Environmental impacts of co-working

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Presentation based on:

Vaddadi, B.; Bieser, J.; Pohl, J.; Kramers, A. (2020): Towards a conceptual framework of direct and indirect environmental effects of co-working. In *Proceedings of ICT4S 2020 – 7th International Conference on ICT for Sustainability. ACM, Virtual Conference, 8 pages* [accepted for publication]

Telecommuting and co-working

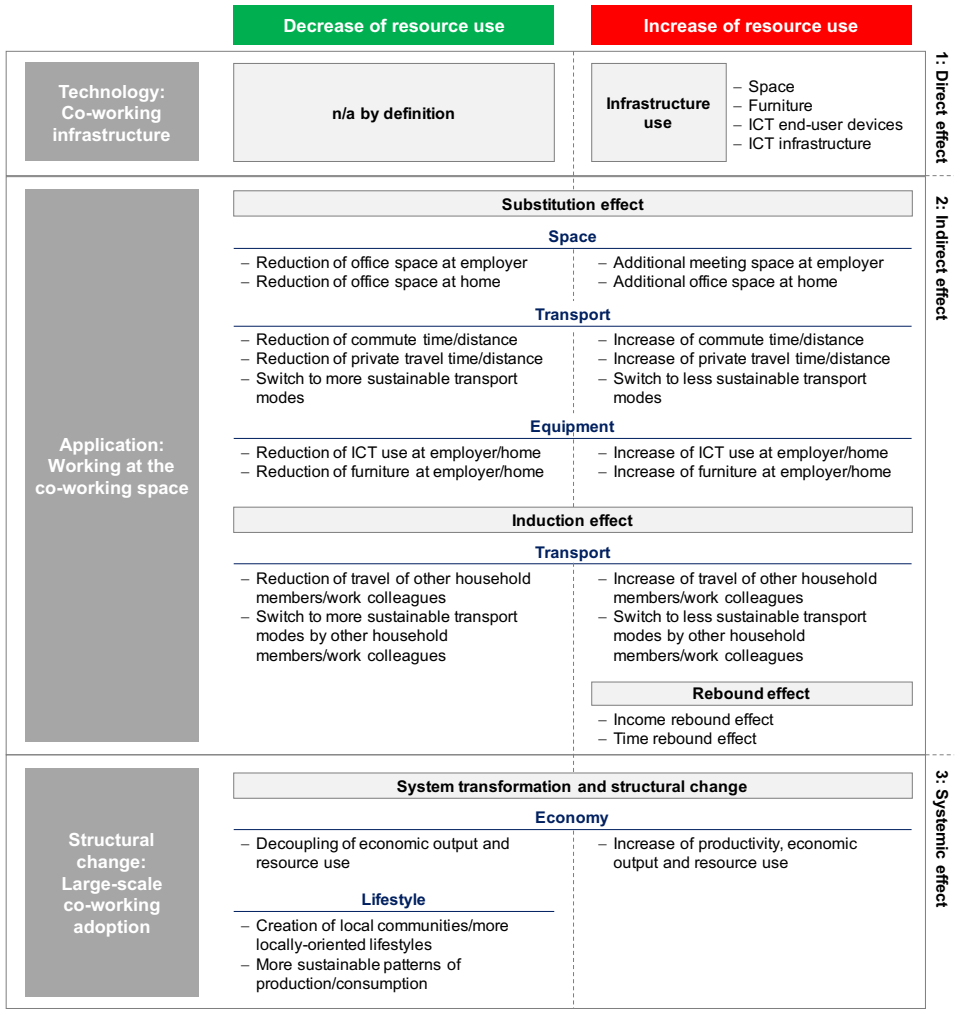
Telecommuting, working remotely and collaborating with colleagues and partners by means of ICT, has the potential to reduce commute-related environmental impacts.

Co-working "describes any situation where two or more people are working in the same place together, but not for the same company".[1]

Co-working spaces are "shared workplaces utilized by different sorts of knowledge professionals […] working in various degrees of specialization in the vast domain of the knowledge industry".[2]

(1) DTZ (2014): The CoWorking Revolution, p. 3 , Weblink
(2) Gandini, A. (2015): The rise of coworking spaces: A literature review. *ephemera*, *15*(1), 193, p. 194, Weblink
(3) Picture: Weblink; License: Attribution-ShareAlike 4.0 International

Environmental impacts of co-working
Framework



1: Direct effects
Environmental effects of building, operating and maintaining infrastructures required for co-working (e.g. space, video conferencing systems, parking, etc.).

2: Indirect effects
Environmental effects due to individual co-workers or organizations adopting to working at the co-working space instead of the employer's office or from home (e.g. avoiding commuting)

3: Systemic effects
Environmental effects of a system transformation towards co-working (e.g. changes in work and travel habits)

Environmental impacts of co-working
Direct effects

1: Direct effects

2: Indirect effects

3: Systemic effects

	Decrease of resource use	Increase of resource use
Technology: Co-working infrastructure	**n/a by definition**	**Infrastructure use** – Space – Furniture – ICT end-user devices – ICT infrastructure

Environmental impacts of co-working
Indirect effects

1: Direct effects

2: Indirect effects

3: Systemic effects

	Decrease of resource use	Increase of resource use
Application: Working at the co-working space		
Substitution effect		
Space		
	– Reduction of office space at employer – Reduction of office space at home	– Additional meeting space at employer – Additional office space at home
Transport		
	– Reduction of commute time/distance – Reduction of private travel time/distance – Switch to more sustainable transport modes	– Increase of commute time/distance – Increase of private travel time/distance – Switch to less sustainable transport modes
Equipment		
	– Reduction of ICT use at employer/home – Reduction of furniture at employer/home	– Increase of ICT use at employer/home – Increase of furniture at employer/home
Induction effect		
Transport		
	– Reduction of travel of other household members/work colleagues – Switch to more sustainable transport modes by other household members/work colleagues	– Increase of travel of other household members/work colleagues – Switch to less sustainable transport modes by other household members/work colleagues
Rebound effect		
		– Income rebound effect – Time rebound effect

Environmental impacts of co-working
Systemic effects

1: Direct effects

2: Indirect effects

3: Systemic effects

	Decrease of resource use	**Increase of resource use**
Structural change: Large-scale co-working adoption	**System transformation and structural change**	
	Economy	
	– Decoupling of economic output and resource use	– Increase of productivity, economic output and resource use
	Lifestyle	
	– Creation of local communities/more locally-oriented lifestyles – More sustainable patterns of production/consumption	

Co-working living laboratory in Stockholm

Aim
Investigate the effects of having a professional co-working space near the home of participants on their mobility behavior.

Location
Tullinge, south of Stockholm

Facilities
- Workplaces
- Meeting room
- Telephone booths
- Kitchen

Floor area
170 m^2

Number of workplaces
14

Start of operation
January 2019

Number of co-workers regularly working in the co-working space
44

The living lab is a project in the research program “Sustainable Accessibility and Mobility Services – Mistra SAMS” (https://www.sams.kth.se/) and managed by KTH Royal Institute of Technology in close cooperation with VTI Swedish National Road and Transport Research Institute.

Collection of time-use data for 20 co-workers

20 co-workers who live close to the co-working space and work for an IT company north of Stockholm filled out time-use diaries for a duration of 3 weeks.

When co-workers commute to the employer office, it takes them at least 1.5 hours back and forth.

Analysis of time-use data

Time-use

We compare daily time spent on four activities by work location on the workday.

- Travel
- Work
- Everyday chores
- Leisure

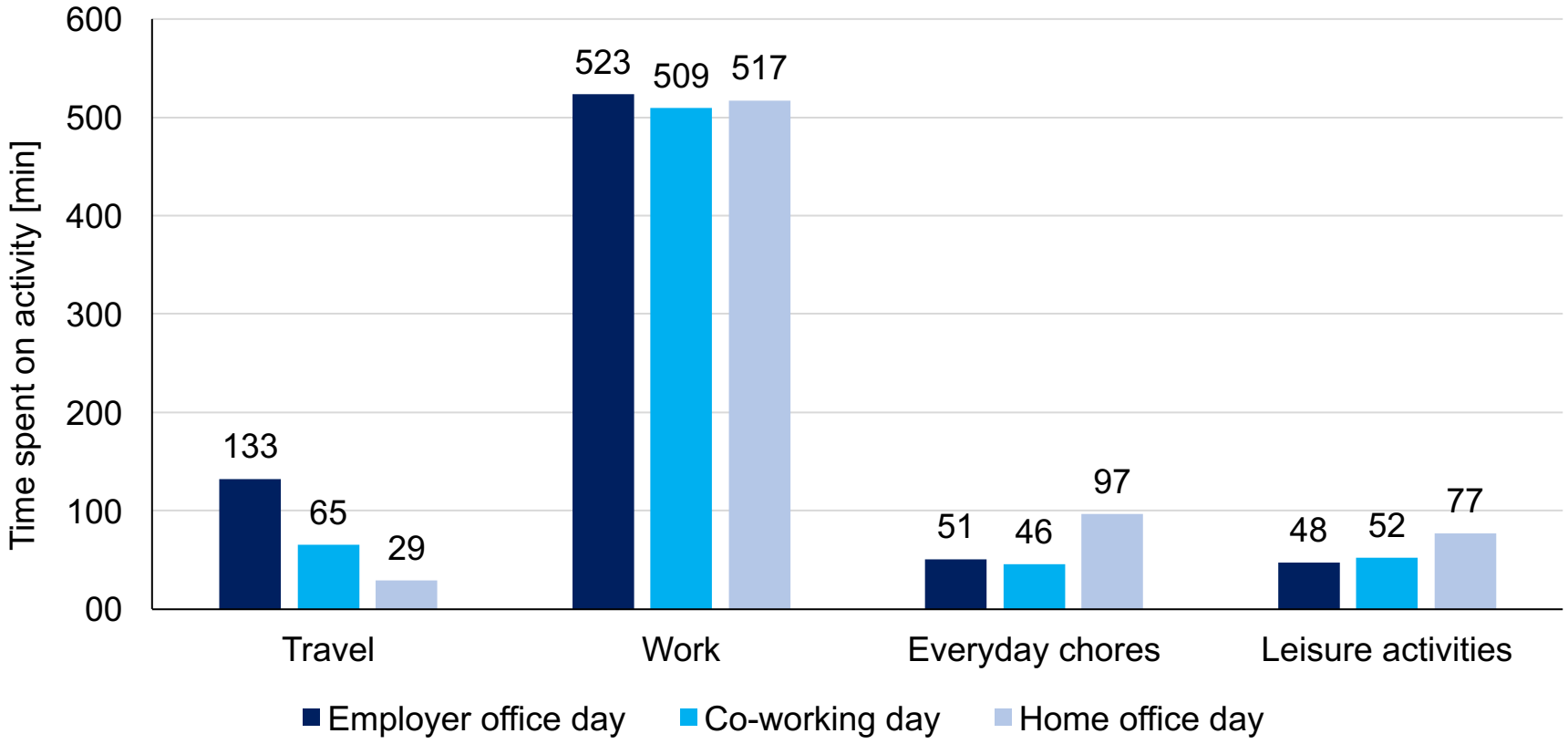
Modal split

We compare daily time spent in transport by transport mode and work location.

- Car
- Public transport
- (E-)bike/walk
- Other

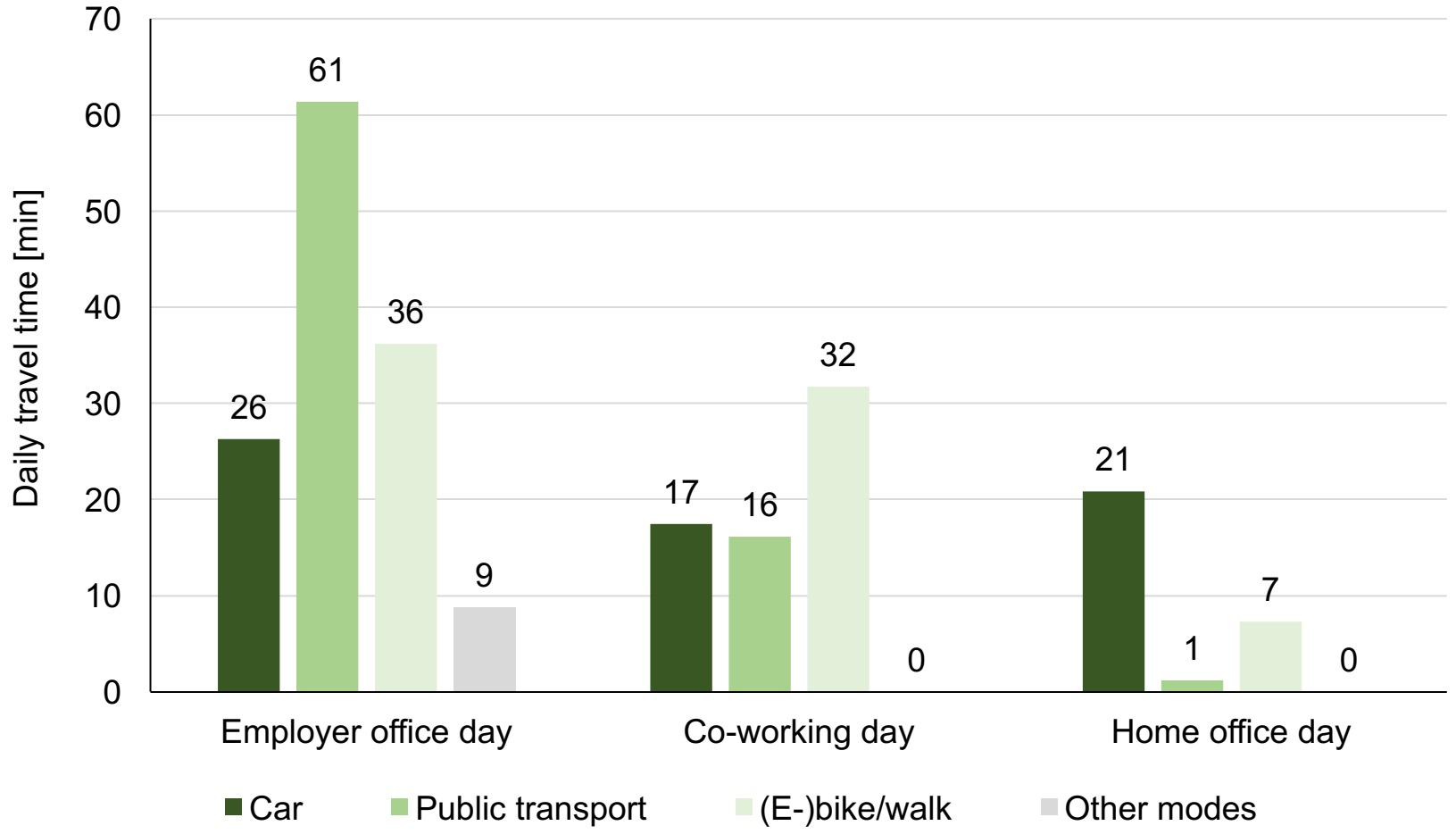
Results

Average time spent on an activity by work location on that day



Results

Average daily travel time spent in different transport modes by work location



Estimation of energy impacts

Estimation approach

We roughly estimate energy requirements associated with…
- heating, cooling and lighting of the CW space (direct effect),
- ICT equipment operated in the CW space (direct effect), and,
- changes in travel time (indirect effect), on employer office, CW and home office days.

All energy impacts are estimated per person and workday.

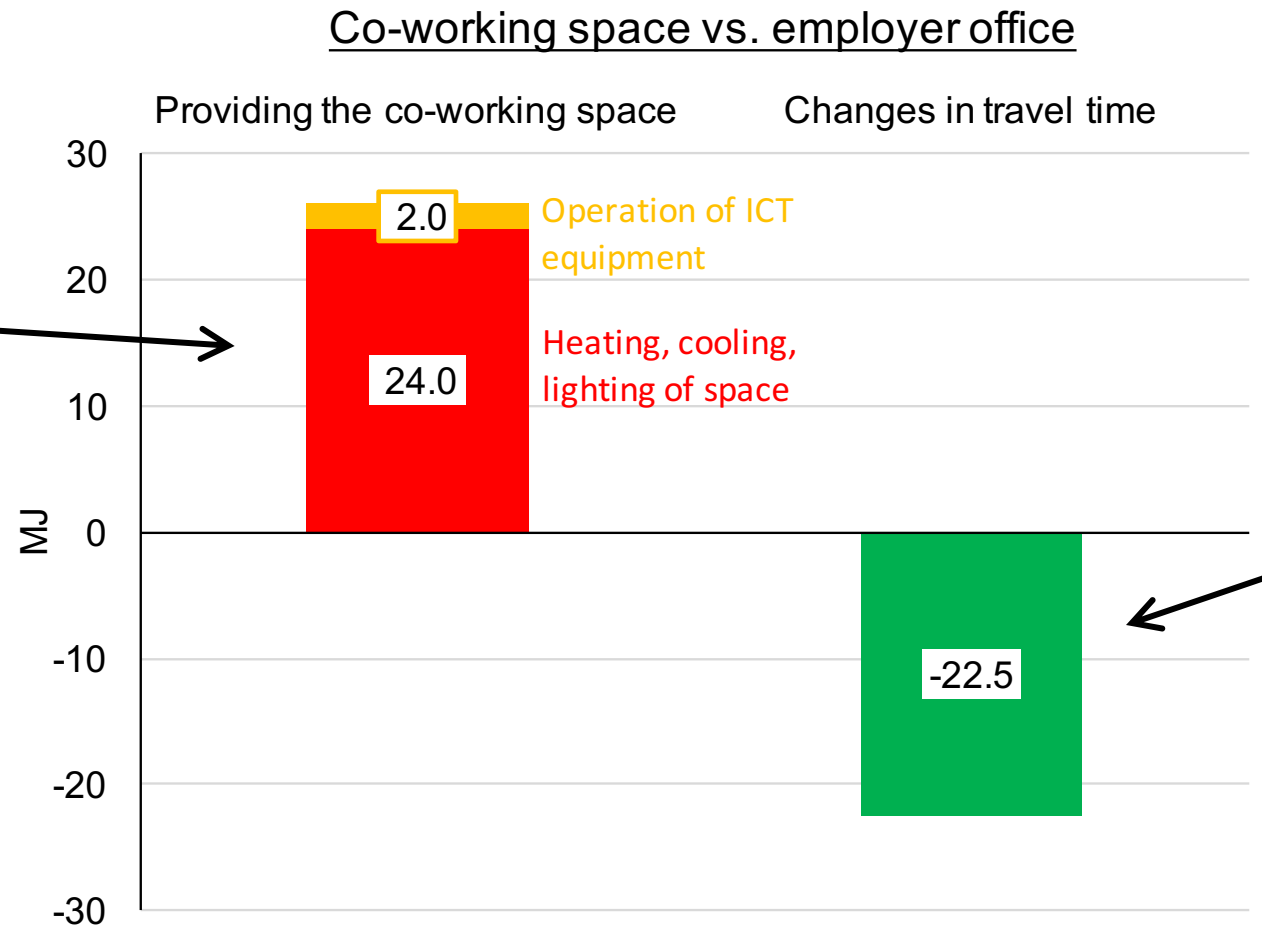
Not considered

- Construction and maintenance of buildings
- Impacts of producing ICT equipment and transport vehicles
- Changes in space use at home or the employer‘s office
- Structural effects of co-working
- Effects on household members of colleagues
- …

Results

Co-working day vs. employer office day

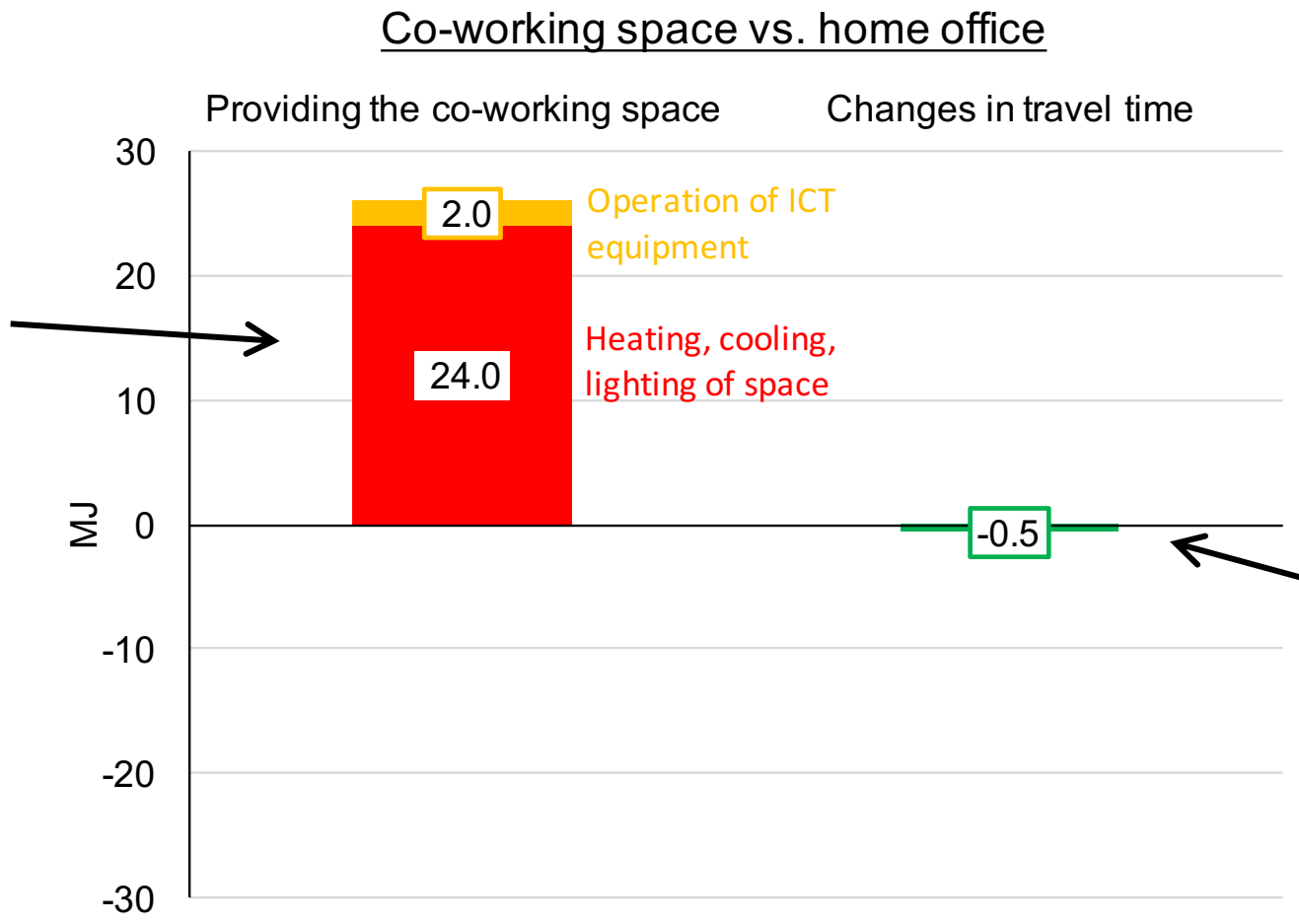
Energy impacts of providing the co-working space per person and workday



Energy impacts of changes in travel time on a co-working day vs. an employer office day

Results
Co-working day vs. home office day

Energy impacts of providing the co-working space per person and workday



Energy impacts of changes in travel time on a co-working day vs. a home office day

Strategy to increase energy savings

Energy requirements of co-working space do not increase with increasing utilization

Total energy required for heating, cooling and lighting the co-working space does not increase proportionally with increasing utilization of the co-working space. That is, because buildings do not require much more heating energy if occupancy increases or vice versa.

Every additional co-working or home office day increases total travel-related energy savings

The number of avoided employer office days (long commute) is proportional to total commute-related energy savings (e.g. one co-working or home office day avoids one long commute, two co-working or home office days avoid two long commutes,…).

Increasing number of avoided commutes increases energy savings

Thus, substituting additional employer office days with co-working or home office days is a good strategy to increase energy savings.

Limitations

- Co-workers work all for the same company
- No time-series data available
- Weekends excluded
- Changes in energy consumption and space use at employer office or at home are out of scope
- Analysis of average time use across co-workers and not individual co-workers
- ….

Conclusions

Co-working does not lead to energy savings per se, but should be accompanied by additional energy savings measures.

The **main levers to realize energy savings** through co-working are:

- Reduction of total travel time and distances (e.g. by choosing co-working spaces close to home)
- Use of sustainable transport modes
- Net reduction of (heated) floor space at the CW space, at the employer's office and the co-workers home
- A high number of CW or home office days (increasing the number of avoided commutes to employer offices)

These conclusions also apply to telecommuting by working from home instead of the employer’s office.

Thank you for your kind attention!

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