Publication Series
Policy Pathways towards 1.5-Degree Lifestyles

An Essential Plank in Bridging the Emissions Gap

Reducing Emissions Through Equitable 1.5-Degree Lifestyles

ZOE institute for future-fit economies

1.5 degree lifestyles

Imprint

Authors
Sophia Tomany, Christoph Gran, Jakob Hafele, Coline Lavorel, Lydia Korinek

Please cite as
Tomany, S. et al. (2021): Reducing Emissions through Equitable 1.5-Degree Lifestyles: An Essential Plank in Bridging the Emissions Gap.

Policy Brief #2. ZOE-Institute for future-fit economies.

Transparency
The financial support of KR Foundation, Partners for a New Economy and Laudes Foundation is greatly appreciated.

Layout and design concept
Drees + Riggers

Image Credits
Front page: Roger Richter / Westend61
Inside Pages: Bernard Hermant / Unsplash; CDC / Unsplash; Erik Jan Leusink / Unsplash; Shelly Pence / Unsplash

Policy Pathways towards 1.5-Degree Lifestyles

This publication is third in a series that explores *Policy Pathways towards 1.5-Degree Lifestyles* – lifestyles which are compatible with staying within 1.5 °C global warming. Three upcoming publications target the hotspot areas for reducing consumption-related greenhouse gas emissions: food, housing and mobility. Two more general publications provide background information on *Equitable 1.5-Degree Lifestyles: How Socially Fair Policies Can Support the Implementation of the Green Deal* and this publication, *Reducing Emissions through Equitable 1.5-Degree Lifestyles: An Essential Plank in Bridging the Emissions Gap.* The policy briefs present insights from academic research discussed and further developed in a Policy Lab last June, organised by the ZOE Institute, through exchange between policy makers and other stakeholders. The policy briefs serve as a basis for ongoing thematic Policy Labs exploring how future-fit policy pathways for Europe can be created in the areas of food, mobility and housing.

Executive Summary

This report makes the case that **a policy landscape which equitably supports sustainable lifestyles is an integral part of the path towards achieving the European Union's climate goals.** While renewable energy, efficiency improvements, and technological advancement are all critical elements of Europe's climate strategy, **lifestyle changes are also essential in order to achieve a rapid enough transition.** Changing our ways of living has enormous potential to reduce emissions and to help close the gap between the current level of emissions and the much lower level necessary to achieve the 1.5 °C target set in the Paris Agreement. For this to be possible, consumption-based carbon footprints will have to fall from a European average of 8.6 (t CO_2e) to a global average of 2.5 by 2030 and 0.7 by 2050[1,2]. **The hotspot areas food, housing and mobility are particularly significant,** collectively accounting for ~75% of consumption-based greenhouse gas (GHG) emissions[2]. In each of the three hotspot areas, **unsustainable patterns of consumption can be clearly identified and targeted** by reshaping the policy mix to better enable sustainable living rather than sustain structures supporting unsustainable consumption. To effectively create change in these sectors, **equity considerations have to be woven into the heart of policy measures.** This would not only increase the impact of such measures by targeting those with the greatest lifestyle carbon footprints, but also increase the acceptability of demand-side measures and thereby generate support for sustainable lifestyles.

As representatives of a region responsible for some of the world's most carbon-intensive lifestyles, EU policymakers have both an opportunity and a responsibility to be pioneers in reducing lifestyle-related GHG emissions. This paper lays out the basis for equitable "1.5-Degree Lifestyles" as both achievable and necessary, encouraging policymakers to embrace the trailblazing spirit of Europe's ambitious climate commitments by tapping into the potential for climate transformation through shaping the conditions for equitable "1.5-Degree Lifestyles" in Europe.

At this unique juncture, a window is widening to co-creatively imagine, explore and implement policy options which enable equitable sustainable lifestyles in Europe.

Introduction

Climate change is no longer one among many policy issues but rather a core strand intertwined with every issue and every policy area. This reflects our new understanding of the era in which we are living, an epoch many scientists refer to as the Anthropocene[3]. In the Anthropocene, the state of the natural world is changing rapidly, and these changes have been brought on in large part by human activity[3]. Taking action to alter the course of these changes is no longer a matter of saving other species or preserving ecosystems but a matter of securing our own survival as a human race on this planet. As the 2020 United Nations Development Programme (UNDP) Human Development Report explains, "our future is not a question of choosing between people or trees; it is neither or both"[3].

With the European Union implementation of the Green Deal and the 2021 United Nations Climate Change Conference (COP26) serving as a crucial crossroad for more ambitious targets, a window of opportunity for ambitious climate action in Europe is widening. This is perhaps just in time, as the latest report from the Intergovernmental Panel on Climate Change (IPCC), Climate Change 2021: The Physical Science Basis, paints a stark picture of the time remaining to reduce greenhouse gas (GHG) emissions to such a level that global warming does not exceed the 1.5 °C limit set in the Paris Agreement[4]. To reach the level of emissions needed will require a rapid reversal away from our current carbon-intensive ways of living towards a climate-neutral society. The European Union has both a responsibility and an opportunity to be pioneering in this sense, both as a historical propagator of the environmentally destructive Industrial Revolution and the Great Acceleration and as a region currently responsible for ~15 % of global consumption-based GHG emissions worldwide despite accounting for only 7 % of the world's population[3–5].

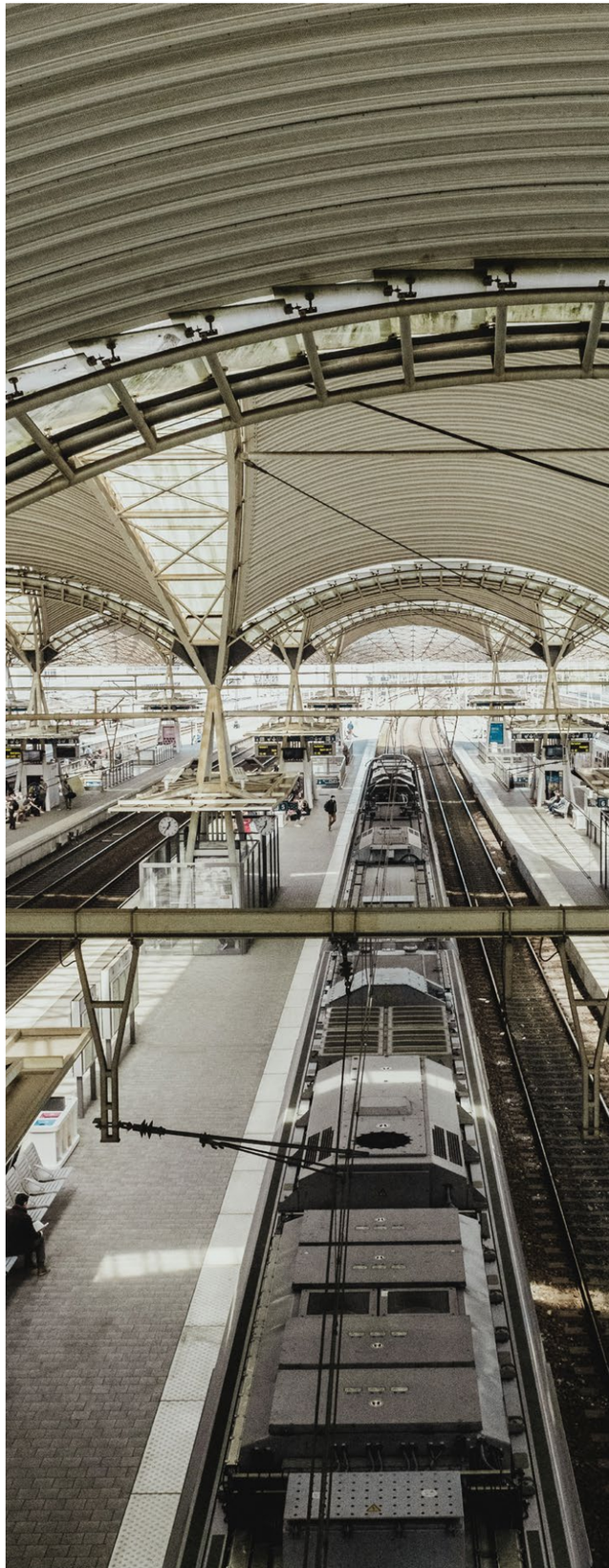
The recovery from the COVID-19 pandemic presents an opportunity to rethink our lifestyles and the policies which shape them, re-envision our towns and cities, and invest wisely[i]. The policy decisions made at this turning point will in large part determine whether the 1.5 °C goal is achievable[1]. Changing lifestyles in an equitable way presents unique challenges, but also incredible potential to achieve substantial emissions reductions at the speed needed.

i The Zoe Institute's recent report "A future-fit recovery?" found that the National Recovery and Resilience Plans (NRRPs) miss many opportunities, especially in translating solutions to social and environmental problems into new reforms and investments.

Through the European Green Deal, the Climate Law, the "Fit for 55" package and other measures, the EU has already introduced an array of opportunities for the exploration of 1.5-Degree Lifestyles, that is, lifestyles in line with the 1.5°C climate target[6]. In the food sector, the Farm to Fork Strategy takes promising steps on sustainable food production and food waste. In the mobility sector, the Sustainable and Smart Mobility Strategy is both improving the sustainability of existing travel methods and furthering the availability of more sustainable options. In the housing sector, the New European Bauhaus initiative is re-envisioning the built environment while the Renovation Wave sets out to improve existing buildings. Climate is front and centre on the EU policy agenda, and the momentum is there to take emissions reduction to a higher level. To do that, emissions reductions must continue to reach from the centre of the discussion down into detailed sector-specific policy processes and through to implementation, connecting policymakers across sectors and levels of governance[4,7]. Co-creation with communities and stakeholders is also an essential part of designing policies with strong local and high-level ownership, enabling approaches which are both tailored to the local context and coherent with a shared vision[ii].Policy options which bring the EU closer to 1.5 °C have to be strengthened, policies which increase the emissions gap have to be phased out, and new policy options enabling sustainable lifestyles have to be co-creatively imagined, explored and implemented. To implement such policies effectively and with public support, equity must be at the heart of the discussion.

This paper begins with a short overview of the "emissions gap" between current emissions and the level of emissions needed before outlining why European policymakers should pay particular attention to the contribution of carbon-intensive European lifestyles, concluding with a brief dive into why equity is an essential component of the transformation towards sustainable living.

ii See the High-Level Construction Forum and the New European Bauhaus for recent examples of co-creation in a European policy context.



Limiting global warming to 1.5 °C in line with the Paris Agreement is still possible but will require a fast and far-reaching transformation across all sectors, including a steep and ambitious pathway towards climate neutrality in Europe.

The State of the Emissions Gap

Six years ago, the Paris Agreement set forth the goal to keep global warming well below 2 °C, aiming for 1.5 °C[8]. The recently published IPCC report, Climate Change 2021: The Physical Science Basis, projects that 1.5°C will be surpassed by 2040 in all scenarios and likely earlier[9]. Many studies have found that 1.5 °C could be passed within the next 5–7 years, meaning that a rapid transition substantially reducing GHG emissions has to begin immediately to ensure that achieving the 1.5 °C target even remains possible[10]. The International Energy Agency (IEA) highlighted in May 2021 that global energy demand, a major cause of GHG emissions, continues to rise, and that the path towards a 1.5 °C future is narrow, but it is still possible[11]. Similarly, the United Nations Environment Programme (UNEP) Emissions Gap Report 2021 projected that even if all current policy pledges are followed through, the world is still heading for at least 2.2 °C, emphasising that for 1.5 °C or even 2 °C to remain possible, large-scale emissions reductions must begin immediately[12]. As estimated by the IPCC, the remaining carbon budget for limiting warming to 1.5 °C stands at 400 Gt CO_2, while global CO_2 emissions average 40 Gt CO_2 annually, indicating the importance of ambitious reductions within the decade[12].

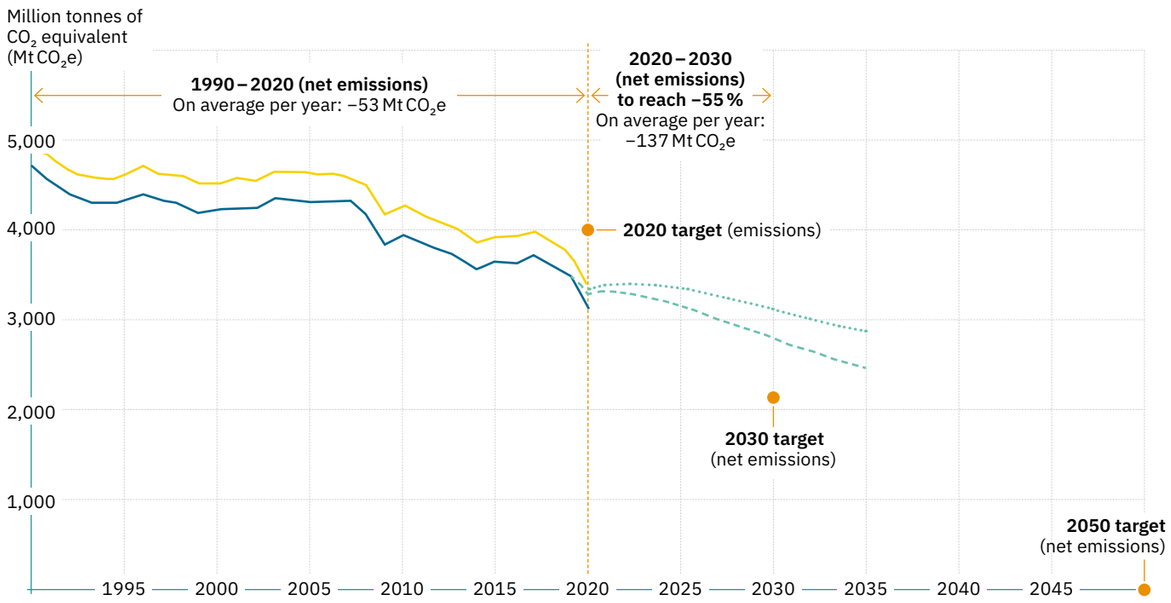


Figure 1: *The rate of the reductions ahead in the EU[13] (see right page for legend)*

The European Union has set targets in line with the goals of the Paris Agreement and met its 2020 climate targets; however, projected emissions in line with current EU and Member State policies are not on track to meet the EU's 2030 or 2050 climate targets[13]. As of October 2021, the EU was on track for an emissions reduction of 41 % by 2030, considerably short of the 55 % goal[13]. This is in part due to the delay in Member States realigning national targets and policies with the new 55% goal, but the need for steeper reductions is nonetheless clear[13]. The IEA's recently published "World Energy Outlook 2021" identified an implementation gap of 470 Mt CO_2 between the EU's 2030 targets and the path of its policies, about equivalent to a fifth of annual emissions in the EU14. This gap could be shrunk significantly with full implementation of the proposed "Fit for 55" package, but many observers, such as the European Environmental Bureau (EEB), see the "Fit for 55" policies as a step forward, but not the leap necessary to achieve the 2030 targets[14,15]. The European Union has set strong targets, and with little time remaining before the 1.5 °C target is passed, the path towards these targets has to be as ambitious as possible.

The scale of emissions reductions needed worldwide to close this gap will be an unprecedented reduction deeper than any such reduction in modern history[16]. In developed countries, by 2050, GHG emissions will have to be reduced by more than 95 % from 1990 levels[8]. The steep scale of the reductions necessary to meet EU climate targets can be seen in Figure 1[17]. Many studies have indicated that widespread and ambitious lifestyle change offers an actionable pathway towards achieving large-scale reductions with little or no ecological risk[2,18]. Such changes are an essential complement to the negative emissions technology on which many emissions reduction strategies rely, especially as policy changes towards sustainable lifestyles can begin immediately[2,18]. This is perhaps especially true in the European Union, a net importer of environmental impacts, where consumption-based emissions have remained stable since 1990 even as territorial emissions have steadily declined[3,7].

Clear evidence of the speed with which lifestyles can change when necessary can be seen in the COVID-19 pandemic. However, despite the rapid and steep drop in behaviours such as commuting or passenger flights, this period has not significantly contributed towards closing the emissions gap, amounting globally to a cooling of around 0.01 ± 0.005°C by 2030 compared to pre-pandemic projections[19]. This is because while the pandemic substantially curbed some carbon-intensive consumption choices, carbon-intensive consumption increased in other areas such as travel in individual cars rather than public transportation. Furthermore, the overall goal of sustainability and accompanying policy infrastructure were missing, demonstrating the necessity of a conscious policy-led effort to build sustainable lifestyles[20]. This necessity is further demonstrated by the IEA's forecast that the recovery from the pandemic could precipitate the second-largest increase in energy-related CO2 emissions ever recorded[21]. To build lasting carbon-neutral lifestyles which reliably decrease emissions, holistic policy-led changes are needed, with a clear and vocal focus on sustainable transformation.

Bridging the emissions gap and satisfying the goals of the Paris Agreement are still possible, but this will require a fast and far-reaching transformation across all sectors[2]. The European Union is working towards conceiving and creating this new climate-neutral Europe, but to build the comprehensive, transformative policies which will carry us across, EU policymakers must pay special attention to **the significance of consumption and lifestyles,** especially in light of the link between **equity and emissions within the EU.**

- Historical greenhouse gas emissions without land use, land use change and forestry (LULUCF)
- Historical net greenhouse gas emissions
- Projections of net emissions "with existing measures" (WEM)
- Projections of net emissions "with additional measures" (WAM)

Reshaping the policies which drive and influence consumption patterns is a critical element in Europe's climate neutrality journey, especially in hotspot sectors food, housing and mobility.

The Significance of Consumption and Lifestyles

Viewing GHG emissions by the location of end-product consumption rather than the location of the emissions themselves shows that the growing emissions gap is closely linked to consumption by private households, with two-thirds of GHG emissions worldwide connected to household consumption[1]. "Hotspot" areas of household consumption include **mobility, food and housing,** both on a global scale and in the European Union[2,7]. Collectively, these three areas account for around 75 % of lifestyle-related GHG emissions globally[2]. Despite the urgent need for reductions in these areas, emissions in these sectors are on the rise in the European Union[4,22,23]. In addition, many of the products for which consumption is increasing are among the most carbon-intensive, including meat consumption and air travel. As of 2020, the average per capita lifestyle carbon footprint in the European Union stands at around 8.6 t CO_2e[1]. To achieve the 1.5 °C target, lifestyle carbon footprints will not only have to decline but also to decline enormously, to a global average of 2.5 (t CO_2e) by 2030, 1.4 by 2040, and 0.7 by 2050 as estimated in a 2019 study by the Institute for Global Environmental Strategies and Aalto University and confirmed in the 2021 updated report[2,24]. The scale and distribution of this drop is demonstrated in Figure 2 with Finland as an European example.

Consumption and behavioural change have often been levers which governments are hesitant to pull, preferring to focus instead on renewable energy, technological innovation and efficiency improvements[18]. These changes are important, but with little time remaining before the 1.5 °C target is surpassed, changes in consumption patterns are an essential step in reducing emissions with sufficient speed[25]. Emissions reductions achieved through efficiency improvements risk being undone by the "rebound effect", in which the improved performance of efficient products leads to increased usage, ultimately reducing or cancelling out any potential emissions reductions[25]. This effect can be observed for example in the increased ownership of cars or the demand for continually larger living spaces[4,26]. In residential buildings, the lack of sufficiency policies (that is, policies which aim to avoid demand without compromising wellbeing) almost entirely offset the effect of efficiency improvements, as demonstrated in Figure 3. Meanwhile, using technologies such as the mass expansion of electrification and biomass-energy options at the scale suggested, even if this were enough to close the emissions gap, could have potentially devastating impacts

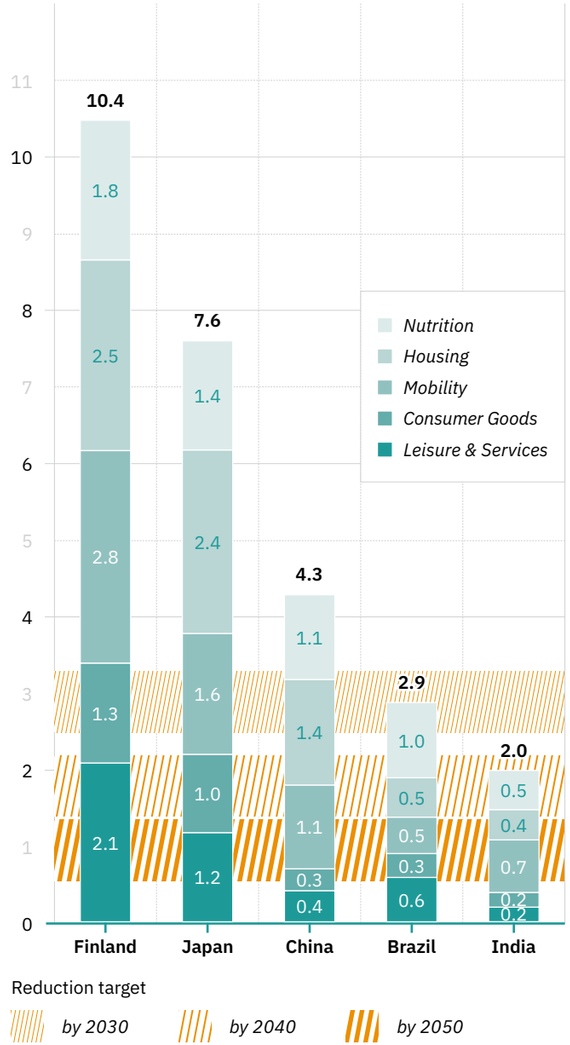


Figure 2: *Current lifestyle carbon footprints against reduction targets*[2]

on biodiversity, soil degradation and resource depletion[18]. The reality that changes in consumption patterns are a necessary addition to the existing policy mix is increasingly being recognised, and the UNEP Emissions Gap Report 2020 and the upcoming fifth chapter of the Sixth Assessment Report (AR6) of the IPCC respectively explore equitable low-carbon lifestyles and the role of demand in climate change mitigation[1,27].

To change consumption patterns at the scale demonstrated in Figure 2, the policy environment which shapes these consumption patterns must change[28]. Even pro-environmental consumers are often "locked into" unsustainable patterns of consumption for example by infrastructure (e. g., investments in car infrastructure, missing cycling lanes), regulations (e. g., the difficulty of switching from home ownership to usership), convenience (e. g., meat-based meals in school cafeterias), and flawed price incentives (e. g., cheaper flights than trains)[29]. This is a matter then of changing the ways in which the policy landscape is already shaping the lifestyle choices of Europeans[28].

To sufficiently reduce lifestyle carbon footprints, developed countries will have to reduce consumption-based emissions in hotspot sectors by 47 % in nutrition, 68 % in housing, and 72 % in mobility by 2030[2]. These reductions are ambitious but not out of reach. In all three hotspot sectors, there are a handful of highly impactful lifestyle changes which, when practiced by increasingly larger portions of the population, could sharply bring down the average lifestyle carbon footprint. Research by Ivanova et al. identified the highest-potential lifestyle changes in terms of emissions reductions, the top ten of which, when taken together, could reduce a person's lifestyle carbon footprint by 9.2 t CO_2e[1,30]. Enabling and encouraging these lifestyle changes could therefore powerfully reduce consumption-based emissions.

Decomposition of CO_2 emissions of residential buildings in the EU27 + UK over the period 1990 – 2018

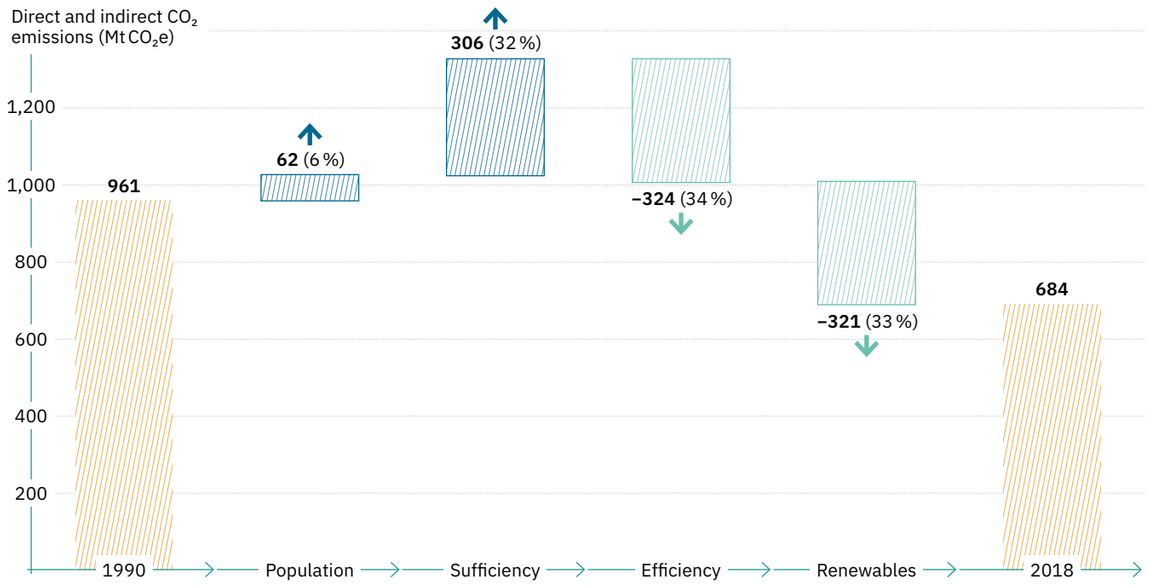


Figure 3: *Efficiency-related emissions reductions in housing offset by the lack of sufficiency policies*[26]

Food

The most impactful changes include switching to a vegan, vegetarian or partially vegetarian diet and avoiding food waste[30]. A widespread shift towards vegetarianism could result in up to 31 % less GHG emissions in the food sector worldwide[1,30]. However, meat consumption has steadily risen within the EU over the last decades and is currently 50 % higher than it was in 1960 and twice the global average[4]. Food waste is another clear area for reductions, as 8 % of all anthropogenic GHG emissions globally are linked to producing food which is then wasted[31]. Within the EU, more than half of food waste takes place in private households. Nonetheless, a vegan / vegetarian diet is significantly more impactful, estimated to reduce annual per-capita carbon footprints by 10–15 times more than household food loss reduction[24].

Mobility

This sector has the highest mitigation potential, with especially powerful options being car-free travel and the reduction of flights[30]. Car-free travel for short distances would be much more impactful than a switch to electric vehicles, with cyclists producing 84 % less GHG emissions in their daily travel than car users[32]. However, this will be a challenge, as car ownership is steadily rising in the EU, with a recent surge during the COVID-19 pandemic[4,20]. Globally, reducing air travel is the highest-impact option in the mobility sector. In the EU, cars continue to account for the largest share of transport-related GHG emissions, with the average European four times more likely to own a car than the average person globally; however, aviation is the fastest-growing source of GHG emissions in the European transport sector and demand for air travel is expected to double by 2050 if left unabated[4,20].

Housing

Reducing per capita living space and switching to renewable energy are the most impactful options. To achieve climate neutrality in the EU by 2050, energy demand in the building sector would have to be reduced by at least 50 %[33] However, the demand for living space continues to rise, increasing the need for residential energy use[22]. The way in which this rising demand counteracts energy efficiency improvements can be seen above in Figure 3.

Each of these three hotspot sectors presents unique challenges, from changing diets interwoven with cultural identities to reducing flights among wealthy Europeans to broadening the idea of better housing beyond larger housing, challenges which will vary by country and context and cannot be solved with one-size-fits-all solutions. However, each sector also presents incredible potential. Consumption patterns have been heading in the wrong direction for years, but one of the great advantages of pushing towards “1.5-Degree Lifestyles” is that change can begin immediately. There is no need to wait for the right technology and no cause for worry about unforeseen ecological consequences[18]. The path towards reducing lifestyle-related GHG emissions is clear and measurable, with well-documented ecological benefits, and policymakers can utilize tools and policy options which already exist, from increasing investments in public transport to providing financial support for communal housing[18,25]. Further, many of these lifestyle changes present a host of co-benefits such as reducing pollution, bolstering local communities, improving health, and enhancing overall wellbeing[28]. One study found that up to 84 % of the costs of reducing GHG emissions to a 1.5 °C level in the European Union could be compensated by the savings in healthcare costs alone[19]. The time has come for EU policymakers to join the IPCC, UNEP, and other bodies in pursuing ambitious, cross-sectoral lifestyle change as a central and critical plank in any emissions reduction strategy, particularly as carbon-intensive consumption in Europe continues to grow[1,27]. To implement such policies effectively and with public support, equity must be at the heart of the discussion.

Reducing lifestyle-related emissions in the EU must go hand-in-hand with reflection on whose lifestyles are being targeted and how the policies under consideration are likely to impact equity.

Equity and Emissions Within the EU

The most significant predictor of a person's lifestyle carbon footprint is their income, meaning that the differences between income groups must be considered when targeting lifestyle-related emissions[3,4]. The distribution of lifestyle carbon footprints by income group is stark, both on a global level and on an EU level. As of 2021, the wealthiest 1 % of people worldwide are responsible for more than 100 times more GHG emissions per capita than the bottom 50 %[3]. This inequality is present not only between high-income regions and low-income regions, but also within regions and even within countries[5]. Within the European Union, the wealthiest 1 % of Europeans are responsible for more than 10 times more GHG emissions than the bottom 50 %[28]. The stark differences between the lifestyle carbon footprints of EU income groups, and the enormous reductions required, are illustrated in the graph shown on the right page.

Not only are current lifestyle carbon footprints vastly different depending on income level, but income level has also greatly tilted emissions reductions. Despite the need for reductions among the wealthiest, emissions reductions to date in the EU have come mostly from lower- and middle-income households while the emissions of the wealthiest Europeans have risen rather than fallen[5]. The largest share of this difference is attributable to lifestyle choices in the area of mobility – while emissions are declining overall in the EU, flights and car travel among the wealthiest Europeans continue to increase[5]. To reach 2.5 t CO_2e as the average European lifestyle carbon footprint, the wealthiest 10 % of Europeans would have to emit 10 times less GHG emissions, and the wealthiest 1 % would have to emit 30 times less[5]. These reductions are 5–15 times greater than those required from the bottom 50 %, whose lifestyle carbon footprints are much closer to the target at an average of 4.2 t CO_2e[5]. Targeted policies are necessary to shift the reduction burden away from low- and middle-income households and onto the households where reductions are needed the most.

This can be achieved by understanding the differences in consumption between different income groups. The emissions gap between the wealthiest Europeans and the average European is not only one of scale but also one of character[28]. For the average or low-income European, much of their consumption-based emissions come from necessities such as food or heating, while a large proportion of high-income Europeans' carbon consumption arises

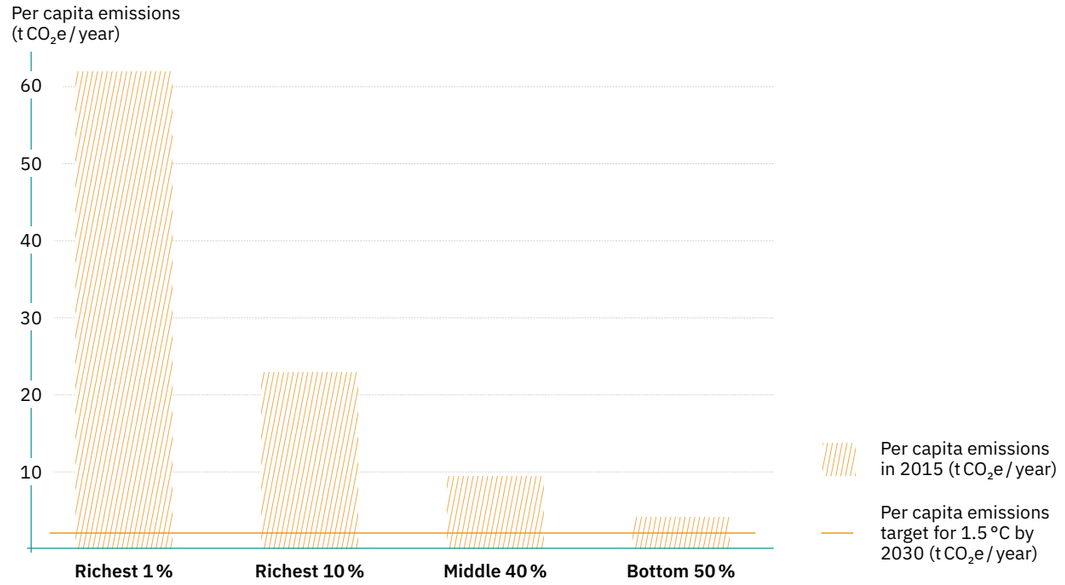


Figure 4: *Carbon emissions by income group in the EU[5]*

from luxuries. For example, air travel accounts for around 41 % of the carbon footprint of the highest-emitting 1 % of EU households, but less than 1 % of the emissions of the bottom 50 % of households by income, many of whom fly once a year or not at all. Policies which aim to reduce air travel, especially when complemented by increasing the affordability of rail transport and providing a just transition for those working in the air travel industry, thus target the carbon consumption of high-income frequent flyers without impacting the wellbeing of low-income European households[1,35]. The previous paper in this series by the ZOE Institute, Equitable 1.5-Degree Lifestyles: How the Green Deal can support socially fair and sustainable policies, has laid out in detail how emissions reduction strategies interact with equity and how this impact can be improved.

With such differences in the level and makeup of lifestyle-related emissions between income groups, policymaking which seeks to reduce lifestyle-related emissions should incorporate reflection on whose lifestyles are being targeted and how the policies under consideration are likely to impact equity. This is important for two reasons. The first is a matter of effectiveness. The only income bracket in the EU whose GHG emissions are growing continuously is the wealthiest 10 %[5]. Not only does this bracket account for the same volume of GHG emissions as the bottom 50 % of Europeans, but non-essential carbon-intensive consumption makes up a significant proportion of this bracket's consumption-based emissions[5,28]. Substantial reductions are therefore possible with the right policy instruments, and a policy approach which does not address the consumption patterns of the top income bracket will likely not achieve the steep reductions needed to meet the 1.5 °C target[28].

The second reason why policymakers should always consider equity when setting the emissions reduction agenda is acceptability. Lifestyle-related policy can be a sensitive topic, especially if the policy changes under discussion are not perceived as fair, sparking backlash[28]. Lifestyles are shaped by the policy environment, but lifestyle choices, at the end of the day, remain in the hands of citizens. To achieve substantial GHG emissions reductions, broad public support and participation are necessary[28]. By targeting the emissions of the worst-offending minority and ensuring that the lowest-earning Europeans do not become sustainability policy "losers", policymakers can both gain the support of the public for the emissions reduction agenda and bolster the effectiveness of that agenda.

Conclusion

According to the European Environment Agency report "European Environment: State and Outlook 2020" (SOER 2020), the actions taken to implement sustainability over "the decade from 2020 to 2030 will be of vital importance in determining Europe's opportunities in the 21st century"[4]. Alongside other countries, European countries were pioneers of the modern age, ushering in industrialization, growth and development[4]. At the threshold of the post-pandemic era, with more energy directed towards climate action than ever before, Europe has an opportunity to be a pioneer once again. This time, the European Union can play a key role in leading the way towards a higher level of ambition and modelling comprehensive emissions reduction strategies and a sustainable way of living previously unimaginable. To bridge the ever-widening emissions gap, policymakers must take the boldest, most transformative steps possible to reduce emissions, with a focus on shifting towards equitable sustainable lifestyles and the ambition to be not only compliant but pioneering. Next in this publication series, the ZOE Institute will explore through three thematic policy papers how an equitable "1.5-Degree Lifestyles" approach could be implemented in the European housing, mobility and food sectors, highlighting positive developments while showing where there is room for new ideas and more ambitious approaches.

References

1. **UNEP.** (2020). *Emissions Gap Report 2020.* UNEP – UN Environment Programme. http://www.unep.org/emissions-gap-report-2020

2. **Akenji, L., Lettenmeier, M., Koide, R., Toivio, V. & Amellina, A.** (2019). *1.5-Degree Lifestyles: Targets and options for reducing lifestyle carbon footprints.* Institute for Global Environmental Strategies, Aalto University, and D-mat ltd.

3. **Conceição, P.** (2020). *Human Development Report 2020: The Next Frontier – Human Development and the Anthropocene.* http://hdr.undp.org/sites/default/files/hdr2020.pdf

4. **European Environment Agency.** (2019). *The European environment – state and outlook 2020.* https://www.eea.europa.eu/publications/soer-2020

5. **Oxfam.** (2020). *Confronting Carbon Inequality in the European Union.* https://oi-files-d8-prod.s3.eu-west-2.amazonaws.com/s3fs-public/2020-12/Confronting%20Carbon%20Inequality%20in%20the%20EU_0.pdf

6. **COM(2019) 640** (2019). *The European Green Deal.*

7. **Serenella Sala.** (2019). *Consumption and consumer footprint: indicators and assessment of the environmental impact of European consumption.* https://data.europa.eu/doi/10.2760/15899

8. **Duscha, V., Denishchenkova, A. & Wachsmuth, J.** (2019). *Achievability of the Paris Agreement targets in the EU: demand-side reduction potentials in a carbon budget perspective.* Clim. Policy 19, 161–174

9. **Climate Change 2021: The Physical Science Basis.** (2021). *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press.

10. *Breakthrough. Climate Reality Check 2020.* (2020). CRC 2020. https://www.climaterealitycheck.net/flipbook

11. **IEA.** (2021). *A Roadmap for the NetZero by 2050 – Global Energy Sector.*

12. **UNEP.** (2021). *Emissions Gap Report 2021.* http://www.unep.org/resources/emissions-gap-report-2021

13. **Förster, H. et al.** (2021). *Trends and Projections in Europe 2021 – European Environment Agency.* https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2021

14. **Cozzi, L. & Gould, T.** (2021). *World Energy Outlook 2021.* 386

15. **Mariani, B.** (2021). *"Fit for 55" EEB Assessment.* https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2021/07/EEB_FF55-2.pdf

16. **Otto, I. M. et al.** (2020). *Social tipping dynamics for stabilizing Earth's climate by 2050.* Proc. Natl. Acad. Sci. 117, 2354–2365

17. **Förster, H. et al.** (2020). **T***rends and projections in Europe 2020.* https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2020

18. **Kai Kuhnhenn et al.** (n.d.) *A Societal Transformation Scenario for Staying Below 1.5 °C.* Heinrich-Böll-Stiftung https://www.boell.de/en/2020/12/09/societal-transformation-scenario-staying-below-15degc

19. **Stagl, S.** (2020). *Opportunities of post Covid-19 European recovery funds in transitioning towards a circular and climate neutral economy.* https://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_BRI(2020)658186

20. *European Mobility Atlas 2021.* (2021). https://eu.boell.org/en/European-Mobility-Atlas-2021-PDF

21. **IEA.** (2021). *Global Energy Review 2021.* https://www.iea.org/reports/global-energy-review-2021/co2-emissions

22. **Bierwirth, A. & Thomas, S.** (2019). *Estimating the sufficiency potential in buildings: the space between under-dimensioned and oversized.* European Council for an Energy-Efficient Economy.

23. **Lóránt, A. & Allen, B.** (2019). *Net Zero Agriculture in 2050: How to Get There.* https://ieep.eu/uploads/articles/attachments/eeac4853-3629-4793-9e7b-2df5c156afd3/IEEP_NZ2050_Agriculture_report_screen.pdf?v=63718575577

24. **Akenji, L. et al.** (2021). *1.5-Degree Lifestyles: Towards a Fair Consumption Space for All.* https://hotorcool.org/wp-content/uploads/2021/10/Hot_or_Cool_1_5_lifestyles_FULL_REPORT_AND_ANNEX_B.pdf

25. **Nyfors, T. et al.** (2020). *Ecological Sufficiency in Climate Policy: Towards Policies for Recomposing Consumption.* Futura

26. **Saheb, Y.** (2021). *Sufficiency and circularity: the two overlooked decarbonisation strategies in the "Fit For 55" Package.* https://eeb.org/library/sufficiency-and-circularity-the-two-overlooked-decarbonisation-strategies-in-the-fit-for-55-package/

27. **Creutzig, F. et al.** (2018). *Towards demand-side solutions for mitigating climate change.* Nat. Clim. Change 8, 260–263

28. **Wang, S. & Khosla, R.** (2021). *Achieving Low-Carbon and Equitable Lifestyle Change.* https://cast.ac.uk/wp-content/uploads/2021/01/CAST-Briefing06.pdf

29. **Bohnenberger, K.** (n.d.) *Freiheit zum Weniger – wie EU-Politik nachhaltiges Leben und Wirtschaften ermöglichen kann.* 21.

30. **Ivanova, D. et al.** (2020). *Quantifying the potential for climate change mitigation of consumption options.* Environ. Res. Lett. 15, 093001

31. *Food Wastage Footprint & Climate Change.* (2015). FAO 4

32. **Brand, C. et al.** (2021). *The climate change mitigation effects of daily active travel in cities.* Transp. Res. Part Transp. Environ. 93, 102764

33. **Staniaszek, D.** (2021). *The Road to Climate Neutrality: Are National Long-Term Renovation Strategies Fit for 2050?* https://www.bpie.eu/wp-content/uploads/2021/03/BPIE_LTRS-_10-1.pdf

34. **Hubacek, K., Baiocchi, G., Feng, K. & Patwardhan, A.** (2017). *Poverty eradication in a carbon constrained world.* Nat. Commun. 8, 912

35. *A Rapid and Just Transition of Aviation.* (2021). https://stay-grounded.org/wp-content/uploads/2021/02/SG_Just-Transition-Paper_2021.pdf

ZOE, the Institute for Future-Fit Economies, is a non-profit and independent think & do tank. We are dedicated to research for a future-fit economy. At the interface of politics, science and civil society, we develop trend-setting impulses for the fundamental questions of economic development.

info@zoe-institut.de

www.zoe-institut.de @zoe_institute

zoe institute for future-fit economies