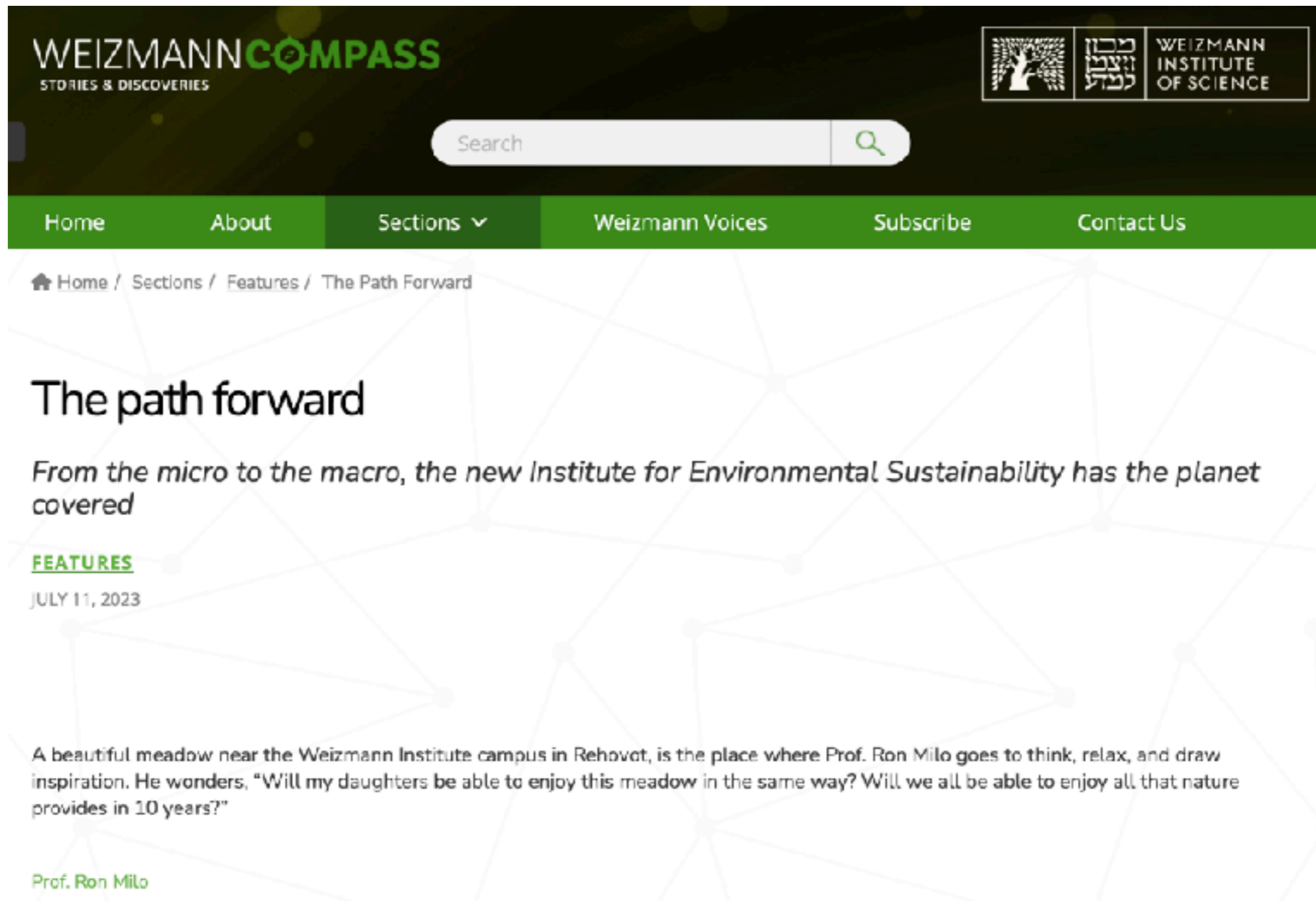


Overall Footprint 2023: 25,7 CO2eq (tons)
 Lab Footprint 2023: 14,6 CO2eq (tons)
 1,98 CO2eq (tons)/FTE
 1,14 CO2eq (tons)/FTE



Teaching

Interdisciplinary mentoring scheme for PhDs



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The path forward

From the micro to the macro, the new Institute for Environmental Sustainability has the planet covered

FEATURES

JULY 11, 2023

A beautiful meadow near the Weizmann Institute campus in Rehovot, is the place where Prof. Ron Milo goes to think, relax, and draw inspiration. He wonders, "Will my daughters be able to enjoy this meadow in the same way? Will we all be able to enjoy all that nature provides in 10 years?"

Prof. Ron Milo

Summary

- **Use the skills you have**
- **Try it out**
- **Think where you can have an impact**
- **You can more than you think**
- **Have fun**

Thanks

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LinkedIn: <https://www.linkedin.com/in/jeroen-dobbelaere-74756915/>
Twitter: <https://twitter.com/JeroenDobbelaere5>



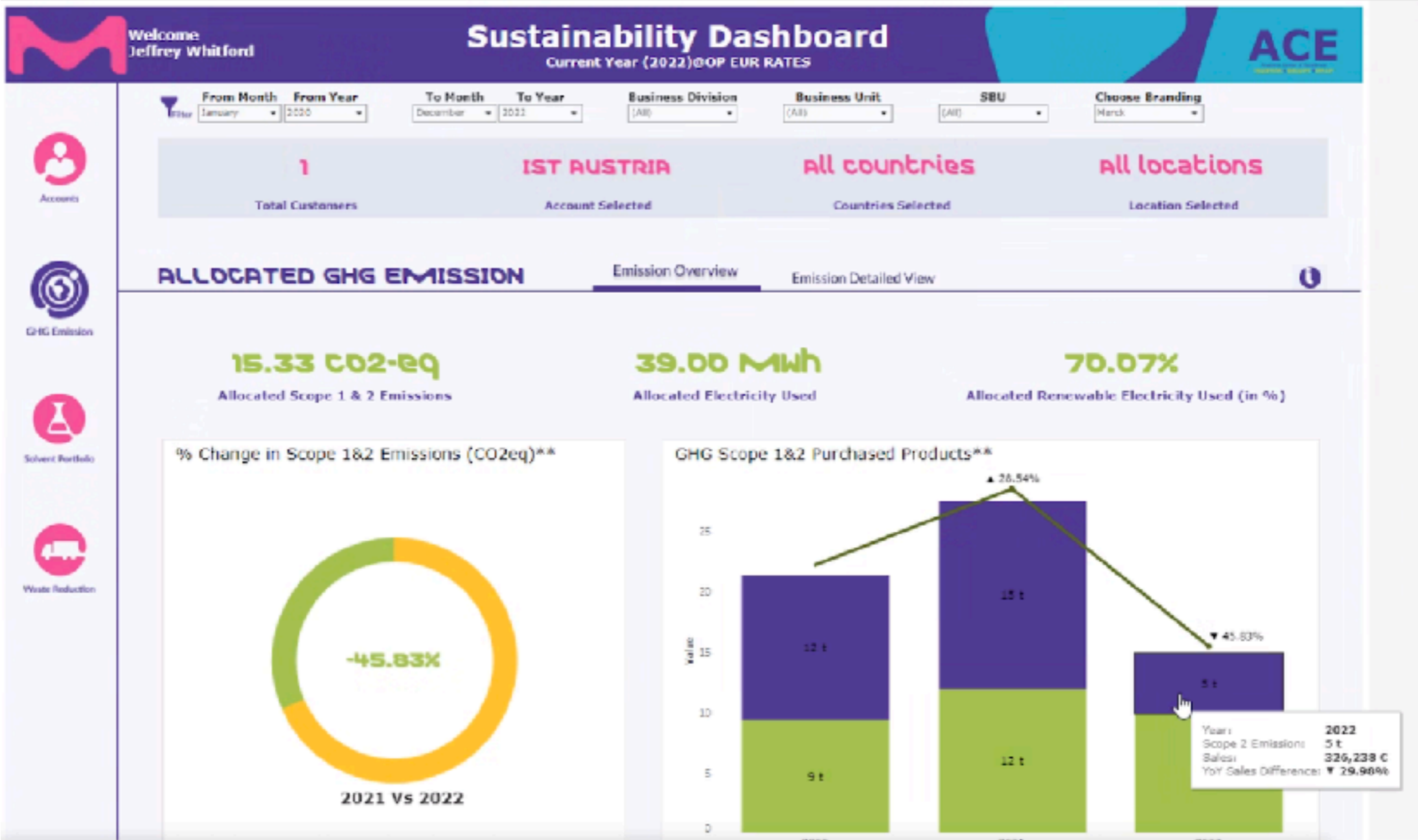
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Bicycle project

Flight Policy Project

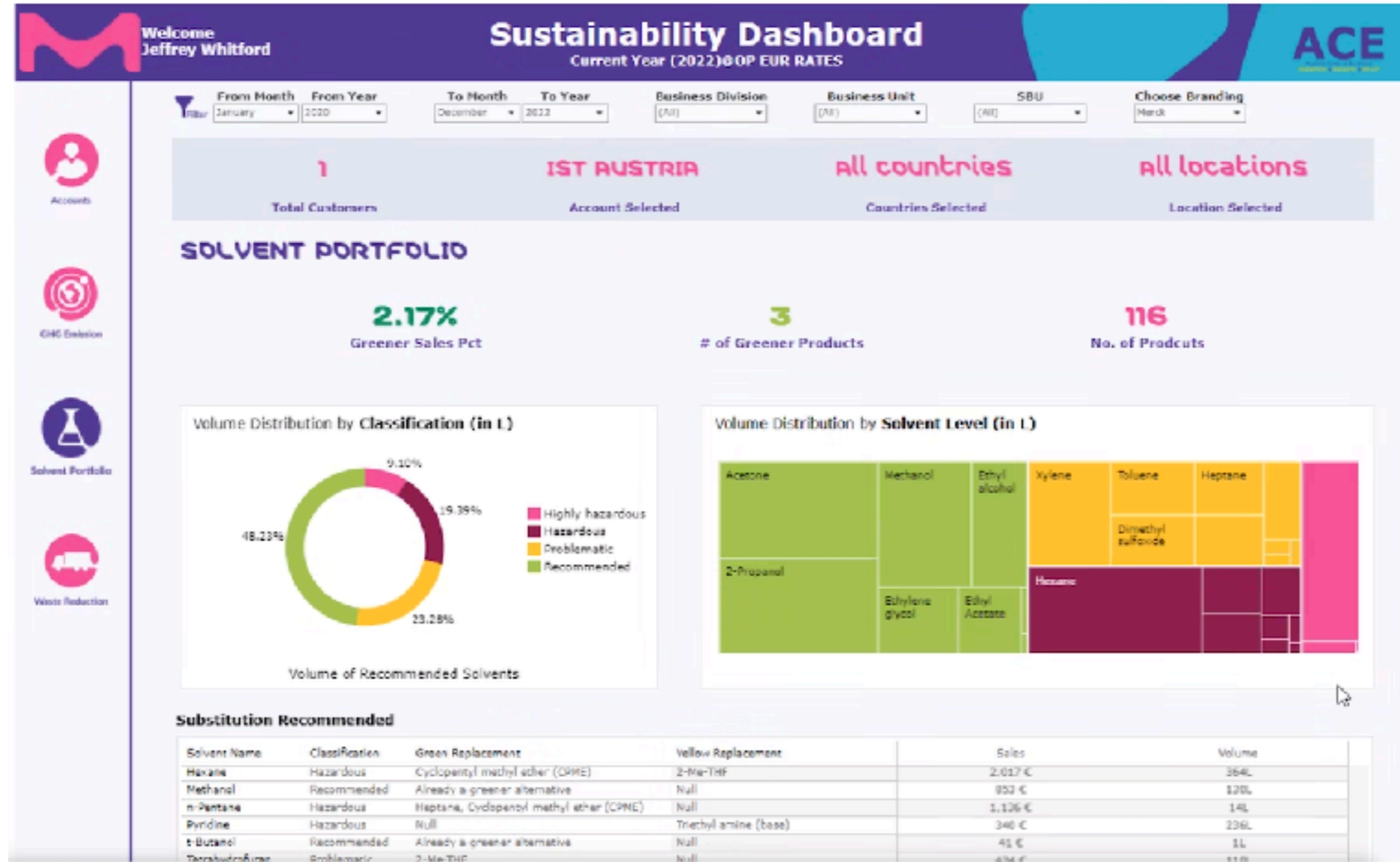
Procurement Footprint

Sigma-Merck



Procurement Footprint

Sigma-Merck



Mobility Footprint

Business Travel

Cornerstones of more sustainable business trips

Mobility, especially flights, contributes significantly to the carbon footprint of universities. Therefore, the University of Vienna wants to address this issue: **From November 2021 onwards**, the following **cornerstones of sustainable business trips** apply to new applications for necessary business trips that, for example, cannot be replaced by a video conference:

- For business trips to destinations in Austria and to destinations that can be reached by train within 6 hours, the University recommends travelling by train.
- Employees may also choose to travel by train if air travel would be the cheaper option.
- For flights, 20 % of the flight costs (a least EUR 50.00) will be additionally debited from the responsible cost centre. This does not apply to business trips financed by third-party funded projects without overheads as well as to travel allowances.

To the cornerstones (in German)



Eckpunkte für nachhaltigere Dienstreisen (Stand Oktober 2021)

Der Bereich Mobilität und hierbei insbesondere Flugreisen tragen zu einem erheblichen Anteil zum CO₂-Fußabdruck von Universitäten bei. Dieser Bereich wird daher verstärkt im Fokus der Aktivitäten der Universität Wien zur Verkleinerung des CO₂-Fußabdrucks stehen. Als eine Grundlage für die Treibhausgasbilanz der Universität Wien wird zeitnah auch eine Umfrage zur Mobilität durchgeführt werden. Dass Reduktionen möglich sind im Bereich der Reisen haben die letzten eineinhalb Jahre bewiesen: die COVID-Pandemie hat gezeigt, dass auch in Zukunft ein gewisser Anteil an Reisen entfallen oder digital substituiert werden kann.

Wenn eine Dienstreise notwendig ist, gelten folgende Regeln:

- Für alle Reisen mit Zielorten innerhalb Österreichs, sowie für Zielorte, die mit der Bahn innerhalb von 6 Stunden zu erreichen sind, wird empfohlen, das Reisemittel „Bahn“ zu nutzen.
- Die Bahn kann auch dann genutzt werden, wenn ein Flug die finanziell günstigere Option darstellt.
- Bei Flugreisen werden 20% der Flugkosten (mind. jedoch € 50,-) zusätzlich von der finanzierenden Kostenstelle abgebucht. Dies gilt nicht für Reisen die aus Drittmittelprojekten ohne Overheads finanziert werden sowie für Reisekostenzuschüsse.

Mobility Footprint

Bicycle Analysis Vienna Biocenter Campus



**Climate@
MaxPerutzLabs**

VBC Campus Bicycle Initiative

Dr. Jeroen Dobbelaere, September 2021

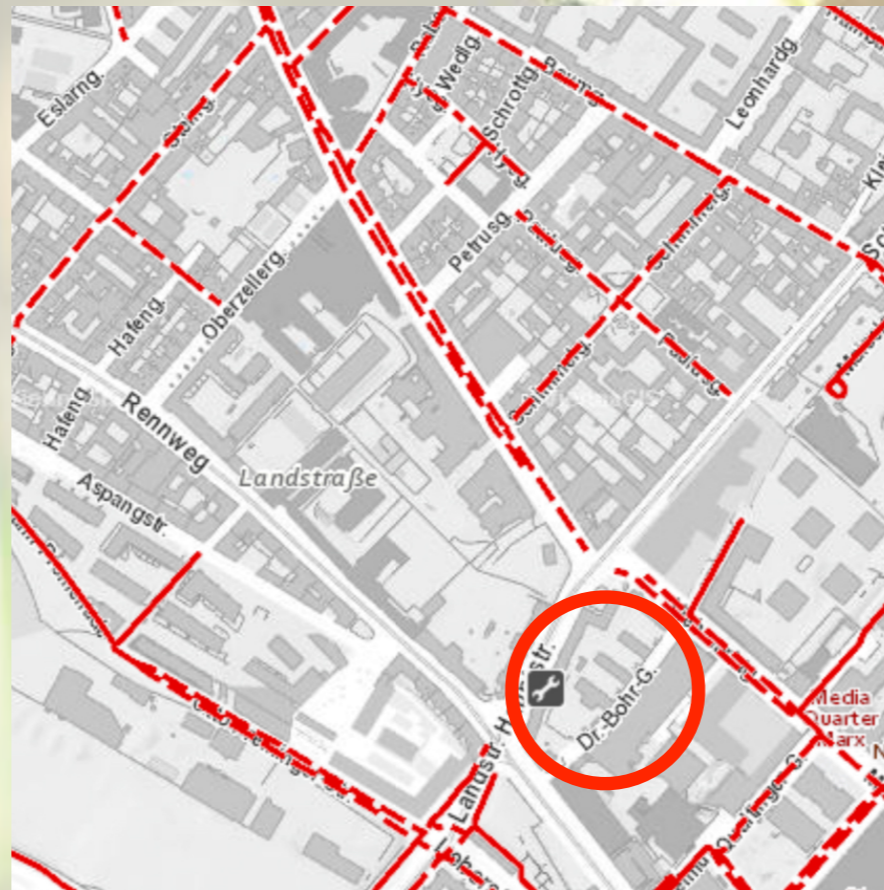
Mobility Challenges

- Infrastructure. Lacking and no secure cycle tracks

Cycle Accidents¹



Official Cycle Lanes²



1) <https://www.statistik.at/atlas/verkehrsunfall/>

2) <https://www.wien.gv.at/umweltgut/public/grafik.aspx?ThemePage=11>

Mobility Challenges

- City conditions not optimal
High pollutions levels

Air Pollution¹

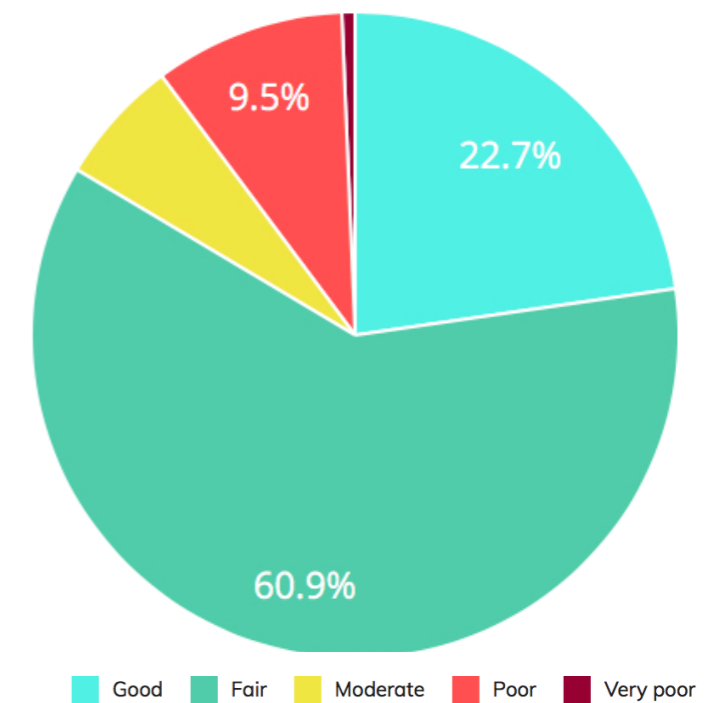


Noise Pollution²



Air pollution³

Accumulated past 365 days



1) <https://maps.laerminfo.at>

2) <https://www.eea.europa.eu/data-and-maps/figures/annual-mean-concentrations-of-no2>

3) <https://www.eea.europa.eu/themes/air/air-quality-index/index>

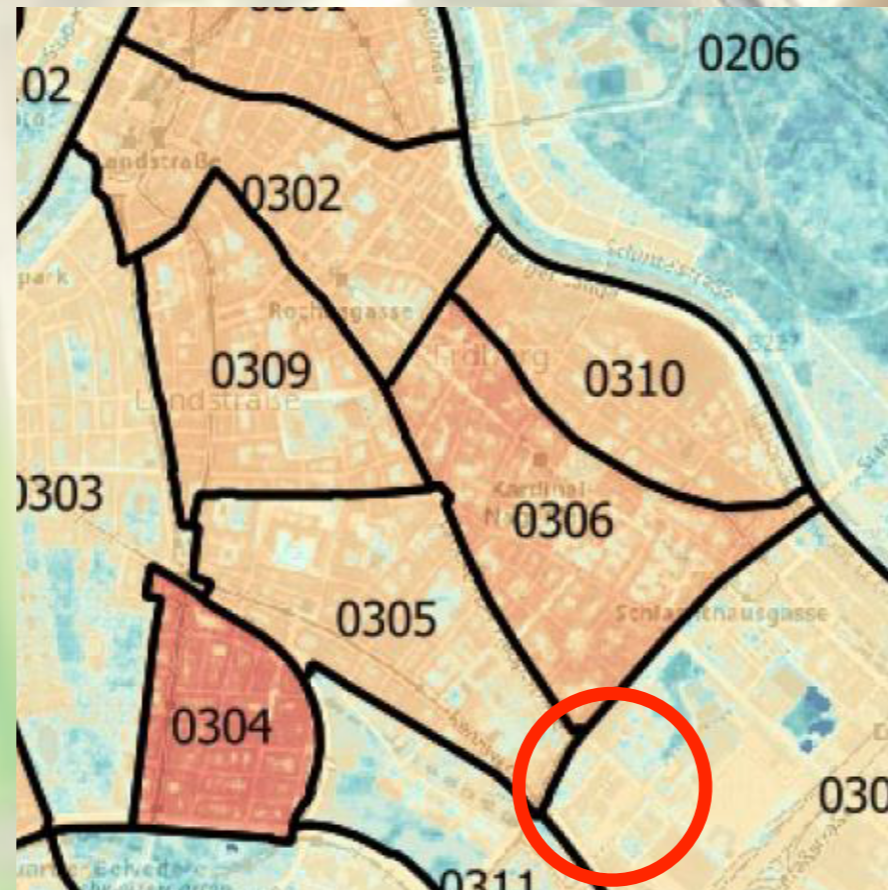
Mobility Challenges

- City conditions not optimal
High Temperatures and little greening

Trees¹



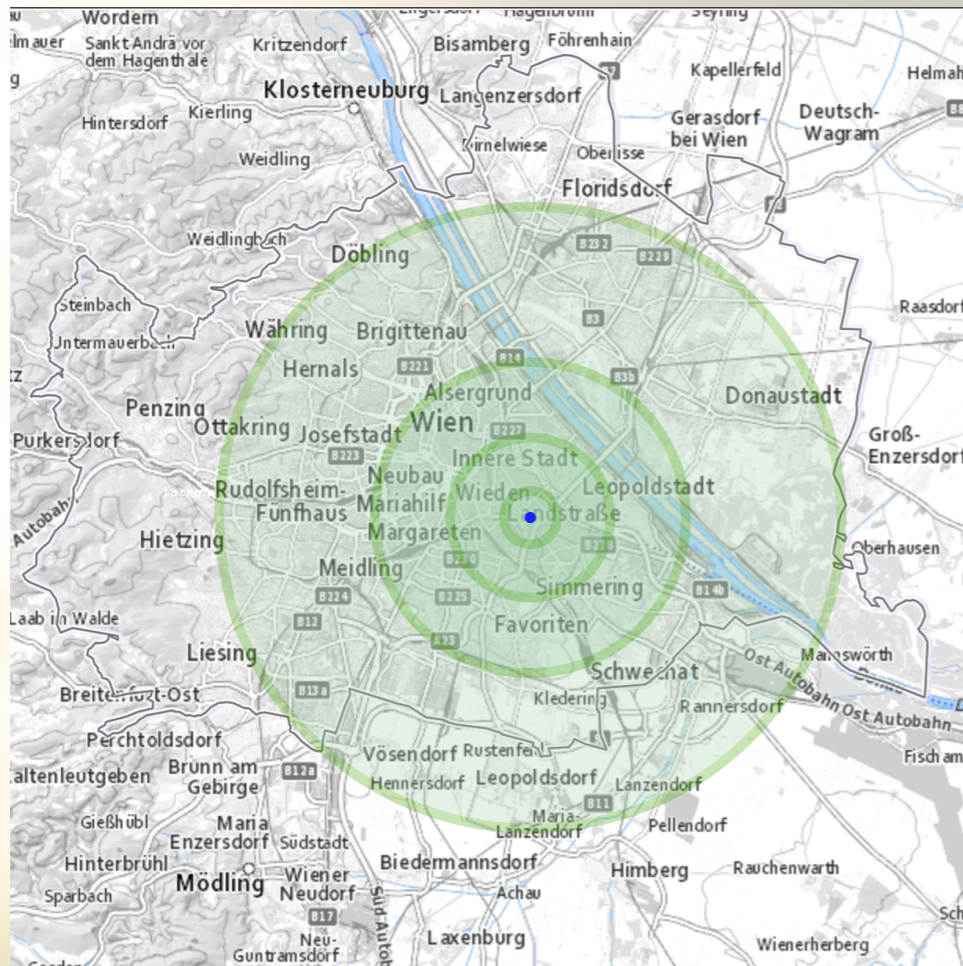
Heat Map²



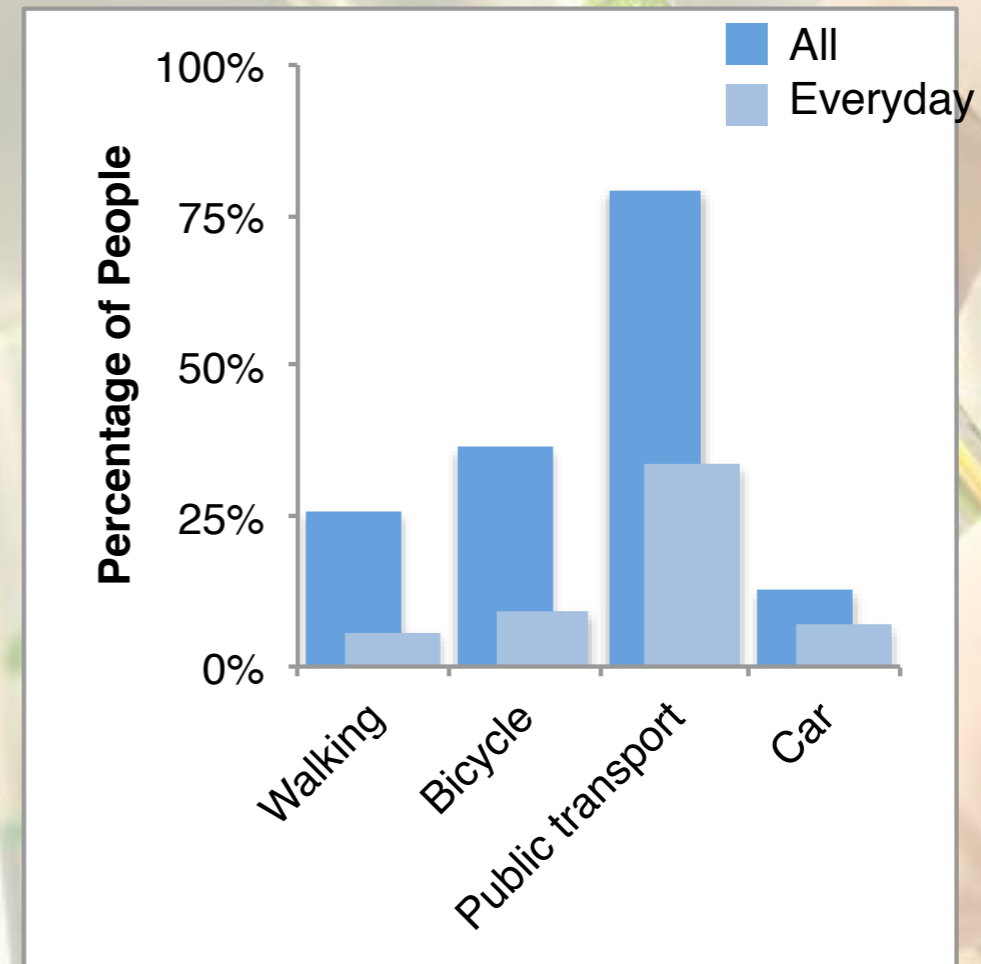
1) <https://www.wien.gv.at/umweltgut/public/grafik.aspx?ThemePage=11>

2) MA20. <https://www.wien.gv.at/stadtentwicklung/energie/hitzekarte.html>,

Mobility Data Analysis - VBC Campus

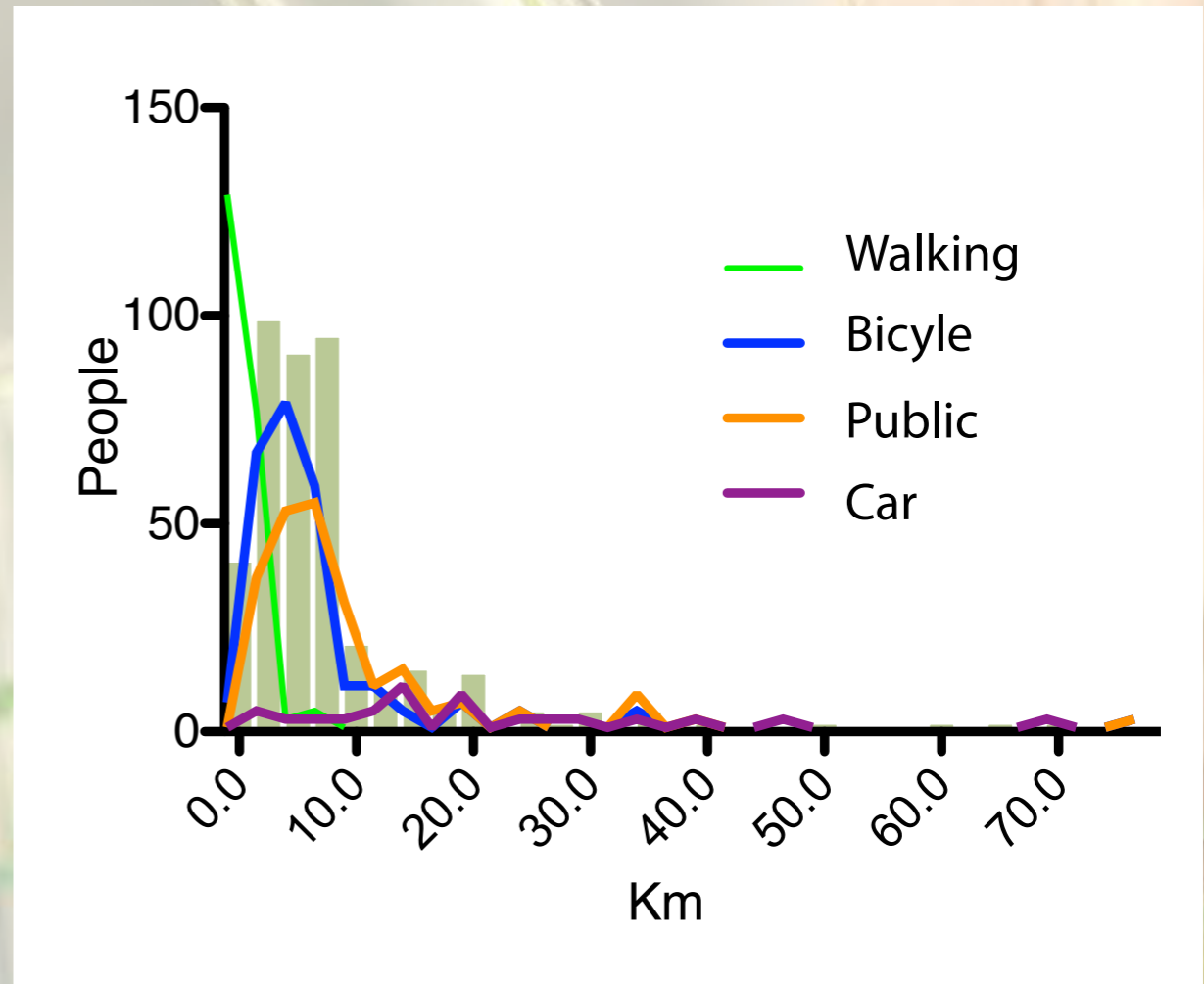
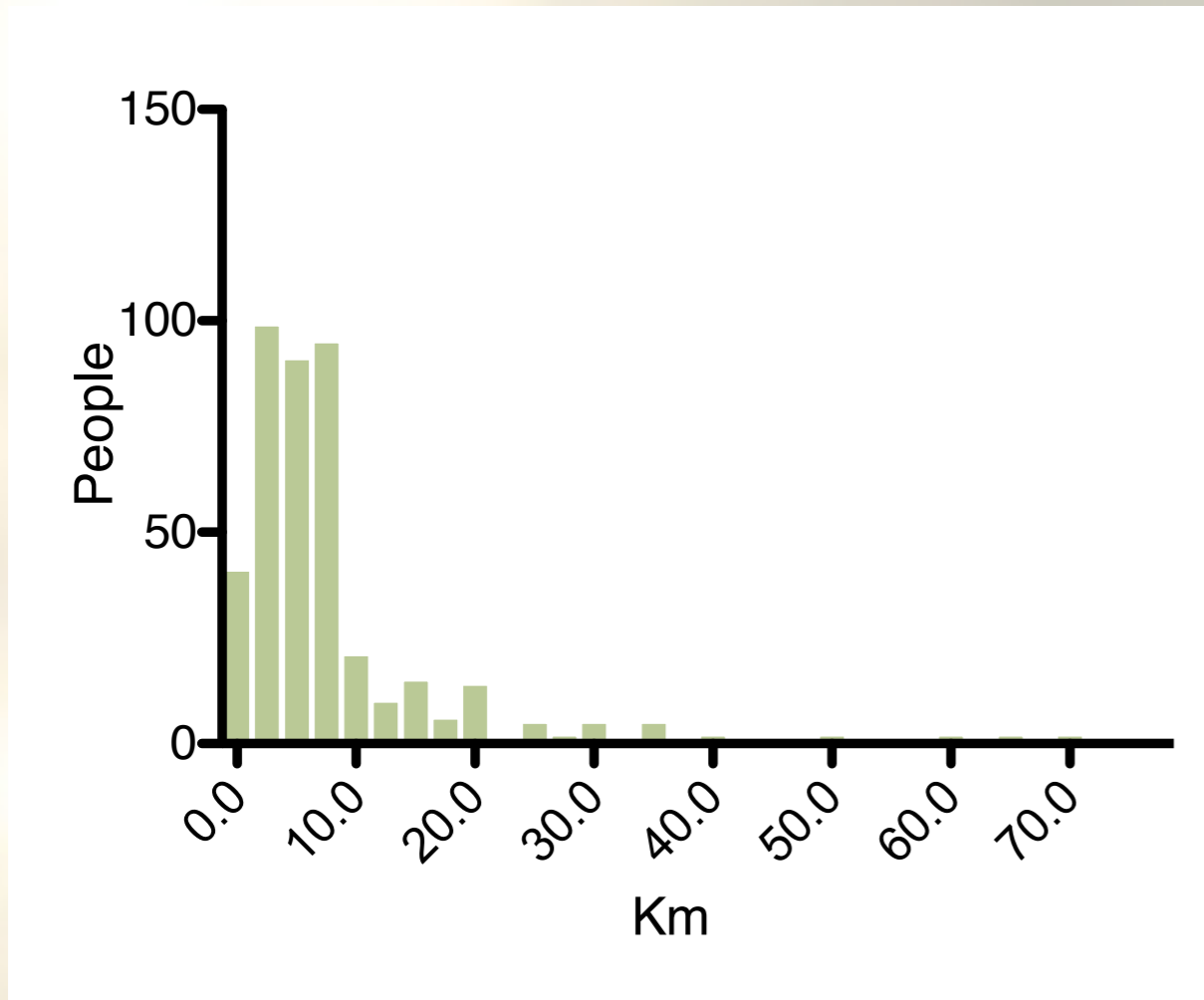
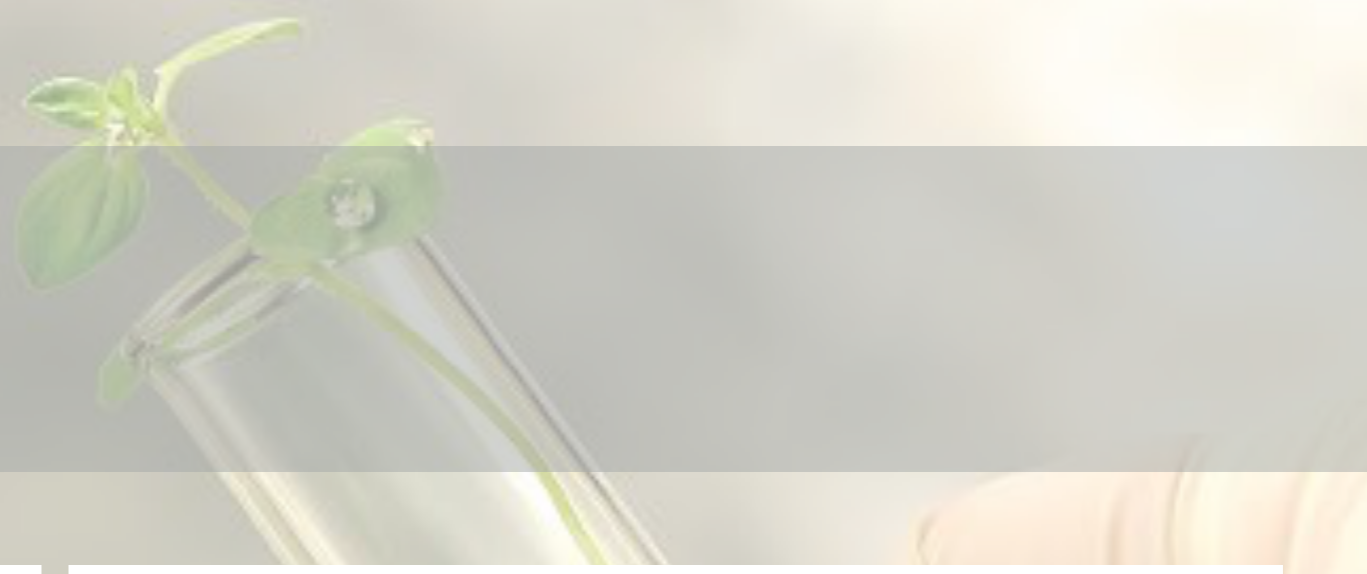


80% of employees lives in a 10km radius from work but only 8% cycle everyday to work



Travel to work by category. (Dark blue all travel, Light blue everyday travel)

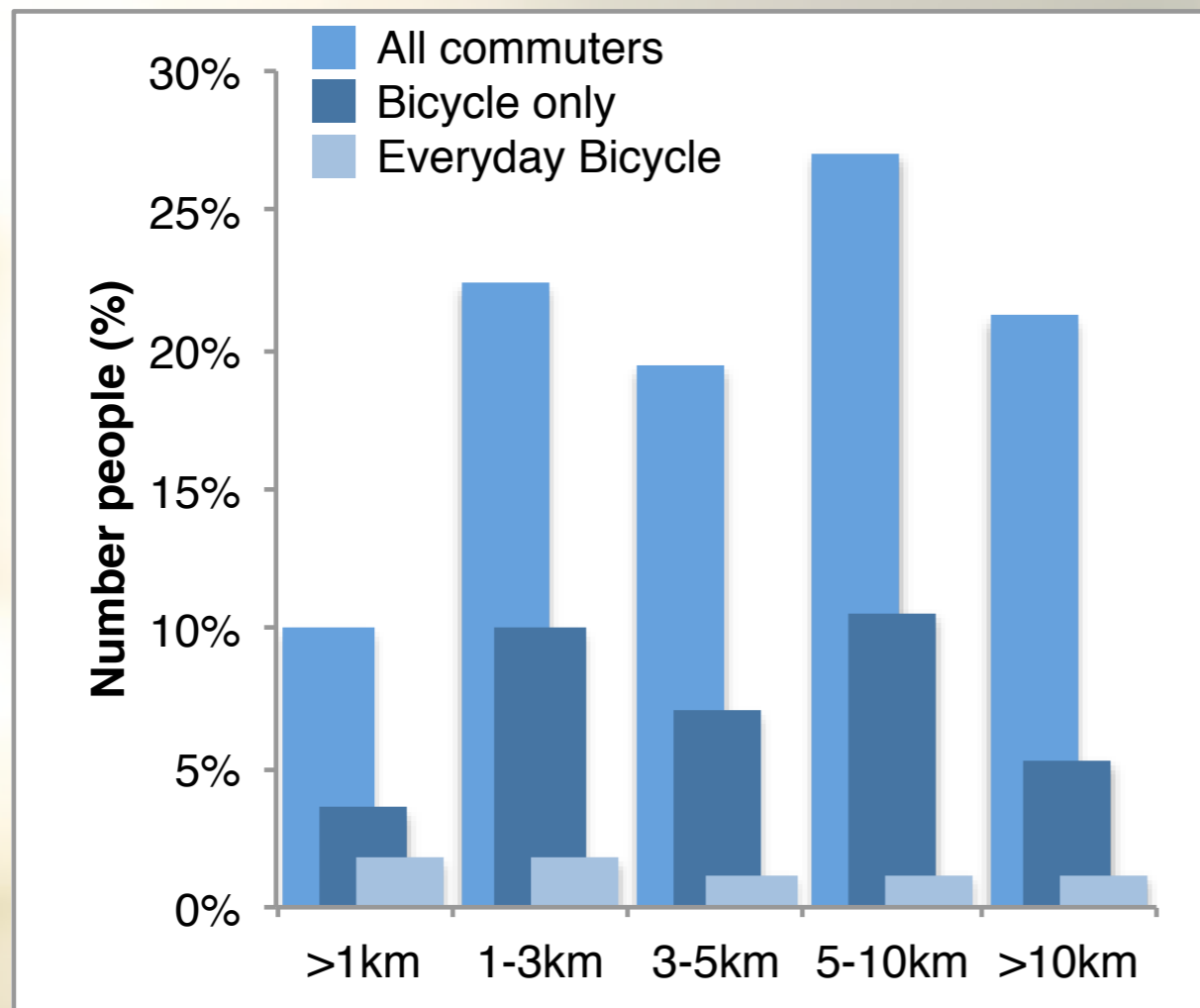
Mobility Data Analysis - VBC Campus



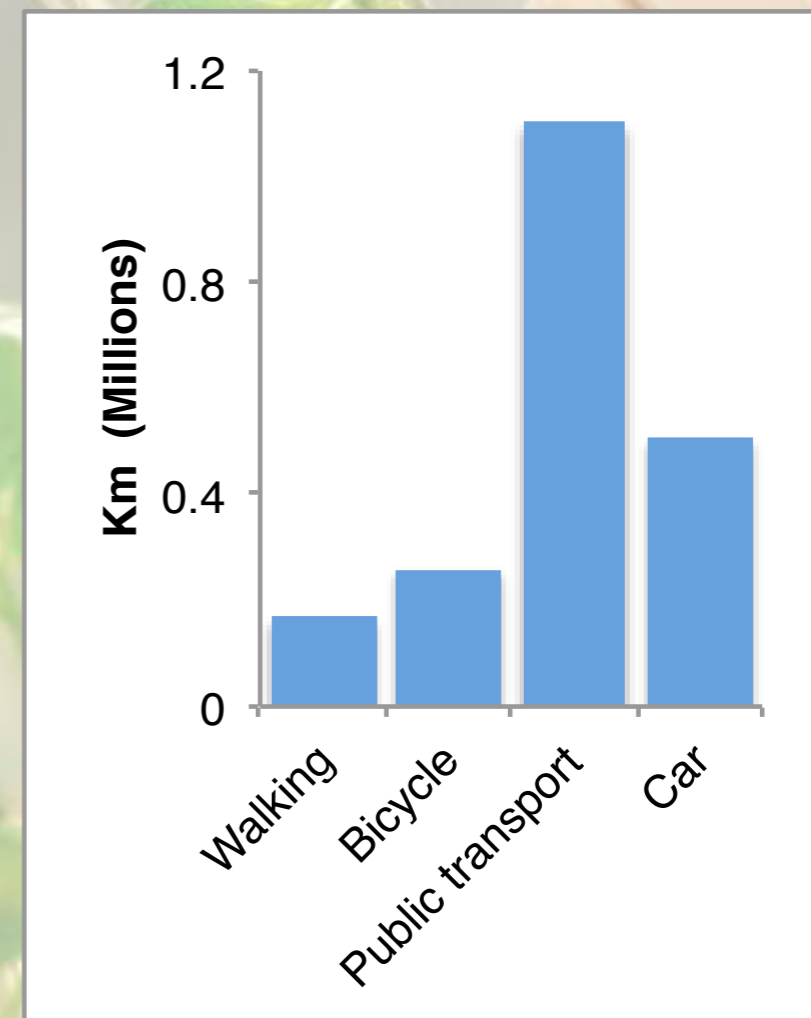
Bicycle are used mainly in a 4 km radus from work

Better conditions and support for electric bikes can extend this radius to 11km (89% of students and employees). Engelman (2012), Wolf and Seebauer (2014), Castro (2019)

Mobility Data Analysis - Max Perutz Labs



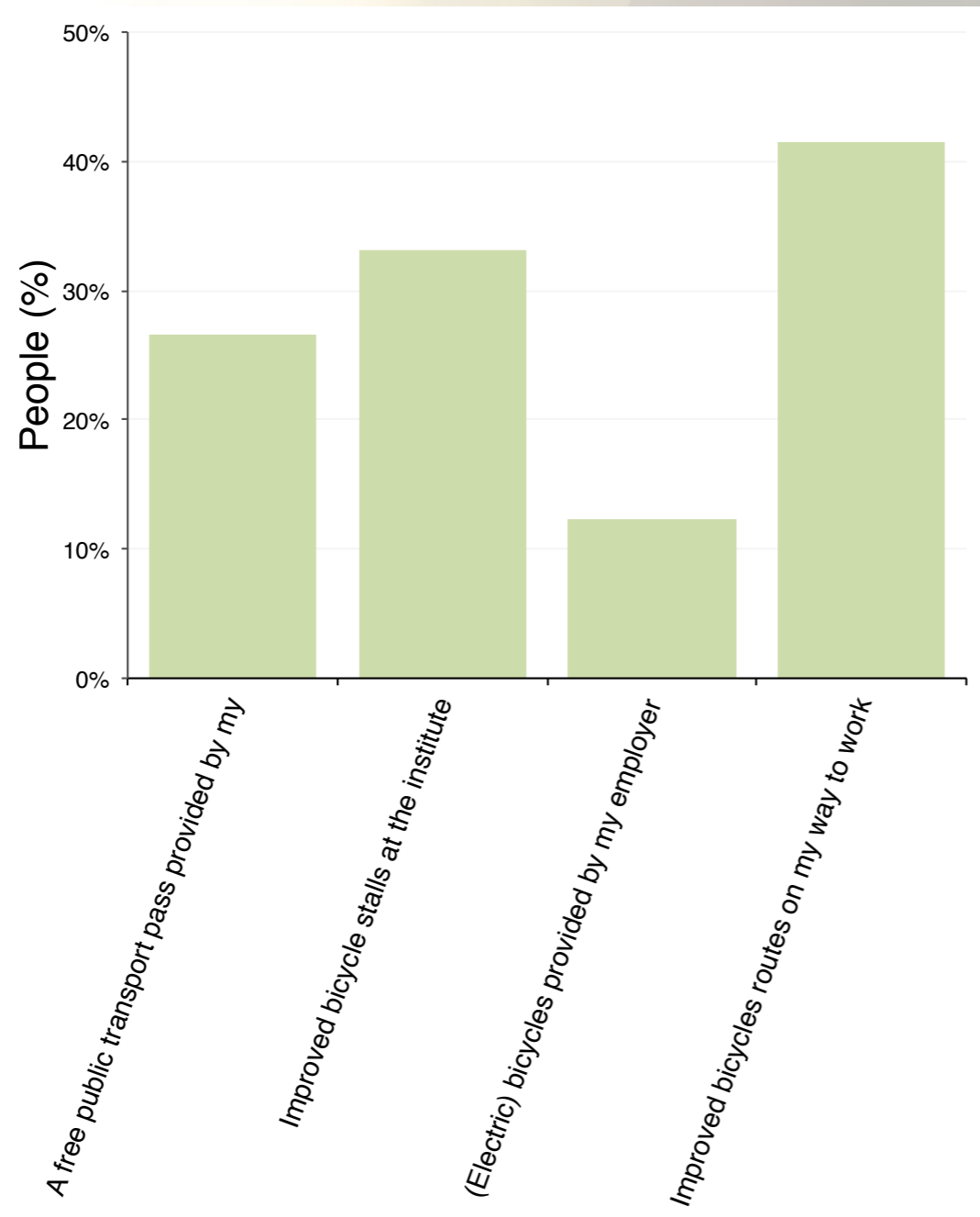
Travel to work by distance. (Medium blue all travel, Dark blue all bicycle travel, Light blue everyday bicycle travel)



Kilometer (Km) travelled to work by different methods

Mobility

Sustainable commuting. What would help using your bicycle?



Selected individual answers:

- Improved bicycle stalls in my residence area
- Don't want to cycle on Rennweg
- Better public transport
- Bicycle repair facility provided or subsidised by my employer
- Discount on bicycle services, nicer shower facilities
- improved bike lanes allowing kids to ride safely to campus daycare
- Less cars

Mobility Footprint

Commuting

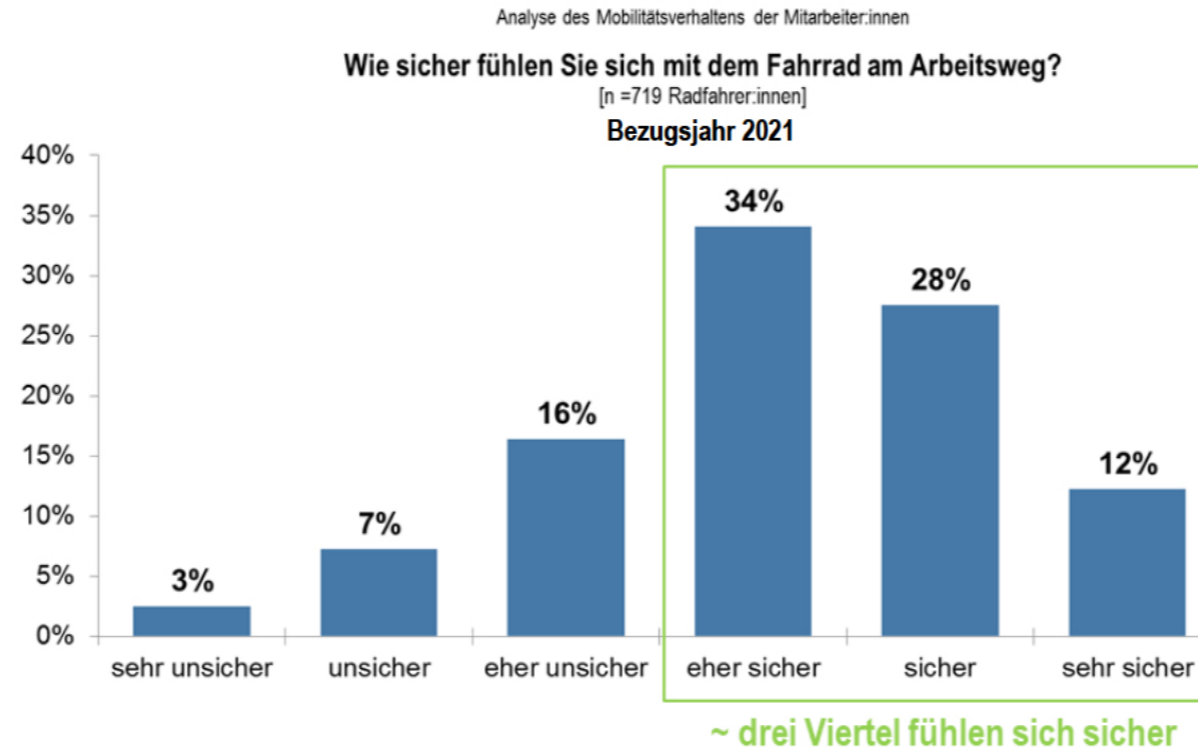


Abbildung 21: Verbesserungsvorschläge im Bereich „Radfahren“ 2021

