



### Supplement of

# **European primary emissions of criteria pollutants and greenhouse gases in 2020 modulated by the COVID-19 pandemic disruptions**

Marc Guevara et al.

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### Supplementary material

GNFR_A     30: Austria, Belgium, Bulgaria, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Switzerland, Stovakia, Slovenia, Turkey, Ukraine       GNFR_B     Manufacturing industry     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Slovakia, Slovenia, Turkey, Ukraine       GNFR_C     Manufacturing industry     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Iteland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Walta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey Walta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey Walta, Belgium, Bulgaria, Czech Republic, Cyrus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Methar, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey 23: Austria, Bosnia and Herzegovina, Belgium, Belgium, Belgium, Bulgaria, Czech Republic, Switzerland, Ciernany, Demmark, Estonia, Spain, France, Finland, United Kingdom, Groreet, Aungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Mol	Sector	Description	Countries included		
GNFR_A     Energy industry     Greece, Croatia, Hungary, Ireland, Italy, Liftunania, Lativia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Switzerland, Slovakia, Slovenia, Turkey, Ukraine       GNFR_B     Manufacturing industry     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Liftuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Svitzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Liftuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Liftuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Suveden, Turkey       GNFR_F     Solvents     23: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Liftuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey       GNFR_F1 GNFR_F2 GNFR_F4     Shipping     36: Austria,					
GNFR_B     Manufacturing industry     Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Switzerland, Slovakia, Slovenia, Turkey, Ukraine       GNFR_B     Manufacturing industry     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdon, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Gramay, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdon, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_F     Solvents     23: Austria, Bolgium, Bulgaria, Czech Republic, Germany, Dermark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey       GNFR_F2     Solvents     36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Gremany, Benmark, Estonia, Spain, France, Hinland, United Kingdon, Greece, Croatia, Hungary, Pel			Denmark, Estonia, Spain, Finland, France, United Kingdom,		
GNFR_B     Manufacturing industry     Switzerland, Slovakia, Slovenia, Turkey, Ukraine       GNFR_B     Manufacturing industry     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Mata, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Netherlands, Switzerland, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Turkey       GNFR_F1 GNFR_F2 GNFR_F4     Road Transport     36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Gremany, Demmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Matha, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Sussia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_F1 GNFR_F4 </td <td>GNFR_A</td> <td>Energy industry</td> <td colspan="2"></td>	GNFR_A	Energy industry			
GNFR_B   Manufacturing industry   32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey     GNFR_C   Other stationary combustion activities   35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine     GNFR_D   Fugitive emissions from fossil fuels   32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Switzerland, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey     GNFR_E   Solvents   36: Austria, Boslia and Herzegovina, Belgium, Belgran, Dermark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Vatriane, Slovakia, Slovenia, Turkey, Ukraine     GNFR_F1 GNFR_F2 GNFR_F4   Aviation   36: Austria, Bosnia and Herzegovina, Belgium, Belgarus, Bulgaria, Czech Republic, Switzerland, Germay, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Anreneia, Spain, France, Hi	_		Netherlands, Norway, Poland, Portugal, Romania, Russia,		
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GNFR_B     Manufacturing industry     Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_F1 GNFR_F2 GNFR_F3 GNFR_F4     Solvents     23: Austria, Belgium, Bulgaria, Czech Republic, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Turkey       GNFR_F4     Road Transport     36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine			32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria,		
GNFR_B     Manufacturing industry     Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_C     Other stationary combustion activities     35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romark, Estonia, Spain, France, Finland, United Kingdom, Greee, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Slovenia, Turkey       GNFR_F1 GNFR_F2 GNFR_F3 GNFR_F4     Xoat Transport     36: Austria, Boeljum, Bulgaria, Czech Republic, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greee, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Sweden, Slovakia, Slovenia, Turkey       GNFR_F4     Road Transport     36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Iteland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukranine			Switzerland, Czech Republic, Cyprus, Germany, Denmark,		
GNFR_C Other stationary combustion activities 35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovakia, Slovenia, Turkey, Ukraine   GNFR_D Fugitive emissions from fossil fuels 32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey   GNFR_E Solvents 32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey   GNFR_F1 GNFR_F3 GNFR_F3 GNFR_F4 Road Transport 36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Witzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine   GNFR_F4 Aviation 39: Albania, Armenia, Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Germany, Denmark, Gromania, Serbia, Sweterland, Sonya, Poland, Portugal, Romania, Serbia, Sweterland, Norway, Poland, Portugal, Borenmark, Germany, Letonia, Malta, Luxembourg, Lithuania, Austria,	GNFR_B	Manufacturing industry	Estonia, Spain, France, Finland, United Kingdom, Greece,		
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GNFR_C   Other stationary combustion activities   35: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine     GNFR_D   Fugitive emissions from fossil fuels   32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey     GNFR_E   Solvents   23: Austria, Begium, Bulgaria, Caceh Republic, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Turkey     GNFR_F1 GNFR_F2 GNFR_F3   Road Transport   36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Neland, Portugal, Romania, Russia, Sweden, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Neland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine     GNFR_F2 GNFR_F4   Shipping   30: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czeek, Ruski					
GNFR_COther stationary combustion activitiesCzech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, UkraineGNFR_DFugitive emissions from fossil fuels32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, TurkeyGNFR_ESolvents23: Austria, Belgium, Bulgaria, Czech Republic, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Metherlands, Norway, Poland, Portugal, Romania, Sweden, TurkeyGNFR_F1 GNFR_F3 GNFR_F4Road Transport36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, UkraineGNFR_F3 GNFR_F4ShippingAtlantic Ocean, Baltic Sea, Black Sea, Caspian Sea, English Atlantio Coen, Baltic Sea, Black Sea, Caspian Sea, English Atlantio Coen, Baltic Sea, Black Sea, Caspian Sea, English Atlantio Coen, Baltic Sea, Black Sea, Caspian Sea, English, Denmark, Germany, Lenand, Halta, Morceo, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Sloveina, Turkey,					
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GNFR_C   Outer stationary combustion activities   Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine     GNFR_D   Fugitive emissions from fossil fuels   32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey     GNFR_E   Solvents   23: Austria, Belgium, Bulgaria, Czech Republic, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Latvia, Metherlands, Norway, Poland, Portugal, Romania, Sweden, Turkey     GNFR_F1 GNFR_F2 GNFR_F3 GNFR_F4   Road Transport   36: Austria, Bosnia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine     GNFR_G   Shipping   Atlantic Ocean, Baltic Sea, Black Sea, Caspian Sea, English Channel, Greenland Sea, Irish Sea, Kara Sea, Mediterranean Sea, North Sea, Norwegian Sea     GNFR_H   Aviation   39: Albania, Armenia, Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Denmark, Germany, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slo					
GNFR_C     combustion activities     Hungary, Ireland, Ialy, Lifulania, Latvia, Ludva, Lucembodrg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_D     Fugitive emissions from fossil fuels     Svitzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey       GNFR_E     Solvents     23: Austria, Belgium, Bulgaria, Czech Republic, Germany, Greece, Hungary, Italy, Lithuania, Latvia, Netherlands, Norway, Poland, Portugal, Romark, Estonia, Spain, France, Finland, United Kingdom, Greece, Hungary, Italy, Lithuania, Sweden, Turkey       GNFR_F1 GNFR_F2 GNFR_F3 GNFR_F4     Road Transport     36: Austria, Bosinia and Herzegovina, Belgium, Belarus, Bulgaria, Czech Republic, Switzerland, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Moldova, Macedonia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Slovenia, Turkey, Ukraine       GNFR_F3     Shipping     Atlantic Ocean, Baltic Sea, Caspian Sea, English Channel, Greenland Sea, Irish Sea, Kara Sea, Mediterranean Sea, North Sea, Norwegian Sea       GNFR_G     Shipping     Atlania, Armenia, Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Denmark, Germany, Estonia, Spain, Finland, Halt, Latvia, Luxembourg, Lithuania, Malta, Morcoc, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania		Other stationary			
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GNFR_IOff-road transportSea, North Sea, Norwegian SeaGNFR_IOff-road transport39: Albania, Armenia, Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Denmark, Germany, Estonia, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, UkraineGNFR_IOff-road transport32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal, Austria, Bosnia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,	GNFR_G	Shipping			
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GNFR_H Aviation Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Denmark, Germany, Estonia, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, Ukraine 32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
GNFR_HAviationDenmark, Germany, Estonia, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, UkraineGNFR_IOff-road transport32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,	GNFR_H	Aviation			
GNFR_HAviationKingdom, Greece, Croatia, Hungary, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, UkraineGNFR_IOff-road transport32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, 					
GNFR_I   Off-road transport   Luxembourg, Lithuania, Malta, Morocco, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, Ukraine     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
GNFR_I   Off-road transport     Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Sweden, Slovakia, Turkey, Ukraine     32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
GNFR_IOff-road transportRomania, Serbia, Sweden, Slovakia, Turkey, Ukraine 32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
GNFR_I Off-road transport 32: Austria, Bosnia and Herzegovina, Belgium, Bulgaria, Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
GNFR_I Off-road transport Switzerland, Czech Republic, Cyprus, Germany, Denmark, Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,	GNFR_I	Off-road transport			
GNFR_I Off-road transport Estonia, Spain, France, Finland, United Kingdom, Greece, Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
Croatia, Hungary, Italy, Lithuania, Latvia, Malta, Luxembourg, Netherlands, Norway, Poland, Portugal,					
Luxembourg, Netherlands, Norway, Poland, Portugal,					
Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey			Romania, Serbia, Sweden, Slovakia, Slovenia, Turkey		

#### Table S1: List of countries (sea regions) included in the COVID-19 emission adjustment factors per GNFR sector

	Fossil fuel + biomass consumption (ktep)	Fossil fuel + biomass consumption (%)	Change due to COVID-19 restrictions	Change in consumption (%)
Workplaces	977	26.5%	-80%	-21.2%
Hospitals	428	11.6%	50%	5.8%
Commercia l buildings	1509	40.9%	-80%	-32.8%
Restaurants and hotels	160	4.3%	-90%	-3.9%
Schools and universities	287	7.8%	-100%	-7.8%
Other buildings	325	8.8%	-80%	-7.0%
	-66.9%			

Table S2: Energy consumption by subsectors of the Spanish commercial/institutional sector (IDAE, 2018) and estimated changes in the energy demand due to the COVID-19 restrictions.

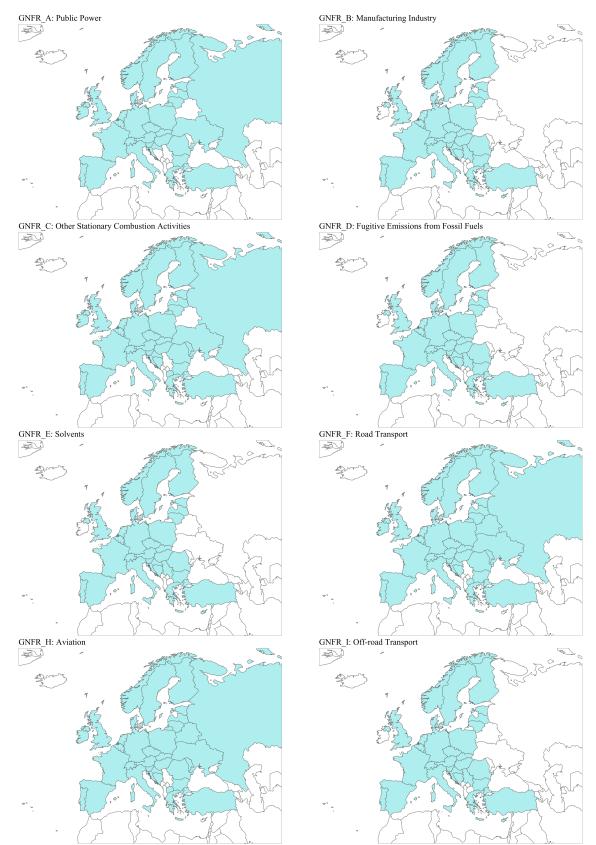


Figure S1: Spatial coverage of the COVID-19 emission adjustment factors constructed for each GNFR sector. Countries included in the database are highlighted in light turquoise

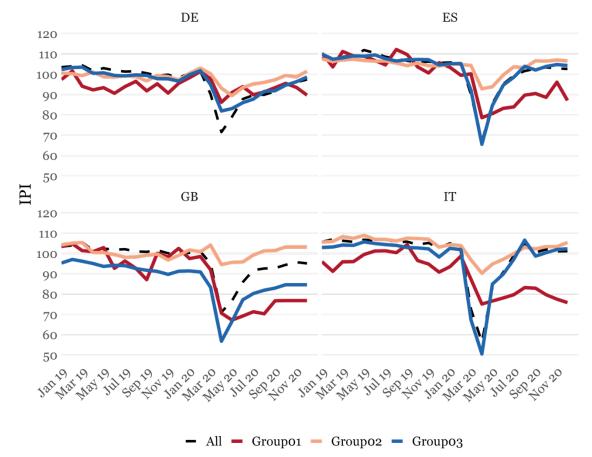


Figure S2 Evolution of the average monthly Industrial Production Index (IPI) values (January 2019 to December 2020) for four manufacturing categories: Group01 (petroleum refining products), Group02 (pharmaceutical, chemistry, food and beverages products), Group03 (non-metallic mineral products, basic metals, paper and machinery and equipment) and All (general index for all the manufacturing industry). Results are presented for Germany (DE), Spain (ES), Italy (IT) and the United Kingdom (GB). The IPI values are seasonally and calendar adjusted data (Eurostat, 2021a)

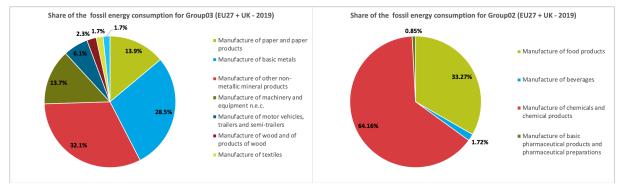


Figure S3: Relative fossil energy consumption in the GNFR\_B3 - Manufacture of other products (left) and GNFR\_B2 - Manufacture of pharmaceutical, chemistry, food and beverages products – (right) manufacturing industry subcategories per industrial branch in the EU27 + UK during 2019 (Eurostat, 2021b).

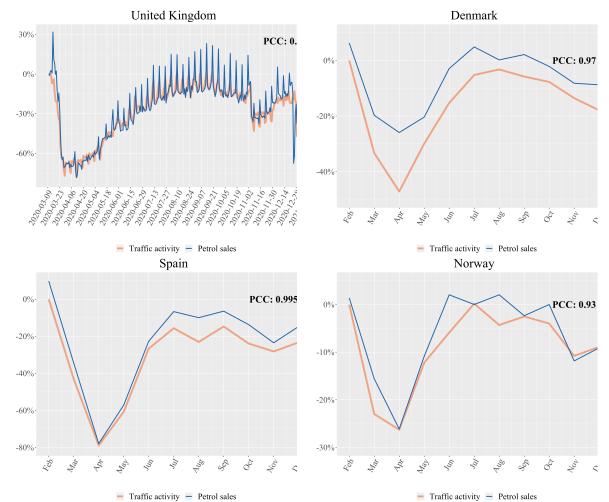


Figure S4: Weekly (UK) and monthly (Denmark, Spain, Norway) changes in traffic activity (orange line) and petrol sales (blue line) due to COVID-19 restrictions during 2020. Correlation between the two parameters is represented with the Pearson correlation coefficient (PCC).

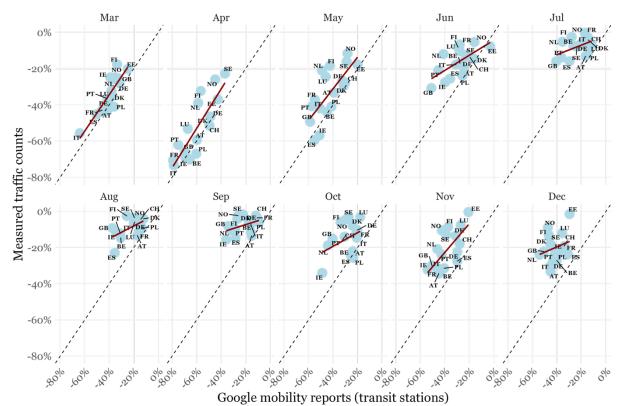


Figure S5: Comparison between averaged monthly adjustment factors for road traffic reported by Google COVID-19 Community Mobility Reports (Google LLC, 2021) and light duty vehicles and cars (LDV) measured-based trends per country (see Table A1 of the paper for references).

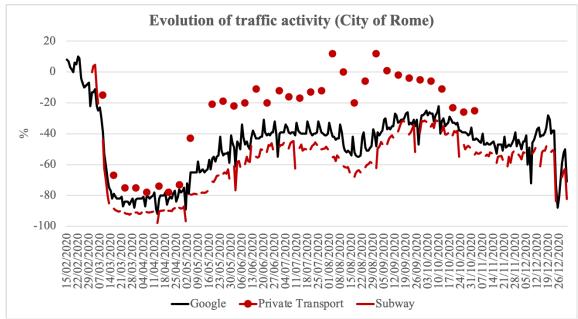
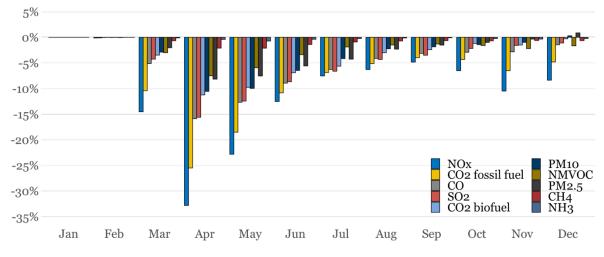


Figure S6: Comparison of Google LCC (2021) traffic movement trends with the evolution of the private transport and access to subway reported by Roma Mobilita (2021) for the city of Rome and the period 21 February to 31 December 2020.



## **Relative Emission Changes by Pollutant and Month** EU-27 + UK

Figure S7: Relative decline in monthly emissions [%] by pollutant between January and December 2020 for EU27 + UK.

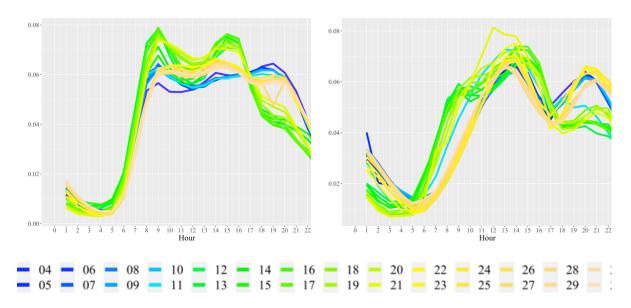


Figure S8. Hourly temporal profiles derived from measured-traffic counts in Madrid city for the year 2020 (AM, 2021) for weekdays (left) and Saturdays (right) discriminated by week of the year (week 4 to week 29)

#### References

AM: Madrid city council. Permanent traffic counts. Available at: https://datos.madrid.es/portal/site/egob/menuitem.c05c1f754a33a9fbe4b2e4b284f1a5a0/?vgnextoid=fabbf 3e1de124610VgnVCM2000001f4a900aRCRD&vgnextchannel=374512b9ace9f310VgnVCM100000171f 5a0aRCRD&vgnextfmt=default (last accessed, May 2021) 2021.

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