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Titre: Title:	Regionalized climate footprints of battery electric vehicles in Europe. Supplément
Auteurs: Authors:	Christine Roxanne Hung, Steve Völler, Maxime Agez, Guillaume Majeau-Bettez, & Anders Hammer Strømman
Date:	2021
Type:	Article de revue / Article
Référence: Citation:	Hung, C. R., Völler, S., Agez, M., Majeau-Bettez, G., & Strømman, A. H. (2021). Regionalized climate footprints of battery electric vehicles in Europe. Journal of Cleaner Production, 322, 129052. https://doi.org/10.1016/j.jclepro.2021.129052

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URL de PolyPublie: PolyPublie URL:	https://publications.polymtl.ca/9228/
Version:	Matériel supplémentaire / Supplementary material Révisé par les pairs / Refereed
Conditions d'utilisation: Terms of Use:	Creative Commons Attribution 4.0 International (CC BY)

Document publié chez l'éditeur officiel
Document issued by the official publisher

Titre de la revue: Journal Title:	Journal of Cleaner Production (vol. 322)
Maison d'édition: Publisher:	Elsevier
URL officiel: Official URL:	https://doi.org/10.1016/j.jclepro.2021.129052
Mention légale: Legal notice:	

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Supplementary Information for:

Hung, C.R., Völler, S., Agez, M., Majeau-Bettez, G. & Strømman, A.H. (2020.) Regionalized climate footprints of battery electric vehicles in Europe. *Journal of Industrial Ecology.*

This file consists of four main sections. The first contains supplmentary results figures for the baseline scenario presented in the main manuscript. This includes a figure illustrating national electricity trading, and results for all four segments included. Numerical data for the figures are available in the Excel file in the Supplementary information. The second section contains the results when there is no allocation of battery production to second life applications. In the third section, results for the grid average approach to calculating eletricity consumption mix are presented. The last section contains background information regarding the vehicle specifications and calculation of footprints.

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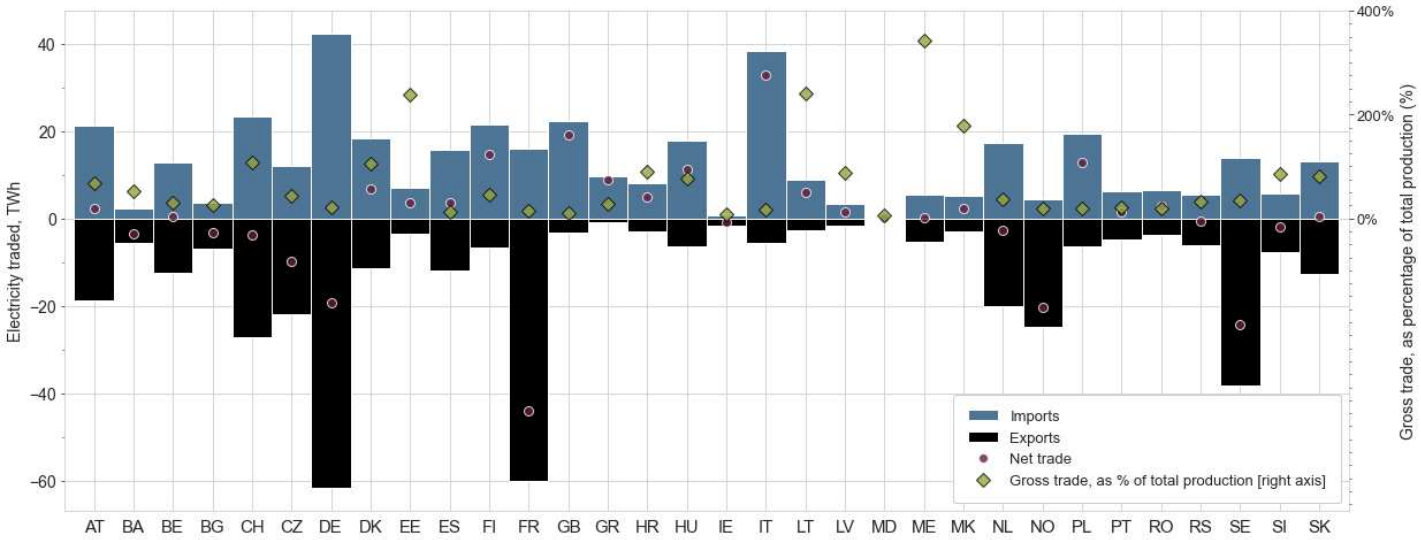

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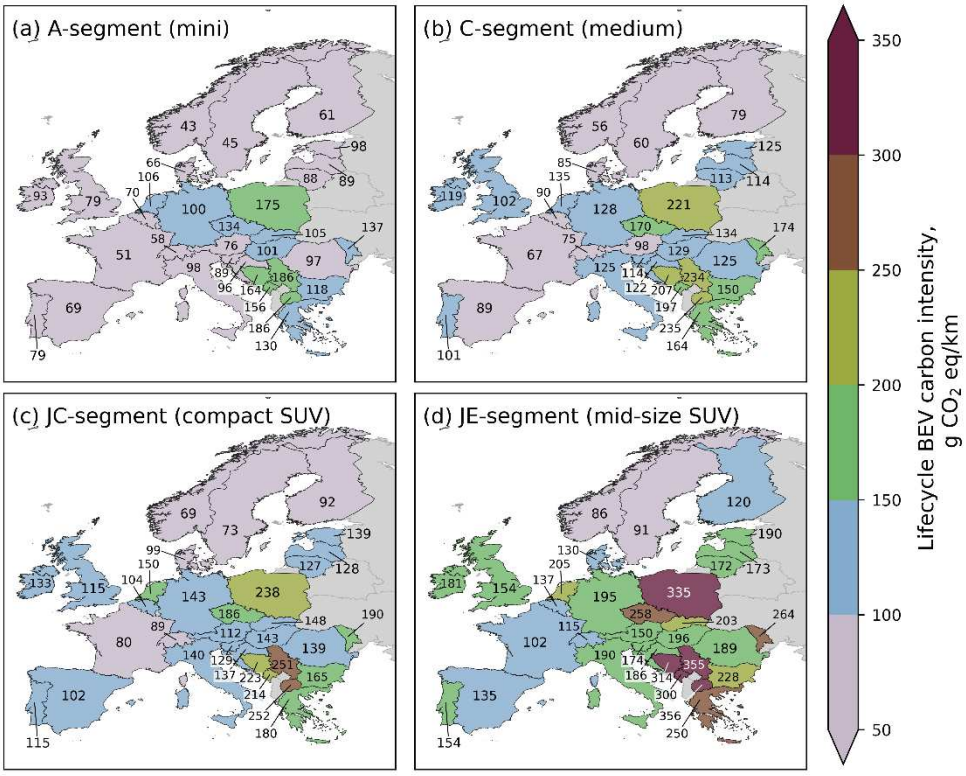

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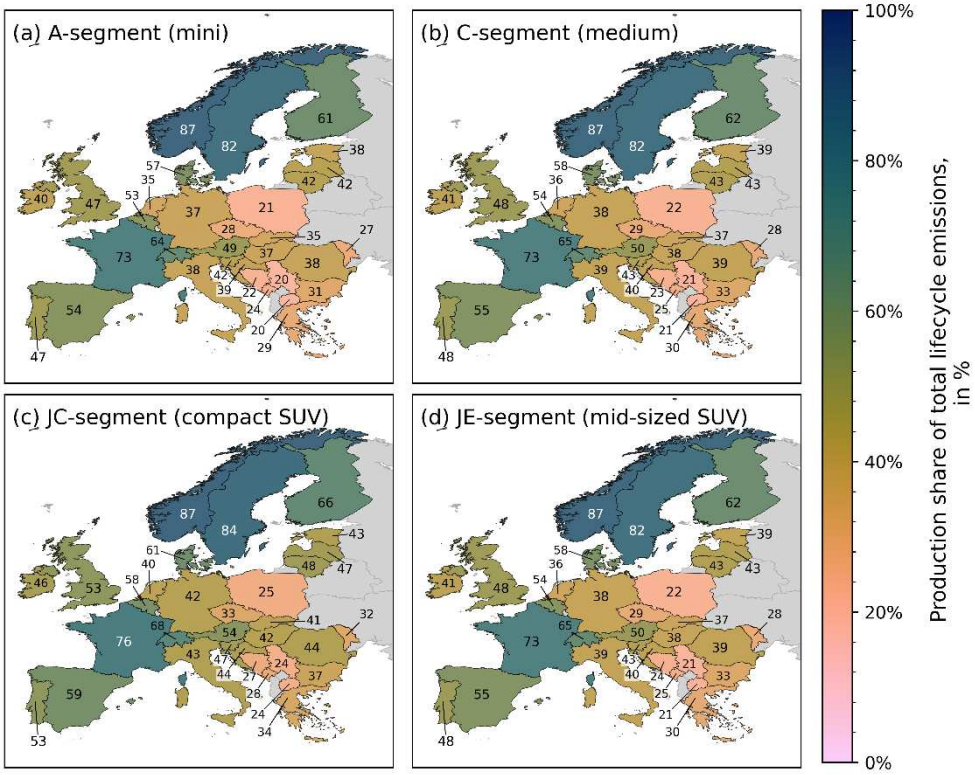

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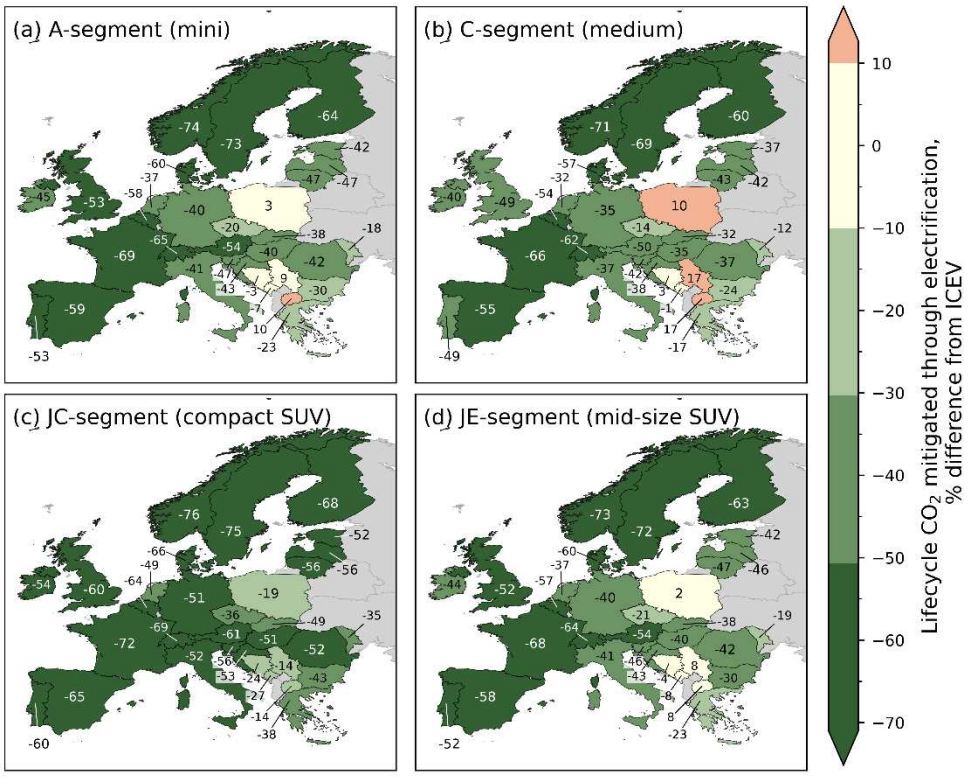

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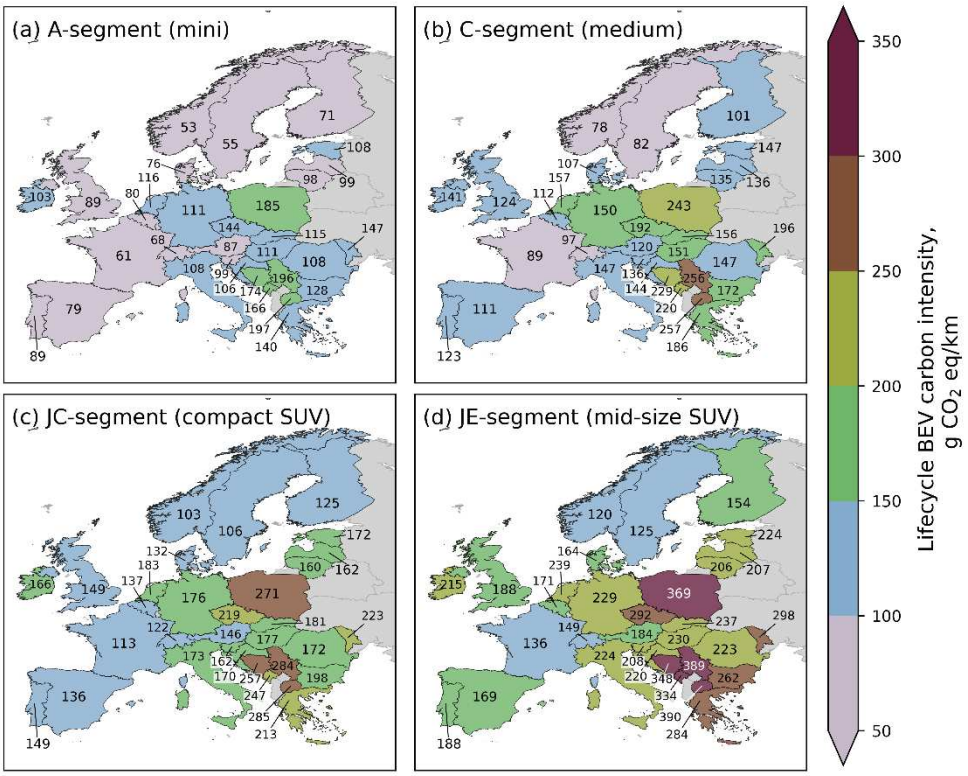

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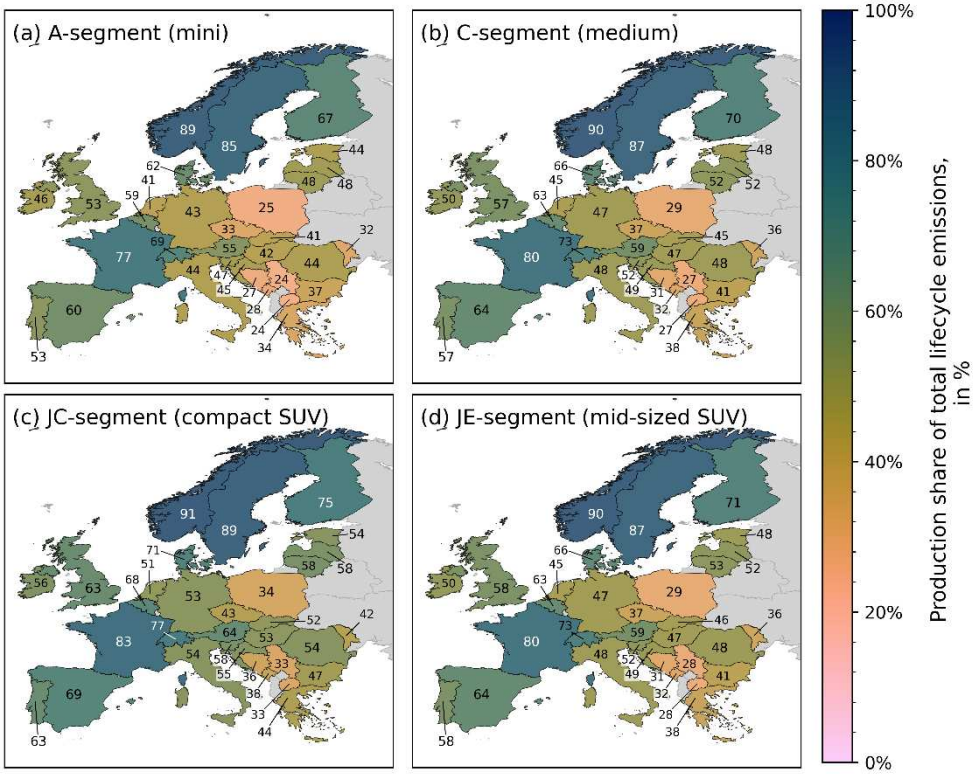

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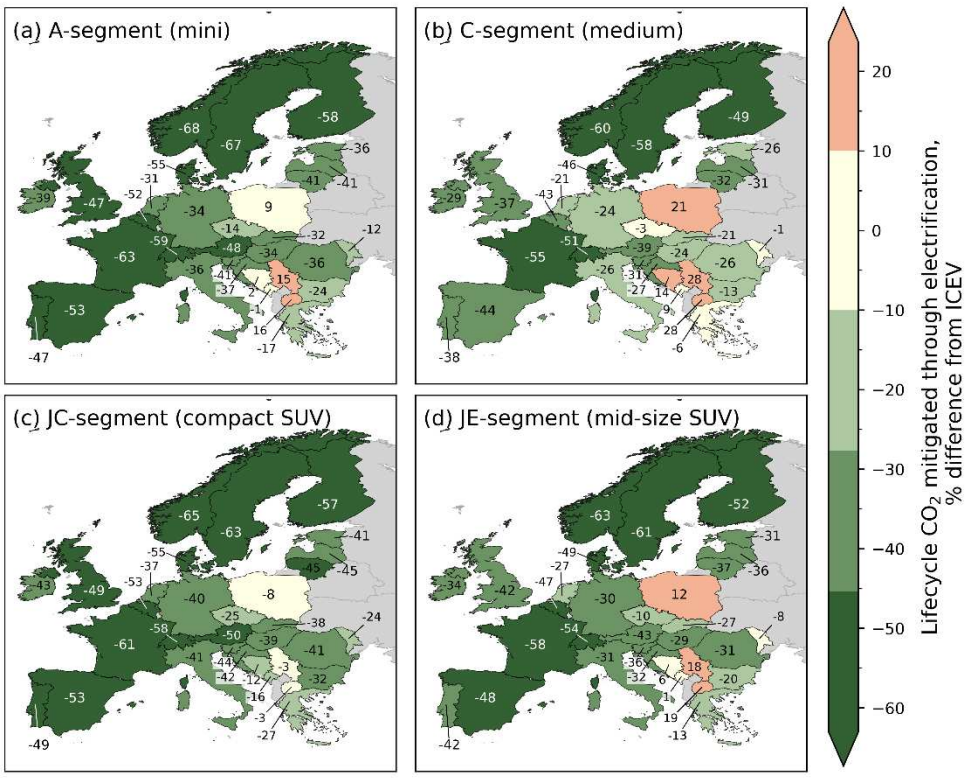

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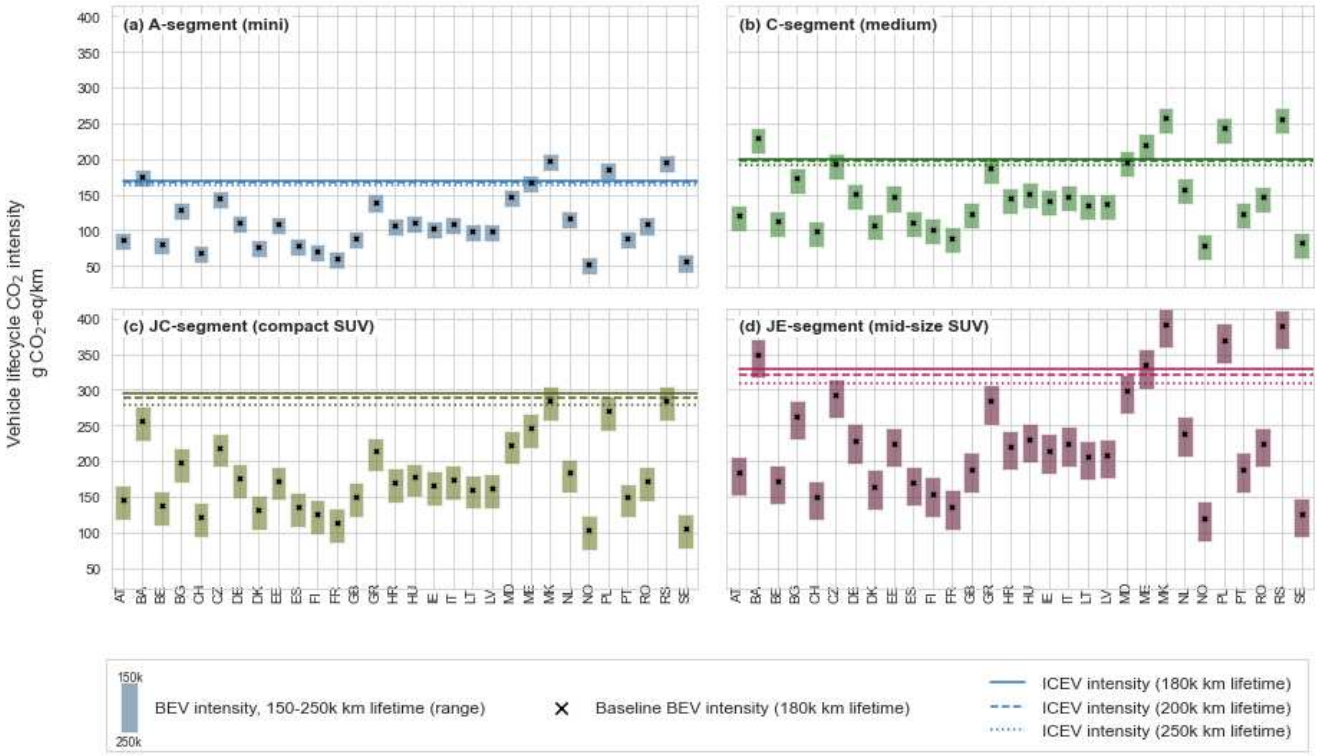

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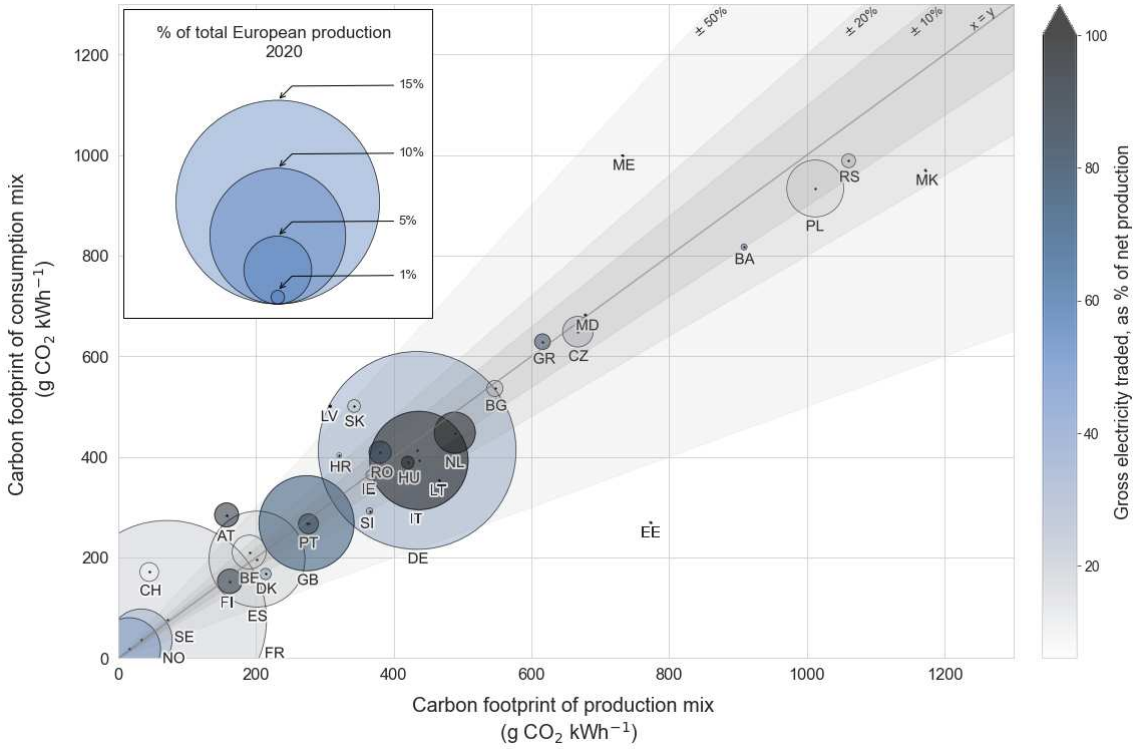
Results using grid average approach to calculating consumption for electricity



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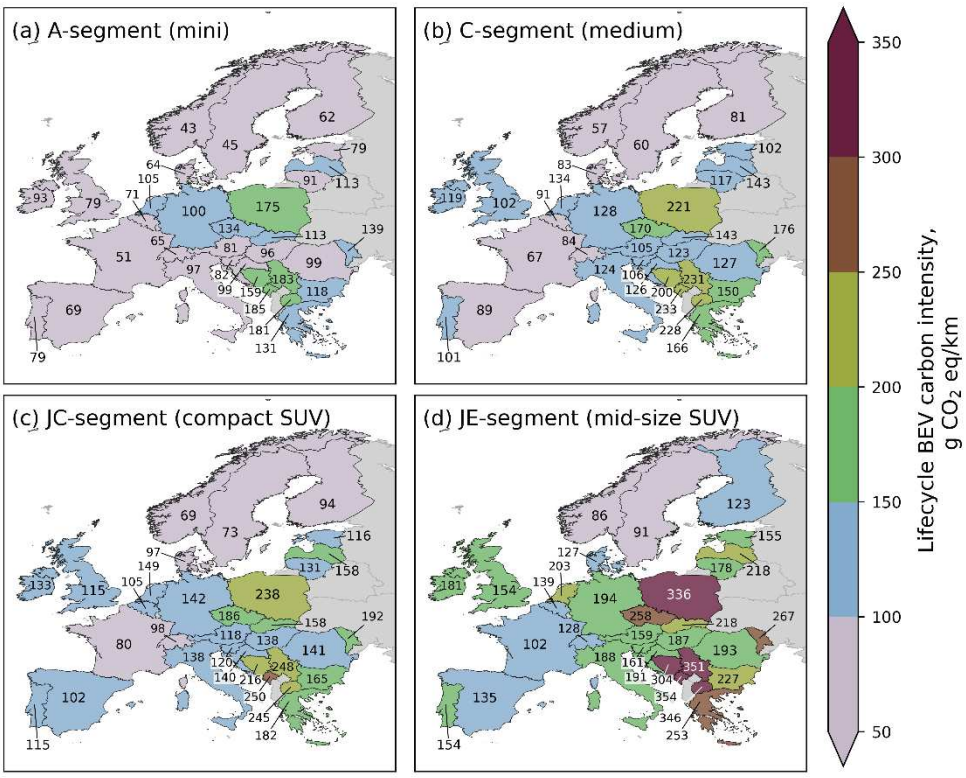

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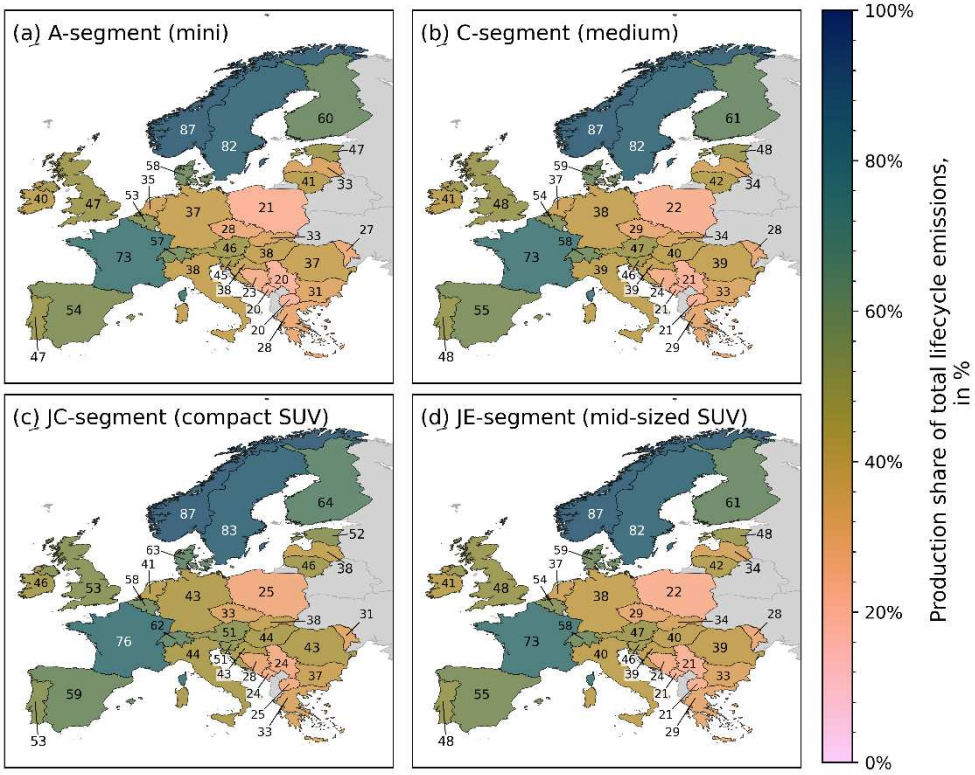

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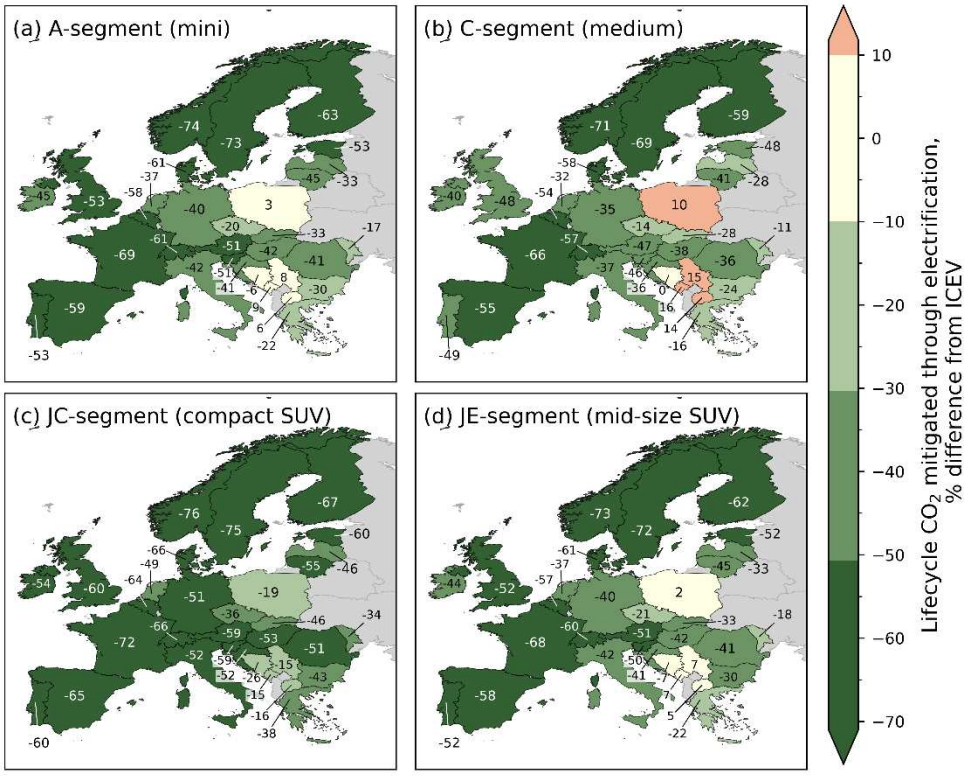

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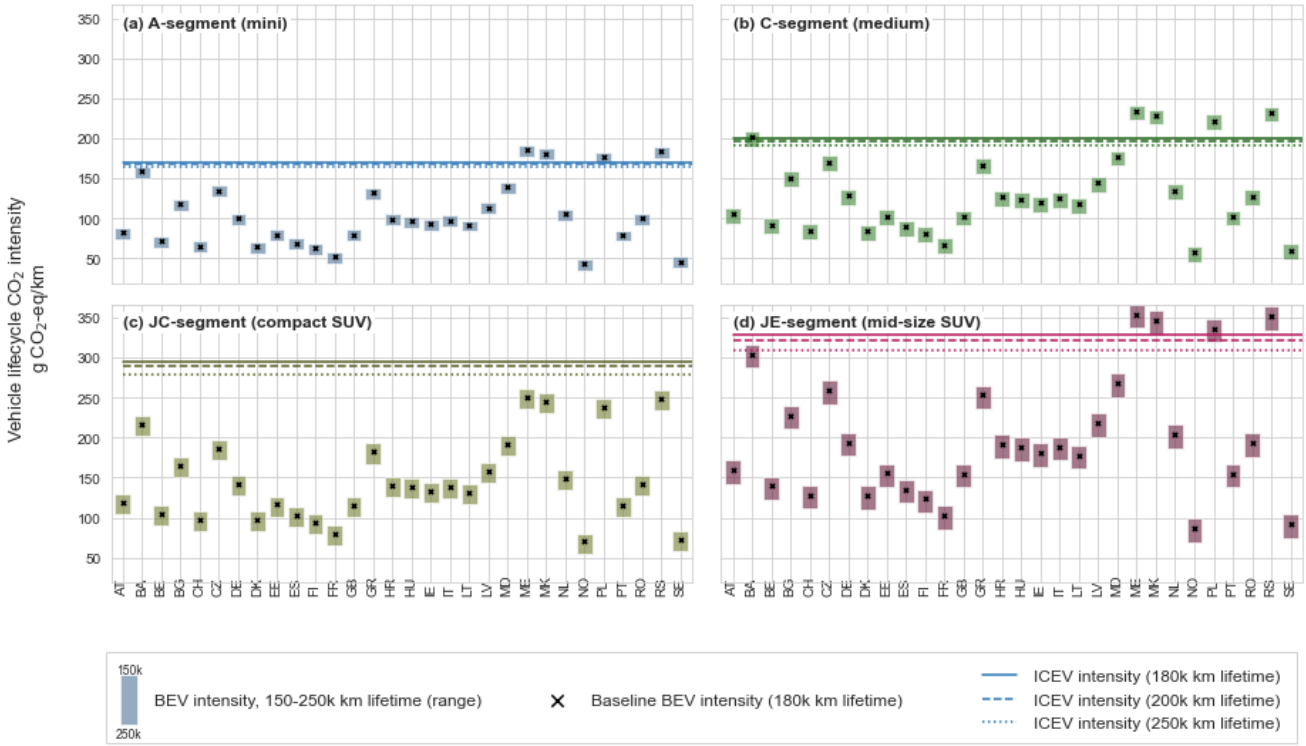

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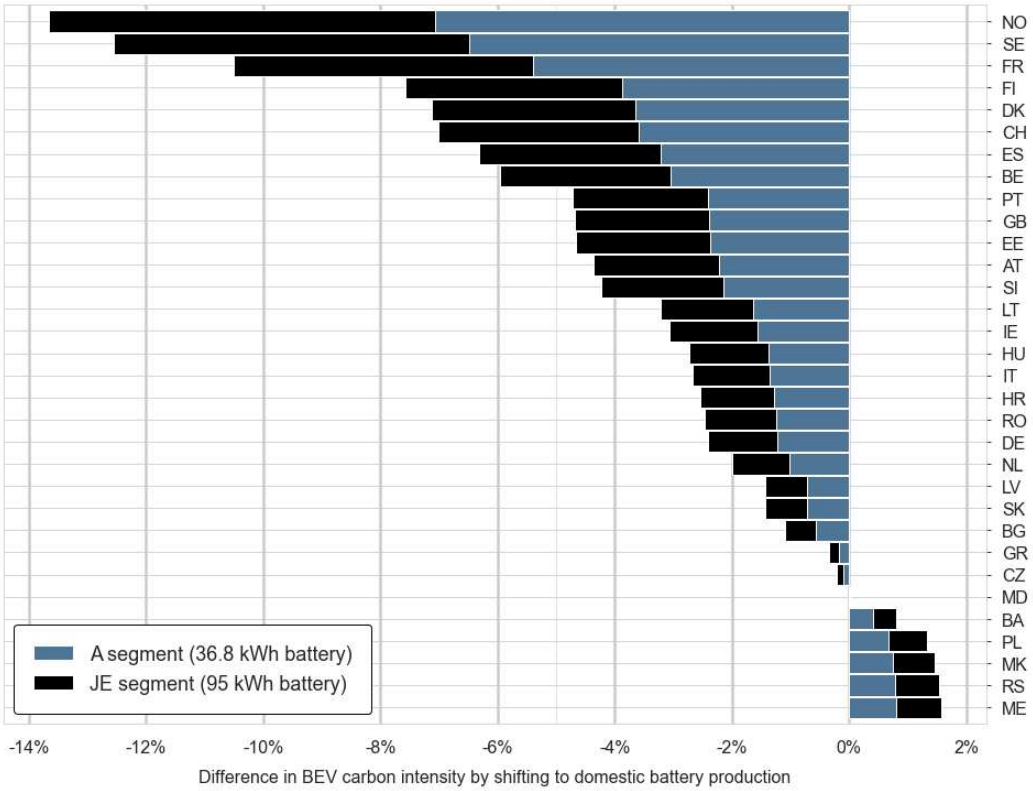

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Background data

Table 1 describes selected technical specifications regarding the vehicles modelled in the article. The curb and battery weight, use phase energy intensity (WLTP), WLTP tailpipe emissions and fuel efficiency were based on the respective representative models listed below. Note, however, that generic production and end-of-life emissions intensities were used and therefore the study does not represent an LCA of the specific models. Emissions factors for production and end-of-life for both powertrain technologies are based on Ellingsen et al (2016), with the F-segment (luxury) values being used as a proxy for the SUV classes here.

Table 1: Detailed vehicle specifications and background information.

			A mini car	C medium car	JC compact SUV	JE mid-size SUV
BEV	Representative model		Volkswagen e-up! 36.8 kWh	Nissan Leaf e+ 62 kWh	Volkswagen ID.4 82 kWh	Audi e-tron S 55 quattro 95 kWh
	Curb weight	kg	1160	1686	2149	2620
	Battery weight	kg	248	440	493	700
	Curb weight without battery	kg	912	1246	1656	1920
	Vehicle production emissions intensity (without battery)	t CO_2e (t vehicle)$^{-1}$	5.2	5.2	5.2	5.2
	End of life emissions intensity, battery	t CO_2e (t battery)$^{-1}$	0.36	0.36	0.36	0.36
	End of life emissions intensity (without battery)	t CO_2e (t vehicle)$^{-1}$	0.45	0.45	0.45	0.45
	Allocated share of production emissions to BEV	%	53%	39%	30%	38%
ICEV	Representative model		Volkswagen up! GTI	Volkswagen Golf 1.5 TSI	Skoda Kodiaq 2.0 TSI	BMW X4 M40i
	Curb weight	kg	916	1240	1700	1985
	WLTP fuel efficiency	L (100 km)$^{-1}$	5.3	6	8.6	9.3
	WLTP tailpipe emissions	g CO2 km^{-1}	120	135.5	194	212
	Well-to-wheel use phase intensity[1] (tailpipe + fuel chain, based on fuel efficiency)	g CO2e km^{-1}	148	168	240	261
	Production emissions intensity	t CO_2e (t vehicle)$^{-1}$	3.9	4.3	5.7	5.7
	End of life emissions intensity	t CO_2e (t vehicle)$^{-1}$	0.4	0.5	0.6	0.7

[1] Assumes 17 g CO2-eq upstream emissions MJ^{-1} fuel and lower heating value of 31.6 MJ L^{-1} (Prussi et al. 2020)

Table 2: Correspondence of ecoinvent 3.5 activities with ENTSO-E power generation technology categories

ENTSO-E category	*ecoinvent* 3.5 activity
Biomass	heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014
	heat and power co-generation, biogas, gas engine
	heat and power co-generation, wood chips, 6667 kW
Fossil Brown coal/Lignite	heat and power co-generation, lignite
	electricity production, lignite
Fossil Coal-derived gas	treatment of coal gas, in power plant
Fossil Gas	electricity production, natural gas, conventional power plant
	heat and power co-generation, natural gas, 500kW electrical, lean burn
	heat and power co-generation, natural gas, conventional power plant, 100MW electrical
	electricity production, natural gas, combined cycle power plant
	heat and power co-generation, natural gas, combined cycle power plant, 400MW electrical
Fossil Hard coal	heat and power co-generation, hard coal
	electricity production, hard coal
Fossil Oil	heat and power co-generation, oil
	electricity production, oil
Fossil Peat	electricity production, peat
Geothermal	electricity production, deep geothermal
Hydro Pumped Storage	electricity production, hydro, pumped storage
Hydro Run-of-river and poundage	electricity production, hydro, run-of-river
Hydro Water Reservoir	electricity production, hydro, reservoir, non-alpine region
	electricity production, hydro, reservoir, alpine region
Nuclear	electricity production, nuclear, pressure water reactor
	electricity production, nuclear, boiling water reactor
	electricity production, nuclear, pressure water reactor, heavy water moderated
Solar	electricity production, photovoltaic, 3kWp slanted-roof installation, CIS, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, a-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp slanted-roof installation, ribbon-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp facade installation, multi-Si, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, ribbon-Si, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, a-Si, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, CdTe, laminated, integrated

ENTSO-E category	*ecoinvent* 3.5 activity
	electricity production, photovoltaic, 570kWp open ground installation, multi-Si
	electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted
	electricity production, photovoltaic, 3kWp facade installation, single-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp flat-roof installation, single-Si
	electricity production, photovoltaic, 3kWp facade installation, multi-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, laminated, integrated
	electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted, label-certified
	electricity production, photovoltaic, 3kWp facade installation, single-Si, panel, mounted
	electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted, label-certified
	electricity production, solar tower power plant, 20 MW
	electricity production, solar thermal parabolic trough, 50 MW
	electricity production, photovoltaic, 3kWp flat-roof installation, multi-Si
Waste	electricity, from municipal waste incineration to generic market for electricity, medium voltage
Wind Offshore	electricity production, wind, 1-3MW turbine, offshore
Wind Onshore	electricity production, wind, <1MW turbine, onshore
	electricity production, wind, >3MW turbine, onshore
	electricity production, wind, 1-3MW turbine, onshore

References from Supplementary Information

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