

Willkommen
Welcome
Bienvenue



Environmental sustainability of the work from home lifestyle, opportunities and pitfalls

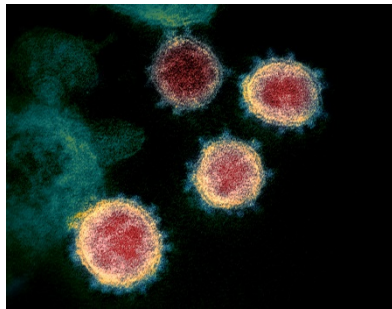
LCM conference 6 to 8 of September 2021

Topic 2.3: Future Sustainable Lifestyle – Urban structure and Individual Choices

Didier Beloin-Saint-Pierre (dib@empa.ch) & Sébastien Lasvaux



- Possible change of lifestyle with the COVID pandemic
 - Increased home office in larger home farther away
 - Reduce commuting



Can it improve the sustainability of our professional activities?



Image of Corona Virus: NIAID - <https://www.flickr.com/photos/niid/49534865371/>

Other images created by macrovector at www.freepik.com

Considered Aspects

Office equipment

- Monitor
- Printer
- Mouse
- Keyboard
- Desk



Commuting options

- New distance
- Number of travels
- Types of transport



Heating needs

- From office to home
- Change of surface
- Types of heating system



Images created by macrovector at www.freepik.com
Map of Switzerland: Poulpy - Own work, based on Image:Suisse cantons.svg

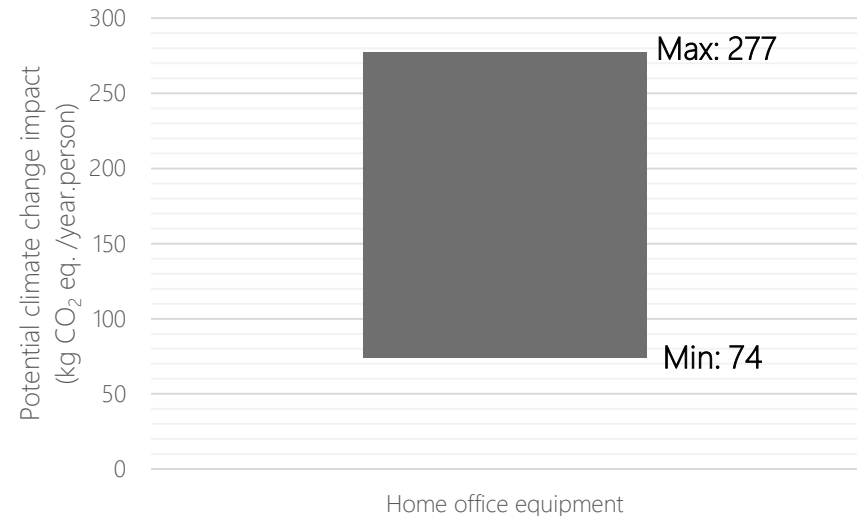
Scope of the Study

- **Only looking at the consequences:** results present the difference in GHG emissions
- *Swiss context*
- Year of reference: *2019*
- Focus on GHG emissions (*i.e. kg of CO₂ eq. – factors of IPCC 2013 for a 100 years*)
- Sources of data:
 - Commuting need: **Federal statistical office & Deloitte**
(<https://www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/passenger-transport/commuting.html>)
(<https://www2.deloitte.com/ch/en/pages/public-sector/articles/mobilitaet-nach-der-corona-krise.html>)
 - Office use: **Credit Suisse**
(<https://www.credit-suisse.com/ch/en/unternehmen/unternehmen-unternehmer/aktuell/bueroflaeche-pro-mitarbeiter-nimmt-ab.html>)
 - Change in home surface: **Federal statistical office**
(<https://www.bfs.admin.ch/bfs/fr/home/statistiques/construction-logement/logements/taille.gnpdetail.2020-0073.html>)
 - Heating needs: **Extrapolation from Empa study with measures from NEST building**
Mutschler et al. 2021 (<https://www.sciencedirect.com/science/article/pii/S0306261921001719?via%3Dihub#s0130>)
 - Environmental data (mainly): **ecoinvent v3.7.1 (cut-off modelling perspective)**
(<https://www.ecoinvent.org/home.html>)

Scenario for Office Equipment

- New office equipment needs at home (in addition to the office)

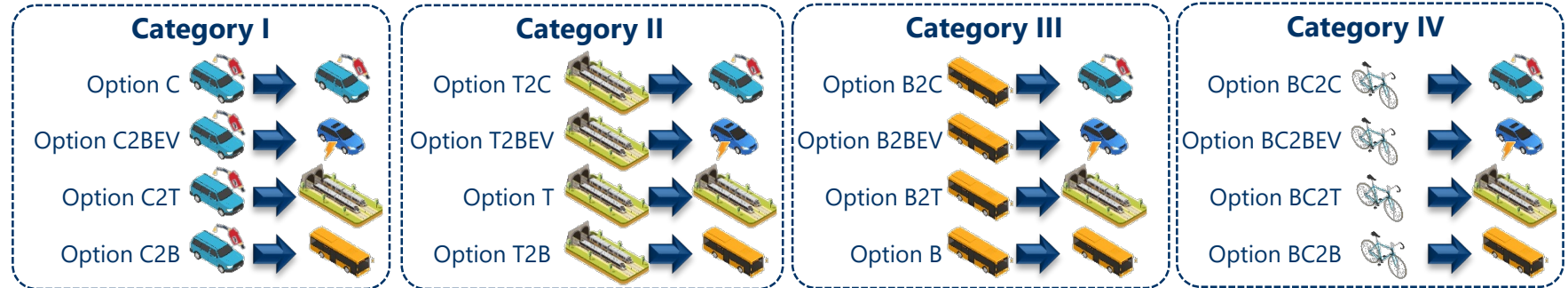
Equipment	Expected lifetime	# of user
Monitor	4 years	1
Keyboard	4 years	1
Mouse	4 years	1
Printer	4 years	2
Desk	10 years	1



High variability & uncertainty on this data

Scenarios for Commuting

- Average distance in 2019: 29 km/day (i.e. commuting 6815 km/year)
- Moving to a larger home at twice the distance (i.e. 58 km)
 - Scenario 1: Going to the office 1 per week (**reduction of 4089 km/year**)
 - Scenario 2: Going to the office 2 per week (**reduction of 1363 km/year**)
- Change of commuting vehicle when moving to new house



* We make the assumption that there is 1 person per car

Images created by macrovector at www.freepik.com

Results for Commuting

■ Scenario 1 (travelling 1 per week)

	kg CO ₂ eq./year
C	-1214
C2BEV	-1602
C2T	-1997
C2B	-1749

	kg CO ₂ eq./year
T2C	743
T2BEV	356
T	-40
T2B	208

	kg CO ₂ eq./year
B2C	121
B2BEV	-266
B2T	-662
B	-413

	kg CO ₂ eq./year
BC2C	733
BC2BEV	346
BC2T	-50
BC2B	199

■ Scenario 2 (travelling 2 per week)

	kg CO ₂ eq./year
C	-405
C2BEV	-1179
C2T	-1970
C2B	-1473

	kg CO ₂ eq./year
T2C	1552
T2BEV	778
T	-13
T2B	484

	kg CO ₂ eq./year
B2C	931
B2BEV	157
B2T	-635
B	-138

	kg CO ₂ eq./year
BC2C	1542
BC2BEV	768
BC2T	-23
BC2B	474

Scenarios for House & Heating

- Reduction in the use of heated office space

- Scenario 1: Use of the office space 1 per week (i.e. 15 m² and reduction of 708 kWh/year for heating)
- Scenario 2: Use of the office space 2 per week (i.e. 15 m² and reduction of 531 kWh/year for heating)



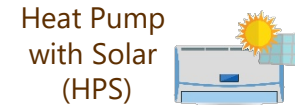
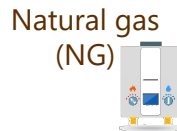
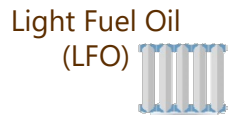
- Moving to a larger home of different age in different regions of Switzerland

- Increased surface: +27 m² (compared to 99 m² average)
- Considered regions: Zurich (Average) / Davos (Cold) / Lugano (Warm)
- Comfort temperature in the house: 20 °C / 25 °C
- Age of the new home:



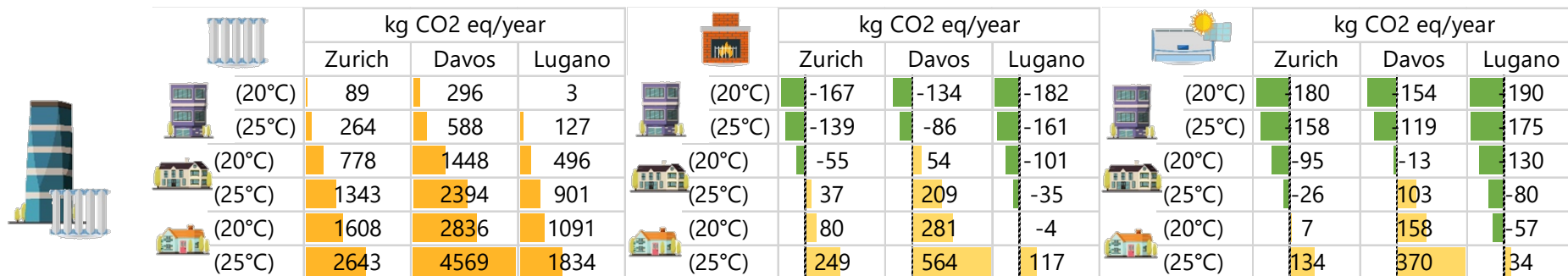
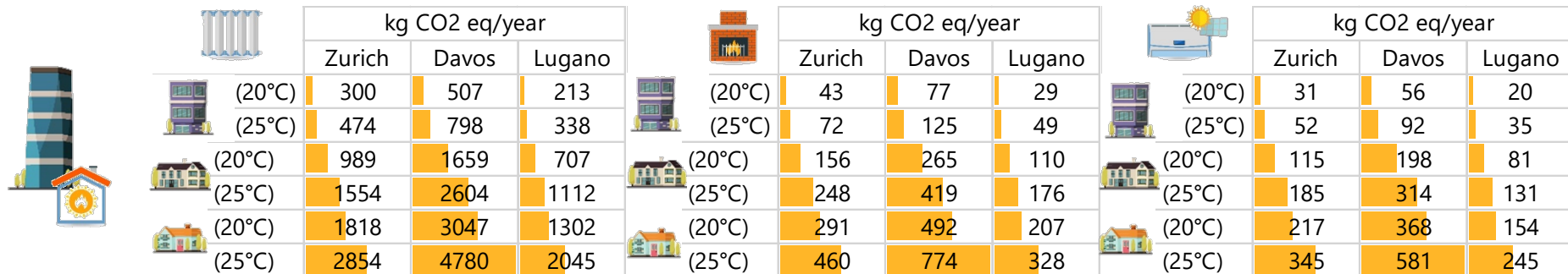
Range of energy for heating
From: 716 kWh/year
To: 15580 kWh/year

- Type of heating sources



Images created by macrovector at www.freepik.com

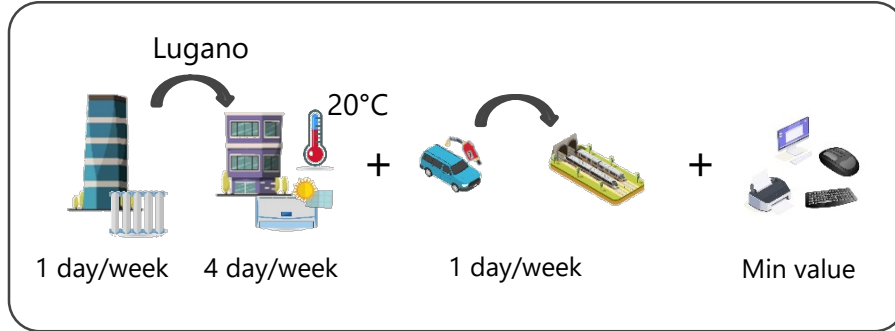
Key Results for House & Heating



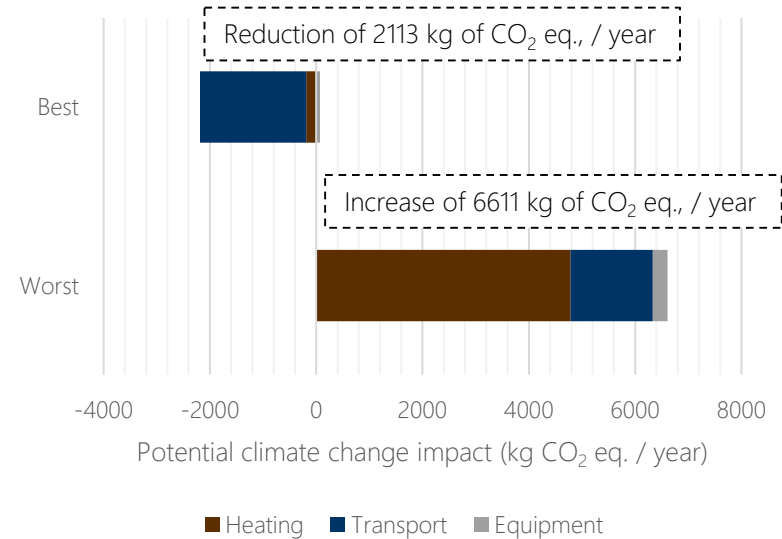
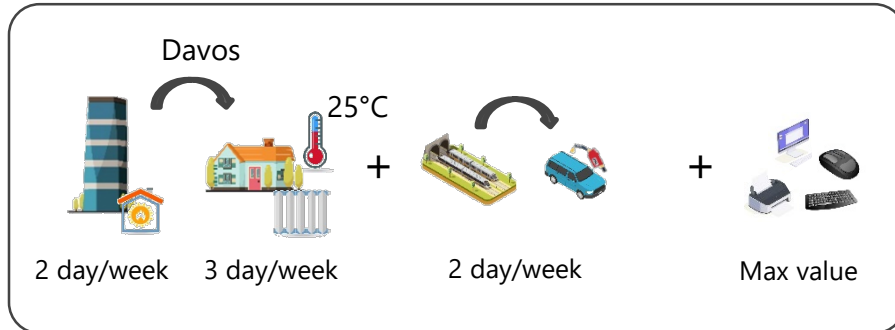
Images created by macrovector at www.freepik.com

Key scenarios

Best case scenario

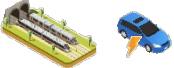


Worst case scenario



Images created by macrovector at www.freepik.com

Conclusion & Further Ideas

- Results of scenarios can vary substantially (positive to negative impacts)
- All considered aspects can be the main source of impacts (no silver bullet)
- Important observations:
 - If new home was built in 1970's → Renovate (heating system & insulation)
 - Avoid buying a car if you move away from the office 
 - Altitude of home can be important in Switzerland
- Other aspects that should be considered
 - Where will the kids study? (availability of public transport)
 - Are you moving away from leisure activities (~60% of total travel)
 - Staying in the same home to avoid substantial impacts

Images created by macrovector at www.freepik.com