UN environment programme

UNEP DTU PARTNERSHIP

Emissions Gap Report 2020

Annexes

Annex 1. Additional information on scenarios, LULUCF and global warming potentials underlying chapter 2

Annex 1.1. Definitions of scenarios investigated[1]

NDC scenarios (unconditional and conditional): identifies the GHG emissions that each member could emit in the target year (2025 for the US, 2030 for the other G20 members) under the unconditional and, where applicable, conditional NDCs. Where available, the emission levels reported by the national governments are used as central estimates. Alternatively, the emission levels are calculated from base-year or baseline data based on the NDCs and on other official documents submitted by countries to the UNFCCC (e.g. national GHG inventories, national communications, biennial reports and biennial update reports). Emission level estimates published in the literature are also considered when official values are unavailable.

2. Current policies scenario (official data): identifies the most recent, available official estimates of target year emissions, accounting for the projected emission trends resulting from current climate, energy and land-use policies. We considered scenario projections that cover policies up until 2017 or later. The modelling base year of the current policy scenario projections differ across reports.

3. Current policies scenario (independent studies): identifies emissions estimates for the target year, accounting for emission projections resulting from the full implementation of current policies based on independent studies. We considered studies that are published in 2017 or later. Emissions projections reviewed here cover main energy and climate policies that were implemented by a cut-off date (depending on the studies) and do not consider prospective policies that were still under consideration or planning as of the cut-off date. Moreover, while studies differ in their approaches for policy impact quantification, they do not automatically assume that policy targets will be achieved when they are enshrined in the form of a law or a strategy document – studies also consider the status of policy implementation and the extent to which the policy plan is supported by measures. These independent analyses of current policy trajectories supplements the official sources described under point two, by providing data that targets consistency across countries and political independence.

[1] Adapted from den Elzen *et al.* (2019).

Annex 1.2. Accounting of LULUCF emissions

Country/region	LULUCF accounting (based on: Kuramochi *et al.* 2019)	Official NDC target levels available for LULUCF sector?	Assumptions for LULUCF emissions when studies only report projections excluding LULUCF	
			NDC scenario	Current policies scenario
Argentina	Incl. LULUCF	No	2020 inventory (data year: 2016)	2020 inventory (data year: 2016)
Australia	Incl. LULUCF	No	2020 inventory (data year: 2018)	2020 inventory (data year: 2018)
Brazil	Incl. LULUCF	No	(all studies reported projections incl. LULUCF)	Minimum and maximum projections from other studies
Canada	Excl. LULUCF with LULUCF credits	No	2020 inventory (data year: 2018)	Minimum and maximum credit projections by CAT (Climate Action Tracker, 2019)
China	Incl. LULUCF	No	2018 inventory (data year: 2014)	2018 inventory (data year: 2014)
EU	Excl. LULUCF	No	---	---
India	Incl. LULUCF	No	BUR2 (inventory data year: 2014)	BUR2 (inventory data year: 2014)
Indonesia	Incl. LULUCF	Yes	NDC LULUCF	Minimum and maximum projections from other studies
Japan	Excl. LULUCF with LULUCF credits	Yes	NDC LULUCF (credit estimates)	NDC LULUCF (credit estimates)
Mexico	Incl. LULUCF	No	2018 inventory (data year: 2015)	2018 inventory (data year: 2015)
Republic of Korea	Excl. LULUCF	No	2019 inventory (data year: 2016)	2019 inventory (data year: 2016)
Russia	Excl. LULUCF with LULUCF credits	No	2020 inventory (data year: 2018)	2020 inventory (data year: 2018)
Saudi Arabia	Excl. LULUCF	No	2018 inventory (data year: 2012)	2018 inventory (data year: 2012)
South Africa	Incl. LULUCF	No	2019 inventory (data year 2015)	2019 inventory (data year 2015)
Turkey	Incl. LULUCF	Yes	NDC LULUCF	2020 inventory (data year: 2018)
USA	Incl. LULUCF	No	2020 inventory (data year: 2018)	2020 inventory (data year: 2018)

Annex 1.3. Conversion of GWPs used in country-level GHG emissions projections

In this year's report, all GHG emission figures are expressed using the 100-year global warming potentials (GWPs) from the IPCC Fourth Assessment Report (AR4). Since some studies provide GHG emissions projections using GWPs from the IPCC Second Assessment Report, we converted them into IPCC AR4 GWP terms by applying conversion factors derived from the PRIMAP historical GHG emissions database (Gütschow, Jeffery and Gieseke 2019) using 2015 historical data ("HISTCR") as well as from Meinshausen and Alexander (2017).

Country	GWP in NDC and national GHG inventories	Conversion factor to AR4 GWP (multiplication)	Source
Argentina	*SAR*	*103.8%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
Australia	*AR4*	*100%*	
Brazil	*AR5*	*98.3%*	U.Melbourne factsheet (ver. Nov 2017, comparison of 2015 emissions)
Canada	*AR4*	*100%*	
China	*SAR*	*102.4%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
EU	*AR4*	*100%*	
India	*SAR*	*103.0%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
Indonesia	*SAR*	*105.0%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
Japan	*AR4*	*100%*	
Mexico	*AR5*	*98.8%*	U.Melbourne factsheet (ver. Nov 2017, comparison of 2015 emissions)
Republic of Korea	*SAR*	*100.8%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
Russia	*AR4*	*100%*	
Saudi Arabia	*Does not specify*	*100%*	
South Africa	*SAR*	*101.5%*	PRIMAP-hist_v2.0_11-Dec-2018 based on 2015 data (HISTCR)
Turkey	*AR4*	*100.0%*	
USA	*AR4*	*100.0%*	

References

Climate Action Tracker (2019). *Canada | June 2019 update*. Climate Action Tracker (Climate Analytics, NewClimate Institute). Available at: https://climateactiontracker.org/countries/canada/ (Accessed: 10 September 2019).

den Elzen, M. *et al.* (2019). Are the G20 economies making enough progress to meet their NDC targets?, *Energy Policy*. Elsevier Ltd, 126(October 2018), pp. 238–250. doi: 10.1016/j.enpol.2018.11.027.

Gütschow, J., Jeffery, L. and Gieseke, R. (2019). The PRIMAP-hist national historical emissions time series (1850-2016) V 2.0. GFZ Data Services. Available at: http://dataservices.gfz-potsdam.de/pik/showshort.php?id=escidoc:3842934.

Kuramochi, T. Nascimento, L., de Villafranca Casas M. J., Fekete, H., *et al.* (2019). *Greenhouse gas mitigation scenarios for major emitting countries. Analysis of current climate policies and mitigation commitments: 2019 update*. NewClimate Institute, PBL Netherlands Environmental Assessment Agency and International Institute for Applied Systems Analysis.

Meinshausen, M. and Alexander, R. (2017). NDC & INDC Factsheets | Climate and Energy College. Update October 2017. University of Melbourne. Available at: http://climatecollege.unimelb.edu.au/ndc-indc-factsheets (Accessed: 30 August 2019).

Annex 2. Overview of the methodologies of the COVID-19 fiscal investment trackers included in chapter 4

Table A.2. Overview of methodologies for the four COVID-19 fiscal investment trackers in figure 4.2

#1 - Oxford Economic Stimulus Observatory	
Tracker / Analysis	Oxford Economic Stimulus Observatory, supported by UNEP, IMF, and GIZ through the Green Fiscal Policy Network
Institution	Oxford University Economic Recovery Project, Smith School of Enterprise and the Environment, The University of Oxford Green Fiscal Policy Network (United Nations Environment Program, International Monetary Fund, and Deutsche Gesellschaft für Internationale Zusammenarbeit)
Link	Available at https://www.smithschool.ox.ac.uk/publications/wpapers/Oxford-Economic-Stimulus-Observatory.xlsx
Release date (of publication included in UNEP EGR Chapter 4)	09/11/2020
Country coverage	50 largest economies according to IMF 2019 GDP estimates. This list consists of the G20, EU, Spain, Netherlands, Switzerland, Taiwan, Thailand, Poland, Sweden, Belgium. Iran, Austria, Nigeria, Norway, UAE, Israel, Ireland, Malaysia, Singapore, Philippines, Denmark, Colombia, Bangladesh, Egypt, Chile, Pakistan, Finland, Vietnam, Czech Republic, Romania, Portugal, Peru, and Iraq.
Input data	Original desktop research, policies only included if publicly announced. Input data cross-checked with other public trackers.
Output data	~2,400 policies, of which all are categorised by GHG impact. GHG impact is described in the short-term, long-term, and with an overall score. Policies are also categorised by air pollution impact, natural capital impact, and according to three social impact factors and two economic impact factors.
Methodology	The tracker intends to cover all policy measures that (i) are induced by the COVID-19 pandemic and government response and (ii) impact the fiscal balance sheet. Spending measures and taxation measures (including tax delays and temporary waivers) are both included. Regulation/deregulation measures are not covered unless they directly impact public finance. The tracker classifies all policies, across all sectors, using a set of 41 archetypes and 195 sub-archetypes. Each sub-archetype is rated on a five-point scale (highly negative to highly positive) for both short-term GHG impact and long-term GHG impact relative to a baseline of the national rate of emissions with no intervention. These scores are then weighted to give a net GHG impact. GHG emissions impacts are all assessed relative to a baseline of the rate of emissions without intervention. An adjustment factor is included to account for the variation in existing emissions profiles across nations. For example, broad liquidity support of corporations is likely to have a larger negative short-term GHG impact in high emissions nations than low emissions nations. In the event that reported government spending is too broad to be reasonably categorised into a single archetype, it is considered 'unclear' spending.
Coding in figure 4.2 (original and translation to categories used in Chapter 4)	**Unclear** – Neutral or unclear **Highly negative** – High-carbon **Negative** – High-carbon **Relatively Neutral** – Neutral or unclear **Positive** – Low-carbon **Highly positive** – Low-carbon

#2 – Vivid Economics Greenness of Stimulus Index	
Tracker / Analysis	Greenness of Stimulus Index
Institution	Vivid Economics
Link	Tracker unpublished. Index available at https://www.vivideconomics.com/casestudy/greenness-for-stimulus-index/
Release date (of publication included in UNEP EGR Chapter 4)	08/2020 (end of month)
Country coverage	G20 members, Spain, Singapore, and the Philippines
Input data	Original desktop research including data from the IMF
Output data	~800, of which ~230 are categorised by greenness
Methodology	The tracker intends to cover all spending measures, as well as reduced taxation, waivers, and ~~deregulation measures (which are unquantifiable but integrated~~ into the indexing). Classification of the climate and nature impacts of spending are done only for five key sectors: agriculture, energy, industry, transport, and waste. For each key sector, policies are classified into one of nine archetypes. Positive archetypes include bailouts with green strings, green infrastructure investment, green R&D subsidies, and subsidies/tax reductions for green products. Negative archetypes include bailouts without green strings, subsidies for environmentally harmful practices, environmentally harmful infrastructure investment, deregulatory measures and subsidies/tax reductions for environmentally harmful products.
Coding in figure 4.2 (original and translation to categories used in Chapter 4)	**Positive interventions** – Low-carbon **Neutral interventions** – Neutral or unclear **Negative interventions** – High carbon
#3 – IMF Tracker of Climate Relevance of Fiscal Response to the COVID-19 Crisis	
Tracker / Analysis	IMF Tracker of Climate Relevance of Fiscal Response to the COVID-19 Crisis
Institution	International Monetary Fund (IMF)
Link	Tracker unpublished. Output featured in box 1.1 of the Fiscal Monitor (October 2020) available at https://www.imf.org/en/Publications/FM/Issues/2020/09/30/october-2020-fiscal-monitor
Release date (of publication included in UNEP EGR Chapter 4)	09/2020 (end of month)
Country coverage	G20 members
Input data	Member state reporting
Output data	~100 policies identified as climate-positive or climate-negative
Methodology	The Fiscal Monitor Database intends to cover all spending measures, at the broad package level. The Tracker of Climate Relevance of Fiscal Response considers individual policy items which are deemed to be either climate-positive or climate-negative in five priority sectors. All other, 'climate-neutral, policies are not tracked at the policy level and instead left in aggregated 'package' form in the Fiscal Monitor Database. Climate relevant policies are and categorised using 43 climate-relevant archetypes (equivalent to the granularity of sub archetypes in the Oxford Tracker). Of these 43 archetypes, 17 are climate-positive and 26 are climate-negative.
Coding in figure 4.2	**Climate-positive (green)** – Low-carbon

(original and translation to categories used in Chapter 4)	**Unspecified** – Neutral **Climate-negative (red)** – High-carbon
#4 - Climate Action Tracker (CAT) analysis of COVID-19 economic recovery in five selected countries	
Tracker / Analysis	Climate Action Tracker (CAT) analysis of COVID-19 economic recovery in five selected countries
Institution	Climate Action Tracker (CAT)
Link	Available at https://climateactiontracker.org/documents/790/CAT_2020-09-23_Briefing_GlobalUpdate_Sept2020.pdf
Release date (of publication included in UNEP EGR Chapter 4)	09/2020 (with cut-off for data collection at end of 08/2020)
Country coverage	China, Republic of Korea, EU27 (excl. EU Member States), USA, India
Input data	Data inputs from publicly available trackers and analyses supplemented by original desktop research
Output data	~20 overarching packages and ~90 interventions relevant to GHG emissions across five countries covered
Methodology	The analysis of COVID-19 economic recovery intends to cover all fiscal spending measures at the overarching package level as of August 2020. The analysis further covers individual interventions under these overarching packages relevant to GHG emissions in seven sectors. All other interventions without direct relevance to GHG emissions, for examples expenditures on health care or social services) are not tracked at the individual intervention level and instead left in overarching package level. All overarching packages and individual interventions are either classified as *green* (low-carbon) or *red* (high-carbon supporting an unsustainable status-quo, or new high-carbon investments). Table 4.1 and this Annex of the publication provide more specific information on the expert judgement on level of '*greenness*'. Single overarching packages have further been classified as an *unclear mix of green & red* or *unclear mix of green & red* where incomplete information on the specific composition of these packages existed at the time of the analysis.
Coding in figure 4.2 (original and translation to categories used in Chapter 4)	**Green** – Low-carbon **Unclear mix of green & red** – Neutral or unclear **Red** – High-carbon **Unclear mix of red & neutral** – Unclear Neutral or unclear **Neutral** – Neutral or unclear

References

Climate Action Tracker (2020). Global update: Pandemic recovery with just a hint of green, 23 September. https://climateactiontracker.org/publications/global-update-pandemic-recovery-with-just-a-hint-of-green/.

International Monetary Fund (2020a). Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic (October 2020). https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies- Database-in-Response-to-COVID-19. Accessed 14 October 2020.

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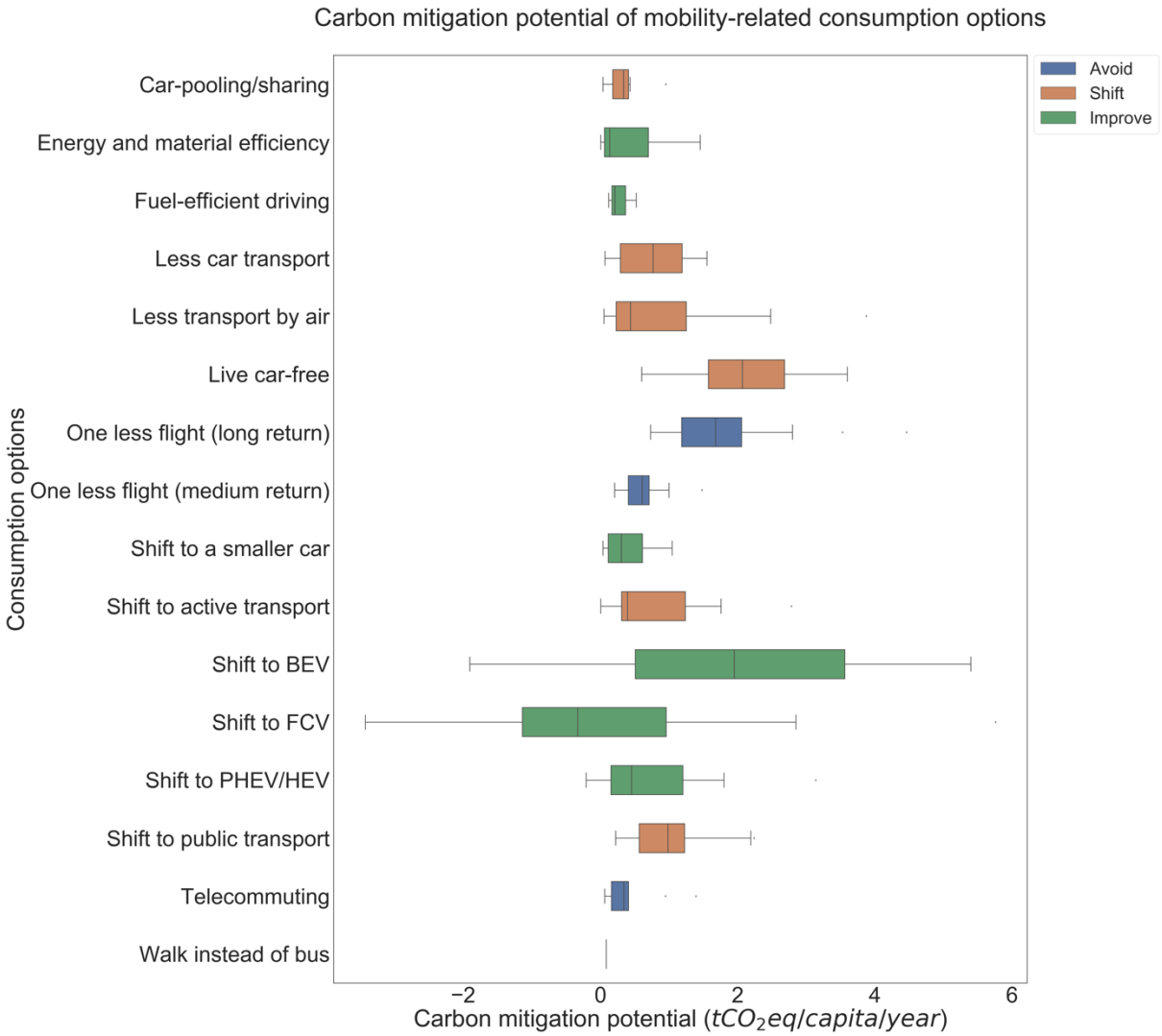
Vivid Economics (2020a). *Green Stimulus Index - August 2020 Update*. https://www.vivideconomics.com/wp-content/uploads/2020/08/200820-GreenStimulusIndex_web.pdf.

Annex 3. Notes on the Ivanova *et al.* (2020) analyses included in chapter 6

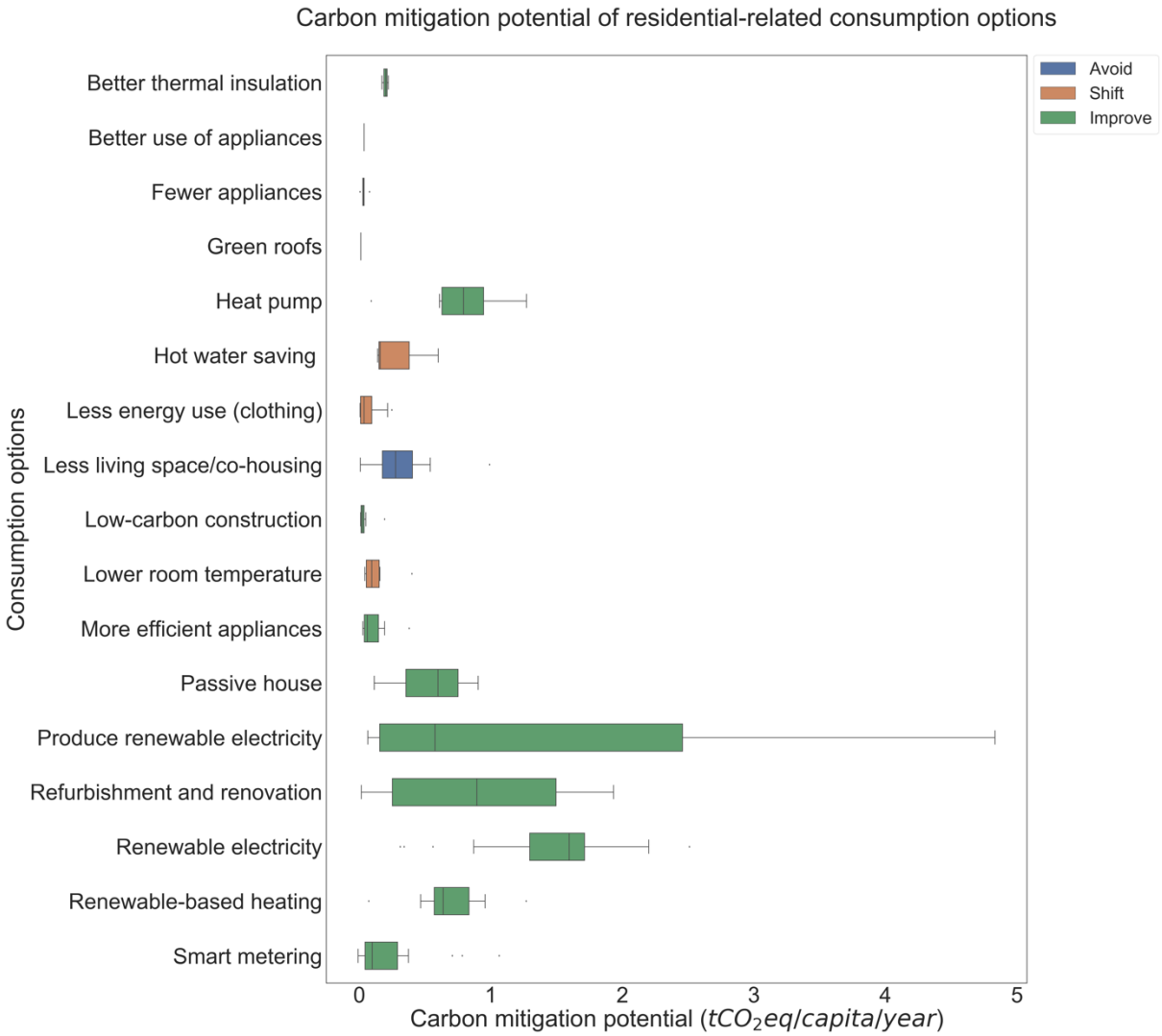
Mitigation potentials in mobility from Australia and New Zealand were estimated to be higher compared with European-focused studies, while those from Asia were estimated to be lower. Geographic location, methodology and energy mix explain 75 per cent of the variation in emission mitigation potentials in the housing domain. In food, mitigation potential estimates from North America, Australia and New Zealand are higher compared with EU-based studies, while estimates from Asia are lower. Some studies quantify mitigation potentials in the context of averages, while others compare them with high-carbon defaults, resulting in additional variation in the mitigation ranges. There is large uncertainty around basic assumptions about the scale of consumption, such as travelled distance, consumed calories and dwelling size. Substantial differences in the system boundary, unit of analysis and modelling further influence the mitigation ranges. The methodological differences among the reviewed studies are particularly pronounced for studies covering residential energy savings, where various functional units are adopted (e.g. kWh of energy use, kg of primary materials, unit of fuel, thermal insulation per surface unit). Most studies exclude GHG emissions associated with land-use change and changes in infrastructure (associated with upscaling renewable energy power plants, cycling lanes, BEV charging stations). The meta-review (Ivanova *et al.* 2020) offers further details.

Figure A4.1. A selection of key mobility-related consumption options categorized as Avoid, Shift or Improve



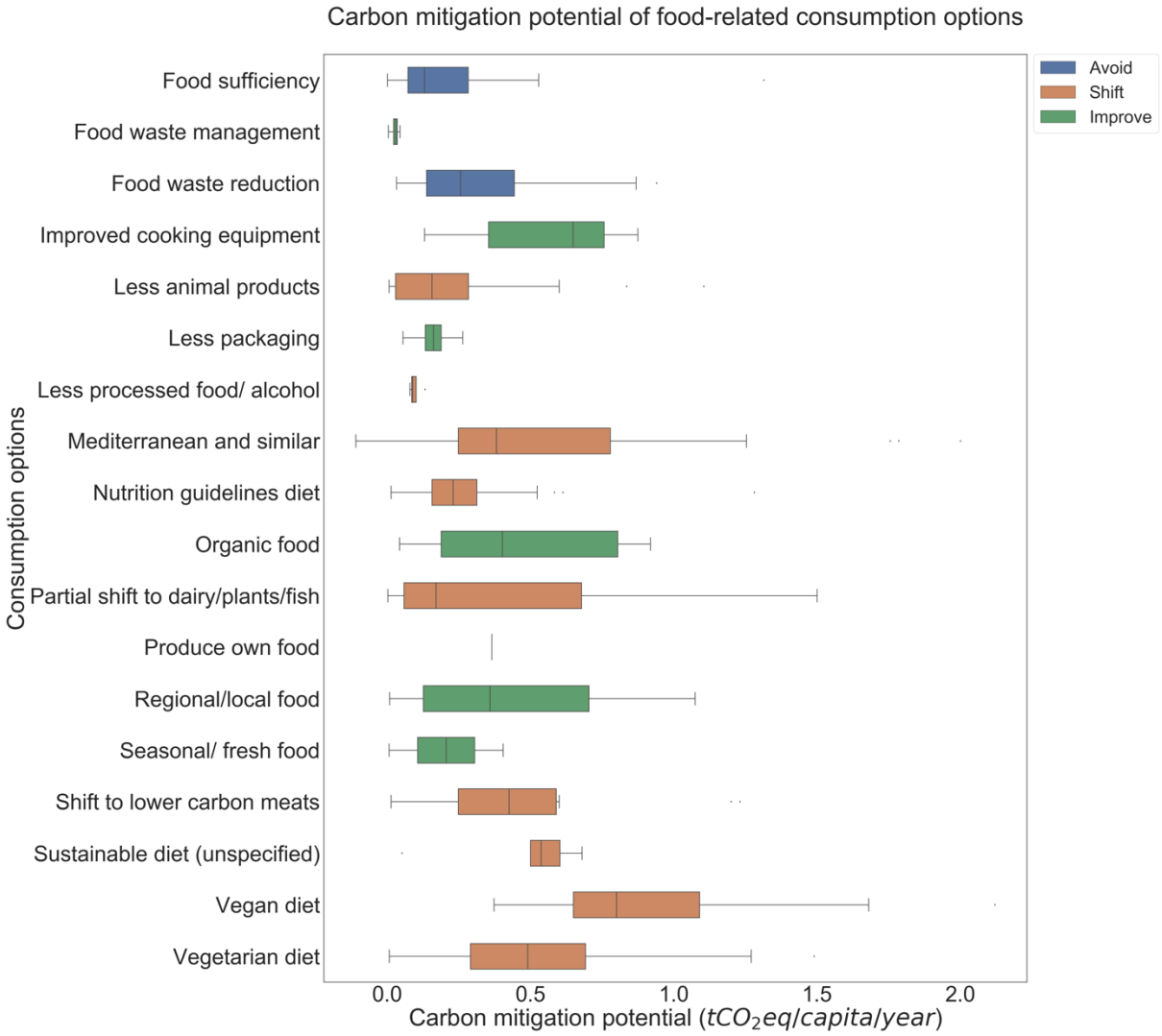
Note: The error bars represent the minimum and maximum values (excluding outliers), the boxes represent the interquartile range, and the middle line represents the median values of the consumption options.

Figure A3.2. A selection of key residential-related consumption options categorized as Avoid, Shift or Improve



Note: The error bars represent the minimum and maximum values (excluding outliers), the boxes represent the interquartile range, and the middle line represents the median values of the consumption options.

Figure A3. A selection of key food-related consumption options categorized as Avoid, Shift or Improve



Note: The error bars represent the minimum and maximum values (excluding outliers), the boxes represent the interquartile range, and the middle line represents the median values of the consumption options.

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Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A. and Hertwich, E. G. (2016). Environmental impact assessment of household consumption. Journal of Industrial Ecology 20(3), 526-536.

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