TRANSFLIGHT: Shaping the future of air travel

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THEORETICAL BACKGROUND

Transport, aviation and climate change

- Transport sector: 23% of global energy-related CO_2 emissions (IPCC, 2022)
- Aviation: 3.5% of global effective radiative forcing, projected to double over next 20 years, 60% - 220% of allowable CO_2 by 2050 (Our World in Data, 2020; EASA, 2023)

Globally

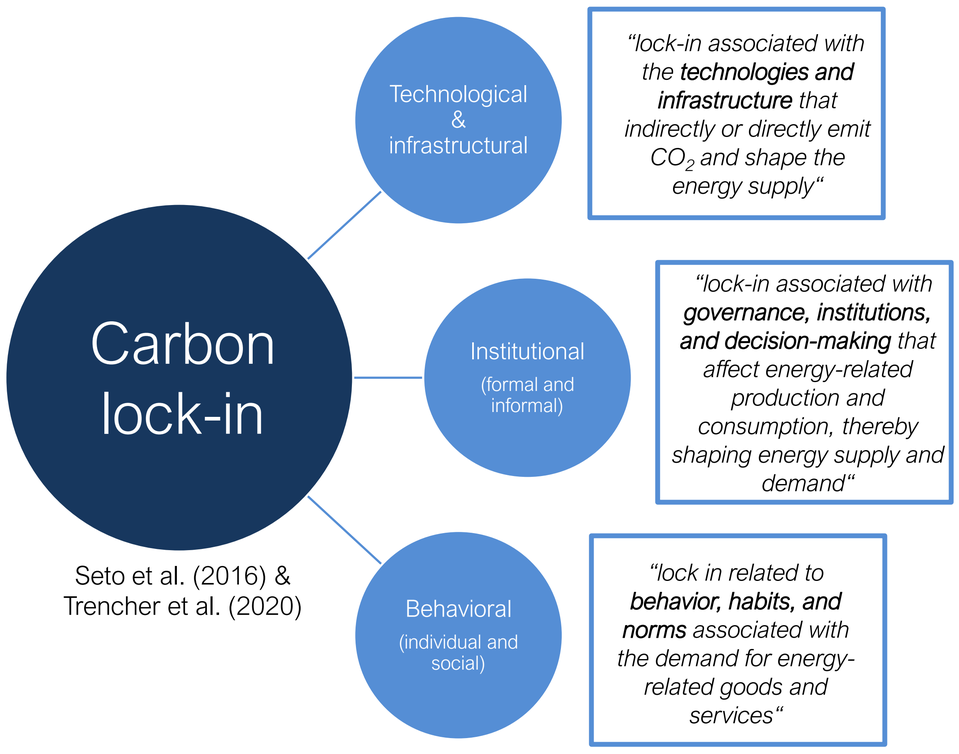
- Transport sector: 23.2% of EU total GHG emissions in 2019 (EEA, 2021)
- Aviation: EU's fastest growing transport sector, (EEA, 2020)
- EU „Fit for 55" package: reduce aviation emissions by 5% by 2030 and 60% by 2050

EU

- Transport sector: 28.2% of Austrian GHG emissions in 2020 (UBA, 2022)
- Aviation: high growth rates (+14.1% passengers in 2019, (Statistik Austria, 2020)), 2.98 million tons emissions in 2019 based on kerosene fuelled in AUT (VCÖ 2020); Kapeller et al. (2019) show likelihood of underestimation

Austria

Carbon lock-in and low-carbon mobility



Seto et al. (2016) & Trencher et al. (2020)

There exist three main approaches for making changes towards more sustainable mobility (cf. Creutzig et al., 2018):

Avoid (Reduction approach)	Shift (Alteration approach)	Improve (Efficiency approach)
Travel less by avoiding for example unnecessary travel	Travel differently by shifting to other modes of transport	Travel more efficiently by using for example less fuel or other technology

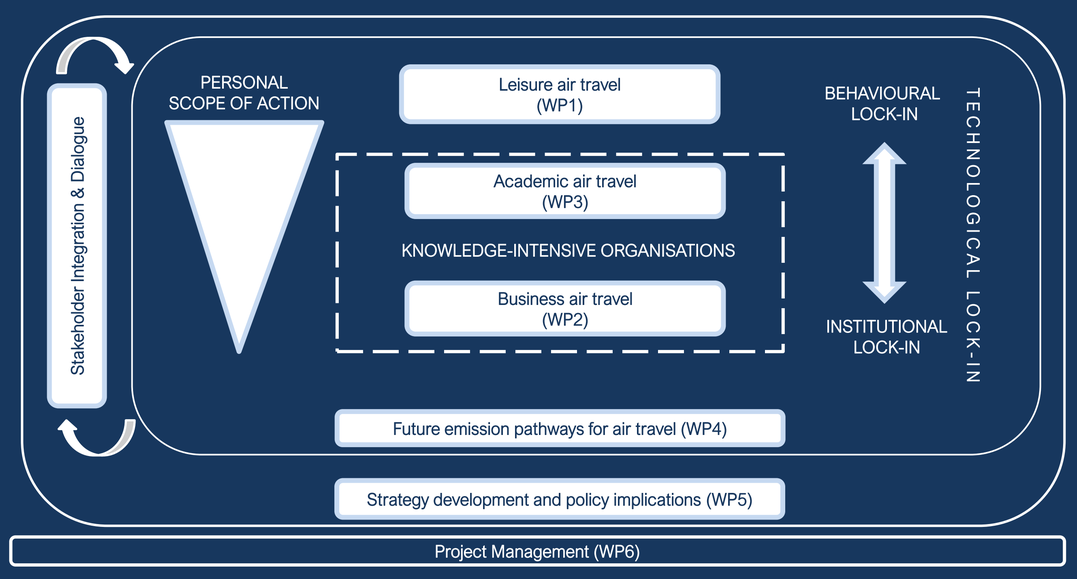
THIS RESEARCH PROJECT

Aim of the project and research questions

To achieve the climate targets, all sectors must reduce their greenhouse gas emissions. The transport sector faces particularly great challenges due to rising emission figures. Especially in air travel, the so-called "carbon lock-in" plays a major role. While air travel for leisure, business or scientific research has become very important for many, the COVID-19 pandemic has drastically changed this situation and opens a window of opportunity for rethinking air travel.

The **TRANSFLIGHT** project supports climate policy at the national and international levels in the complex and conflicting issue of air travel by taking advantage of the COVID-19 window of opportunity. For this, the following main research questions shall be answered:

- *What experiences/challenges/chances has the COVID-19 pandemic brought about in relation to the reorganisation of long-distance travel practices?*
- *How have travel preferences and behavioural intentions in the domains of leisure, business and academic travel changed?*
- *Which role can digitalisation and virtual mobility play as an alternative to physical travel, and which potential other courses for actions exist?*
- *How will emission pathways evolve based on a range of scenarios including different levels of behaviour change?*
- *Which strategies and policy implications for working towards low emission travel practices do result from these findings and what are preconditions for successful implementation?*



Core project team: Alfred Posch, Romana Rauter, Marie Kogler, Annina Thaller, Anna Schreuer, Eva Fleiß, Jakob Grandin, Jesse Schrage, Lydia Lienhart, Holger Hoff
PhD projects: Lydia Lienhart (in progress)
Master projects: Kathrin Winkler (completed), David Baldauf (completed), Adarsh Mishra (completed), Petra Kusternik (in progress)
Student assistants: Alina Delitz, Lisa Gruber, Eva Nenninger, Maximilian Rau

Preliminary results

- Lock-in factors differ for avoid-, shift- and improve-behaviour, but **perceived behaviour control** plays a key role for escaping lock-in for all three behaviour types of leisure air travel (WP1)
- The pandemic has acted as an **important accelerator of digitization** in the context of business air travel, leading to effective online collaboration and efficiency gains in terms of cost, time and productivity. **External pressure** from customers and partner companies are also forcing companies to act sustainably and reduce emissions (WP2).
- The willingness to use virtual solutions in academia has risen sharply during the pandemic, but their perceived suitability still **strongly depends on the type of event** they are employed for. In terms of university policies to reduce emissions from academic air travel, our results indicate c**onsiderable support among university staff** in principle for implementing policies to reduce academic flying, but also **serious concerns regarding certain policies**, such as carbon travel budgets or a university internal carbon tax (WP3).
- Emissions between 2012 and 2019 show a **positive trend for leisure air travel**, and a declining trend for business air travel. The drops caused by COVID-19 are particularly strong for leisure air travel, with a drop of about 75% from the summer peak in 2020 and about 25% in 2021, which indicates a **fast recovery rate to business as usual** in leisure air travel activities (WP4).
- In WP5, we have prepared a series of three international online workshops: a) Scoping the challenge, b) Learning from frontrunners, and c) Roadmaps

Outlook

I — **Finalising empirical work**
Focus groups and survey #2 (WP1), survey (WP2), policy delphi (WP3)

II — **Present findings** at conferences and events, **submit publications** to scientific journals

III — Focus on **outreach activities** and **dissemination;** exchange with **stakeholders** and **scientific advisors**

[1] Creutzig, F., Roy, J., Lamb, W. F., Azevedo, I. M. L., Bruine de Bruin, W., Dalkmann, H., Edelenbosch, O. Y., Geels, F. W., Grubler, A., Hepburn, C., Hertwich, E. G., Khosla, R., Mattauch, L., Minx, J. C., Ramakrishnan, A., Rao, N. D., Steinberger, J. K., Tavoni, M., Ürge-Vorsatz, D., & Weber, E. U. (2018). Towards demand-side solutions for mitigating climate change. *Nature Climate Change*, 8(4), 260–263. https://doi.org/10.1038/s41558-018-0121-1 [2] EASA (2023): European Union Aviation Safety Agency, https://www.easa.europa.eu/eco/eaer/topics/overview-aviation-sector/emissions [3] EEA (2021). Annual European Union greenhouse gas inventory 1990–2019 and inventory report 2021. European Environment Agency. [4] EEA (2020). Greenhouse gas emissions from transport in Europe. https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases-7/assessment [5] IPCC (2022). Climate Change 2022: Mitigation of Climate Change, Chapter 10: Transport [6] Kapeller, M. L.; Füllsack, M.; Jäger, G. (2019). Holiday Travel Behaviour and Correlated CO_2 Emissions—Modelling Trend and Future Scenarios for Austrian Tourists. *Sustainability*, 11, 6418. https://doi.org/ 10.3390/su11226418 [7] Our World in Data (2020): https://ourworldindata.org/co2-emissions-from-aviation [8] Seto, K. C., Davis, S. J., Mitchell, R. B., Stokes, E. C., Unruh, G., & Ürge-Vorsatz, D. (2016). Carbon Lock-In: Types, Causes, and Policy Implications. *Annual Review of Environment and Resources*, 41(1), 425–452. https://doi.org/10.1146/annurev-environ-110615-085934 [9] Statistik Austria (2020). Kommerzieller Luftverkehr auf österreichischen Flughäfen gegliedert nach Flugbewegungen und Fluggästen 2015-2019. [10] Trencher, G., Rinscheid, A., Duygan, M., Truong, N., & Asuka, J. (2020). Revisiting carbon lock-in in energy systems: Explaining the perpetuation of coal power in Japan. *Energy Research & Social Science*, 69, 101770 [11] UBA (2022). Klimaschutzbericht 2022. https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0816.pdf [12] VCÖ (2020a). Treibhausgas-Emissionen des Flugverkehrs in Österreich im Vorjahr auf Rekordhöhe von fast 3 Millionen Tonnen gestiegen. https://www.vcoe.at/presse/presseaussendungen/detail/vcoe-treibhausgas-emissionen-des-flugverkehrs-in-oesterreich-im-vorjahr-auf-rekordhoehe-von-fast-3-millionen-tonnen-gestiegen