THE FUTURE OF WORK AMIDST THE CLIMATE CRISIS

How Work-Time-Reduction Affects Individual Consumption-Based CO_2 Emissions in Austria

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ABSTRACT

Effects of the climate crisis are imminent, while COVID-19 has presented us with a new attitude towards how work. Thus, discussions and increasing experiments of Work-Time-Reduction need to be analysed with respect to their potential impact on the climate. Previous research on the effects of reduced work-hours on greenhouse gas emissions by Schor (2005), Hayden and Shandra (2009), Nässén and Larsson (2015) and Fremstad et al (2019) have assumed a proportional decrease in income with a reduction in work-hours. This thesis however focuses on constant income with work-time-reduction, of which no prior research is available. A non-representative survey was conducted, in style of a time-use analysis developed by Jalas (2002), with time-use categories following Druckman et al (2012), to examine how respondents would spend their increased free-time with reduced hours of work. Answers of the survey were linked to Smetschka et al's (2019) kilogram of CO_2 emissions per hour of activity estimations of Austrian citizens. This thesis concludes that reducing work hours by itself does not lead to a decrease in total CO_2 emissions. However, as Commuting and Food are the most carbon intensive activities, if the policy is coupled with a carbon tax to discourage driving by car, infrastructure available for public transport, subsidies for local vegetables while raising the price of meat, people's consumption patterns may change towards a more sustainable lifestyle.

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LIST OF ABBREVIATIONS

WTR – Work-Time-Reduction

GHG – Greenhouse Gas (emissions)

$kgCO_2/h$ – kilogram of CO_2 per hour

INTRODUCTION

Effects of the climate crisis are predicted to be drastic and imminent, as new research predicts a breach of the pivotal 1.5°C limit already by 2027 (McGrath 2023). A call to action for governments is essential to implement policies aimed at significantly reducing Greenhouse Gas (GHG) emissions globally. While many leaders still rely on sustainable innovation to mitigate high GHG emissions, an increasing body of literature has shown behavioural changes, in addition to innovation, necessary to constrain global warming (Creutzig et al. 2016; Druckman et al. 2012)**.** In other words, transformative changes in production and consumption are essential (Knight et al. 2013; Koide et al. 2021). Simultaneously, discussions on Work-Time-Reduction (WTR) are on the rise, due to experiences from the pandemic, and conclusive literature showing WTR to lead to more happiness. Thus, this thesis explores the understudied impact WTR may have on consumption-based CO_2 emissions.

Governmental inaction and increasingly dire scientific predictions regarding the effects of the climate crisis led to a surge of literature around the degrowth movement (Balderson et al. 2022; Gunderson 2019; Hofferberth 2022; Kallis 2017; Knight, Rosa, and Schor 2013). As innovation will not lead to a sufficient reduction of GHG emissions in time, degrowth calls for reduced consumption, resulting in reduced production, slowing down environmental destruction created through economic growth (Hofferberth 2022; Kallis 2017; Knight, Rosa, and Schor 2013; Koide et al. 2021; Kreinin and Aigner 2022; What is degrowth? 2023). For a slower economy, the degrowth movement sees it necessary to reduce work-hours and *income proportionately* (Antal et al. 2021). This represents a first step in changing behavioural patterns away from overconsumption, efficiency and high GHG emissions, towards a community-oriented, self-sufficient lifestyle, with net-zero emissions (Balderson et al. 2022).

Aside from degrowth, a different approach towards Work-Time-Reduction (WTR) has been emerging in various countries, emphasising *same levels of income,* contrary to degrowth. Experiments have been conducted in several countries, amongst them Iceland, Sweden, the Netherlands and the United Kingdom (Lewis et al. 2023; Spiegelaere and Piasna 2017). While the reduced work-hours of the degrowth movement aim to decrease consumption, production and economic growth, WTR implemented in the above experiments – and the type explored in this thesis – does not slow-down economic growth, but relies on increased efficiency of workers in fewer hours. WTR thus retains the same levels of output, income, and thus also *production emissions* (Lewis et al. 2023). While degrowth reduces GHG emissions, WTR's main aim is to increase welfare, as literature has linked positive social effects to WTR, concluding that decreased work-hours lead to more happiness (Alesina, Glaeser, and Sacerdote 2006; Balderson et al. 2022; Lufkin and Mudditt 2021).

Whereas papers discussing social benefits of WTR can be found easily, literature linking WTR to environmental output is sparse, but increasing (Antal et al. 2021; Devetter and Rousseau 2011; Fremstad, Paul, and Underwood 2019; Nässén and Larsson 2015; Rosnick 2013; Rosnick and Weisbrot 2007; Schor 2005). However, the majority of literature comes from a degrowth perspective, assumes proportional *decreased* income with reduced work-hours, leading to decreased GHG emissions. But, preliminary studies of a 4-day work-week, with constant, not proportional income, are on the rise, whose environmental impact remain unstudied (Lewis et al. 2023). This thesis intends to contribute in closing this gap in literature.

The aim of this thesis is to explore whether, and how WTR will affect carbon-consumption emissions of individuals. It builds on existing research by Jalas (2002, 2015), Druckman et al (2012) and Smetschka et al (2019) who made important contributions to time-use analysis of everyday activities and their relation to energy or CO_2 emissions. A non-representative survey was carried out to infer how people spend their increased free-time with WTR. To assess the carbon-intensity of each activity, data from Smetschka et al (2019) is used. Production emissions are expected to stay the same with WTR, as output stays the same and technological efficiency is held constant. Hence, only changes in consumption-emissions are evaluated. Assuming a 4-day-work-week, commuting emissions are expected to decrease by at least 20%, as people commute to work one day less. If individuals change their mode of transportation within WTR, e.g. from car to public transport, commuting emissions may decrease further. Nevertheless, non-work related emissions are expected to *increase* proportionately with increased time, if behaviour does not change significantly within WTR. Free-time emissions, aside from commuting, can therefore only decrease if people choose to allocate their time differently in a WTR scenario than they do currently – the focus of this thesis.

My findings indicate that total CO_2 emissions increase from current to WTR time-use from 151 $kgCO_2$ per week to 158 $kgCO_2$ per week, however emissions per hour decreased from 1.19 $kgCO_2/h$, to 1.16. Thus, survey-respondents shifted their behaviour towards less carbon intensive activities, which however was counteracted by increased disposable time. This thesis concludes that WTR alone will not reduce CO_2 emissions. So, to pave the way towards sustainable consumption, additional policies like a carbon-tax, investment in renewable energy, a tax on meat and affordable and available public transport are necessary alongside WTR to decrease consumption emissions (Pretis 2022).

The thesis will proceed as follows: in the first section I will provide the ecological and economic theoretical framework and an extensive literature review of the field. Section two incorporates my methodological considerations of the survey. In the third section, I present and discuss my results, with additional policy suggestions. The fourth section concludes with further research suggestions.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Climate Action

Floods, heatwaves, typhoons and wildfires in the summer of 2022 are consequences of the climate crisis, which will escalate further into mass migration if action is not taken immediately (Georgieva 2022). While innovation on carbon mitigation strategies has made substantial progress, it is not fast enough to prevent the climate catastrophe (Bearak and Popovich 2022; Cafaro 2014). Both the most recent Intergovernmental Panel on Climate Change (IPCC) and UN Environment Program (UNEP) report have highlighted the need for a GHG[1] emissions reduction in household emissions – as households make up around 58-72% of global emissions (Koide et al. 2021). Household emissions include direct emissions – emissions from using fossil fuels in heating, electricity, transportation, light – and indirect emissions, which arise from supply chains in production and consumption of goods like food, clothing, electronic devices, etc (Druckman et al. 2012; Jalas 2002; Koide et al. 2021).

In terms of environmental equality, it is crucial to point out that high income countries, like Austria, emit a much higher proportion of GHG emissions per capita than low income countries (Ritchie et al. 2020). In fact, the richest 50% of countries account for 86% of all emissions, while the bottom 50% make up only 14% (Ritchie 2018). Analogously, a study by Oxfam showed that the richest 10% of people contribute to 50% of the earths' consumption-based GHG emissions (Colarossi 2015). In the interest of environmental equity, high-income countries like Austria, and the wealthiest 10% should be urged to do their part in reducing GHG emissions. Individual consumption choices should consequently be viewed as embedded in structural inequalities for a more rounded perspective.

[1] When discussing the climate crisis in general, GHG emissions is used. When talking about this thesis, CO_2 emissions are used, as measurements were done in kg of CO_2

Work-Time-Reduction

When analysing individual carbon emissions, work is a central element. How work is organized, and specifically how much time it consumes, has been the topic of increasing public debate, especially since COVID-19 introduced a new perspective towards work. Reducing work hours has been one of the primary goals of social democratic parties in Europe since their establishment in the late 19th century (Gunderson 2019; Sozialdemokratische Partei Österreichs 2023). Continued fights of labour unions for decreasing work-hours achieved some success, like the introduction of the weekend and a 40 hour working week (Harper 2019). Today, labour union power can be seen when inspecting average work-hours, where countries with strong labour unions continuously work less than the more 'liberal' countries, like the US or the UK (Rosnick and Weisbrot 2007; Schor 2005).

Discharging the status quo that working more equals to working better, studies have shown people to be as efficient, if not more so, in a 4-day-week (Lewis et al. 2023). WTR studies with constant income are conducted around the world, ranging from trials from Microsoft in New Zealand and Japan, to public-sector trials in Iceland and Spain, with the most recent large-scale private sector trial being conducted in the UK, where over 60 companies and around 2,900 employees participated (Lewis et al. 2023; Spiegelaere and Piasna 2017). Results were ground-breaking: 71% of employees had reduced levels of burnout, number of staff leaving decreased by 57% and revenue of companies increased on average by 35% (Lewis et al. 2023). Furthermore, 92% of participating companies pledged to continue with WTR after the trial period (Lewis et al. 2023).

Executing WTR does not have to follow a rigid implementation and should not lead to working the same amount of time in fewer days. Instead, it can be as variable as each sector of work. There are five ways on how to adopt WTR: fifth day stoppage, staggered, decentralised, annualised or conditional (Lewis et al. 2023). While a fifth day stoppage is the same 4-day-week for all, in a staggered 4-day-week employees take different days off to keep the company open on all 5 days. A decentralized WTR lets each department decide how they would like to conduct WTR, which may also result in working for 5 days, but fewer hours on each day (Lewis et al. 2023). Annualised WTR scales decreasing hours over a year, allowing for longer holidays, while conditional WTR ties the 4-day-week to the condition that performance remains as high as in a full working week[2] (Lewis et al. 2023).

WTR is expected to increase happiness, since it allows for more creativity, reduce alienation from work and lead to "self-realization" (Gunderson 2019, 37). Mainly, WTR increases autonomy over one's time, which Balderson et al (2022) directly correlate to happiness. WTR can thus become an end in itself (Granter 2016).

Literature Review

Of the scarce literature linking work-hours to GHG emissions, a vast majority come from the degrowth movement, and assume decreased income with work-hours. Hence, many scholars conclude that a reduction in work-hours leads to a reduction in emissions, as less is consumed (Antal et al. 2021; Devetter and Rousseau 2011; Fremstad, Paul, and Underwood 2019; Hayden and Shandra 2009; Knight, Rosa, and Schor 2013; Nässén and Larsson 2015; Rosnick 2013; Rosnick and Weisbrot 2007; Schor 2005). Schor (2005) was one of the first to breach the field, and created a regression analysis between average hours per employee and their ecological footprints in 18 OECD countries. Linking environmental impact (I) to the total population (P), per capital level of consumption (A for affluence) and environmental impact per unit of consumption (T) – the I=PAT formula – she correlated people's level of consumption to hours worked, assuming "hours are correlated with income and hence consumption" (Schor 2005, 46).

[2] See table in Appendix 3 for more comprehensive explanations

Following her example, Hayden and Shandra (2009), Nässén and Larsson (2015) and Fremstad et al (2019) have conducted further studies, all assuming a proportional relation between income and work-hours, and all consequently finding a correlation between decreased work-hours and lower GHG emissions. While Hayden and Shandra (2009) developed Schor's (2005) approach towards a more extensive STIRPAT analysis, Nässén and Larsson (2015) focused on consumption-patterns of Swedish households, finding a 1% decrease in work-time to correspond to 0.8% reduction in GHG emissions, due to "effects of lower income and lower consumption" (726).

Turning to time-use analysis of consumption-patterns and their links to GHG emissions, this provides a more adequate framework for changes in consumption with increased time. Pioneered by Jalas (2002), Druckman et al (2012) and Smetschka et al (2019) time-use analysis allows for a comprehensive framework of individual behaviour, including activities outside of the market realm, like House- or Care-Work. Individual GHG emissions are influenced by disposable time as much as disposable income, which time-use analysis focuses on. Because WTR would not change income, but disposable time, time-use analysis is fitting for my analysis. The amount of time a person has at their disposal determines whether they commute to work by car or bike, dictates the type of Leisure they engage in or how they prepare food. Its scarcity or abundance influences our everyday consumption patterns and thus is worth considering when analysing the relationship between WTR and CO_2 emissions.

Jalas (2002) first linked everyday activities to their level of energy intensity, analysing Finnish direct and indirect energy consumption-patterns. Using time-use diaries from Eurostat, he analysed differences in energy intensity of activities like housework, watching TV or preparing food – actions done within the home which are not recorded in the market. Analysing time-use patterns for over 20 years, publishing data from 1987, 1998 and latest 2009, he was the first to question whether energy consumption changes are due to activity patterns, energy intensity or demographic changes (Jalas and Juntunen 2015). He concludes that increases in energy intensity over the studied years are due to increased use of time-squeezing technology.

Druckman et al (2012, 2019) used a Multi-Regional Input Output (MRIO) model to analyse the carbon-emissions of time-use categories for the average British adult, further breaking her analysis down by gender. Focusing on "non-work" time, Druckman et al (2012) concentrated on the "dual roles" people encounter, by being in the production process as part of the labour force, and consumers in their free-time (153). They conclude that average CO_2 emissions are at 1.2 kilograms CO_2 per hour ($kgCO_2/h$) per person. Women emit more than men, due to increased time spent in unpaid labour. Sleep is the most sustainable way to spend time, while Commuting is the most carbon-intensive activity. Categories used by Druckman et al. (2012) were carried forward in this thesis.

Finally, Smetschka et al (2019) conducted a comprehensive overview of carbon-emissions of everyday activities in Austria, attributing these, like Druckman et al (2012) and Jalas (2002), to time-use categories**.** Using Eora MRIO[3] data from 2009-2010, they linked Austrian time-use surveys with the Austrian Household Budget survey, and calculated carbon emissions of all time-use activities. As I am from Austria, and most survey respondents currently reside in Austria, I will use carbon-emissions from Smetschka et al (2019) for my analysis.

Linking Time-Use to CO_2 Emissions

Disposable time, like disposable income, dictates the carbon-intensity of everyday activities. This thesis has split up everyday activities into seven categories: Work/Study, Sleep, Leisure, Housework, Food and Drink, Commuting and Care-Work. How and what makes each activity carbon-intensive or carbon-efficient is delineated below. Work/Study dictates how much time is spent in the remaining activities (Druckman and Gatersleben 2019). Neither Jalas (2002),

[3] See Methodology

Druckman et al. (2012) nor Smetschka et al. (2019) include this activity in their analysis of consumption behaviour, all argue it to be a place of production. Income is earned during work, not spent, thus household emissions cannot be allocated to Work/Study.

Time allocated to Sleep is usually constant, cannot be compressed or outsourced to others. CO_2 emissions for this activity come from direct emissions like heating and are influenced by factors like living space available per person (Smetschka et al. 2019). Parallel consumption, so whether the individual person owns a second home, further increases these emissions, as heating, cooling and building the second home are included (Heinonen et al. 2013).

Leisure is very variable, as it can result in very high emissions, like in the case of travelling or very low emissions, like in the case of meeting friends (Smetschka et al. 2019). Dependent on the ability to control one’s own free time and one’s socio-economic situation, Leisure greatly varies with living situations. However, it is framed by infrastructural provision, like parks within cities, or low cost Leisure availabilities (Jalas and Juntunen 2015). Housework, on the other hand, is very locked in in the CO_2 emissions it consumes and difficult to decrease. While influencing factors like the type of energy sources of the washing machine and dishwasher can be altered, Housework cannot be shortened, but can be delegated to someone else (Smetschka et al. 2019). This also relates to gendered inequalities, where women do more housework than men, thus have greater time inflexibility and emit more GHG (Druckman et al. 2012).

Food and Drink, similarly to Leisure, is a variable factor. Not only do GHG emissions vary based on the type of diet – whether the individual is vegan, vegetarian or eats meat – it further matters what kind of meat they eat, and how often per week. Of further importance in carbon-emissions are where vegetables are bought, whether they are seasonal and/or local and if they are organic or not. Time-squeeze and low socio-economic backgrounds can lead to a higher carbon intensity, as people are more likely to buy cheap meat or pre-cooked food, storing a lot of indirect emissions through shipping and production (Druckman et al. 2012).

Commuting is one of the most carbon intensive activities, however is also comparatively locked in, as it is dependent on available infrastructure. Commuting by car is very carbon-intensive, however if the person has no alternative then they cannot reduce their carbon-emissions. Governments need to provide appropriate infrastructure for public transportation, which should be able to serve as a substitute to cars and hence needs to be affordable and available.

Finally, Care-Work can lead to time-squeezes and is often very carbon-intensive. Care-work can be outsourced, providing one of the reasons why gender inequality is still so high as women continue to do most of the unpaid labour (Striedinger 2020). However, again, providing publicly available infrastructure, like public kindergartens, can decrease the double-burden for women and lead to shared emissions (Smetschka et al. 2019).

METHODOLOGY

In this thesis, a non-representative survey was conducted to determine (1) how people currently spend their time, similar to time-use diaries used by Smetschka et al (2019), Druckman et al (2012) and Jalas (2002). The main aim of the survey was to illustrate (2) how people would spend their increased free-time in a 4-day work-week. This data cannot be found in time-use diaries, and the aforementioned studies have not focused on it. Time-use categories of Druckman et al (2012), also used in Smetschka et al's (2019) paper were carried forward for this thesis. Further data by Smetschka et al (2019) were used to allocate each time-use activity with the appropriate CO_2 emissions[4].

The survey

The survey examined how (1) people currently spend their time, and (2), how they would spend their time in a WTR scenario. Survey time-allocations were then ascribed to Smetschka et al's (2019) carbon estimations, to see whether different time-allocations with WTR change carbon consumption-emissions – the core of this thesis. This may provide a framework for policy suggestions on whether WTR alone can decrease CO_2 emissions, or whether it will have to be paired with other policies aimed at reducing consumption emissions.

The survey was structured in three parts: demographic questions, current time-use questions and WTR time-use questions. The first sets of questions asked about the respondent's gender, age, whether they lived alone, how big the urbanization area they lived in was, and whether they did or did not have children[5].

[4] Found in Appendix 1
[5] The demographic distribution of the survey seen in Appendix 2

The second part of the survey asked how respondents currently distributed their time. With 168 hours at their disposal (=7 days) respondents could allocate these, with sliding scales, to the following categories: Work/Study, Sleep, Leisure, Housework, Food and Drink, Commuting, and – for parents – Care-Work. Although people without children may also have caring responsibilities, only survey respondents who had children could allocate time to "Care-Work", to see how much time children impact people's lives. Although some respondents had troubles scaling their daily activities up to the entire week, asking for time-allocations over 168 hours was more logical than over 24, as WTR occurs over the span of a working-week, not a work-day.

Current time distribution – the second part – continued with more detailed questions on the mode of transportation used for Commuting to work, and asked what type of Leisure people usually engaged in. As these two categories can vary in their emissions, I went into more detail, and expanded Smetschka et al's (2019) research. For Leisure, respondents could indicate the frequency with which they were engaging in seeing Family and Friends, Reading, TV/Radio/Music/Internet, Online Games, Sport or Other[6]. There were additional questions on the type of sport they engaged in, and what hobbies constituted their "Other"[7]. Regarding Commuting, respondents could denote the mode of transportation they primarily used for their daily commute.

The third part of the survey mirrored the second, with the main – and vital – difference being the reduction in work hours. The fifth day stoppage of WTR was assumed, hence their work-time was reduced by 8 hours. Survey respondents could allocate the additional 8 hours to the remaining four or five categories: Sleep, Leisure, Housework, Commuting and – for parents – Care-Work. Previous questions on the mode of transportation for Commuting and additional Leisure were repeated, while reminding respondents of the decreased work-time. The aim was

[6] Seen in Appendix 4
[7] Appendix 8 and 9

to see if respondents would change their current behaviour with increased amount of time at their disposal.

Data from Smetschka et al (2019)

As this paper uses Smetschka et al's (2019) carbon time-use estimations, seen in Table 1, their methodology is outlined shortly. Smetschka et al (2019) used Austrian Time-use surveys conducted in 2010 and linked these to Austrian household budget surveys of 2010 to calculate footprints of household consumption. To do so, a consumer-price version of Multi-Regional Input-Output model, called Eora MRIO[8], was used, which tracks financial flows, including global supply chains, between economic sectors (MRIO Assessments 2023). Hence, direct and indirect emissions can be inferred from MRIO data. By allocating household expenditure to specific time-use categories, the authors could estimate how much kgCO_2 per hour each activity warranted. A detailed table of Smetschka et al's (2019) data is seen in Appendix 1. The paper concluded that the average carbon intensity of current consumption-patterns was 1.3 kgCO_2/h, differing only slightly from Druckman et al. who calculated 1.2 kgCO_2/h (2012).

For this thesis, time-use allocations of survey respondents were multiplied by the hourly CO_2 emissions of each activity, seen in Table 1. Leisure and Commuting were further broken down in the survey, their hourly CO_2 emissions calculated separately from Smetschka et al (2019), portrayed in the calculations section[9].

Table 1: kgCO2/h from Smetschka et al (2019) and my own calculations

Activity	**Sleep**	**Leisure**	**Housework**	**Food and Drink**	**Commuting**	**Care-Work**

[8] For further information, read Smetschka et al (2019), p.4
[9] More details in Appendix 5

Current: *$kgCO_2/h$*	0.64	Own calculated average: 1.04	1.51	2.405	Own calculated average: 1.99	1.79
WTR *$kgCO_2/h$*	0.64	Own calculated average: 1.05	1.51	2.405	Own calculated average: 1.86	1.79

Calculations

Modes of transportation greatly vary in their emission intensity, justifying a differentiation within the survey. Data on CO_2/km emissions of each transportation mode were taken from "Our World in Data" (Ritchie 2020). As Smetschka et al's (2019) emission were given by the hour, further estimations on travel time were used, seen in Table 2 (Fletcher 2022; Gavin 2022; Herausforderung für die Automobilität 2013; Prillinger 2016). Total kilograms of CO_2/h were multiplied by the hours individuals spent on commuting. The entire claculation is portrayed in Equation 1.

Equation 1: Commuting emissions for different transportation modes

$$CO_2 \text{ emissions per km for transportation mode} \times \text{average km travelled per hour for transportation mode} \times \text{amount of time allocated for commuting}$$

Table 2: CO2 emissions per hour for different modes of transportation

Mode of transportation	**Kg of CO_2 emissions per km**	**Average km/h**	**Kg of CO_2/hour**
Bicycle	0.021	20	0.42
Public Transport	0.031	32.5	1.08
Walking	0.056	4.54	0.25
Car	0.192	40.0	7.68
Regional Train	0.041	70	2.87
Car-Sharing	0.064	40	1.92

Although differences in the mode of transportation were accounted for, differences in Food and Drink were not included in the survey. There was no differentiation between people who are vegan, vegetarian or regularly consume meat, whether they cooked food themselves, bought pre-cooked food or ordered take-out. Hence, Food and Drink was multiplied by the emission constant, 2.457, seen in Table 1, from Smetschka et al (2019)[10].

Furthermore, the distribution of the survey was not conducted in a representative way, the survey makes no claim of internal or external validity. It was distributed through my friends and family, via social media channels.

[10] See Equation 2

RESULTS

The results will first contain a brief comparison between current time-use and WTR time-use of respondents. Analogously, the second part will compare current time-use emissions with WTR time-use emissions. Commuting and Leisure emissions will be portrayed in more detail. Lastly, four sets of people with varying lifestyles will be compared to each other for common trends amongst the data set.

Current Time-Use Behaviour

Figure 1 compares current time-allocations of people with and without children. To look after their children, parents spend less time at Work/Study, Sleeping, on Leisure and on Food and Drink than their childless counterparts. The difference in Leisure is most drastic, as parents allocated 13 hours *less* to it per week than people without children. Leisure hence constitutes only around 14% of their week, as opposed to 21% of people without children. Table 3 portrays current and WTR time-allocations of people with and without children, scaled down to one day. Sleeping is scaled down to almost 8 hours without, and 7 hours for people with children. Parents spend approximately 6 hours per day on unpaid labour, including Housework, Food and Drink, and Care-Work, while people without children only allocated 5 hours to it. Work-time is relatively low and Leisure relatively high as these numbers are an average of the whole week, including the weekend. Parents may allocate more time to Housework because they have bigger living spaces, and have children who cannot do Housework themselves yet.

Table 3: Time-Use scaled down to one day

Time Use/day	**Current time-use without children**	**WTR without children**	**Current time-use with children**	**WTR time-use with children**
Work/Study	5.87	4.73	5.73	4.59
Sleep	7.70	7.98	7.10	7.30
Leisure	5.09	5.67	3.25	3.85
Housework	1.50	1.62	2.07	2.17
Food and Drink	2.30	2.43	1.96	2.00
Commuting	1.54	1.58	1.80	1.84
Care-work	0.00	0.00	2.15	2.31

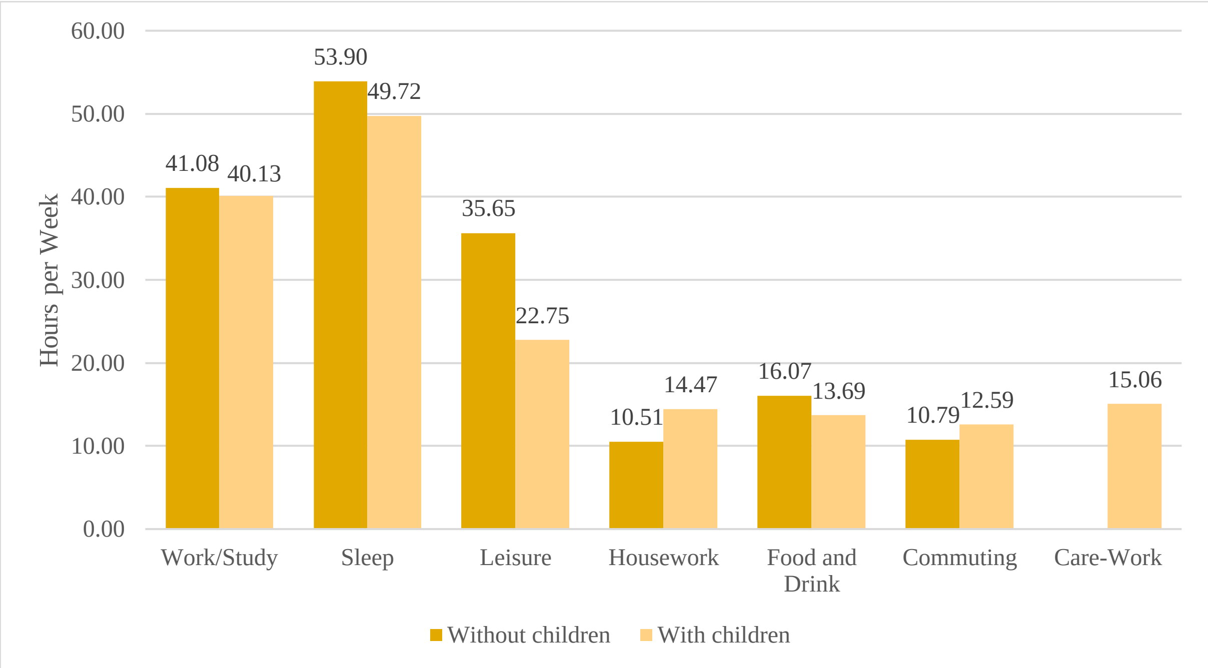

Figure 1: Current time-use of people with and without children, in hours

WTR Time-Use Behaviour

Figure 2 compares WTR time-use allocations of people with and without children. A 4-day work-week model of WTR was assumed, respondents were given 8 hours to allocate amongst the remaining 4 or 5 categories. Parents increased Leisure time by more than 4 hours, Sleep and Care-Work by more than one, less than one hour for the remaining categories. People without children on the other hand increased Sleep by almost 2 hours, and Leisure by a bit less than 4, attributing more time to Food and Drink, Commuting and Housework. Parents thus spend more time with unpaid labour, while people without children spend more time sleeping, also reflected in Table 3.

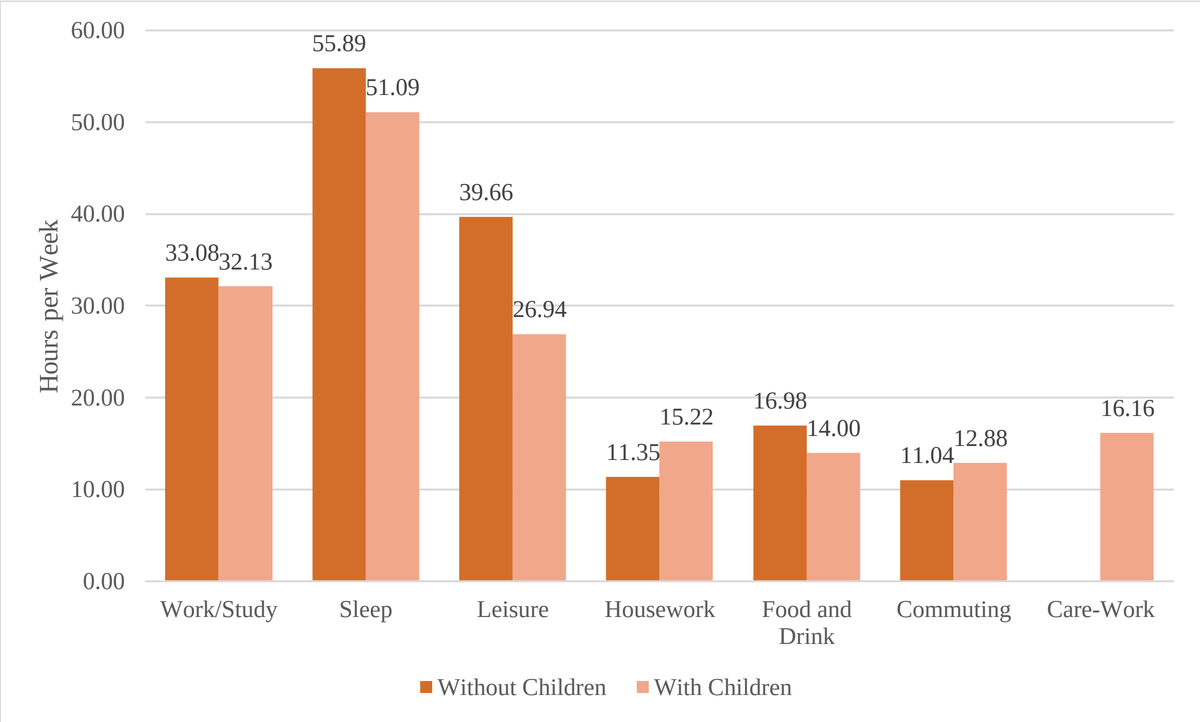

Figure 2: Work-Time-Reduction Time-use of people with and without children, in hours

Total Carbon Emissions of Survey Respondents

According to my calculations[11], the average respondent currently emits 151 kgCO_2 per week (7 days), and 1.19 kgCO_2 per hour. Emissions increased to 158 kgCO_2 per week with WTR, but decreased to 1.16 kgCO2 per hour, summarized in Table 4. Hence respondents shifted their behaviour to more sustainable activities in WTR, seen in the reduced hourly CO_2 emissions. The behavioural change was counteracted by the increased time spent on non-work activities within WTR, leading to an overall increase. Nevertheless, my findings for current emissions are similar to those of Druckman et al (2012) and Smetschka et al (2019), who calculated 1.2

[11] Detailed in Appendix 5

kg CO_2/h and 1.3 kg CO_2/h, respectively. Differences can be attributed to my strong sample-bias.

Table 4: Current and WTR average emissions per Week and Hour

	Current kg of CO_2	WTR kg of CO_2
per Week	**151.02**	**158.25**
per Hour	**1.19**	**1.16**

Figure 3 further shows the importance of individual choices on carbon-emissions within WTR. Hence, although average WTR emissions are higher than average current emissions, some respondents' WTR emissions were below current emissions, seen in cases where the red line is below the blue line. Due to the variations of people's behaviour, one cannot take predict people's future behaviour based on their current emissions. So, because individual lifestyles make a difference, policies directing consumption choices can curb time-use towards more sustainable allocations.

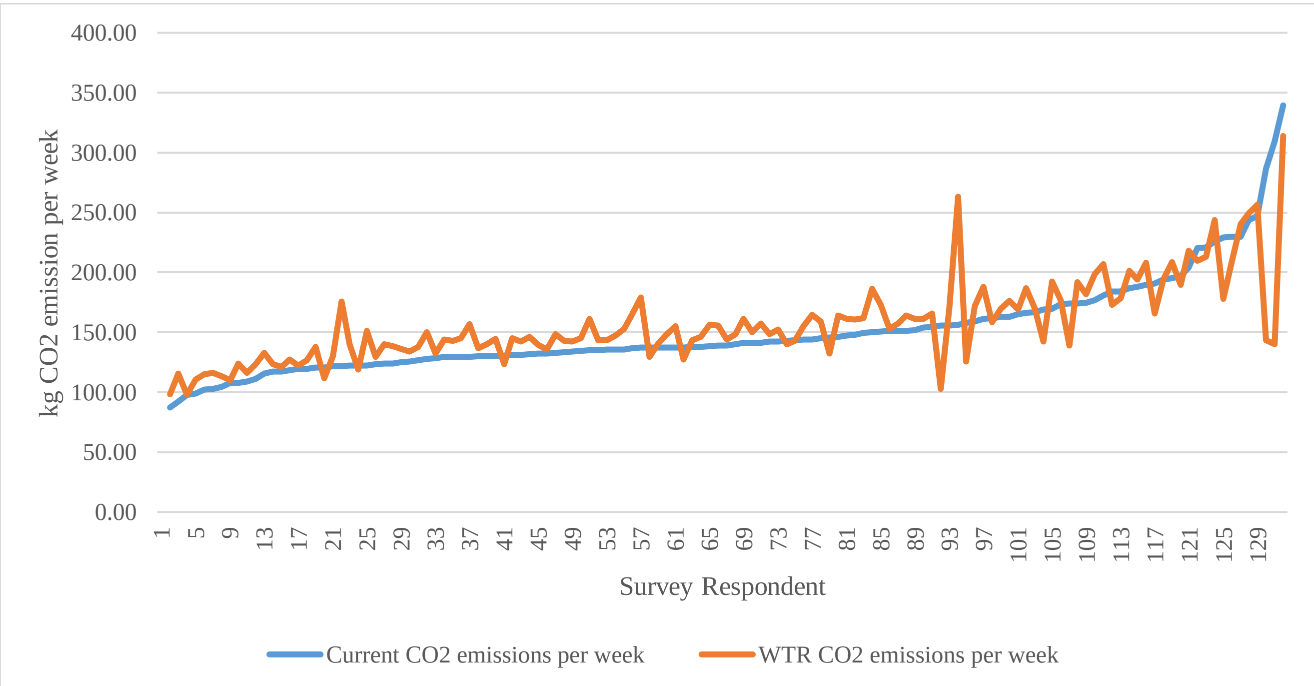

Figure 3: Individual Responses of Emissions per Week, sorted from smallest to largest

Figure 4 illustrates the respondents' average weekly emissions per activity. Surprisingly, Food and Drink, closely followed by Leisure and Sleep were the most carbon-intensive activities, not Commuting. This discrepancy from Druckman et al (2012) and Smetschka et al (2019) can be explained by the biased data set. Figure 5 depicts that people commuting by car still emitted the most carbon, however also had the highest kgCO_2 reduction in WTR. Figure 6, however, shows that 69% of respondents were Commuting by public transport, only 14% drove their car regularly. As the majority of respondents were already commuting with a sustainable mode of transportation to and from work, the average Commuting emissions are relatively low. If the survey were representative, Commuting emissions would be similar to those from Smetschka et al (2019) and Druckman et al (2012). Nevertheless, Commuting emissions decreased by more than 20%, from 22 to 16 kgCO_2 per week, as 13 respondents, 10%, would change their mode of transportation in WTR.

Naturally, emissions for Food and Drink increased with WTR as an emission factor from Table 1 was used, and multiplied by the WTR time increase of each person. Similarly, Housework and Care-Work increased proportionately with increased time respondents allocated to it.

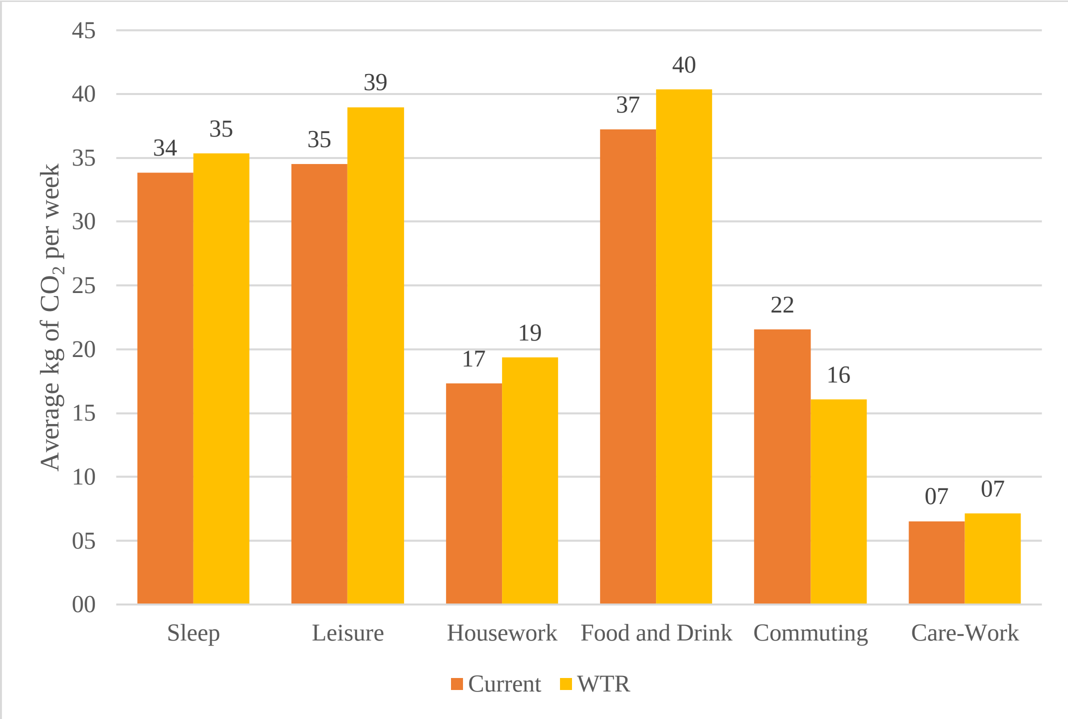

Figure 4: Current and WTR CO_2 emissions, broken down by category

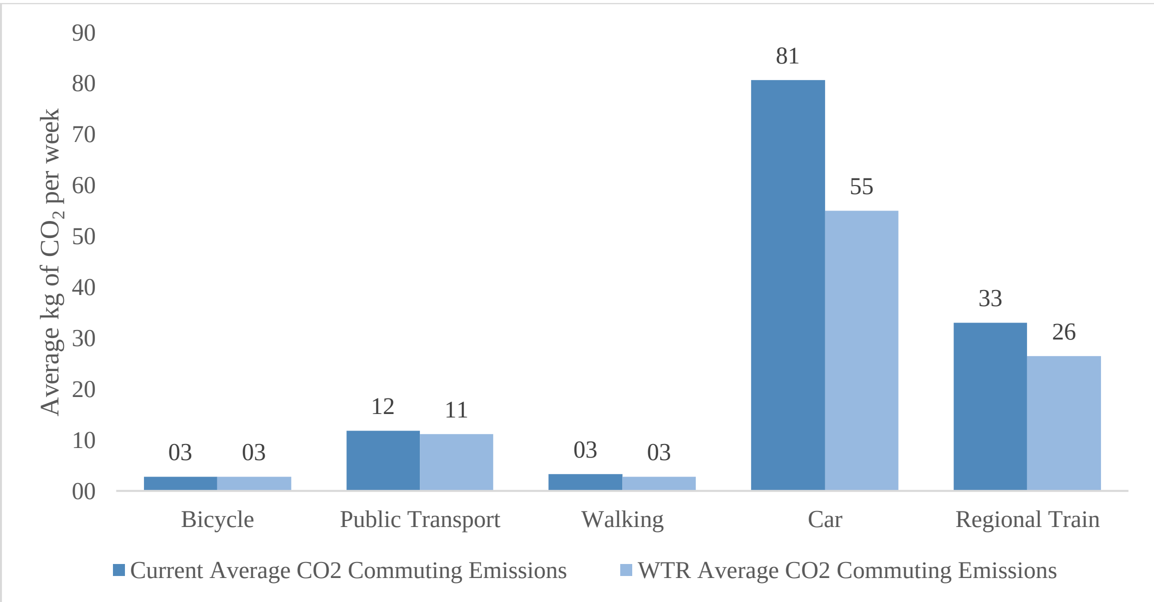

Figure 5: Current and WTR Average Commuting Emissions per Respondent per Week by Mode of Transport

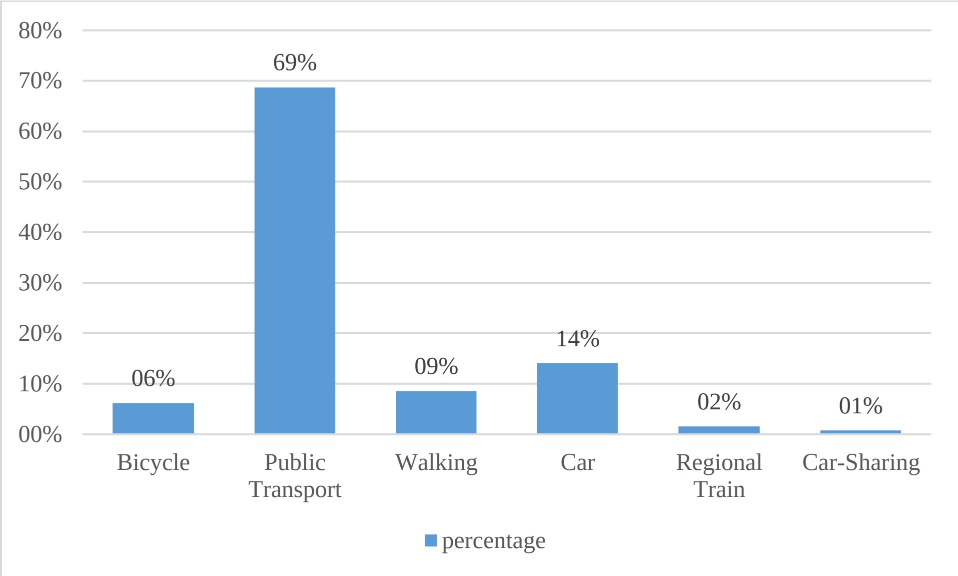

Figure 6: Percentages of Respondents Utilizing the displayed Modes of Transportation

Leisure, however, was broken down into smaller categories, taken from Druckman et al (2012). Figure 7 portrays that the most time and thus emissions were allocated to TV/Radio/Music/Internet. Unsurprisingly, Sport emissions increased the most within Leisure, as survey respondents shifted preferences towards more carbon-intensive sport, like hiking instead of jogging, or mountain-biking instead of cycling[12]. Both would involve more travel, increasing CO_2 emissions. Shopping emissions were surprisingly low, partly due to Smetschka et al's (2019) data[13], and partly due to the little time respondents allocated to it. However, as total Leisure, seen in Figure 4, only increased by 4 kg CO_2 per week, the increase in sport emissions were counterbalanced by minimal increases in video games, and a decrease in "Other" emissions[14].

[12] Frequency seen in Appendix 9
[13] Appendix 1
[14] Appendix 8

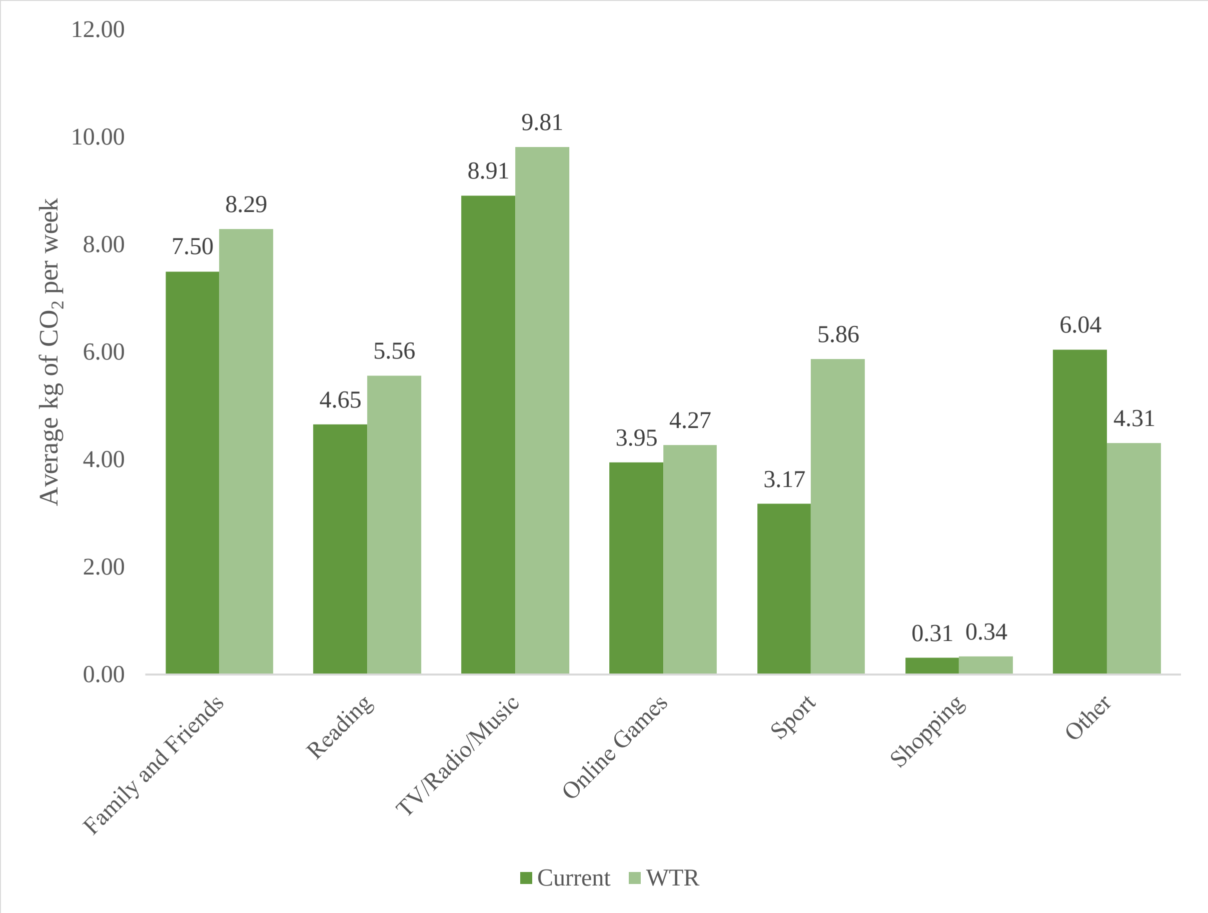

Figure 7: Leisure CO_2 emissions per activity, Current and with WTR

Four Types of Behaviour

Due to the differences in people's lifestyles, highlighted in Figure 3, I have categorized responses into 4 categories, seen in Figure 8: Type 1 –high Food and Drink and Housework emissions composed of 40 people, representing 31% of the data set. The 20 people in Type 2 – 15% – had high Commuting emissions, all drove by car, while Type 3 – high Leisure emissions – included 28 people, 22%. Finally, Type 4 – low emissions – incorporated 18 people, or 14%. The remaining 25 people did not fit in any categories, and were grouped within the "average" allocation. However they did not differ from the total average in Figure 4, so were left out of this analysis. In Type 1 in comparison to Figure 4, Care-Work emissions are above average, while Leisure emissions are 10 kgCO_2 below average, for current and WTR time-allocations. Furthermore, Type 1 had 5 kgCO_2 less than average current Commuting emissions, which however increased to the average of 16 in WTR. One may conclude that Type 1 already used public transport in Commuting, and did not change their mode of transportation with WTR.

Additionally, Type 2 decreased their emissions the most as 13 people changed their transportation in Commuting. However, Type 2 still had the highest overall emissions, with 197 $kgCO_2$ per week, as opposed to Type 1 and 3 who both emitted 155 $kgCO_2$ per week, and Type 4 with 108 $kgCO_2$ per week[15]. Type 2 further had considerably low Leisure emissions and the highest Care-Work emissions, showing that people who have children tend to commute more by car.

In comparison to Type 1 and 2, people in Type 3 and 4 have barely any Care-Work emissions. This confirms correlations that Care-Work responsibilities hinders people with children to spend more time on Leisure, as they do not have full autonomy of their non-work time. Furthermore, Type 4 had the lowest emissions as they spent most of their time sleeping, the least carbon-intensive activity, and comparatively little time on locked-in activities like Housework, and Food and Drink. They further had very low Commuting emissions, spent their Leisure time with carbon-efficient activities and did not have Care-Work responsibilities.

[15] Appendix 7 for further detail

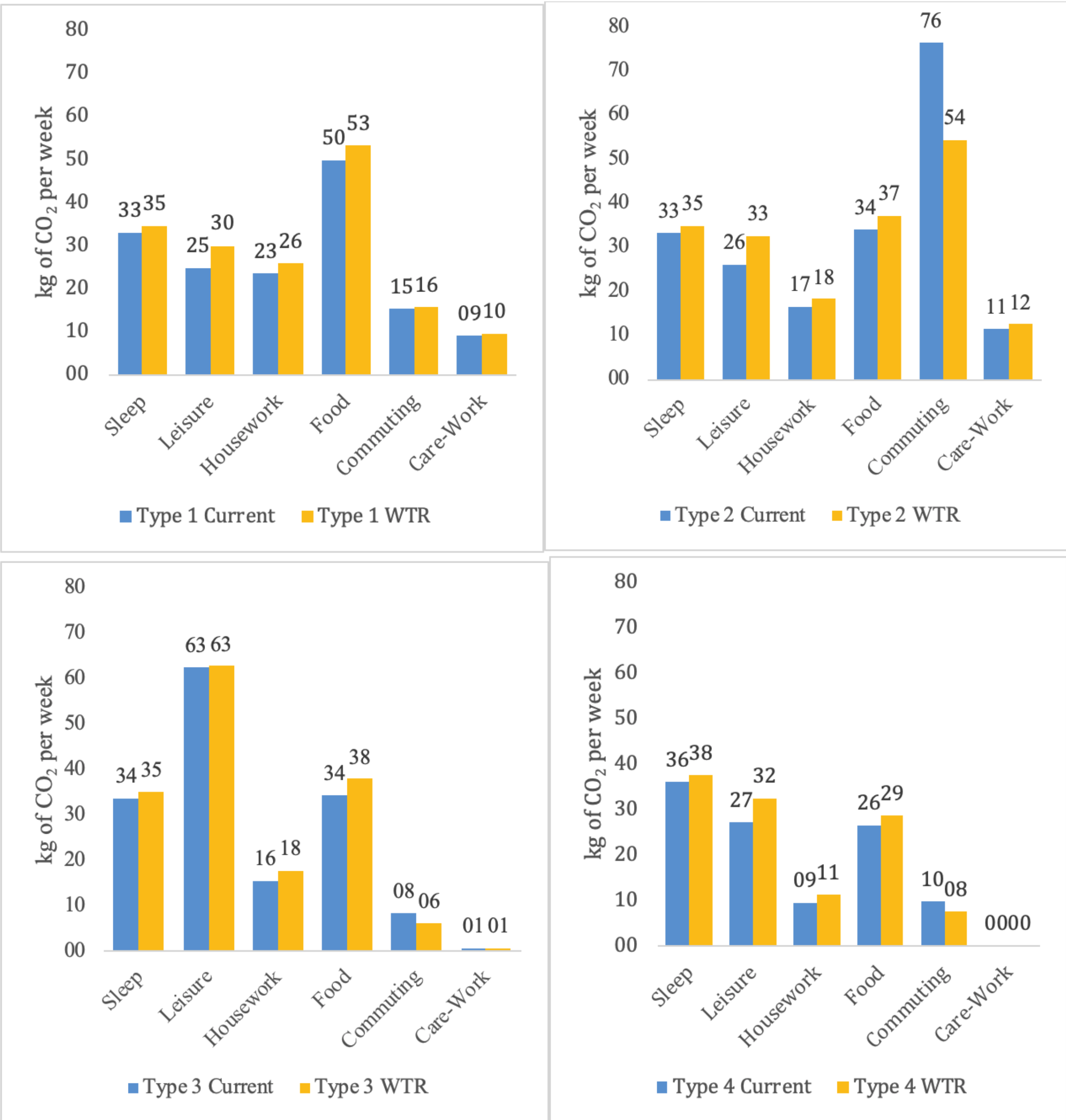

Figure 8: Emissions of Four Types of Behaviours amongst Respondents

DISCUSSION

The results show that WTR did not lead to a decrease in CO_2 emissions in individual consumption behaviour. This conclusion mainly differs from previous research linking WTR to GHG emissions due to the inherent assumption of constant income with WTR. One reason for this is, that constant emission factors (Table 1) were multiplied by increased free-time, leading to an increase in carbon emitted. Commuting and Food and Drink present the best opportunities for a drastic reduction in carbon emissions. The survey's results diverge from Commuting emissions of previous studies, due to the high number of people already taking public transport. Nevertheless, my data shows that car users[16] can reduce their emissions effectively if infrastructure is available. Aside from Commuting and Food and Drink, other categories' emissions are difficult to reduce. While Housework and Care-Work can be outsourced to a third party, this may lead to a double-burden on women, if not taken over by publicly available infrastructure.

Sleep and Leisure are the least carbon intensive activities, however different living situations may allow for decreased autonomy of choice to spend more time in Sleep and Leisure. Two adults with full-time jobs and no children will have more time freedom than a single-parent. Similarly, people with high-income will have more time-abundance than low-income earners, the former can delegate activities – like Housework – to third parties. People with low-income do not have that luxury. However, WTR is a start in giving adults more autonomy over their own time, as paid-work becomes less central.

WTR may further decrease gender inequalities. If carried out effectively, the gender-essentialist dichotomy of the "breadwinner" and the "housewife" would be discarded, as work-time is reduced for all. This could, on the one hand, create opportunities for more women to enter the

[16] Figure 5, Figure 8

labour force, and, on the other hand, delegate more unpaid labour to men, as ideally paid and unpaid labour would be split up more equally. As the Gender-Pay-Gap primarily relies on the uneven distribution of unpaid work, if WTR enabled Housework and Care-Work to be shared more equally, an important step towards closing the pay-gap would be made (Geisberger 2023). Furthermore, as unpaid labour is more carbon-intensive than Leisure and Sleep, if Housework would be shared, carbon-emissions may be reduced. Thus, WTR can decrease gendered inequalities.

Limitations of the Survey:

Food and Drink variations were not accounted for in the survey, see Table 1. So, if people allocated more time to Food and Drink with WTR, emissions rose. Not only do dietary restrictions differ in GHG emissions, whether the person is vegan, vegetarian or eats meat, but also information on where the food is bought and how it is prepared matters for its carbon footprint.

However, one could assume that with increased disposable time people could be more willing to buy local and seasonal food at nearby farmers markets, instead of closer supermarket chains. This would lead to a decrease in emissions, as transportation ways and carbon intensive farming would be reduced. Additionally, in WTR, time-squeeze factors decrease, people may make food from scratch instead of buying pre-cooked meals, or ordering take-out, which have high indirect emissions. However, people may also decide to eat out more often, which increases CO_2 emissions. Furthermore, people's preferences may shift towards more eco-friendly farmed food, or wander to meat alternatives, given the opportunity. Thus, WTR may bring changes in behaviour a simple survey cannot predict.

Surprisingly, Leisure did not rise considerably within WTR. This may be due to people's increased willingness to spend time with family or friends, the most sustainable way of activity aside from Sleep. However, when asked what type of hobby respondents would engage in with

WTR, a significant number of people increased travel, which is very carbon intensive, especially if done by plane. Nevertheless, higher emissions were counteracted by the majority increasing low carbon-intensive activities like reading, seeing family and friends, or being on the internet.

The survey format has methodological limitations. Aside from its lack of representative claim, respondents may find it difficult to imagine their behavior within WTR. Results may be inaccurate as respondents may not be honest about their activities, and portray themselves more socially acceptable, potentially allocating more time to friends or family, when they would spend time playing video games in reality. Furthermore, people tend to think more favourably of themselves and do not frequently achieve self-set goals, like with most New Year's resolutions. In my survey, many respondents said they would learn a new language or be more creative with WTR. It is questionable whether respondents would follow through on these goals, or whether they constitute an ideal scenario most would find difficult to put into practice.

Furthermore, the focus on consumption did not allow for a great reduction of CO_2 emissions. For one, Sleep, Housework, Food and Drink and Care-Work were relatively locked in, due to considerations elaborated previously. As Work emissions were allocated to the production side, therefore excluded from this analysis, the only activities respondents could decrease emissions in were Leisure and Commuting. However, with increased non-work time, Leisure time also increased, as did Leisure emissions. Thus, the only real variable factor was Commuting. Commuting emissions were decreased by 20% for the 4-day work-week scenario[17]. The additional time was evenly distributed amongst all other categories. This thesis primarily shows that most carbon-emissions can be mitigated if people move away from cars, and use sustainable ways of travel, like public transport instead. Important for this transition is available

[17] Exact calculations in Appendix 5

infrastructure. What this survey cannot account for are potential societal changes which may lead to a reduction in CO_2 emissions.

Therefore, WTR should be implemented alongside other policies to ensure continued reduction of GHG emissions. This thesis provides policy suggestions which can reduce GHG emissions alongside a shorter working week.

As Commuting, and Food and Drink are the two categories which allow for efficient CO_2 reduction, discouraging the use of automobiles and the eating of meat, while simultaneously increasing the availability and affordability of public transport and vegetables, would significantly reduce CO_2 emissions. Hence, important policies like a carbon-tax, a maximum restriction of 100 km/h on highways, as well as affordable and efficient public transport in rural areas are crucial to discourage the use of cars. Furthermore, a higher tax on meat, as well as increased subsidies on available vegetables and meat replacements would be important to encourage a less carbon intensive Food consumption. A full list of policies can be found below:

Punitive policies, discouraging car use

- Carbon-tax;
- Tempo Limit of 100 km/h on highways;
- Days where cars with odd/even numbers are not allowed to drive ➔ encourages car sharing;
- Discarding all car subsidies;

Positive policies:

- Providing affordable and efficient public transport;
- Making bike-lanes safe and allocating a part of the road exclusively for cyclists;
- Car-free parts of the city;

Policies for encouraging a more sustainable Food consumption

- Tax on meat, while simultaneously subsidising vegetables;
- Retracting subsidies from meat production;
- Encouraging more meat substitution within supermarkets;

General policies:

- Encouraging, and investing in renewable energy production;
- Providing a realistic alternative to gas heating in homes, which is subsidised;
- Subsidising the building of a solar panel on each house;
- Providing public all-day kindergartens
- Encouraging all-day schools

As WTR will change consumption patterns, these policies are important to implement alongside WTR, to make sure that future consumption patterns decrease CO_2 emissions.

CONCLUSION

To conclude, although WTR decreased average hourly consumption from 1.19 $kgCO_2$ to 1.16 $kgCO_2$, it does not decrease total CO_2 emissions. Although previous research suggested reduced work-time to decrease GHG consumption-emissions, this thesis did not follow their lead in assuming a proportional reduction in income, and thus could not follow them in their conclusion. Albeit non-representative qualities of the conducted survey, it still illuminates sustainable behaviour, like increased Sleep. Commuting and Food and Drink were highlighted as the two activities which present the highest opportunities for a reduction in CO_2 emissions. With appropriate policies alongside an implementation of WTR, such as a high carbon-tax, building and subsidising available public transportation, and reducing consumption patterns of meat, WTR can increase people's happiness and reduce CO_2 emissions.

As WTR also presents an opportunity to reduce the Gender-Pay-Gap, by allowing increased time-freedom for parents, further increasing their happiness, WTR is a policy which can shape people's lives for the better. This thesis can be seen as a start for literature to further investigate additional environmental effects WTR may have on individual lifestyles. However, individual consumption-emissions should always be contextualised within the structures surrounding individual decisions, whether there are viable alternatives, and who the real emitters are. Structural inequalities and lack of infrastructural framework may push individuals towards carbon-intensive lifestyles, which can only change if structural inequalities and the infrastructure of available choices change. Hence, policy-makers need to take initiative in opening sustainable lifestyles for everyone.

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APPENDIX

Appendix 1: Smetschka et al (2019) time-use emissions per activity

Appendix 1: Smetschka et al (2019) time-use data

HH Activity Category	Food & Drink	Housing indirect	Housing direct	Goods	Services	Services Holidays	**kg CO2e**	**kg CO2e w/o holidays**	kg CO2e Druckman*
Sleep & Rest	0,00	0,12	0,50	0,02	0,00		**0,64**	**0,64**	0,09
Personal Care	0,03	0,12	0,50	1,50	0,51		**2,67**	**2,67**	5,14
Eating & Drinking	2,54	0,12	0,50	0,03	0,11		**3,30**	**3,30**	4,63
Repairs & gardening	0,03	0,99	0,50	0,29	0,11		**1,92**	**1,92**	3,19
Food Preparation & Dish Washing	0,03	0,12	0,50	0,72	0,13		**1,51**	**1,51**	2,26
Caring for others	0,03	0,12	0,50	0,02	1,12		**1,79**	**1,79**	0,70
Cleaning, tidying	0,03	0,12	0,50	0,72	0,13		**1,51**	**1,51**	0,67
Shopping, Civic Matters & Services	0,03	0,00	0,00	0,00	0,11	0,72	**0,85**	**0,14**	0,53
work (excluded)									
Study (excluded)									
Entertainment & Culture	0,03	0,12	0,50	0,02	2,26	6,81	**9,74**	**2,93**	1,65
Pet care	0,03	0,12	0,50	0,27	0,11		**1,02**	**1,02**	1,33
Sport & outdoor activities	0,00	0,00	0,00	0,26	0,11	0,72	**1,08**	**0,37**	1,09
Spending Time with Friends/Family/Neighbours	0,03	0,12	0,50	0,25	0,11		**1,00**	**1,00**	0,64
Reading	0,03	0,12	0,50	0,29	0,11		**1,05**	**1,05**	1,05
Recreational courses & study	0,03	0,12	0,50	0,52	1,48	0,72	**3,37**	**2,65**	
Hobbies & Games	0,03	0,12	0,50	0,50	2,26	0,72	**4,13**	**3,41**	0,93
Watching TV & Videos/DVDs, Listening to Radio & Music	0,03	0,12	0,50	0,25	0,11		**1,00**	**1,00**	0,86
Eating Out	0,03	0,00	0,00	0,00	0,11	9,69	**9,82**	**0,14**	
Volunteering	0,03	0,00	0,00	0,00	0,11		**0,14**	**0,14**	

* own estimation from Druckman 2012

Appendix 2: Demographic data

Appendix 2: Demographic Data from Survey, city classifications taken from (Urban population by city size n.d.)

Question	Answers	Frequency
Gender	Male	27
	Female	95
	Non-Binary	9
Age	Under 18	2
	18-24	69
	25-34	18
	35-44	5
	45-54	9
	55-64	25
	65-74	2
	75 or above	0
Urbanisation	Suburbs	6
	Town: <50,000 inhabitants	8
	Small city: 50,000 - 200,000 inhabitants	4
	Medium city: 200,000 - 1.5 million inhabitants	12
	Big city: 1.5 million or more inhabitants	99
Living situation	I live alone	29
	I live with friends	29
	I live with my family	49
	I live with my partner	22
Work/occupation	Paid work	77
	Unpaid volunteer work	20
	Education	74
	Looking for paid work	12
Children	Yes	32
	No	98

Appendix 3: UK WTR model (Lewis et al. 2023)

Appendix 3: Different WTR model's explained

Fifth day stoppage	**The company shuts down operations for one additional day per week.** This was a popular choice in companies where staff collaboration is more important than five-day coverage.
	Example: A video game studio opted for a fifth day stoppage, because it was important for staff to be present at the same time for collaboration. After polling staff on preferences, the studio decided they would suspend work for everybody on Fridays.
Staggered	**Staff take alternating days off:** For example, the staff may be divided into two teams, with one team taking Mondays off, and the other taking Fridays off. This was a popular choice in companies where five-day coverage was important.
	Example: A digital marketing agency organised its staggered days off using a 'buddy' system. Staff members pair up with a partner who has similar knowledge and skills. The partners alternate their day off, in order to ensure a five-day coverage of key functions.

Decentralised	**Different departments operate on different work patterns**, possibly resulting in a mixture of the two models above. This may also incorporate other arrangements, such as some staff working a four-day equivalent over five shorter working days. A decentralised model was chosen in companies whose departments had highly contrasting functions and challenges.	**Example:** A housing association included departments specialising in everything from administration, to community outreach, and building repairs. Each department was asked to take the lead in devising a four-day week model fit for its own purposes.
Annualised	**Staff work a 32 hour average working week,** calculated on the scale of a year.	**Example:** A restaurant whose business is highly seasonal opted to pilot an annualised four-day week, with longer opening times in summer compensated by shorter opening times in winter.
Conditional	**Staff entitlement to the four-day week is tied to ongoing performance monitoring.** Seniors in the company may decide to temporarily suspend the four-day week for certain departments or individuals, if there is evidence that staff are failing to meet agreed performance targets. This may lead to uneven situations where some staff/departments are continuing to work five days over periods of time.	**Example:** A company adopting a decentralised model required each department to agree on a set of KPIs that would need to be met, in order to retain a four-day week. This meant that some departments and individuals entered the pilot later than others, and some were suspended from the four-day week during the 6 month pilot period.

Appendix 4: Leisure Emission Factors

Appendix 4: Leisure Emission Factors, in kgCO2/h

Activity	**Family and Friends**	**Reading**	**TV/Radio/Music/Internet**	**Video Games**	**Sport**	**Shopping**	**Other**
Current: *kgCO_2/h*	1.00	1.05	1.00	3.41	depends	0.14	depends

Appendix 5: Emission Calculations for all Categories

Appendix 5: Emission Calculations for all Categories

The following represent emission calculations with one sample person. These were done for each criteria for all people, with the survey data and data from Smetschka et al (2019), seen in Appendix 1.

Sleep:

$$\text{Current: } Sleep\ and\ Rest \times current\ hours\ spent\ Sleeping = 0.64 \times 42 = 26.88\ kg\ of\ CO_2\ per\ week$$

For WTR, current sleep time was added to WTR sleep time, and the 20% of Commuting time was divided equally across categories, as people would spend one day less commuting, and thus proportional increase in all other activities was assumed.

$$\text{WTR: } \left(Current\ Sleep\ time + WTR\ Sleep\ time + {}^{20\%\ of\ Commuting\ time}/_{5}\right) \times Sleep\ and\ Rest = \left(42 + 9 + \frac{1.8}{5}\right) \times 0.64 = 44.36 \times 0.64 = 28.39 kg\ of\ CO_2\ per\ week$$

Leisure

Hours allocated to leisure were multiplied by the emission factors in Appendix 4, and summed together. For "Other", a further breakdown of emission factor allocations can be seen in Appendix 8.

Housework:

Current: $Cleaning, Tidying \times current\ hours\ spent\ on\ Housework = 1.51 \times 10 = 15.10\ kg\ of\ CO_2\ per\ week$

WTR: $\left(Current\ Housework + WTR\ Housework + {}^{20\%\ of\ Commuting\ time}/_{5}\right) \times Cleaning, Tidying = \left(10 + 2 + \frac{1.8}{5}\right) \times 1.51 = 12.36 \times 1.51 = 18.66\ kg\ of\ CO_2\ per\ week$

Food and Drink:

Equation 2: Food and Drink CO_2 emission from Smetschka et al (2019) data

$$Food\ and\ Drink: \frac{Eating\ and\ Drinking + Food\ Preparation}{2}$$

$$= \frac{1.51 + 3.30}{2} = 2.405$$

Current: $Food\ and\ Drink \times current\ hours\ spent\ on\ Food\ and\ Drink = 2.405 \times 15 = 36.08\ kg\ of\ CO_2\ per\ week$

WTR: $\left(Current\ Food\ and\ Drink + WTR\ Food\ and\ Drink + {}^{20\%\ of\ Commuting\ time}/_{5}\right) \times Food\ and\ Drink = \left(15 + 0 + \frac{1.8}{5}\right) \times 2.405$

$$= 15.36 \times 2.405 = 36.94\ kg\ of\ CO_2\ per\ week$$

Commuting:

Current	Numbers	WTR	Numbers
Current hours for commuting	20	Survey additional allocation for WTR hours for commuting	=20-(20*0,2) =20-4 =16
Current method of commuting	Car	WTR method of commuting	Bicycle
Kg of carbon per km	0,192	Kg of carbon per km	0,021
Km/h of travel, average	40	Km/h of travel, average	20
Current kg of carbon per hour	=0,192*40 =7,68	WTR kg of carbon per hour	=0,021*20 =0,42
Current total emissions for commuting	=7,68*20 =153,6	WTR total emissions for commuting	=0,42*16 =6,72

Care-Work

$$Caring\ for\ others \times current\ hours\ spent\ on\ CareWork = 1.79 \times 12$$

$$= 21.48\ kg\ of\ CO_2\ per\ week$$

WTR: $\left(Current\ CareWork + WTR\ CareWork + {}^{20\%\ of\ Commuting\ time}/_{5}\right) \times$

$Caring\ for\ others = \left(12 + 2 + \frac{1.8}{5}\right) \times 1.79 = 14.36 \times 1.79 = 25.70 kg\ of\ CO_2\ per\ week$

Appendix 6: Summary of emissions per activity

Appendix 6: Summary of average emissions per activity, currently and with WTR

Activity	**Current average kg of CO_2 per week**	**WTR average kg of CO_2 per week**
Sleep	33.84	35.34
Leisure	34.53	38.96
Housework	17.33	19.36
Food and Drink	37.22	40.35
Commuting	21.56	17.11
Care-Work	6.54	7.12
Average per Week	**151.02**	**158.25**
Average per day	**21.57**	**22.61**
Average per hour	**1.19**	**1.16**

Equation 3: Average emissions per hour

$$\boldsymbol{Average\ emissions\ per\ hour = \frac{Average\ emissions\ per\ Week}{168 - time\ spent\ in\ Work/Education}}$$

Appendix 7: Four types of Behaviour's – total emissions

Appendix 7: Four Types of Behaviour's total emissions

Type	**Format**	**Total emissions, kgCO_2 per week**
Type 1	Current	155.28
	WTR	168.63
Type 2	Current	197.49
	WTR	189.75
Type 3	Current	155.42
	WTR	160.71
Type 4	Current	108.72
	WTR	117.20

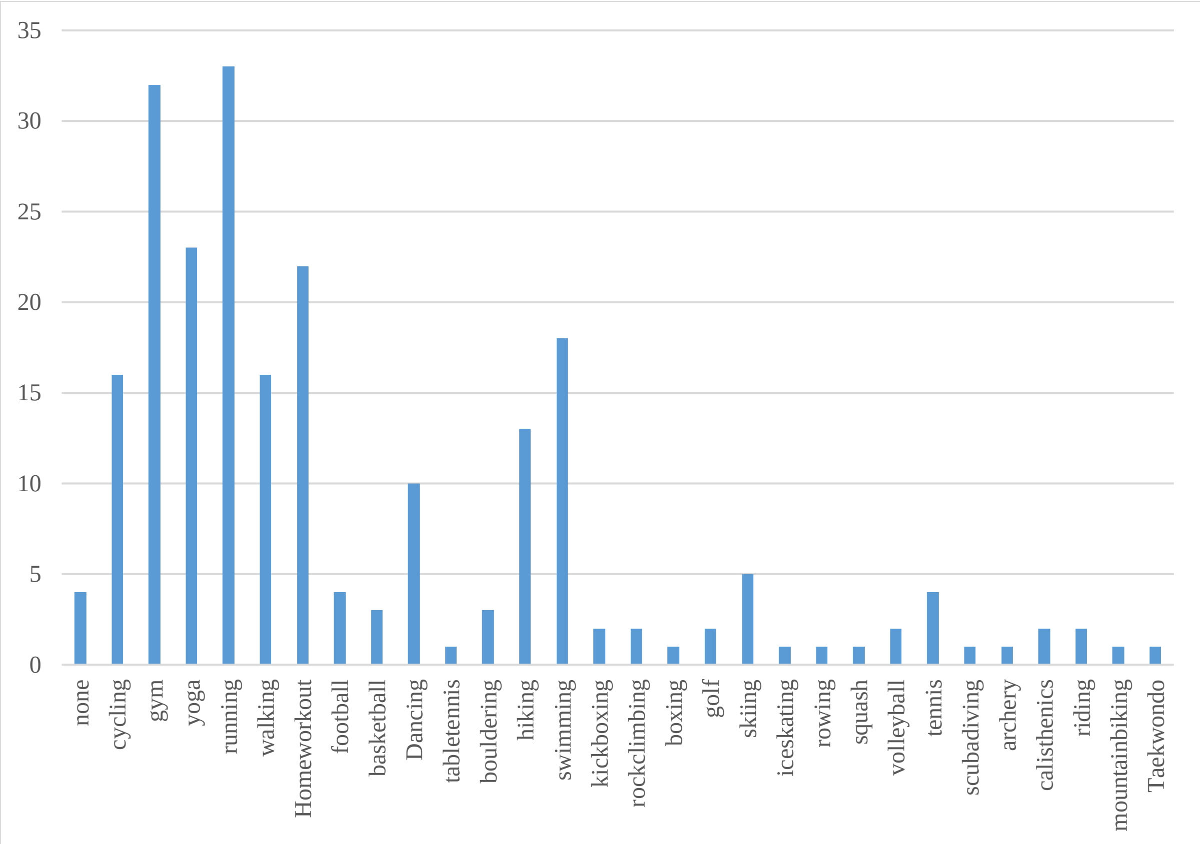
Appendix 8: "Other" hobbies, in frequency and their allocated emission factor

Type of Hobby	Frequency	Kg of CO_2/h	Type of Hobby	Frequency	Kg of CO_2/h
Pets	1	1.02	Poetry	1	1.05
Art exhibitions	7	2.93	Politics	8	0.14
Arts and crafts	11	3.41	pottery	1	0.64
Babysitting	1	1.79	puzzles	1	0,64
Baking	3	1.51	Reading	18	1.05
Chemistry	1	3.41	Scouts	1	1.08
Choir/singing	6	1	Skiing	1	1.08
Cinema	2	2.93	Sleeping	1	0.64
Clarinet	1	0.64	Social media	1	3.41
Clubbing	1	2.93	Sports	2	0.37
Concerts	2	2.93	Streetart	1	3.41
Content-creation	1	3.41	Tennis	1	1.08
Cooking	10	1.51	Theatre	2	2.93
Crocheting	1	0.64	Translating	1	2.65
Dancing	5	0.37	Travelling	7	9.57
Drawing/Painting	12	3.41	Video Games	1	3.41
Education	1	2.65	Walking	4	0.37
Fashion	1	3.41	Writing	9	1.05
flute	1		no specification	4	
Gardening	9	1.92	Yoga	1	0.37
graphic design	1	3.41			
guitar	5				
Hiking	3	1.08			
Home-design	2	3.41			
Playing instruments	3	0.64			
IT-projects	2	3.41			
Knitting/sewing	2	3.41			
Learning a new language	6	2.65			
Make-Up	3	3.41			
Movies	5	1.00			
Listening to music	13	1.00			
no	27				
Philosophy	1	1.05			
Photography	6	3.41			

piano	2	0.64			
Podcasts	2	1.00			

Appendix 9: Sport frequency and emissions

Appendix 9: Frequency of type of sport respondents engaged in



Sport emissions were either multiplied by: 1.08, if they involved traveling somewhere, or 0.37, if they did not.