

# Supplemental Figures and Tables

Historical (1750 – 2014) anthropogenic emissions of reactive gases and aerosols from the  
Community Emission Data System (CEDS)  
Submitted to Geoscientific Model Development (GMD),  
[http://www.geosci-model-dev.net/special\\_issue590.html](http://www.geosci-model-dev.net/special_issue590.html)

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## A. Country and Sector Mapping Tables

Table S1: Mapping of CEDS working sectors (shown in Table 1 in the main text) to aggregate sectors used in the figures in the main text and this supplement.

Aggregate Sector	CEDS Working Sector
Agriculture	B_Manure-management 3D_Soil-emissions 3D_Rice-Cultivation 3E_Enteric-fermentation 3F_Agricultural-residue-burning-on-fields 3L_Agriculture-other
Air	1A3ai_International-aviation 1A3aii_Domestic-aviation
Energy Transformation and Extraction (Energy Transf/Ext)	1A1a_Electricity-public 1A1a_Electricity-autoproducer 1A1a_Heat-production 1A1bc_Other-transformation 1B1_Fugitive-solid-fuels 1B2_Fugitive-petr-and-gas 1B2d_Fugitive-other-energy
Industry	1A2a_Ind-Comb-Iron-steel 1A2b_Ind-Comb-Non-ferrous-metals 1A2c_Ind-Comb-Chemicals 1A2d_Ind-Comb-Pulp-paper 1A2e_Ind-Comb-Food-tobacco 1A2f_Ind-Comb-Non-metallic-minerals 1A2g_Ind-Comb-Construction 1A2g_Ind-Comb-transpequip 1A2g_Ind-Comb-machinery 1A2g_Ind-Comb-mining-quarrying 1A2g_Ind-Comb-wood-products 1A2g_Ind-Comb-textile-leather 1A2g_Ind-Comb-other 2A1_Cement-production 2A2_Lime-production 2Ax_Other-minerals 2B_Chemical-industry 2C_Metal-production 2H_Pulp-and-paper-food-beverage-wood
Residential, Commercial, Other (RCO)	1A4b_Residential 1A4a_Commercial-institutional 1A4c_Agriculture-forestry-fishing 1A5_Other-unspecified
Shipping	1A3di_International-shipping 1A3di_Oil_tanker_loading
Solvents	2D_Degreasing-Cleaning 2D_Paint-application 2D_Chemical-products-manufacture-processing 2D_Other-product-use
Transportation	1A3b_Road 1A3c_Rail 1A3dii_Domestic-navigation 1A3eii_Other-transp
Waste	5A_Solid-waste-disposal 5E_Other-waste-handling 5C_Waste-combustion 5D_Wastewater-handling

Table S2: Mapping of countries to regions used in the figures in the main text and this supplement.

Region	Countries			
Africa	Angola	Burundi	Benin	Burkina Faso
	Botswana	Cote d'Ivoire	Cameroon	Central African Republic
	DR Congo	Congo	Comoros	Cape Verde
	Djibouti	Algeria	Egypt	Eritrea
	Western Sahara	Ethiopia	Gabon	Ghana
	Guinea	Gambia	Guinea-Bissau	Equatorial Guinea
	Kenya	Liberia	Libya	Lesotho
	Morocco	Madagascar	Mali	Mozambique
	Mauritania	Mauritius	Malawi	Namibia
	Niger	Nigeria	Reunion	Rwanda
	Sudan	Senegal	Sierra Leone	Somalia
	South Sudan	Swaziland	Seychelles	Sao Tome and Principe
	Chad	Togo	Tunisia	Tanzania
	Uganda	South Africa	Zambia	Zimbabwe
China	China			
Europe	Albania	Austria	Belgium	Bosnia and Herzegovina
	Bulgaria	Switzerland	Cyprus	Czech Republic
	Germany	Denmark	Spain	Finland
	France	United Kingdom	Gibraltar	Greece
	Greenland	Croatia	Croatia	Hungary
	Ireland	Iceland	Italy	Liechtenstein
	Luxembourg	Macedonia	Malta	Netherlands
	Norway	Poland	Portugal	Romania
	Serbia	Slovakia	Slovenia	Sweden
	Turkey			
Former Soviet Union	Armenia	Azerbaijan	Belarus	Estonia
	Georgia	Kazakhstan	Kyrgyzstan	Lithuania
	Latvia	Moldova	Russia	Tajikistan
	Turkmenistan	Ukraine	Uzbekistan	
International	International Shipping and Aviation			
Latin America	Aruba	Argentina	Antigua and Barbuda	Bahamas
	Belize	Bermuda	Bolivia	Brazil
	Barbados	Chile	Colombia	Costa Rica
	Cuba	Curacao	Cayman Islands	Dominica
	Dominican Republic	Ecuador	Falkland Islands	Faeroe Islands
	Guadeloupe	Grenada	Guatemala	French Guiana
	Guyana	Honduras	Haiti	Turks and Caicos Islands
	Saint Lucia	Mexico	Montserrat	Saint Kitts and Nevis
	Jamaica	Martinique	Nicaragua	Panama
	Paraguay	El Salvador	Suriname	Saint Pierre and Miquelon
	Peru	Sint Maarten	Uruguay	Trinidad and Tobago
	Venezuela	British Virgin Islands	United States Virgin Islands	
	Saint Vincent And Grenadines			
North America	Canada	United States	Puerto Rico	
Other Asia/Pacific	Afghanistan	United Arab Emirates	American Samoa	Australia
	Bangladesh	Bahrain	Brunei Darussalam	Bhutan
	Cook Islands	Fiji	Micronesia	Guam
	Hong Kong	Indonesia	India	Iran
	Iraq	Israel	Jordan	Japan
	Cambodia	Kiribati	Republic of Korea	Kuwait
	Laos	Lebanon	Sri Lanka	Macao
	Maldives	Marshall Islands	Myanmar (Burma)	Montenegro
	Mongolia	Malaysia	New Caledonia	Niue
	Nepal	New Zealand	Oman	Pakistan
	Philippines	Palau	Papua New Guinea	DPR Korea
	Palestine	French Polynesia	Qatar	Saudi Arabia
	Singapore	Soloman Islands	Syria	Thailand
	Tokelau	Timor-Leste	Tongo	Chinese Taipei
	Vietnam	Vanuatu	Samoa	Wallis and Futuna Islands
	Yemen			

## B. Global CEDS Emissions (1750 - 2014)

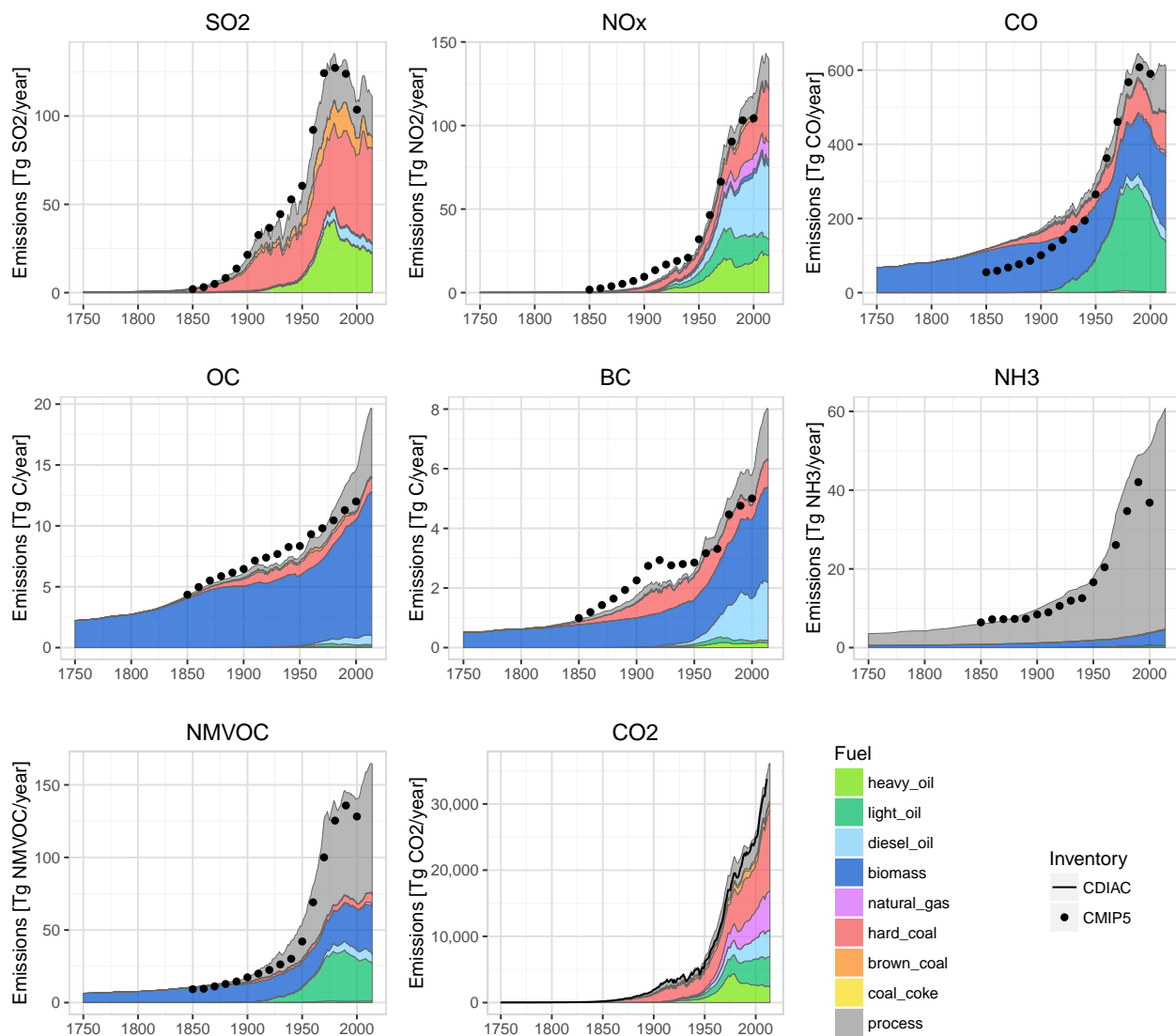


Figure S1: CEDS emissions estimates by aggregate fuel compared to Lamarque et al. (2010) (dots) and CDIAC for CO<sub>2</sub>. For like with like comparison, these figures do not include aviation, or agricultural waste burning on fields. Format is similar to Figures 2 and 3 in the the main text. "Process" notes CEDS non-combustion emissions (see §2.3.2).

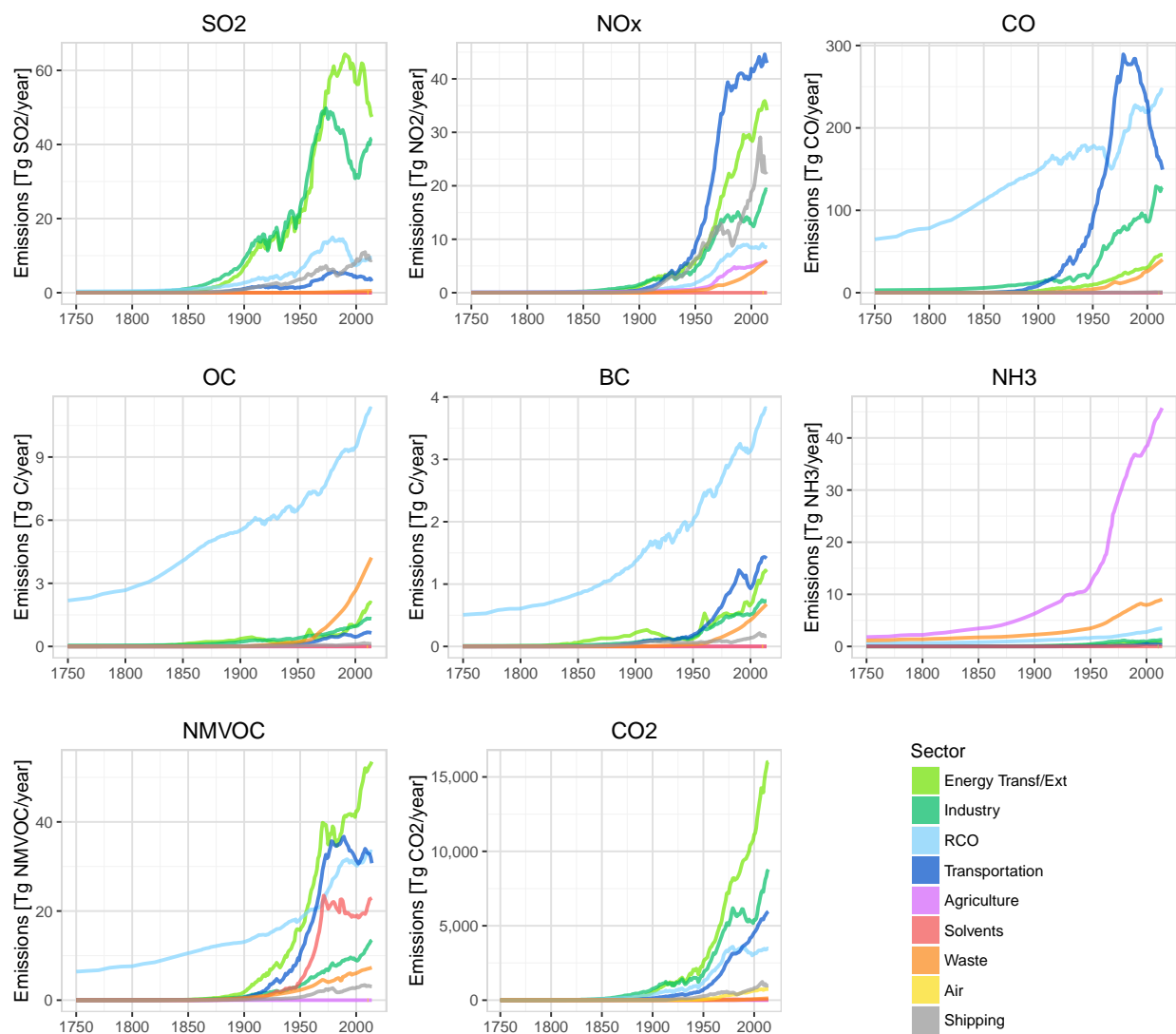


Figure S2: Global CEDS emissions estimates by aggregate sector, showing the same data as Figure 2 in the main text as a line graph. Figure does not include aviation emissions.

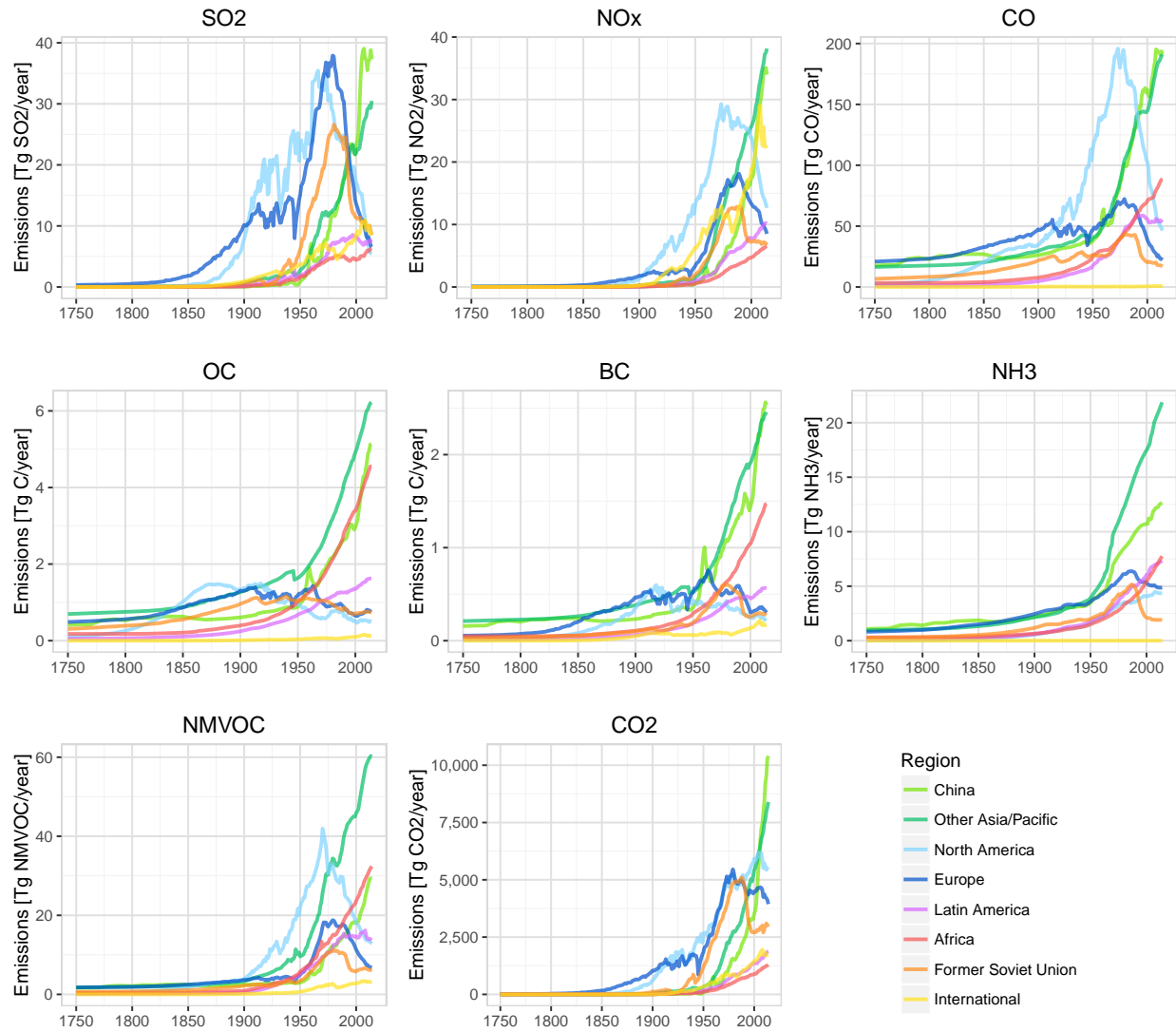


Figure S3: Global CEDS emissions estimates by aggregate region, showing the same data as Figure 3 in the main text as a line graph. Figure does not include aviation emissions.



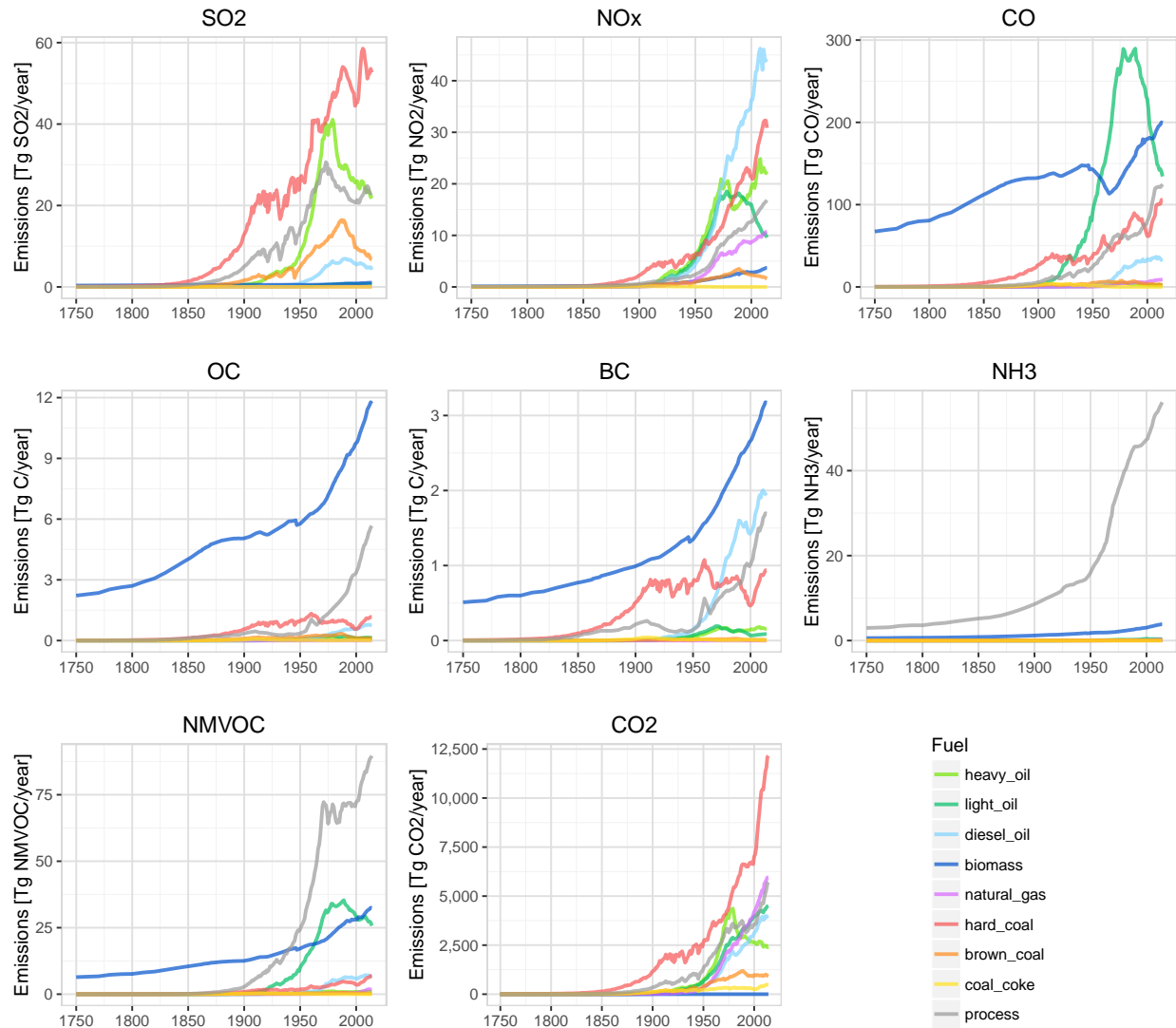


Figure S4: Global CEDS emissions estimates by aggregate fuel, showing the same data as Figure S1 as a line graph. Figure does not include aviation emissions. "Process" notes non-combustion emissions.

## C. Recent Global CEDS Emissions (1990 - 2014)

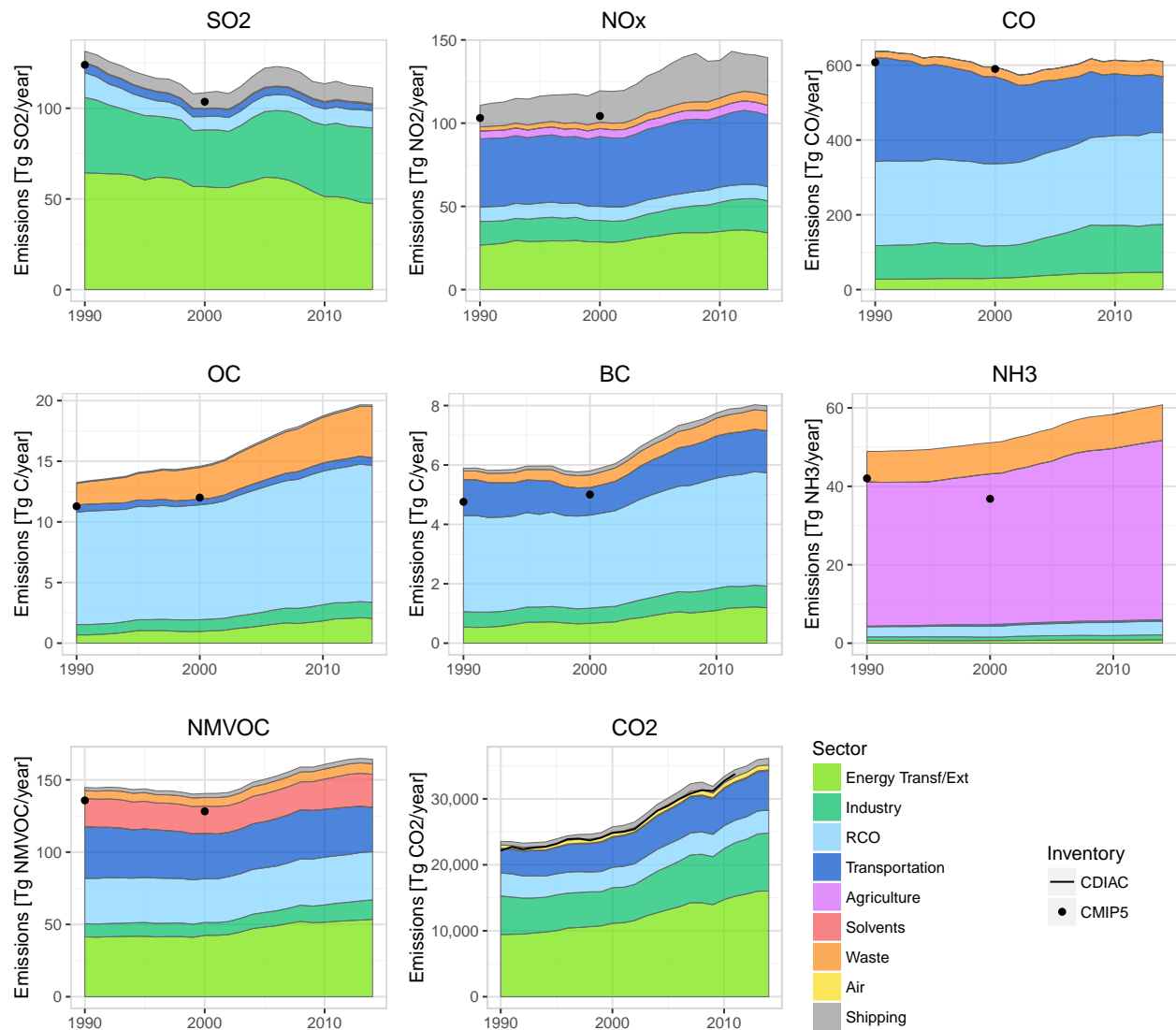


Figure S5: CEDS emissions estimates by aggregate sector compared to Lamarque et al. (2010) (dots) and CDIAC for CO<sub>2</sub>, showing the same data as Figure 2 in the main text over 1990 - 2014. Format is similar to Figures 5 in the the main text. For like with like comparison, these figures do not include aviation, or agricultural waste burning on fields.

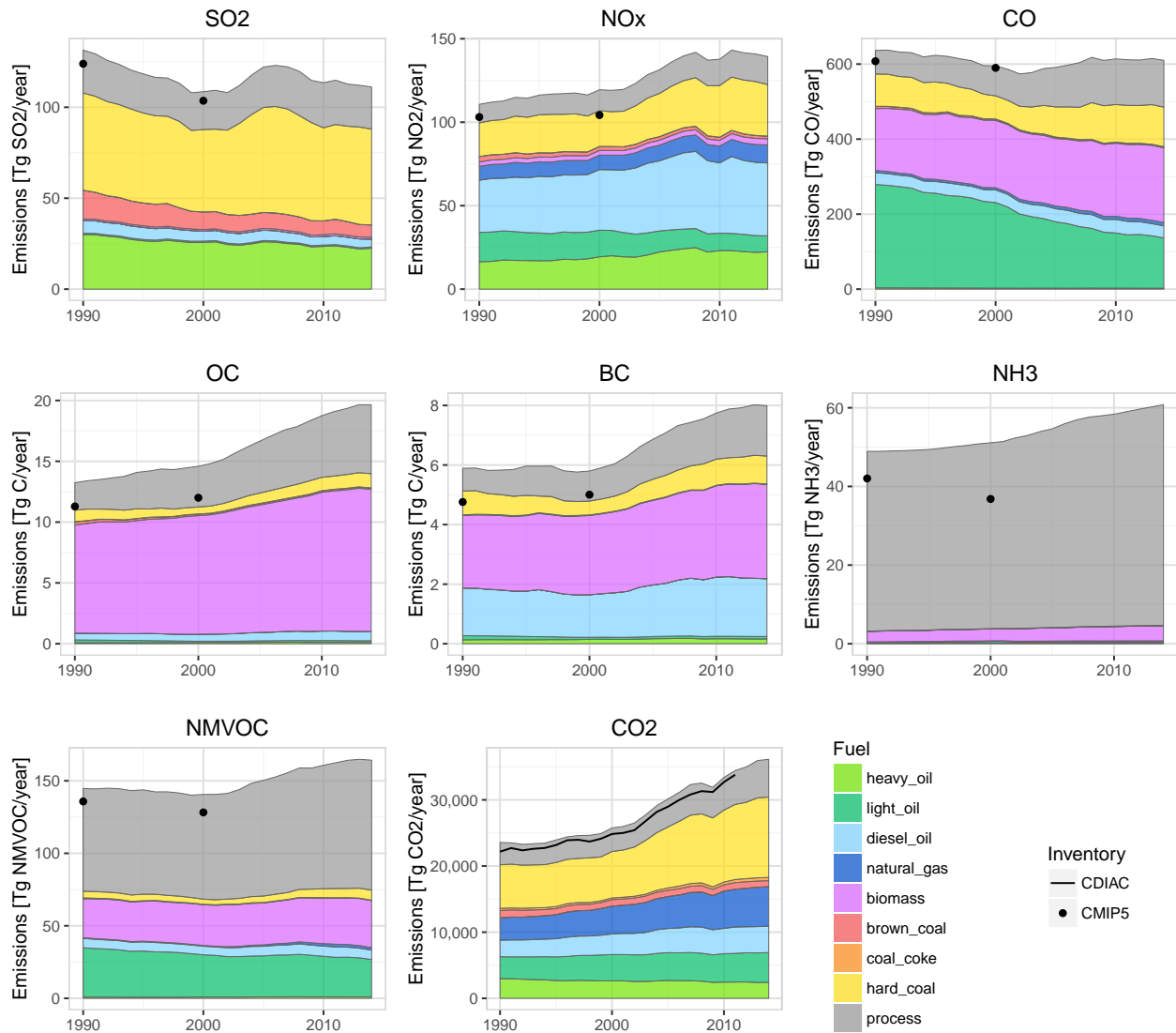


Figure S6: CEDS emissions estimates by aggregate fuel compared to Lamarque et al. (2010) (dots) and CDIAC for CO<sub>2</sub>, showing the same data as Figure S1 over 1990 - 2014. Format is similar to Figures 5 in the the main text. For like with like comparison, these figures do not include aviation, or agricultural waste burning on fields. "Process" denotes CEDS non-combustion emissions (see §2.3.2).

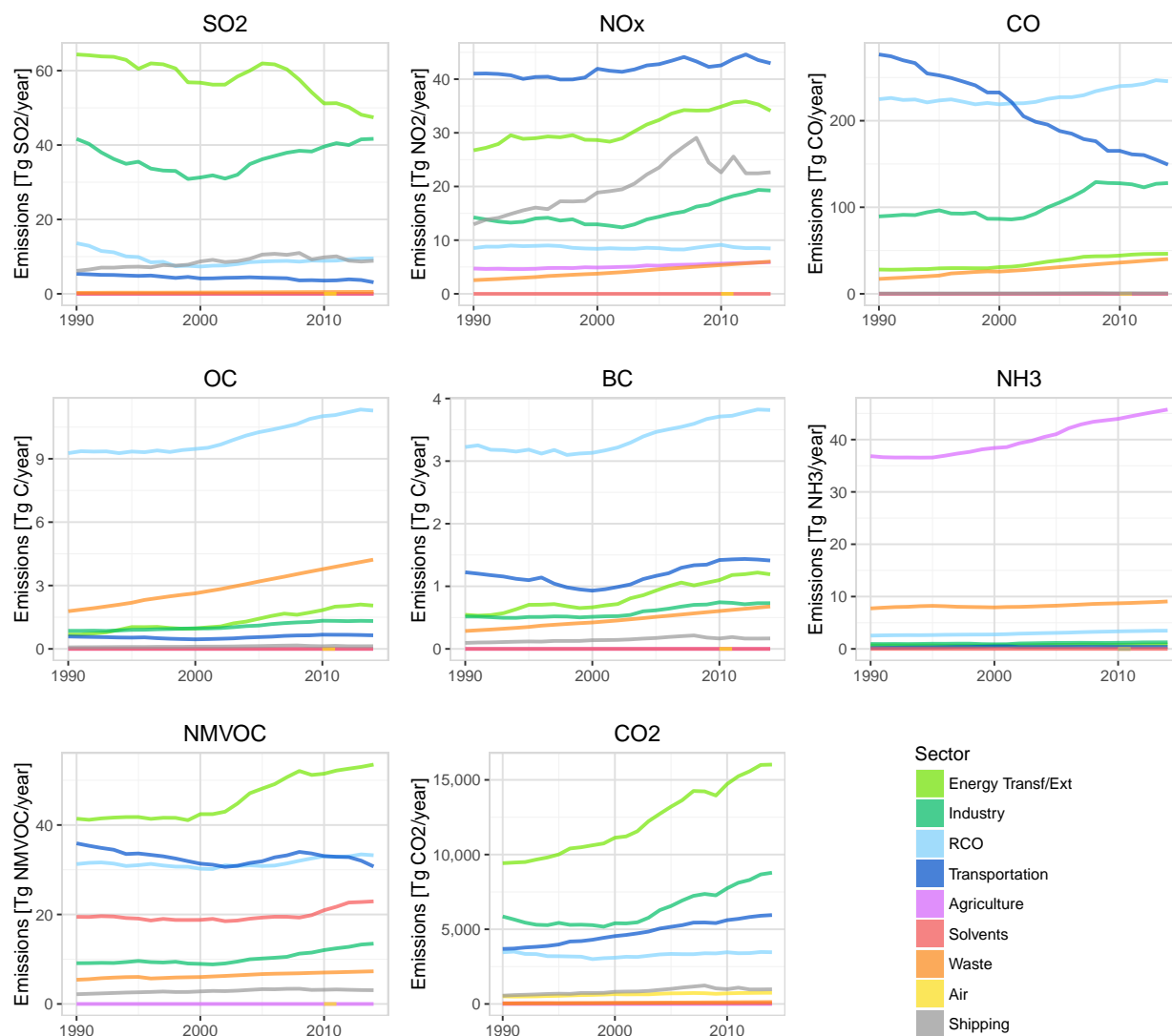


Figure S7: Global CEDS emissions estimates by aggregate sector, showing the same data as Figure S5 as a line graph. Figure does not include aviation emissions.

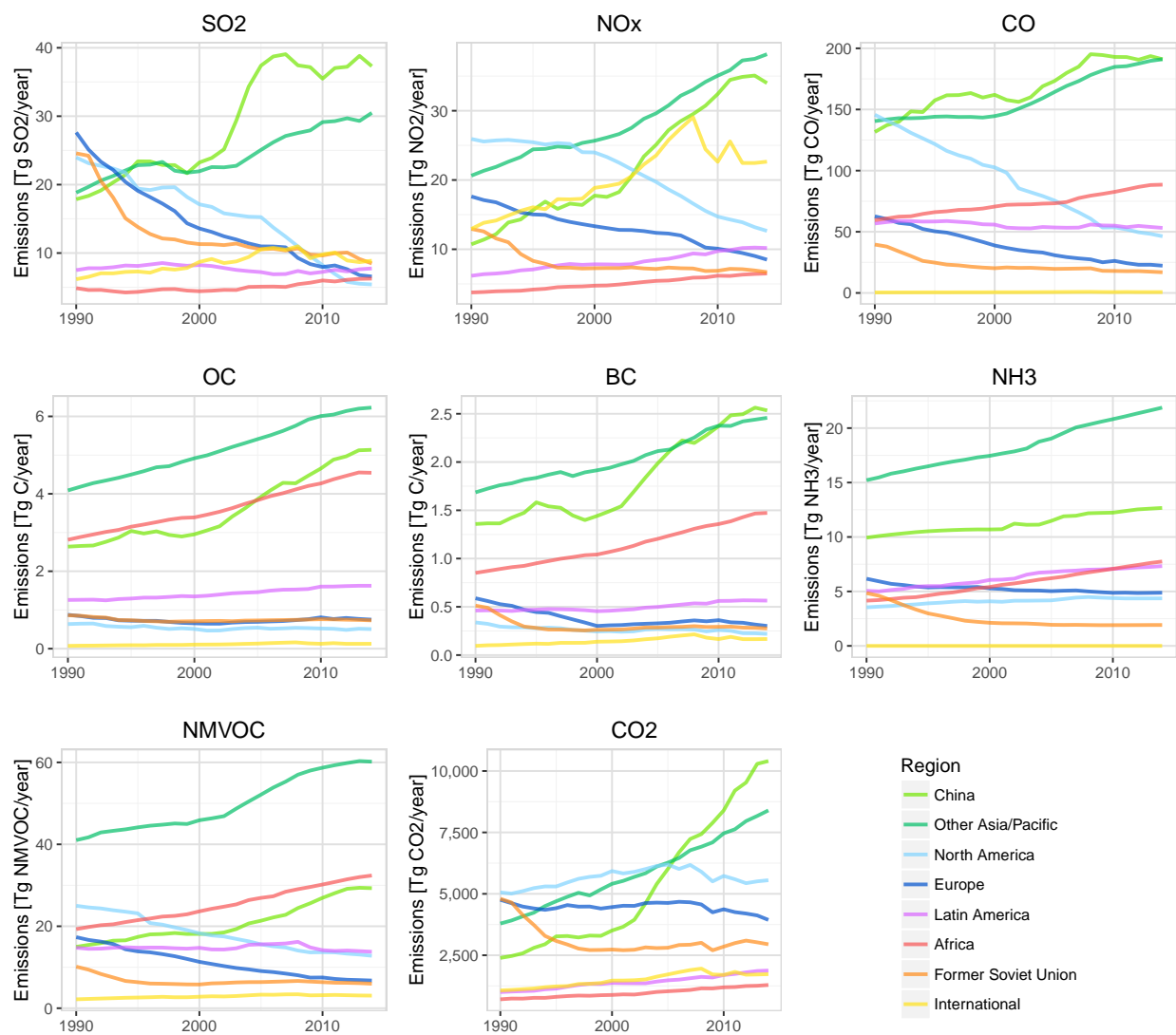


Figure S8: Global CEDS emissions estimates by aggregate region, showing the same data as Figure 5 in the main text as a line graph. Figure does not include aviation emissions.

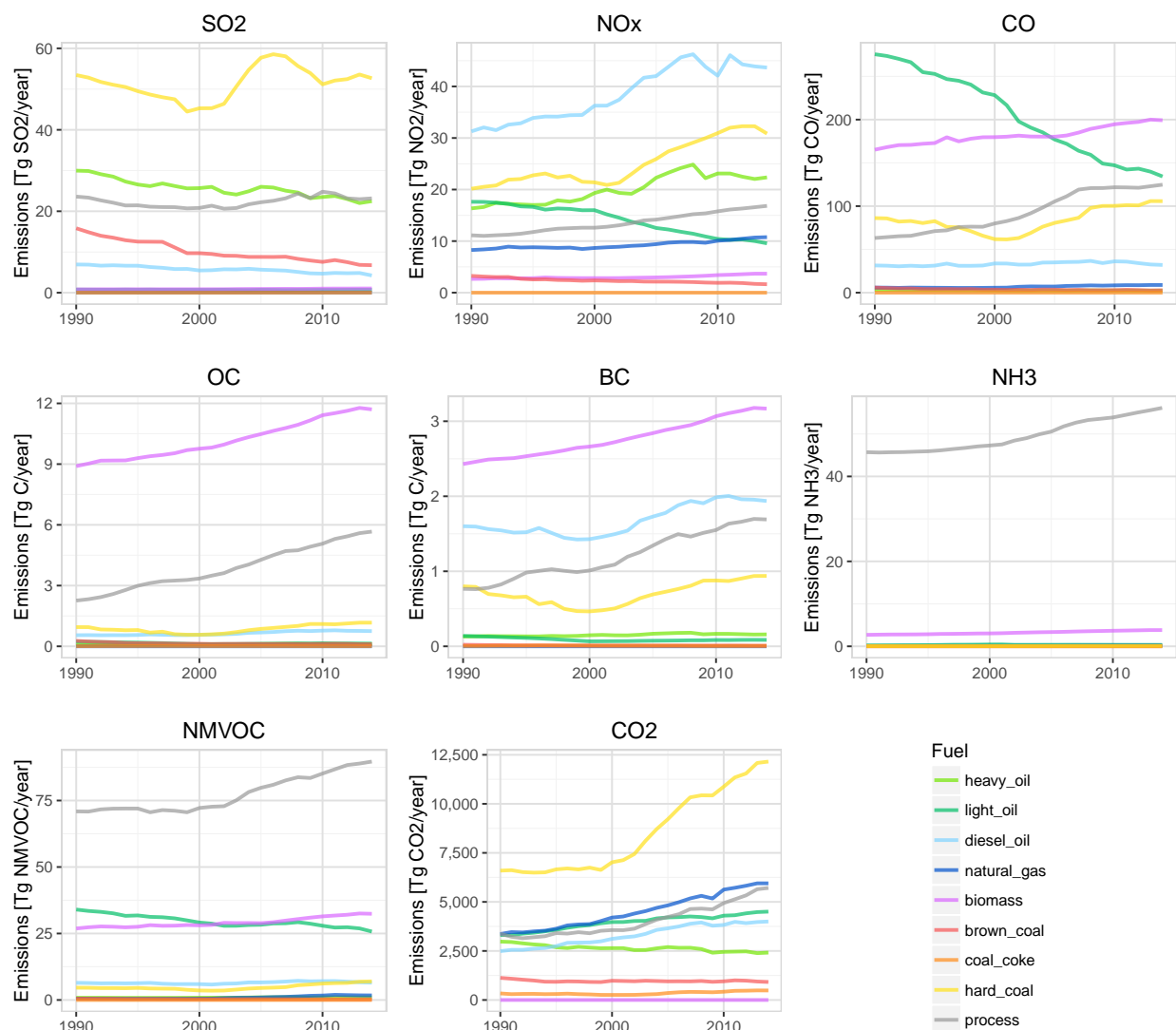


Figure S9: Global CEDS emissions estimates by aggregate fuel, showing the same data as Figure S6 as a line graph. Figure does not include aviation emissions. "Process" notes non-combustion emissions.

## D. CEDS Emissions (1750 - 2014): Regional Summaries by Sector

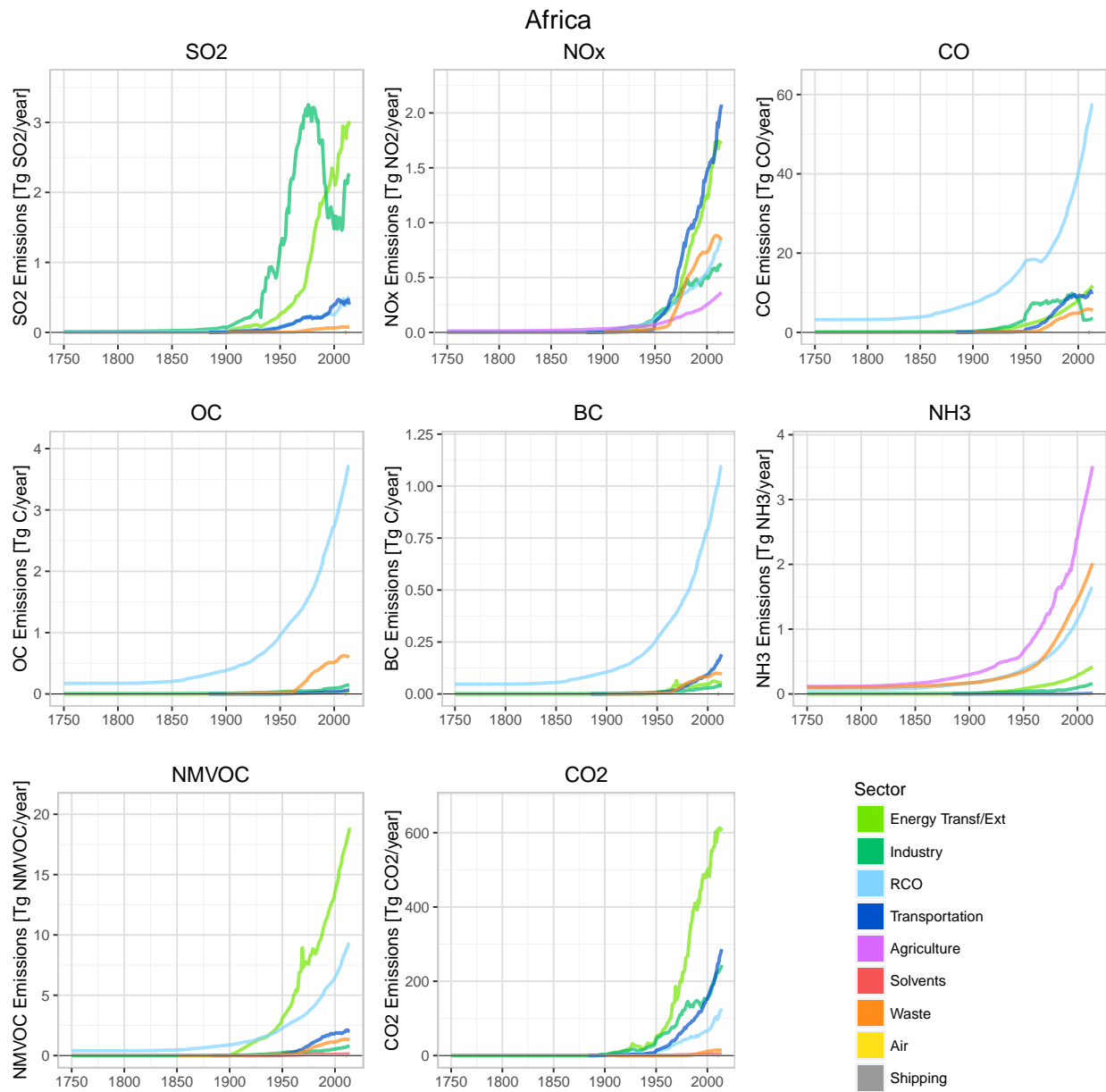


Figure S10: Africa: CEDS emissions by aggregate sector

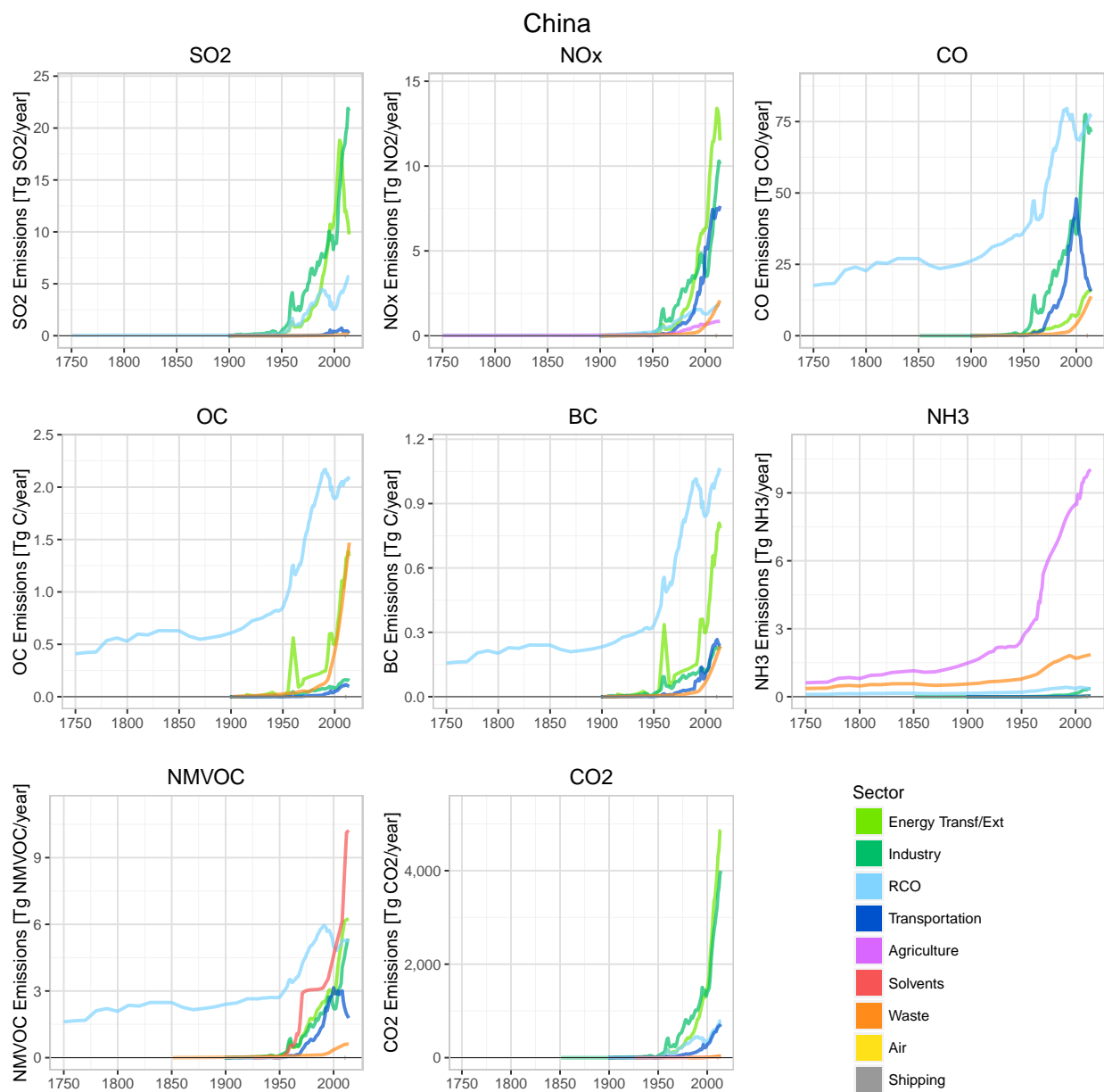


Figure S11: China: CEDS emissions by aggregate sector



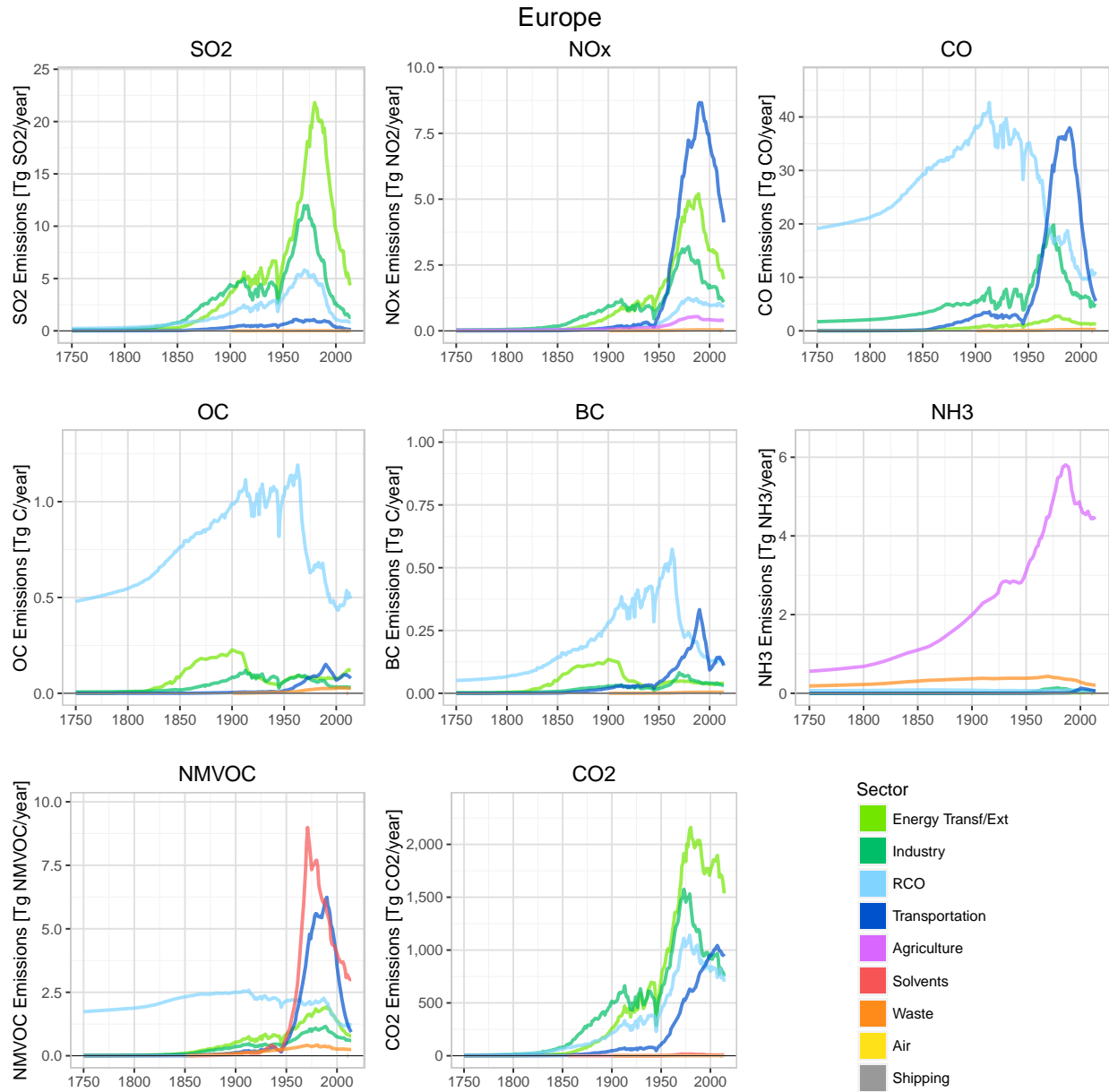


Figure S12: Europe: CEDS emissions by aggregate sector

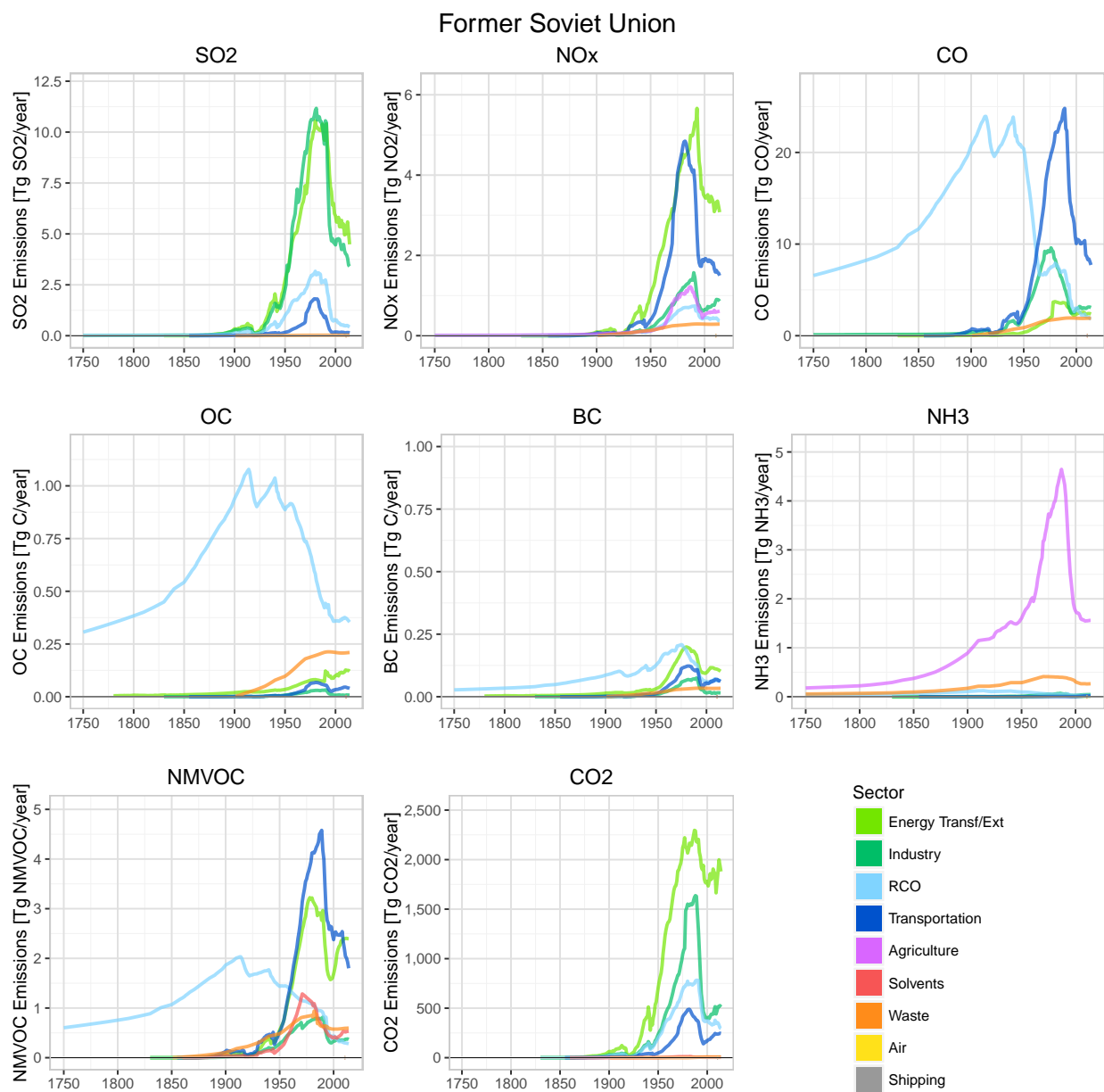


Figure S13: Former Soviet Union: CEDS emissions by aggregate sector

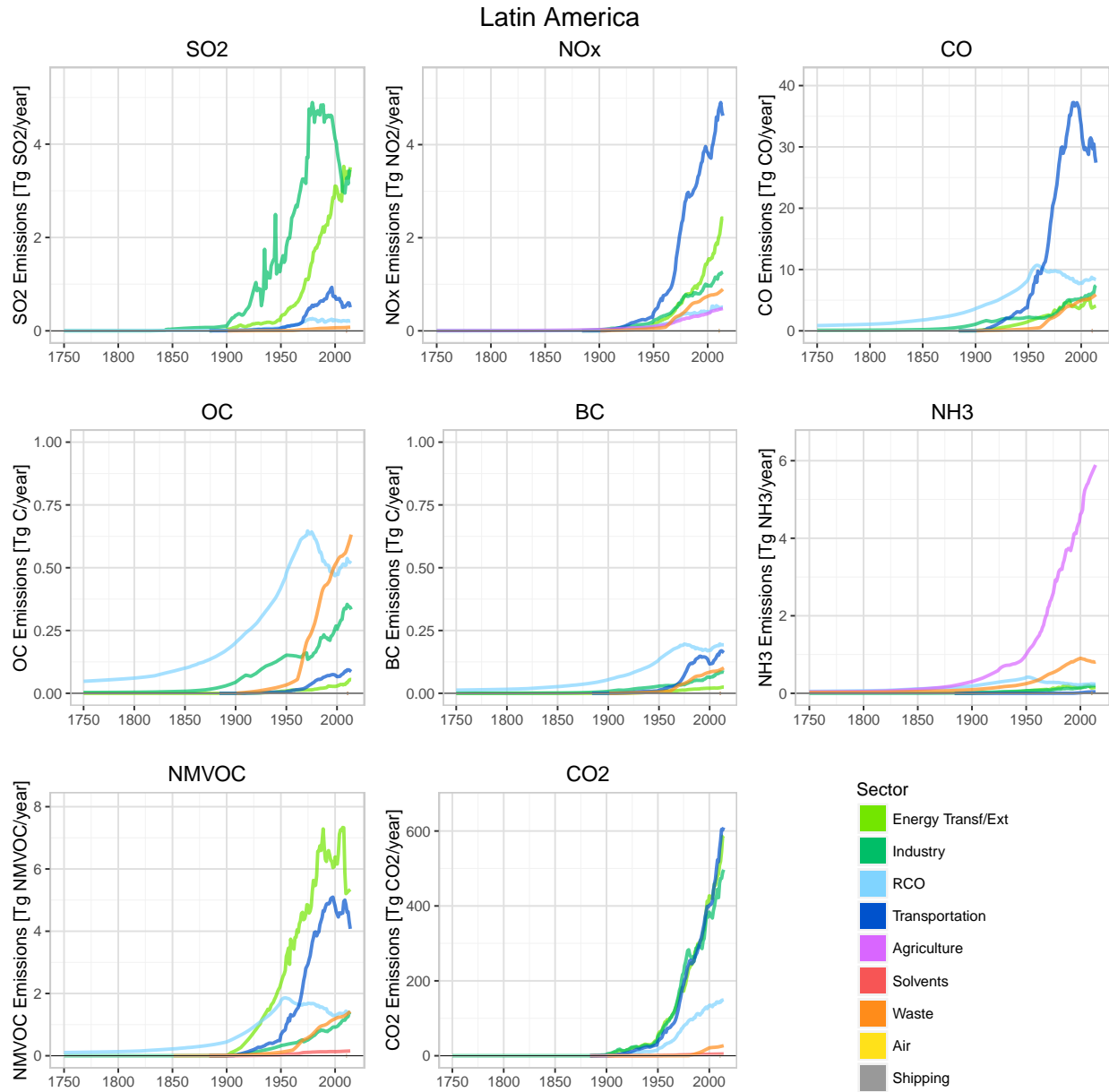


Figure S14: Latin America: CEDS emissions by aggregate sector

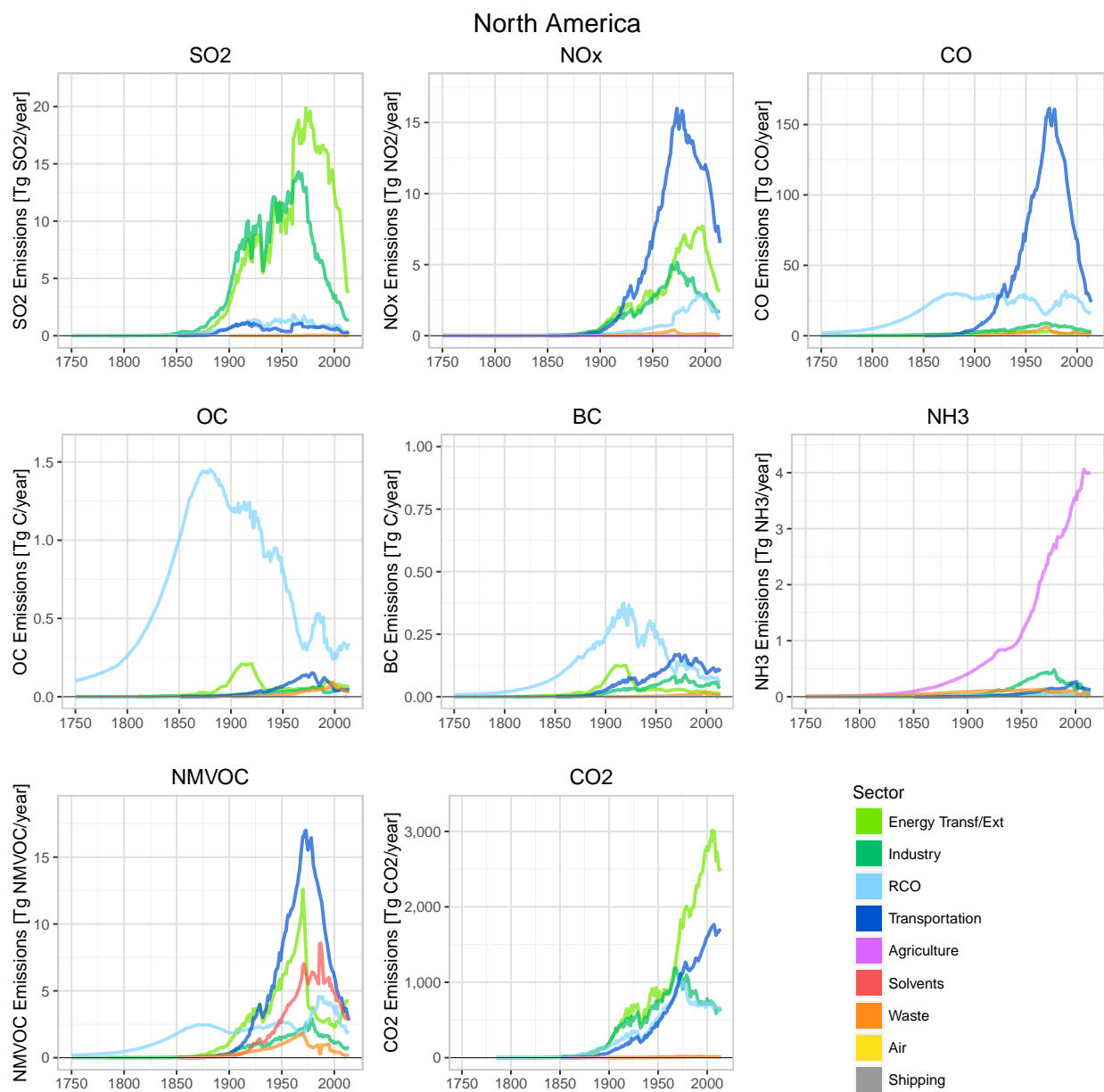


Figure S15: North America: CEDS emissions by aggregate sector

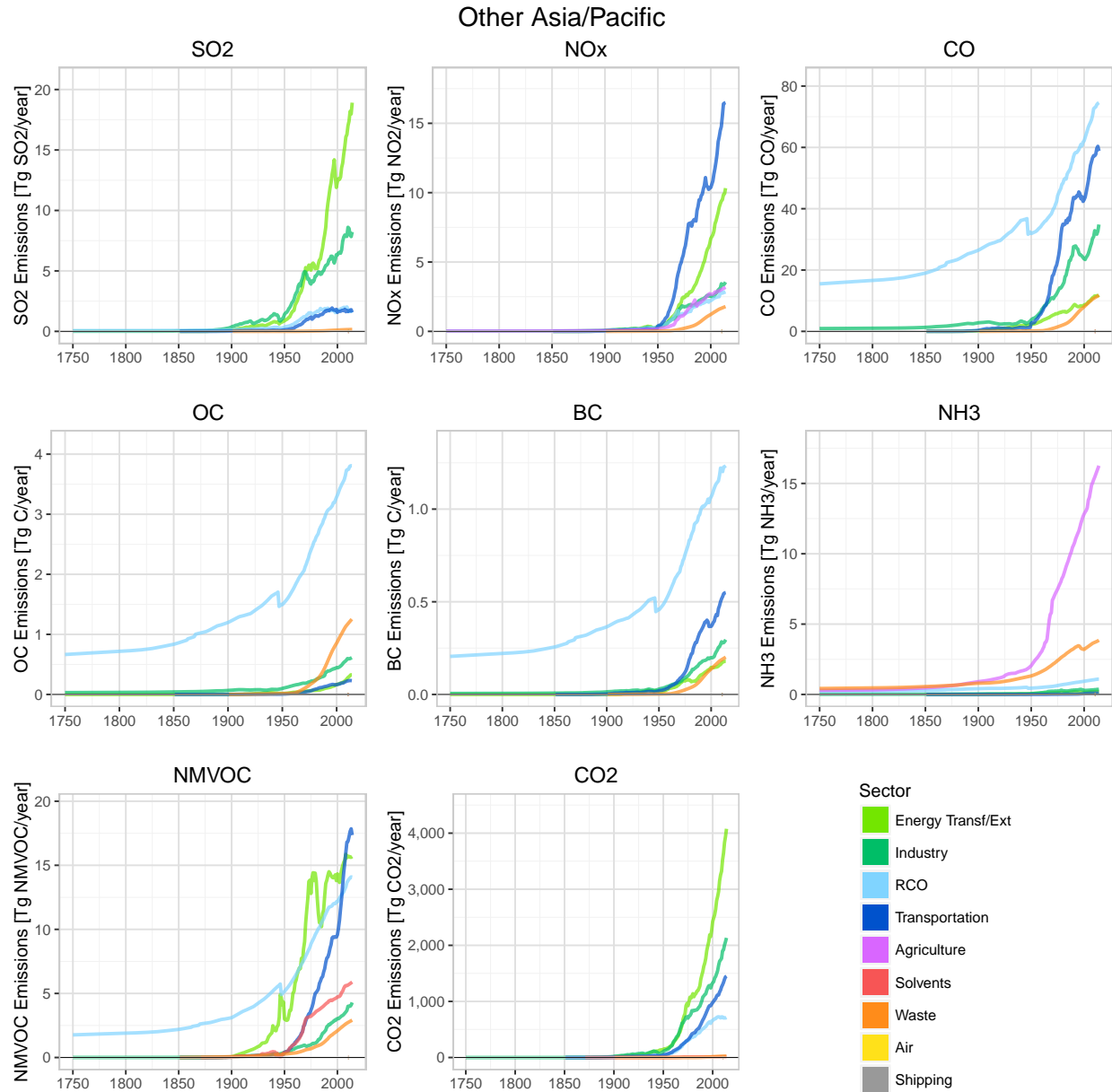


Figure S16: Other Asia/Pacific: CEDS emissions by aggregate sector

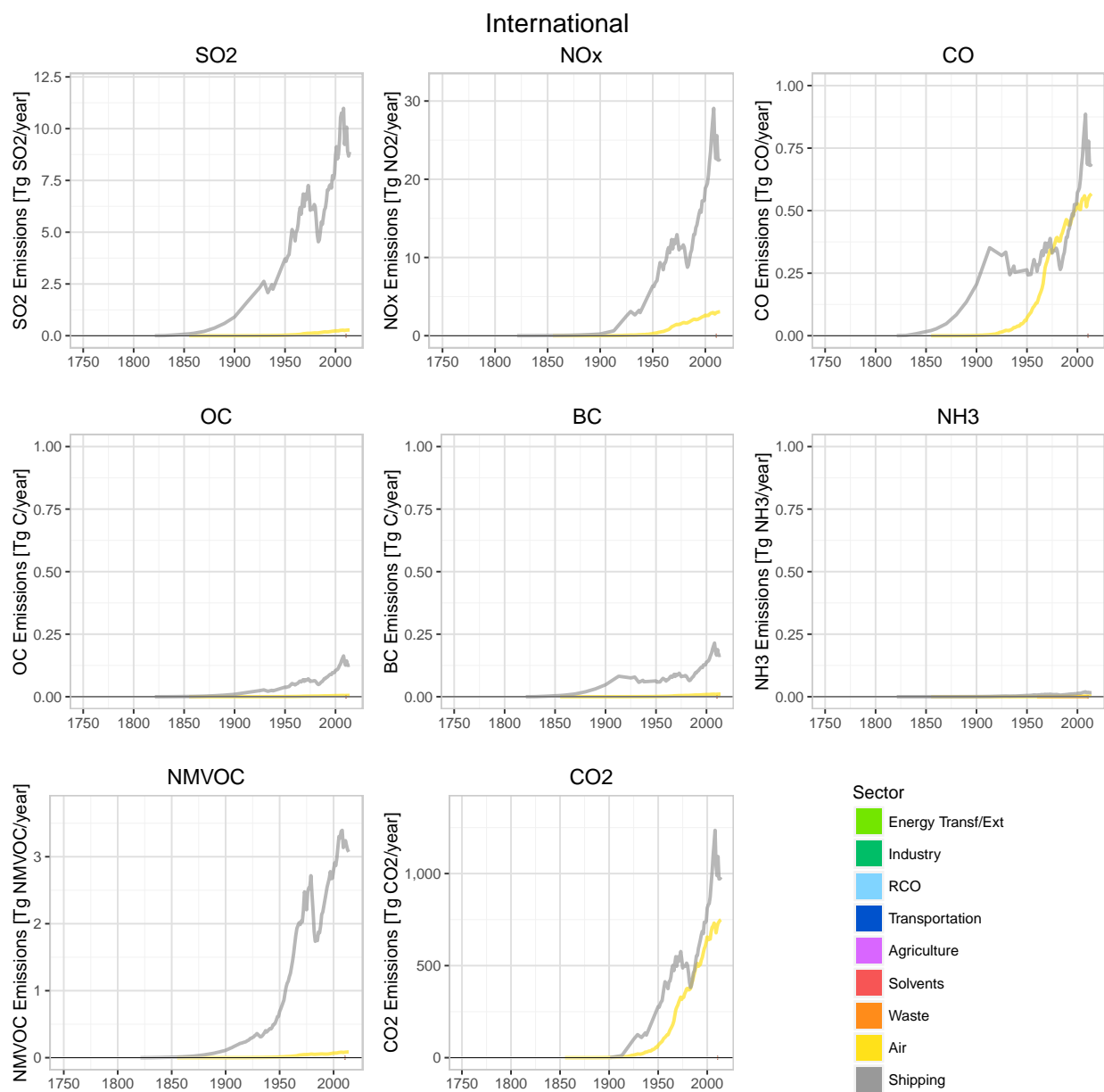


Figure S17: Global International Shipping and Aircraft: CEDS emissions by aggregate sector

## E. Recent CEDS Emissions (1990-2014): Sector Summaries by Region

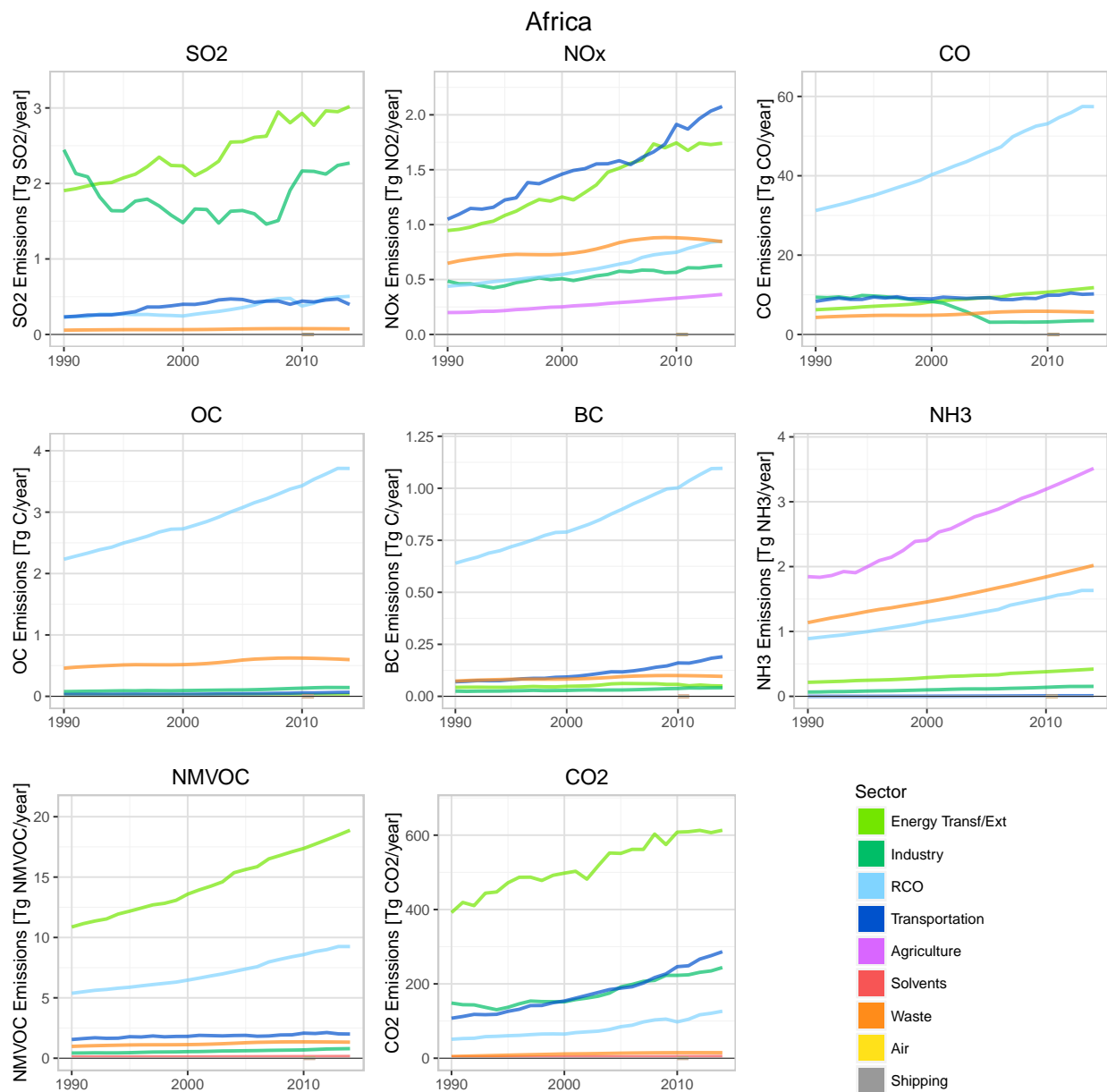


Figure S18: Recent CEDS Emissions: Africa emissions by Sector

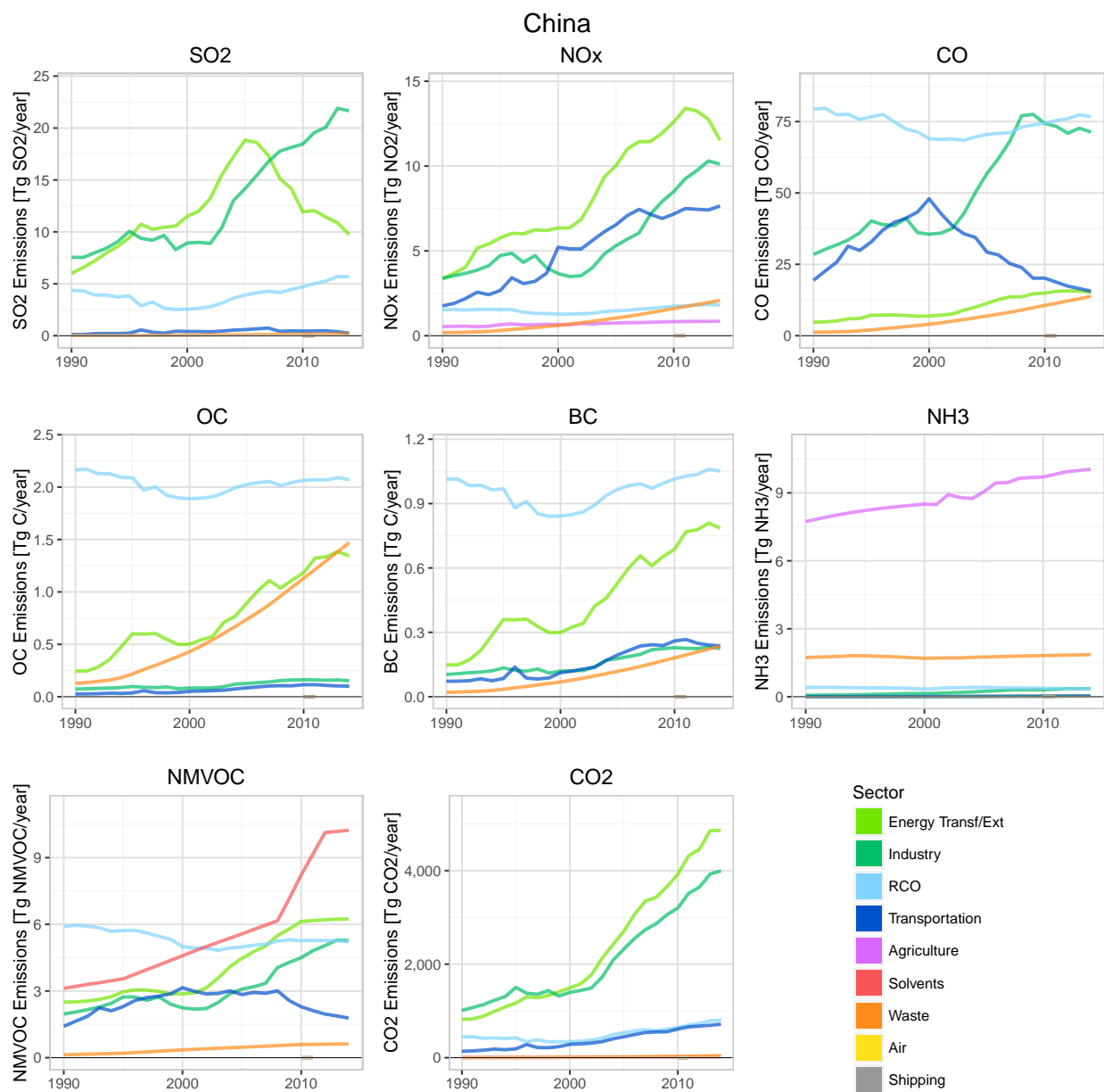


Figure S19: Recent CEDS Emissions: China emissions by Sector



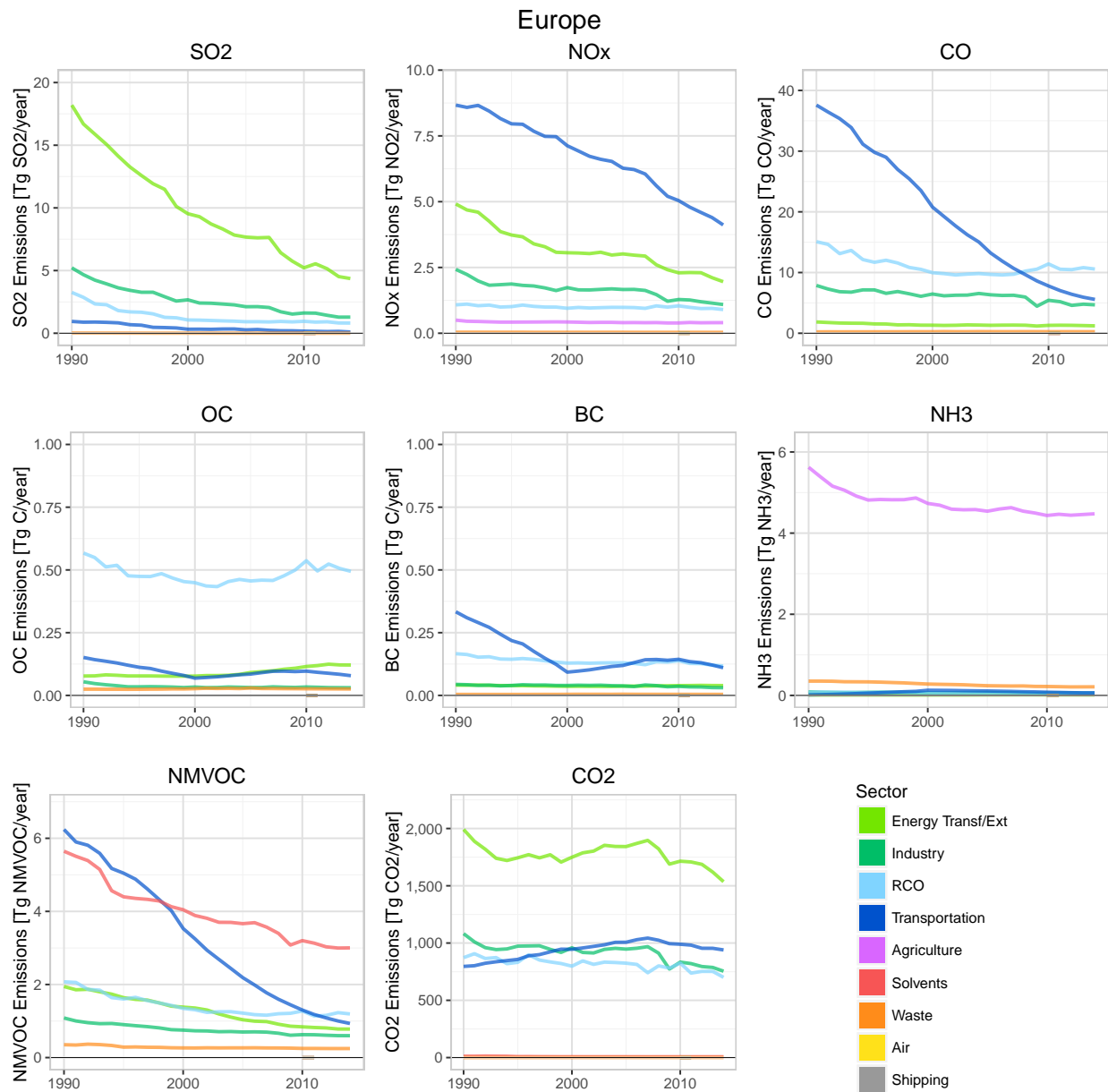


Figure S20: Recent CEDS Emissions: Europe emissions by Sector

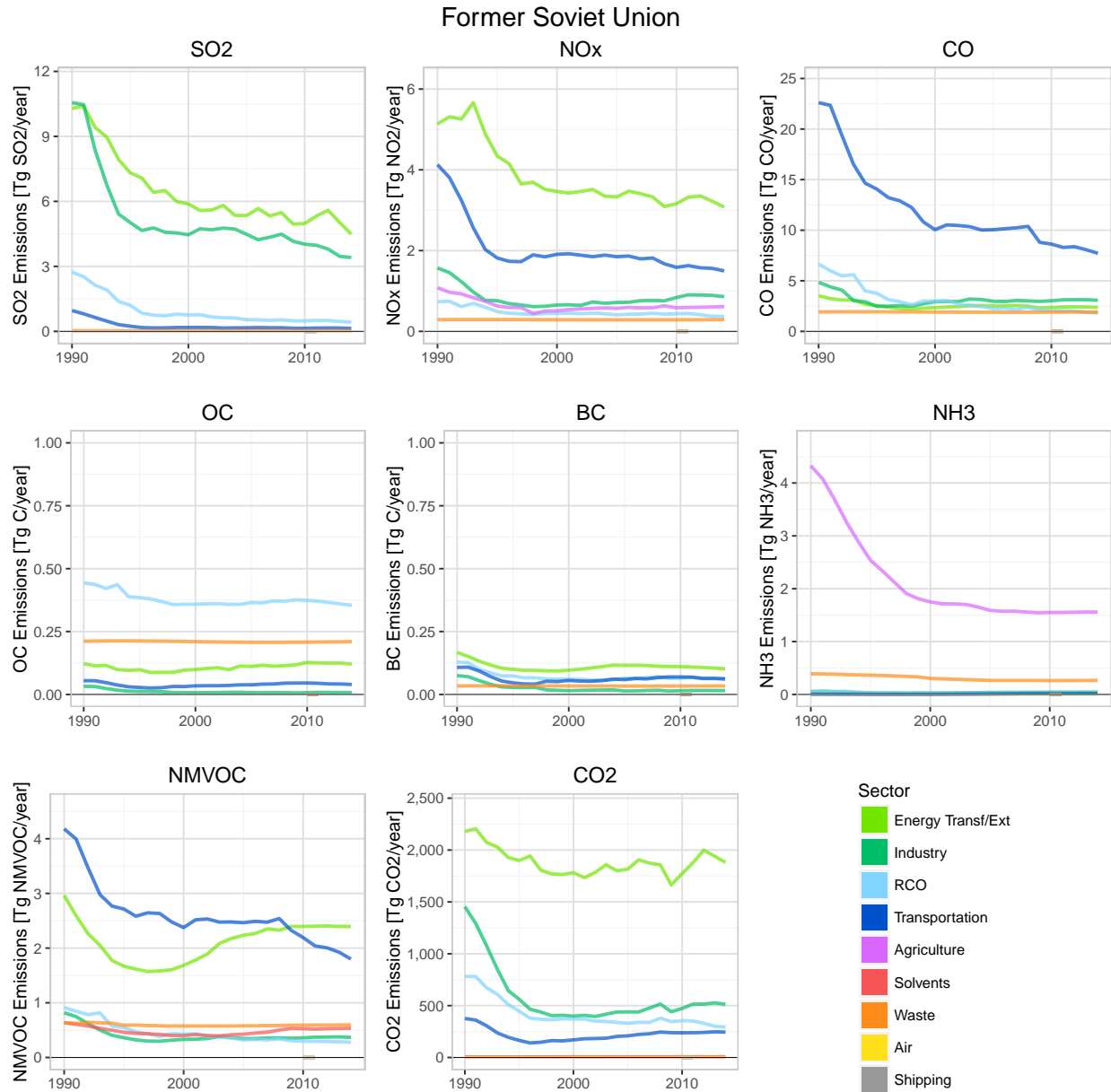


Figure S21: Recent CEDS Emissions: Former Soviet Union emissions by Sector

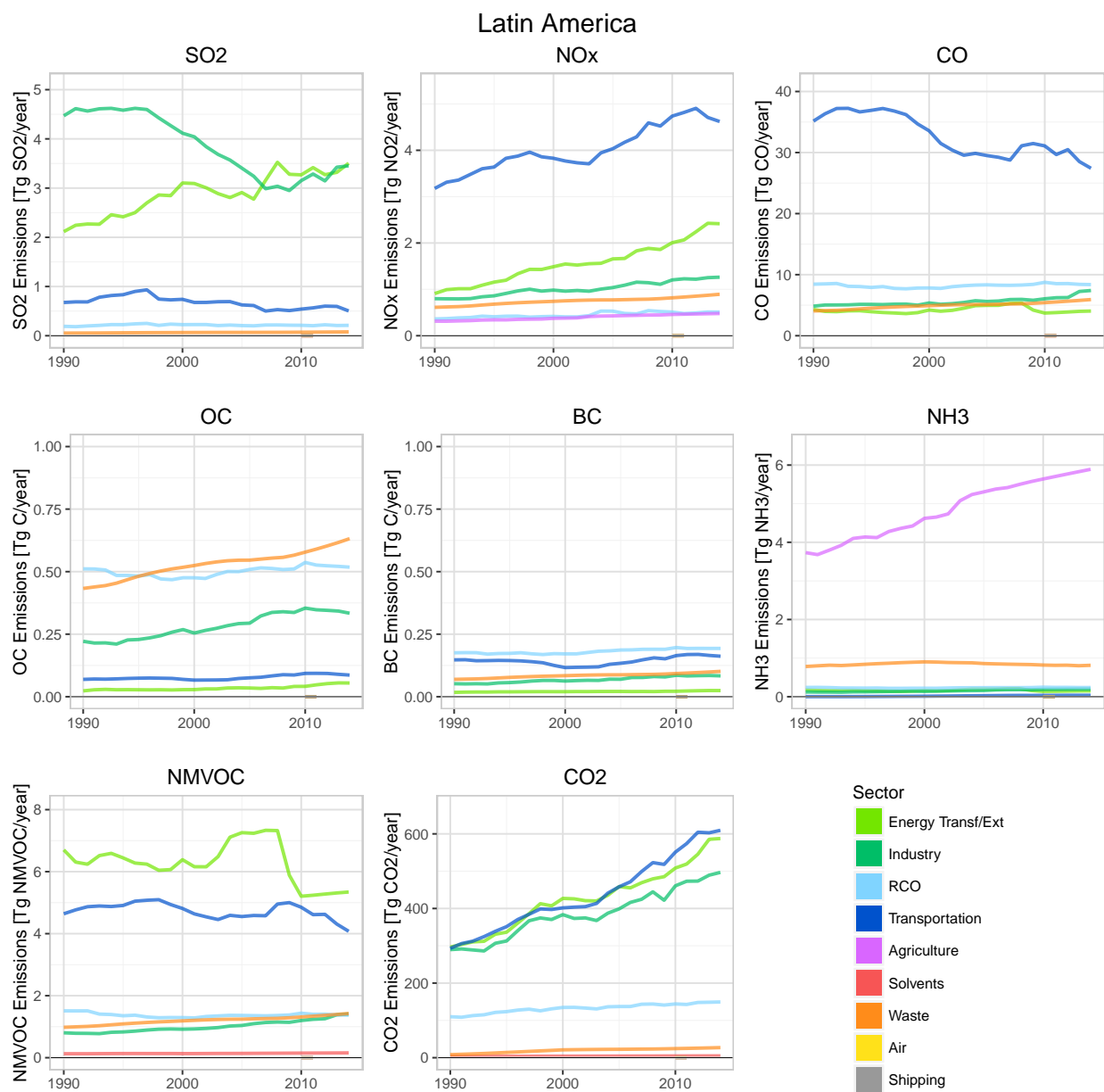


Figure S22: Recent CEDS Emissions: Latin America emissions by Sector

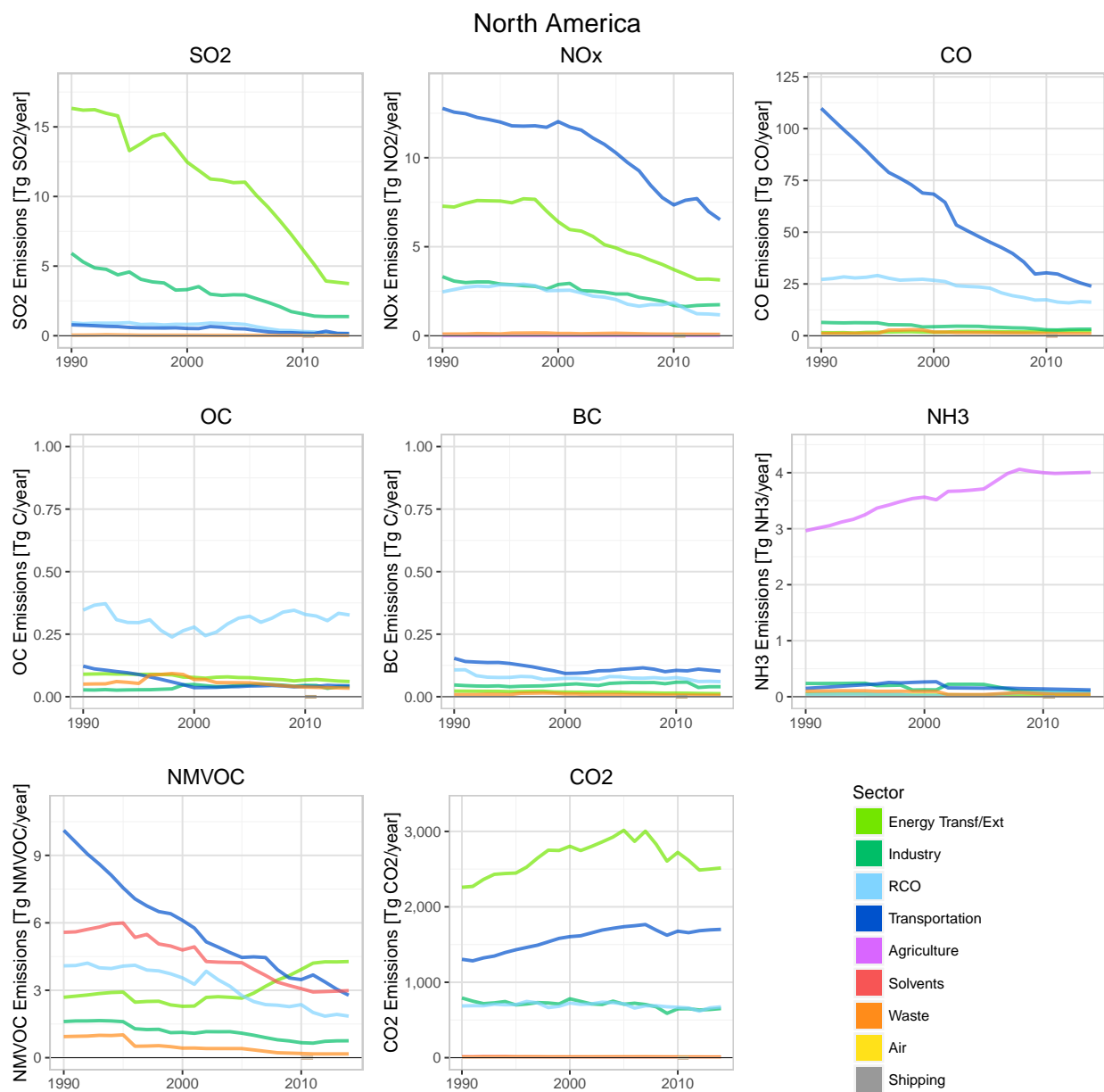


Figure S23: Recent CEDS Emissions: North America emissions by Sector

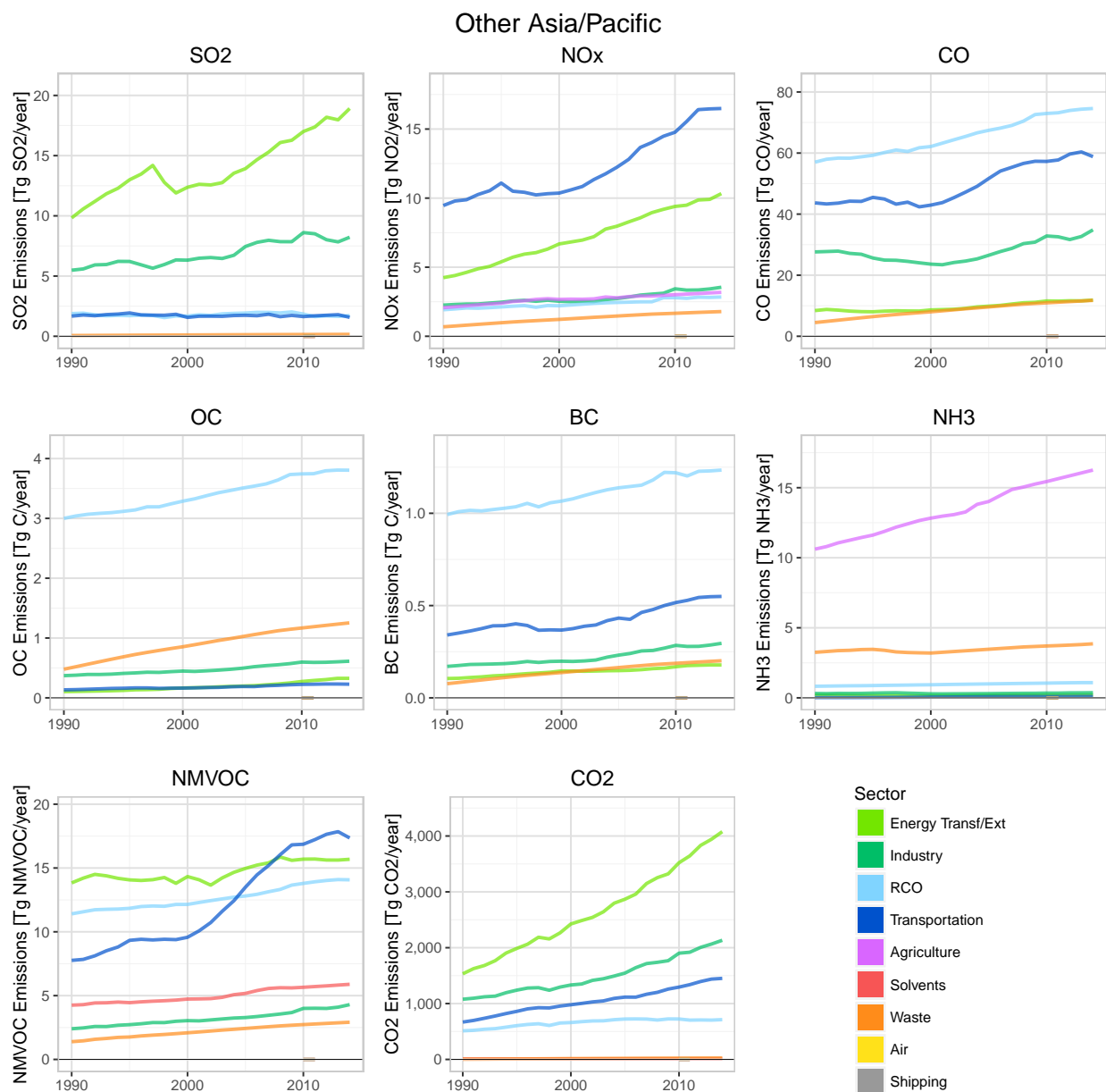


Figure S24: Recent CEDS Emissions: Other Asia emissions by Sector

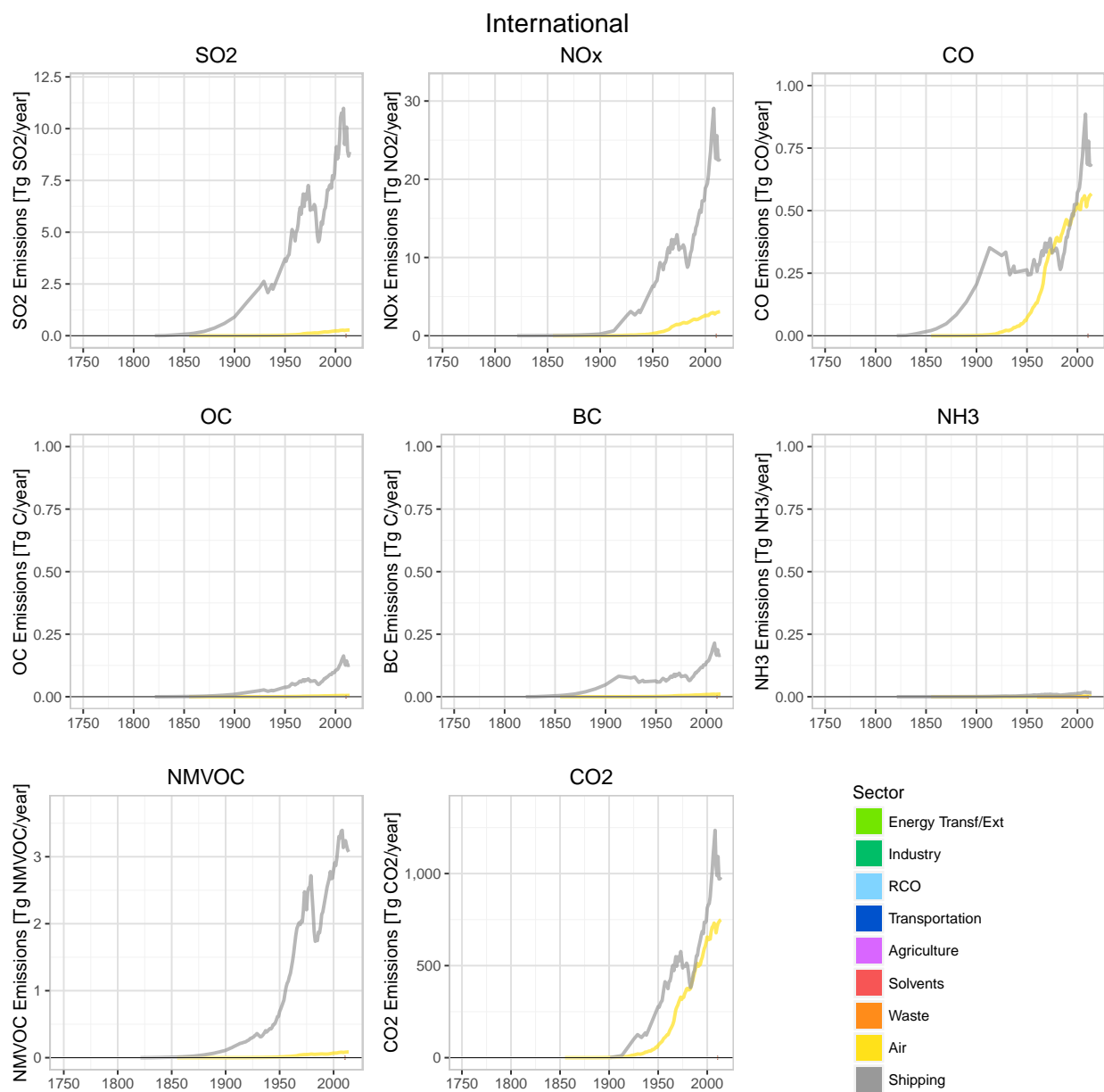


Figure S25: Recent CEDS Emissions: International Shipping and Aircraft emissions by Sector

## F. CEDS Emissions (1750 - 2014): Sector Summaries by Region

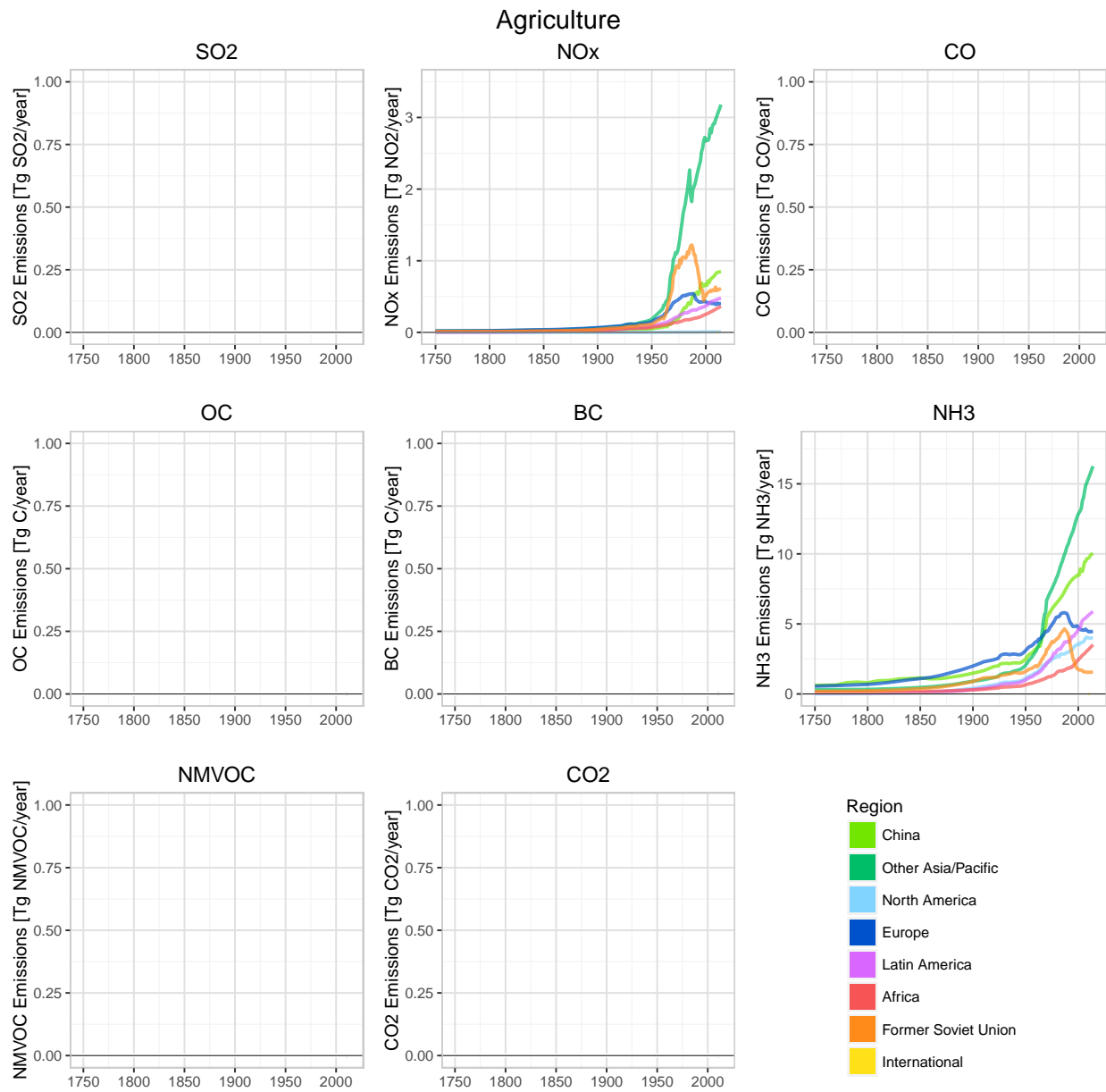


Figure S26: Recent CEDS Emissions: Agriculture emissions by Region

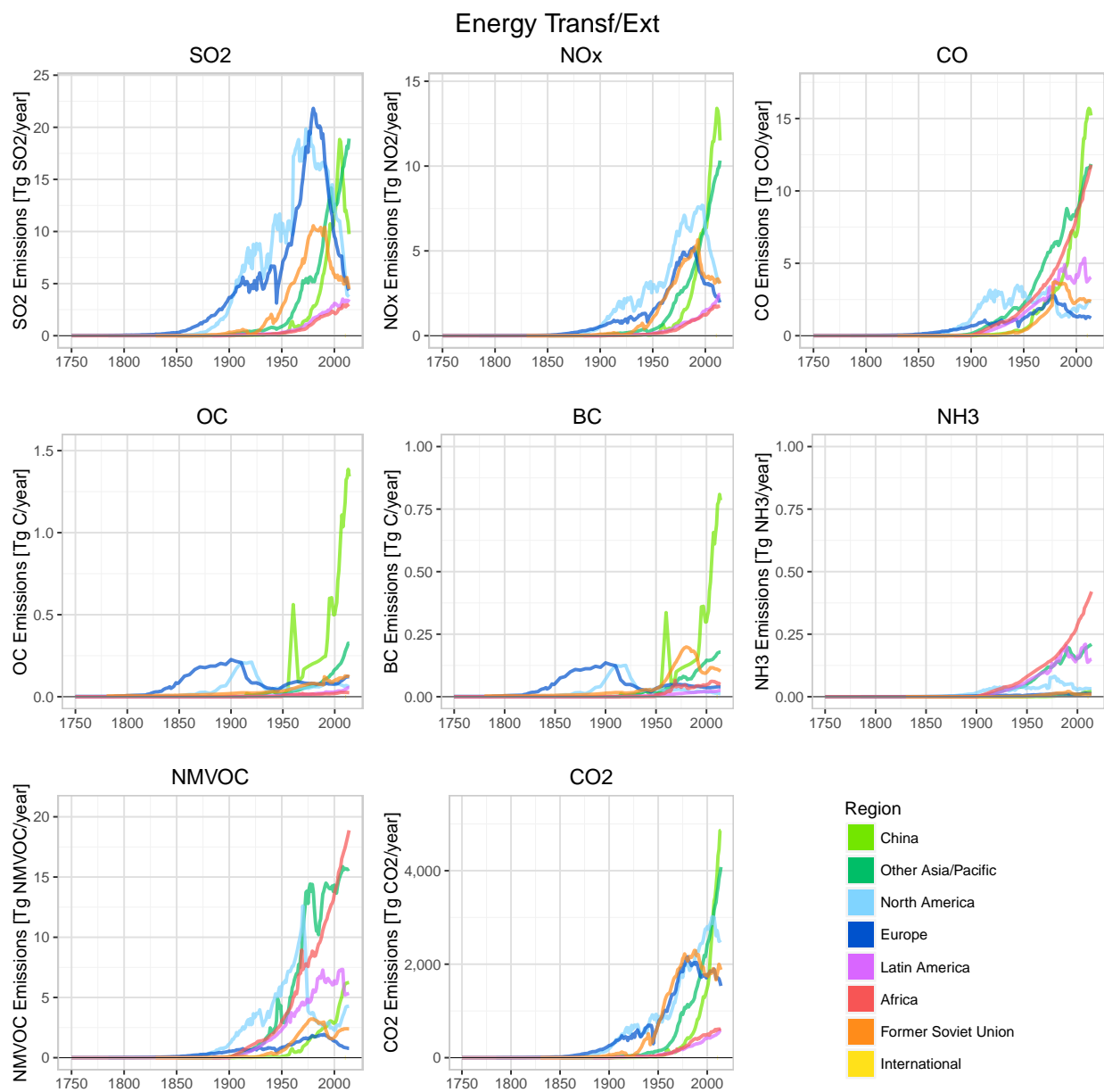


Figure S27: Recent CEDS Emissions: Energy, Transformation, and Extraction emissions by Region



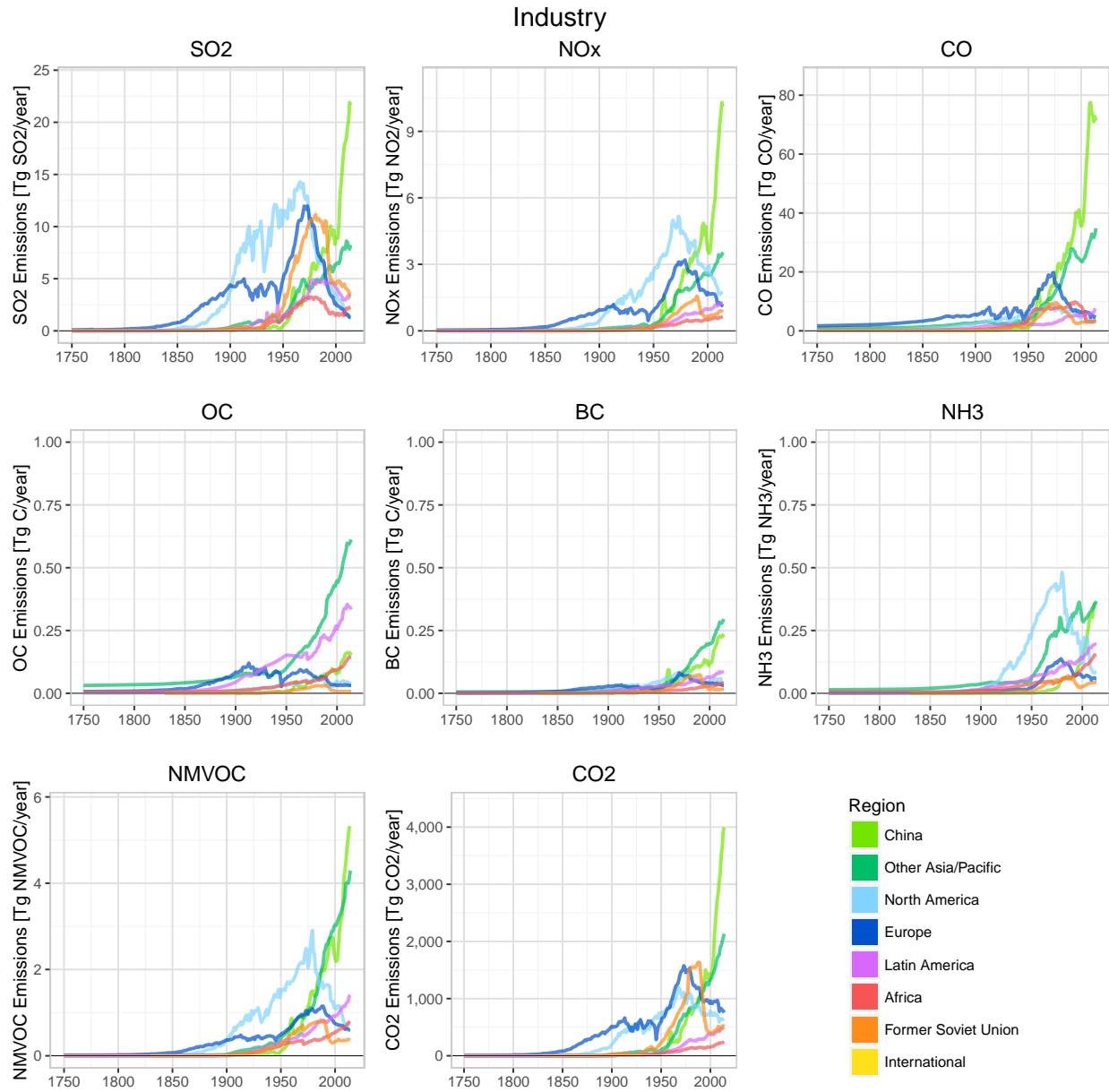


Figure S28: Recent CEDS Emissions: Industry emissions by Region

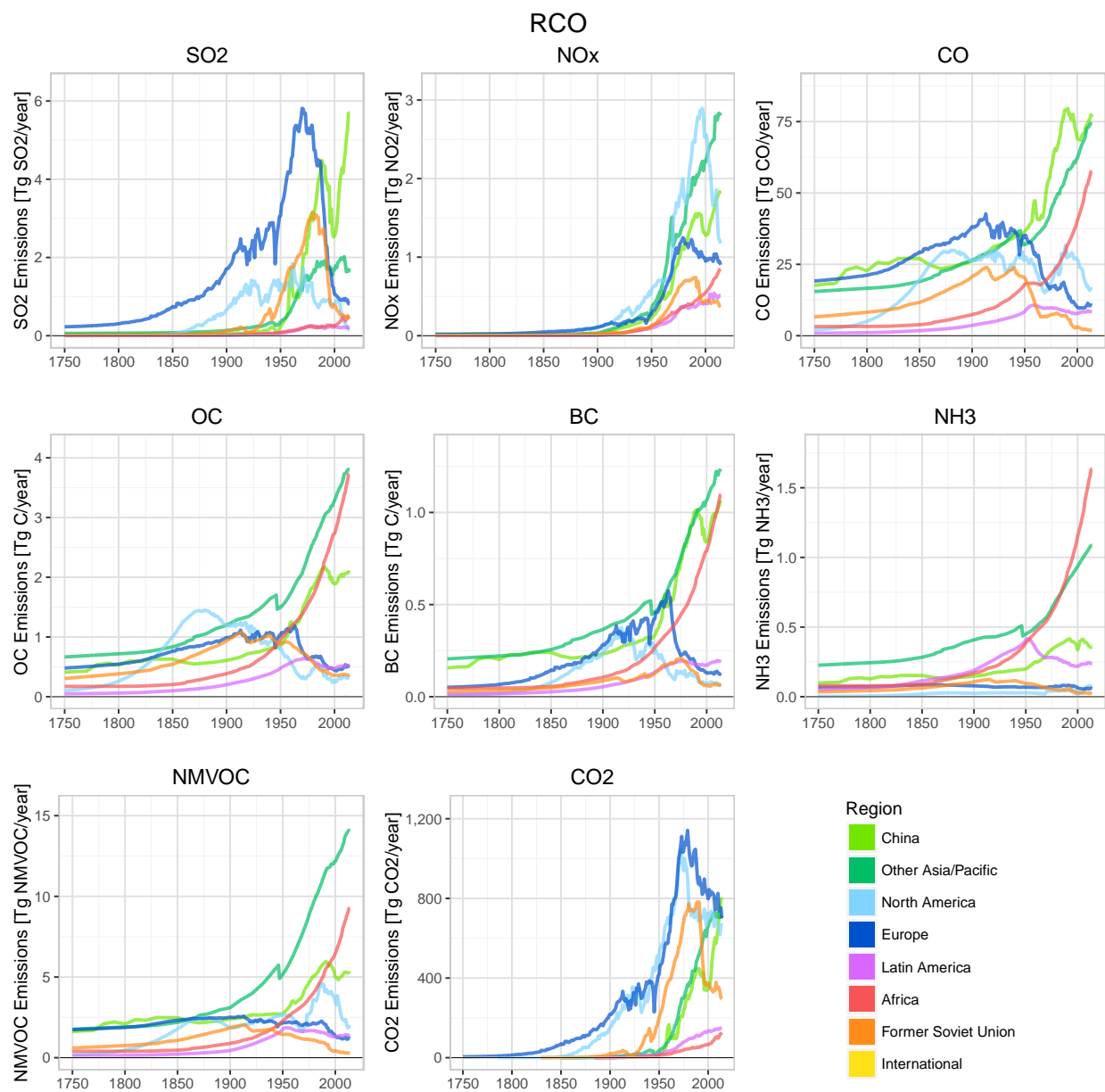


Figure S29: Recent CEDS Emissions: RCO emissions by Region

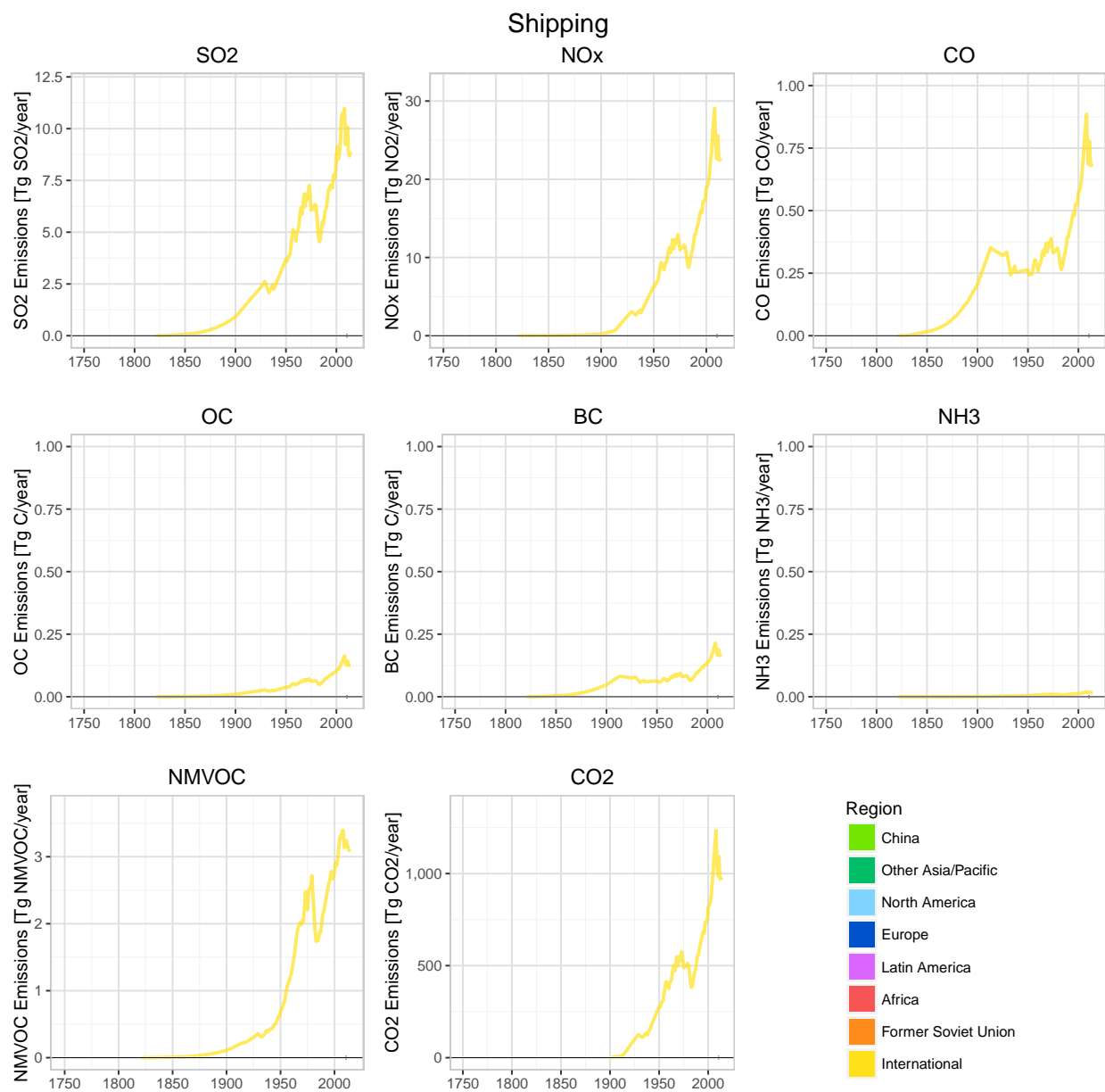


Figure S30: Recent CEDS Emissions: Shipping emissions by Region

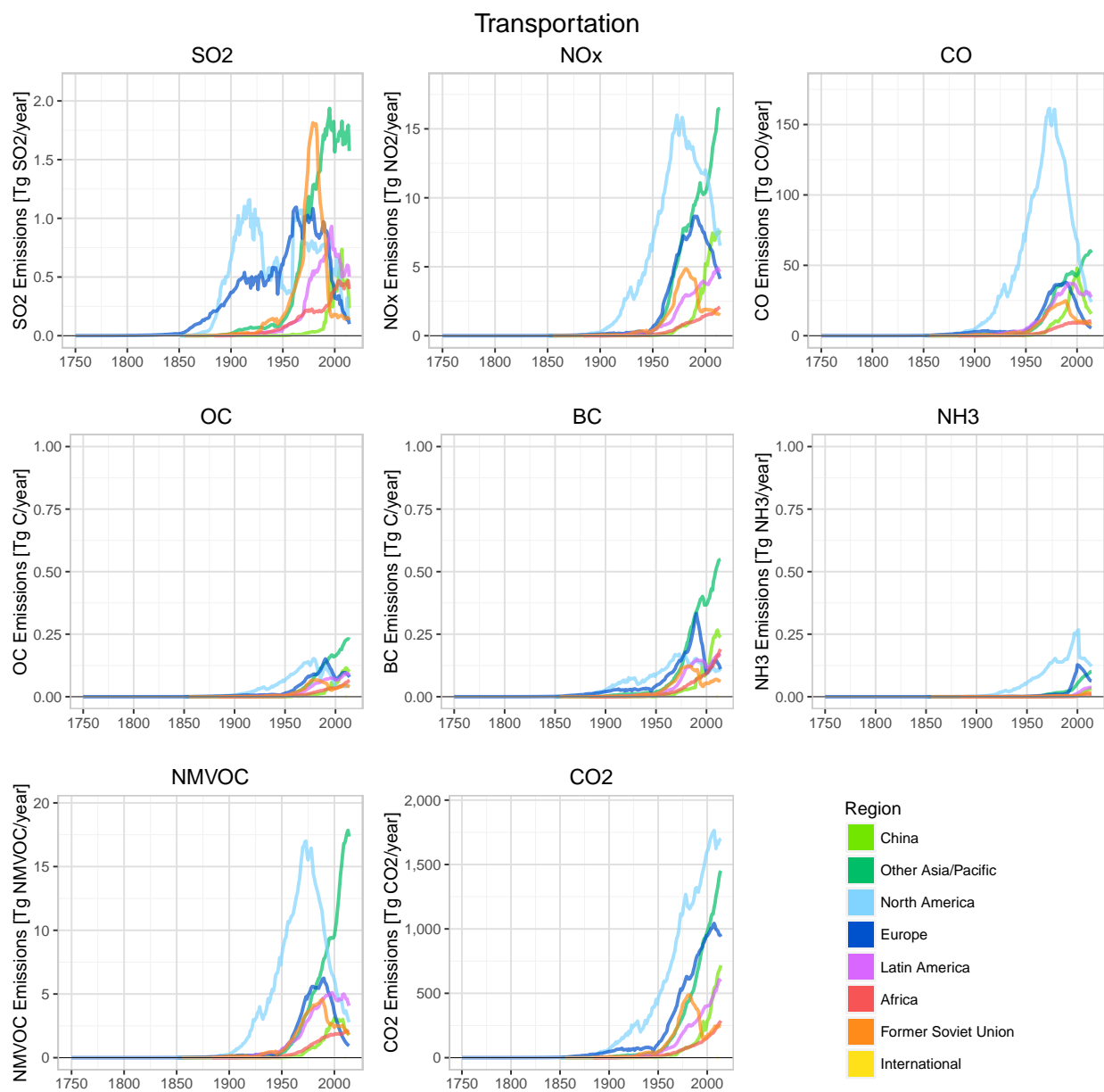


Figure S31: Recent CEDS Emissions: Transportation emissions by Region

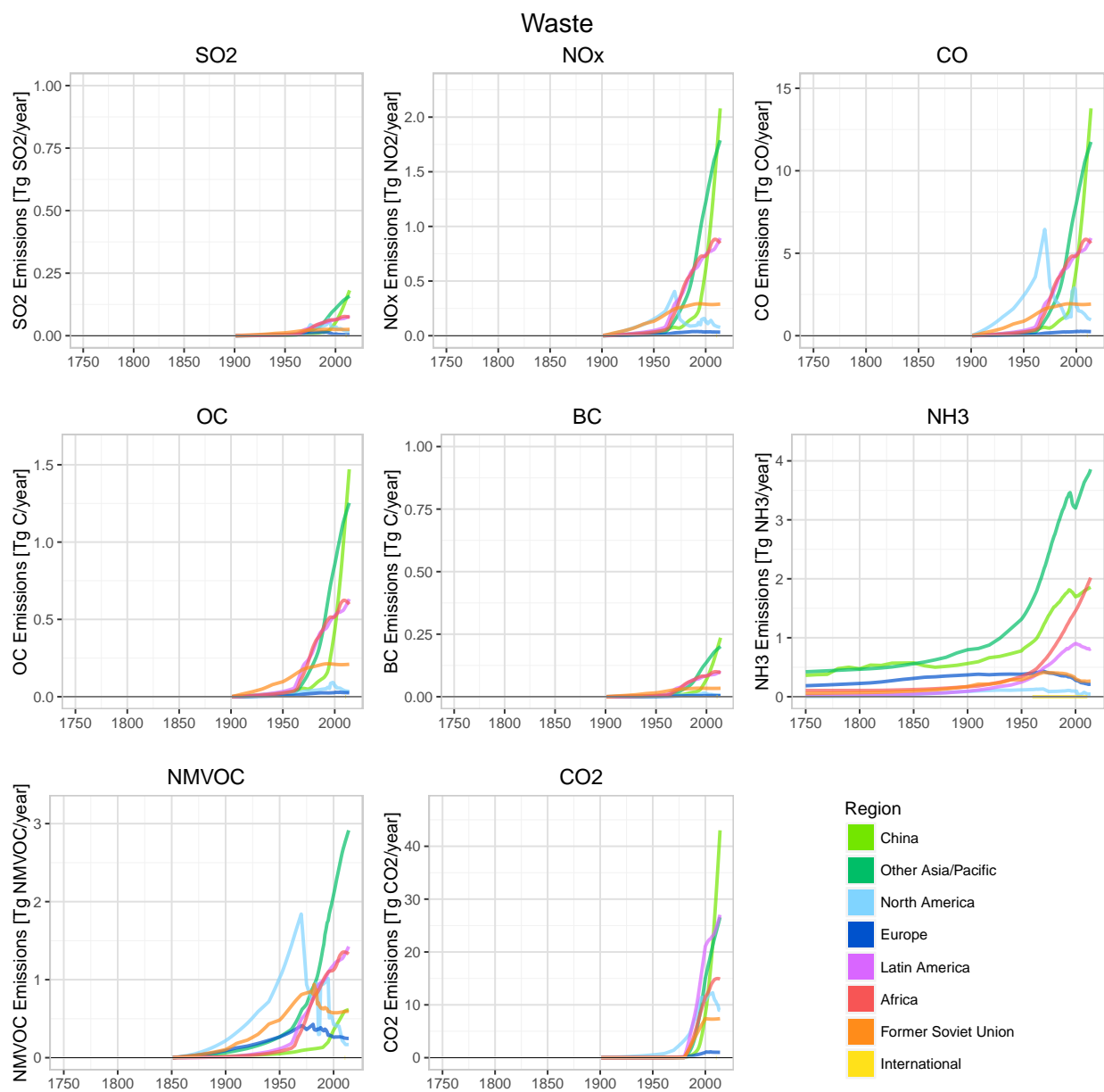


Figure S32: Recent CEDS Emissions: Waste emissions by Region

## G. Recent CEDS Emissions (1990-2014): Sector Summaries by Region

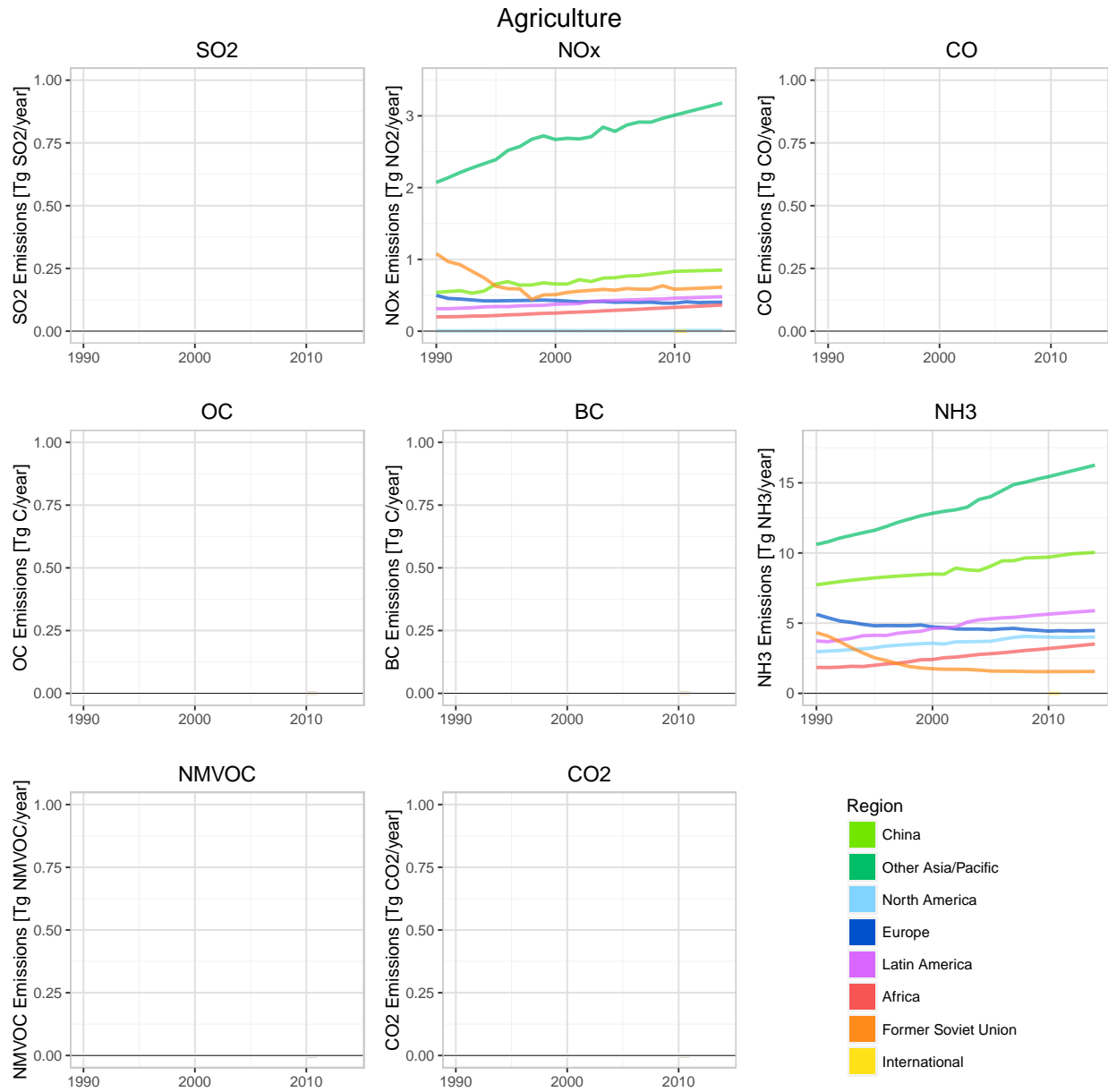


Figure S33: Recent CEDS Emissions: Agriculture emissions by Region

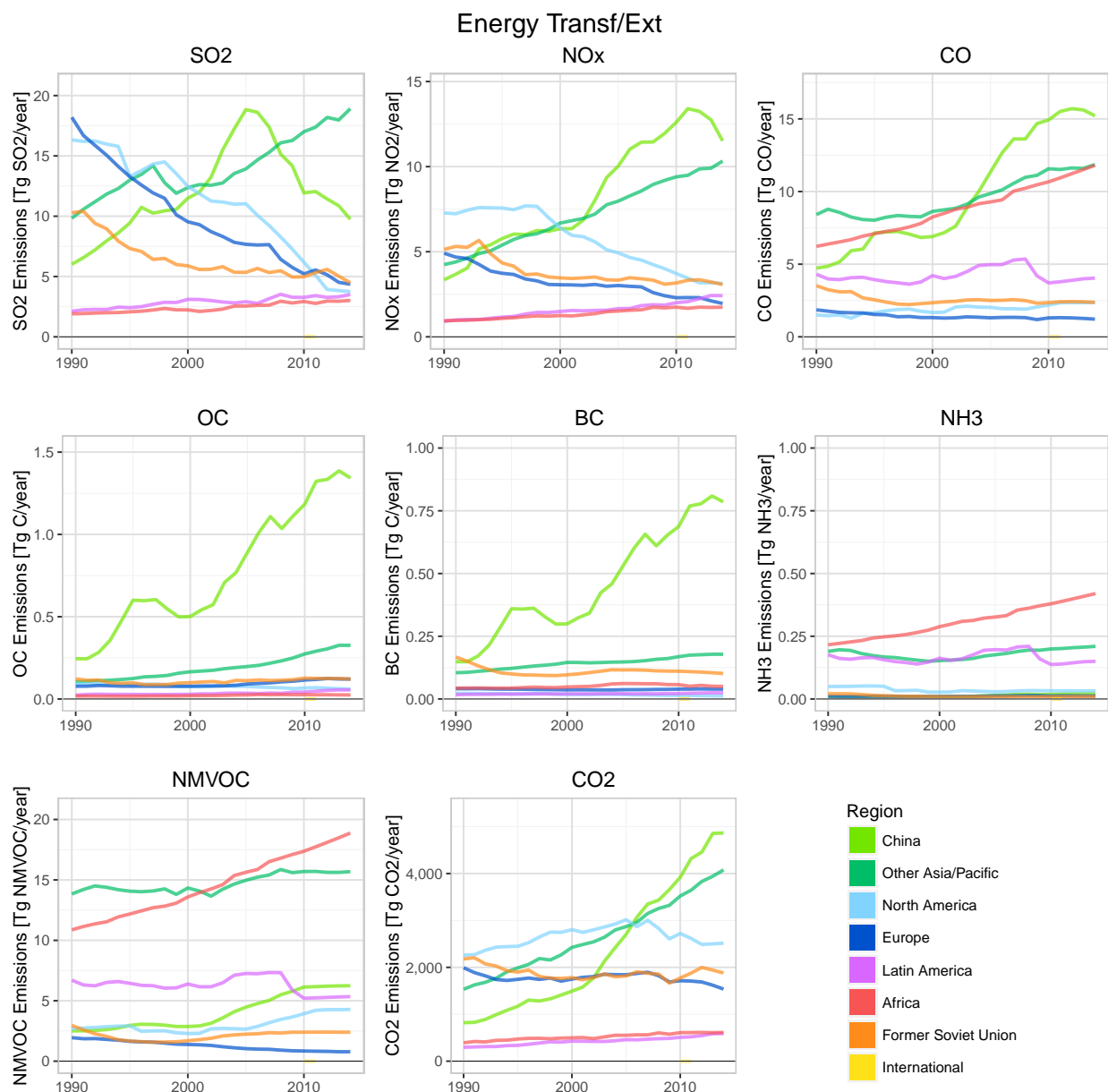


Figure S34: Recent CEDS Emissions: Energy, Transformation, and Extraction emissions by Region

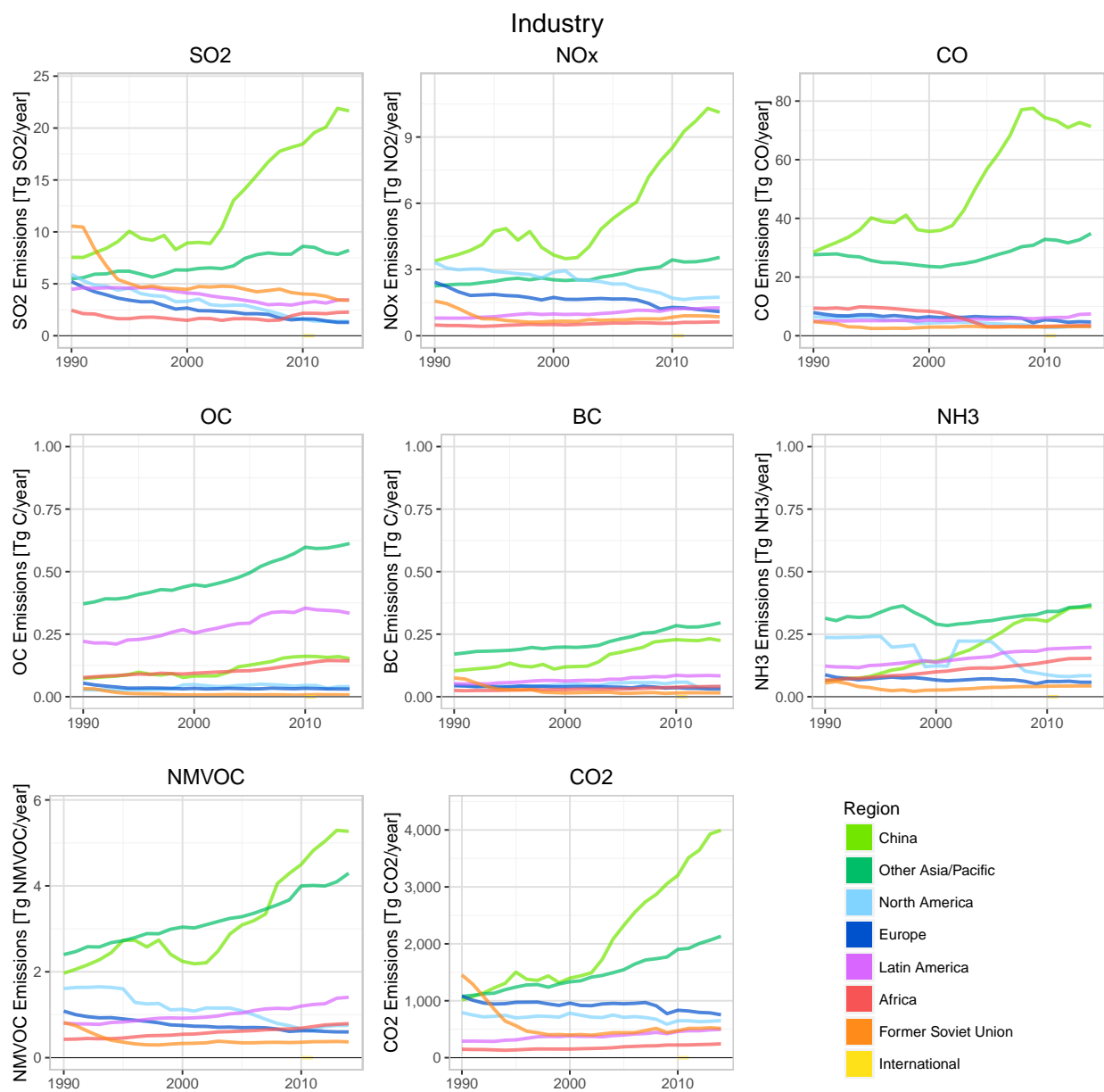


Figure S35: Recent CEDS Emissions: Industry emissions by Region



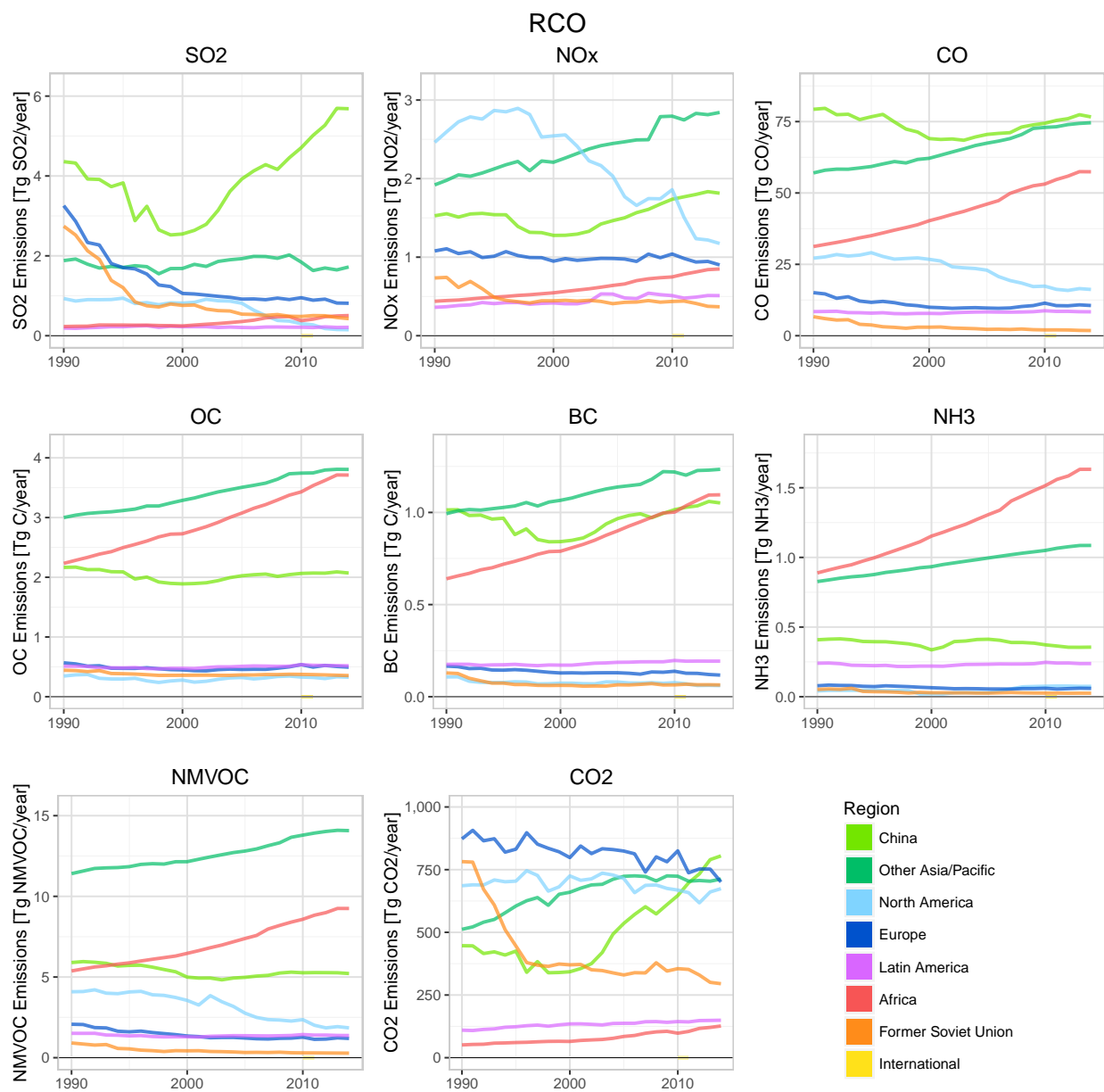


Figure S36: Recent CEDS Emissions: RCO emissions by Region

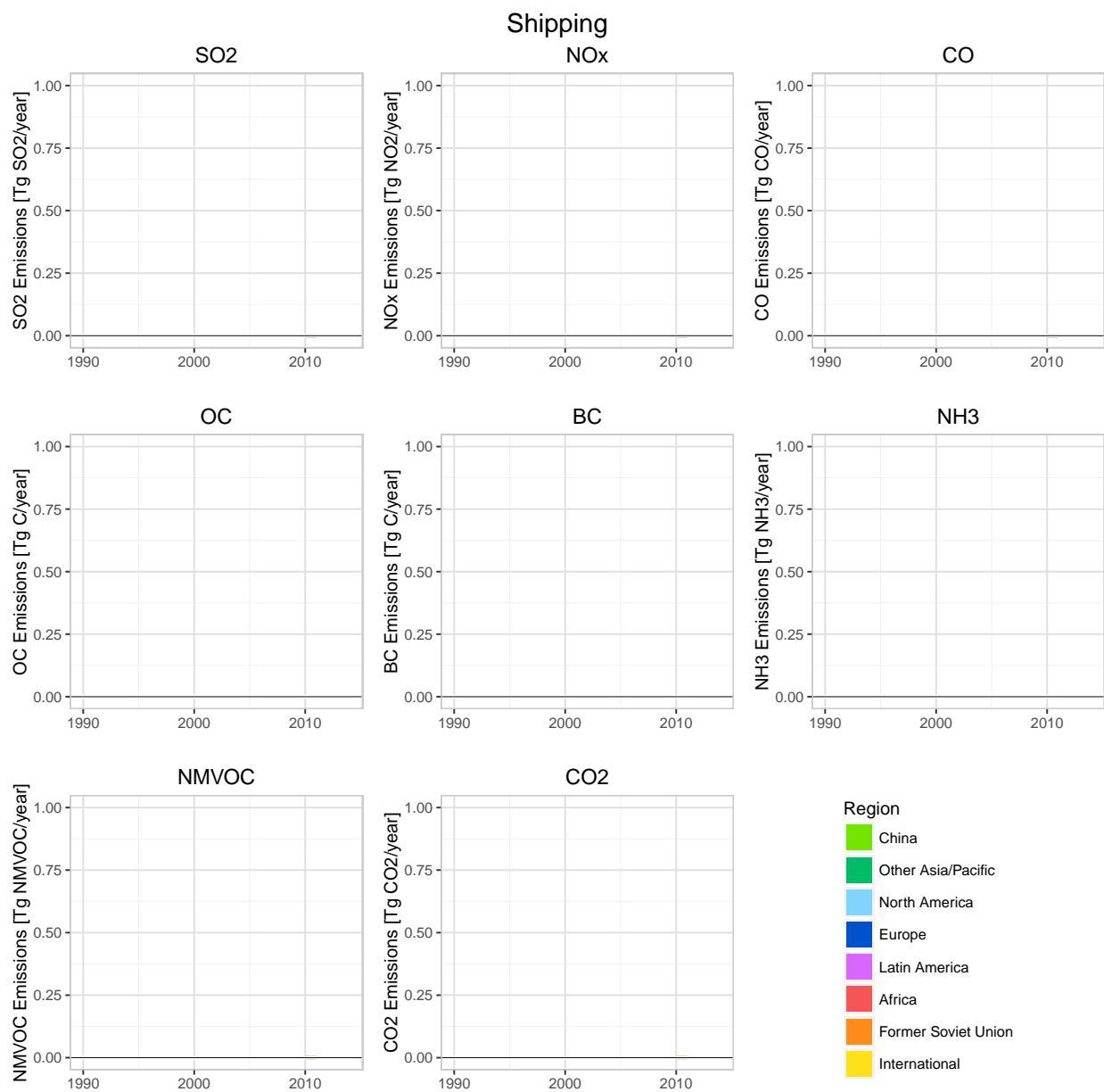


Figure S37: Recent CEDS Emissions: Shipping emissions by Region

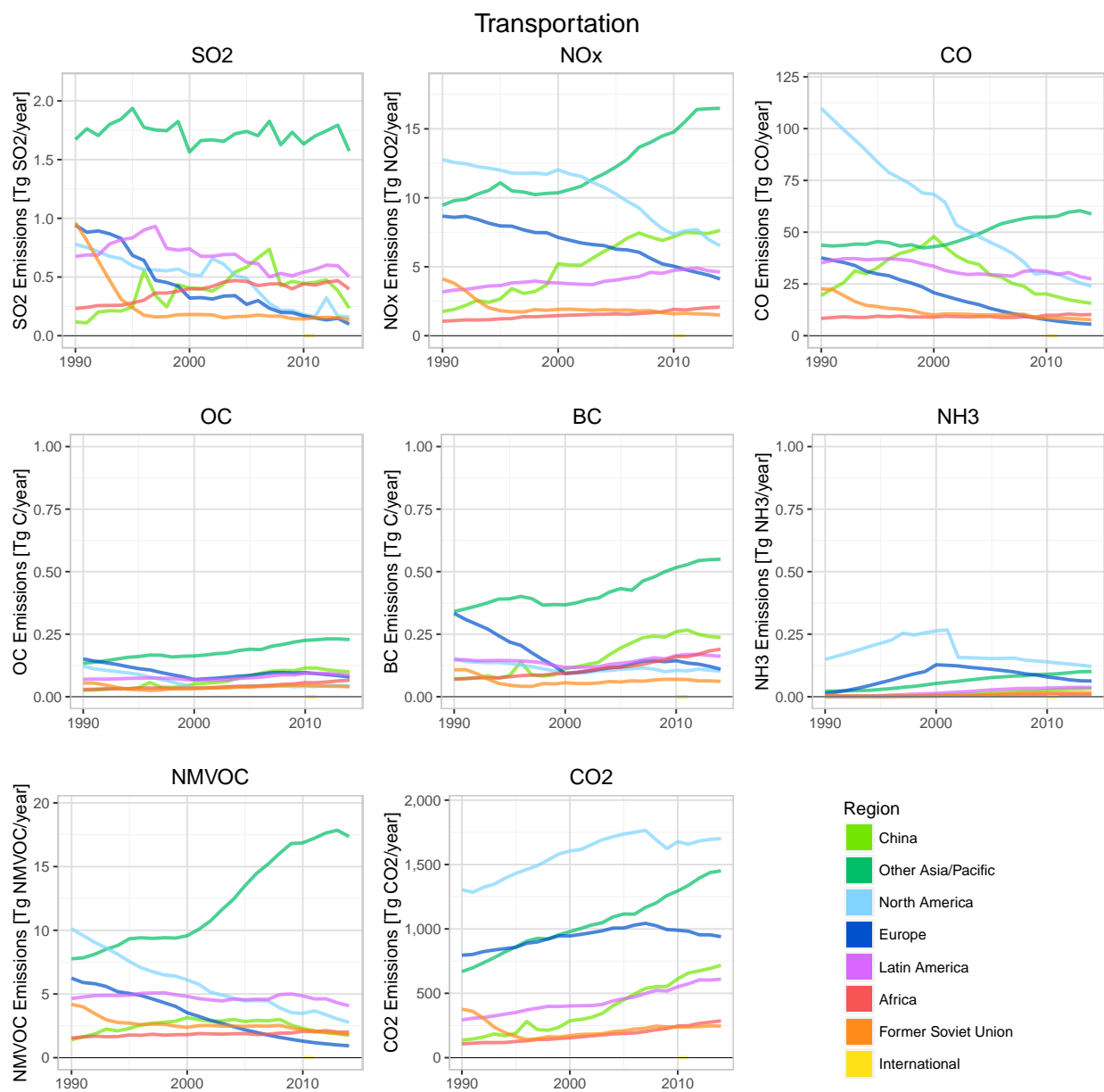


Figure S38: Recent CEDS Emissions: Transportation emissions by Region

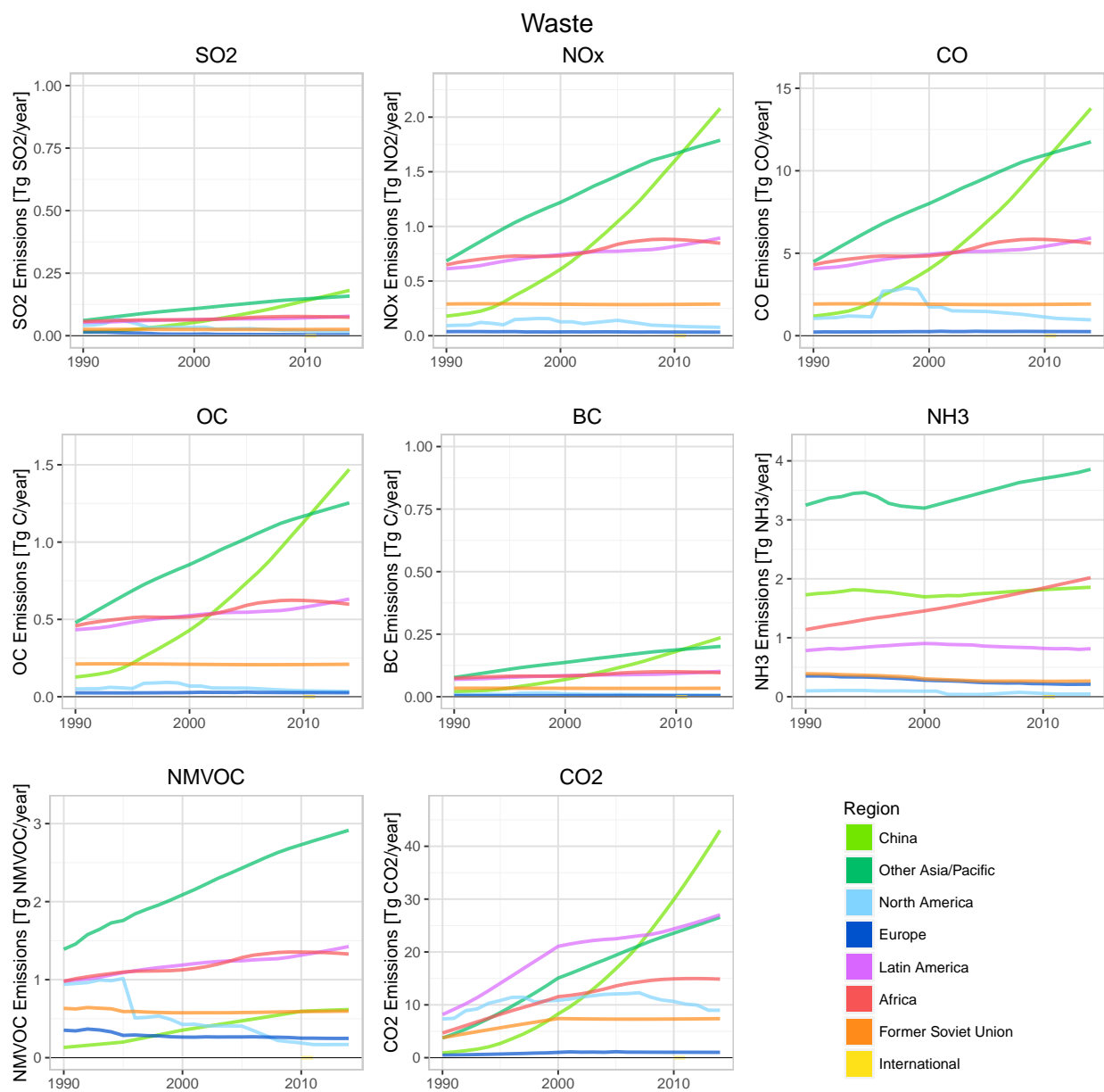


Figure S39: Recent CEDS Emissions: Waste emissions by Region

## H. Comparisons to Other Inventories

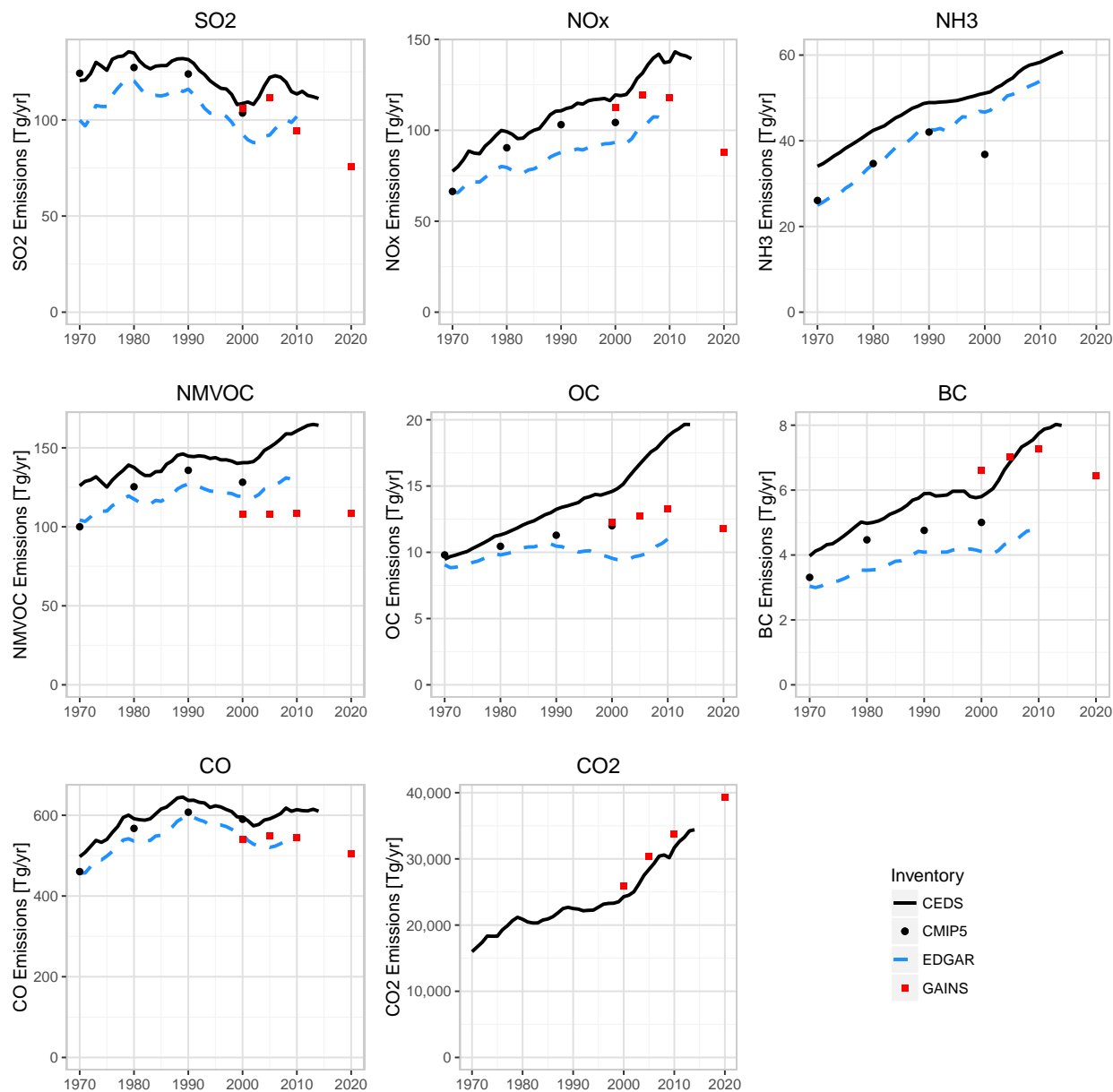


Figure S40: Like with like comparison of global CEDS emissions with EDGAR, GAINS, CMIP5, and CDIAC (for CO<sub>2</sub> only)

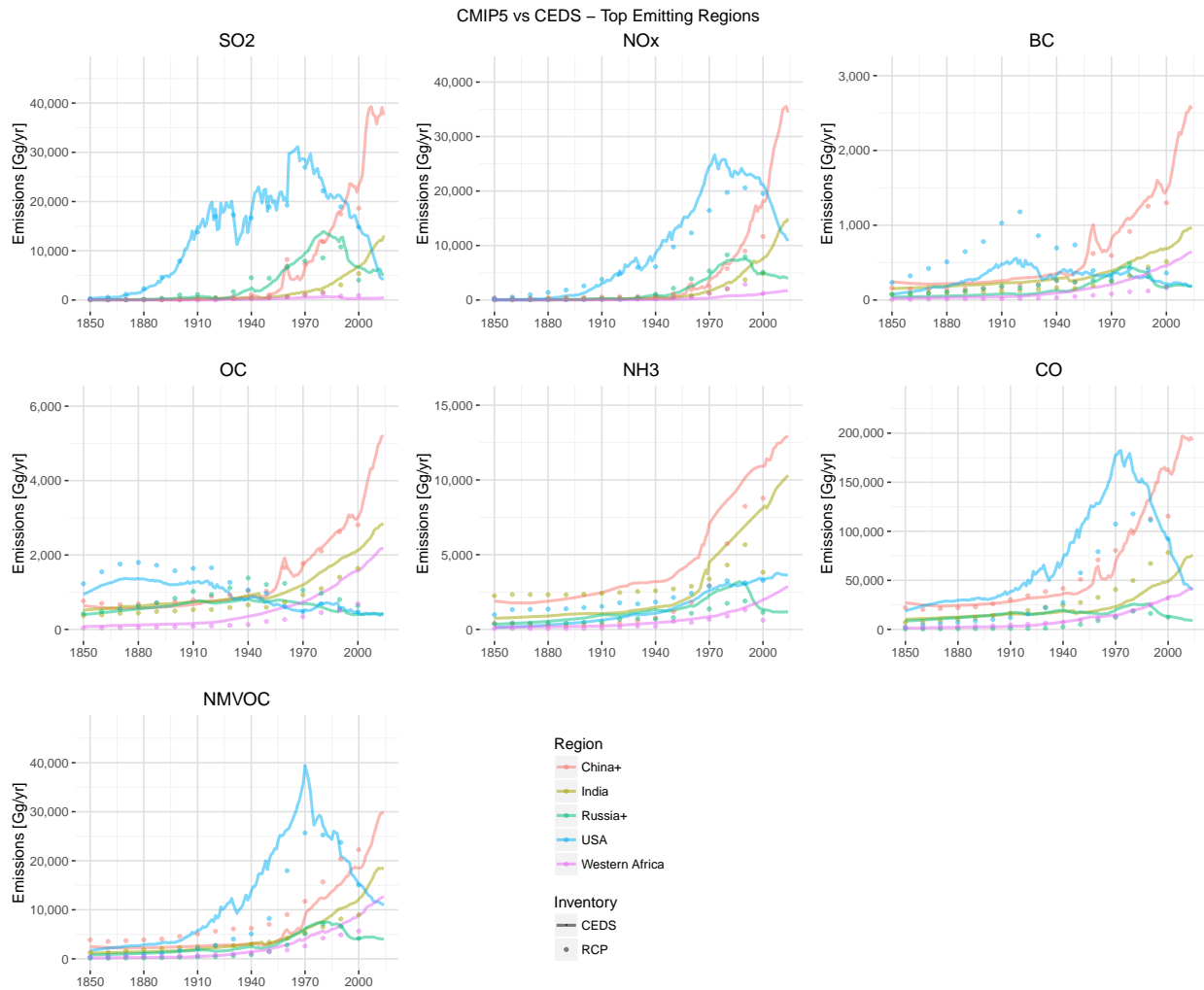


Figure S41: CEDS versus CMIP5: Top 5 emitting regions (CMIP 5 definitions) compared to comparable CEDS regions. Like with like comparison of regional emissions of top emitters. These figures do not include open burning (grassland or forest fires), fossil-fuel fires, agricultural waste burning on fields, or aviation. "China+" includes China, Hong Kong, Macau, Mongolia, and Chinese Taipei. "Russia+" includes Russia, Armenia, Azerbaijan, and Georgia. "Western Africa" includes Benin, Burkina Faso, Central African Republic, Cote d'Ivoire, Cameroon, DR Congo, Congo, Cape Verde, Gabon, Ghana, Guinea, Gambia, Guinea-Bissau, Equatorial Guinea, Liberia, Mali, Mauretania, Niger, Nigeria, Senegal, St Helena, Sierra Leone, Sao Tome and Principe, Chad, and Togo

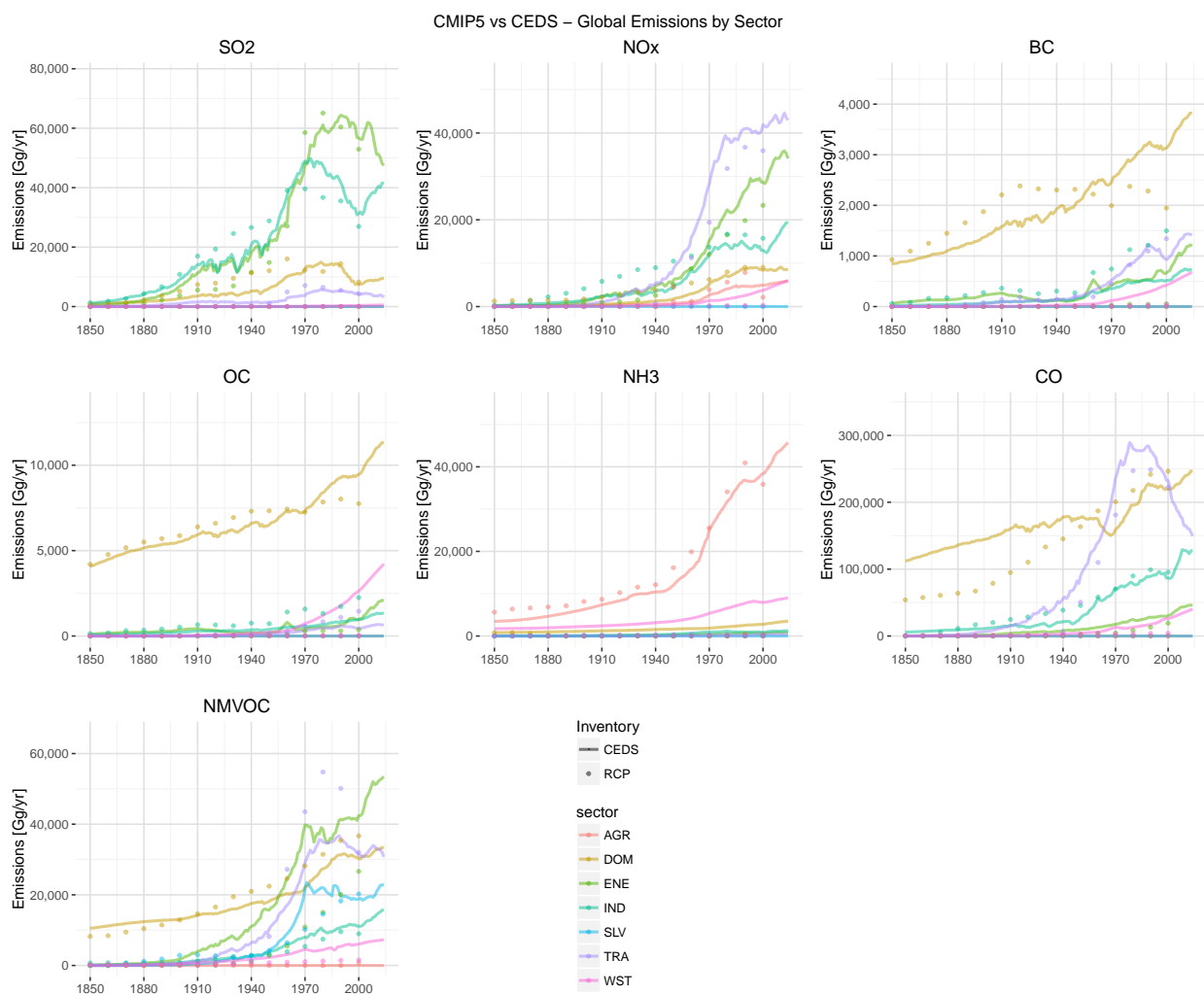


Figure S42: CEDS versus CMIP5: Like with like comparison of global emissions by aggregate sector. These figures do not include open burning (grassland or forest fires), fossil-fuel fires, agricultural waste burning on fields, or aviation.

## I. Global Emission Summaries for Select Years

Table S3: Global Emissions Estimates for 1990, 2000, and 2010.

Emissions Species	Units	1990	2000	2010
BC	kt C/year	5,898	5,808	7,755
OC	kt C/year	13,245	14,595	18,755
NOx	kt NOx/year	112,879	122,103	140,651
SO2	kt SO2/year	131,926	109,131	114,082
CO	kt CO/year	639,591	598,356	616,991
NH3	kt NH3/year	48,928	51,112	58,383
NMVOC	kt NMVOC/year	144,884	140,749	160,887