CEDS Version Comparison

CEDS_v_2019_12_23

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List of Tables and Figures

Janurary 10, 2020

This document compares emission estimates from the v_2019_12_23 release of the Community Emissions Data System (CEDS) with values from the CMIP6 release (v_16_07_2016). Changes in the CEDS system since the CMIP6 release include system structure, additional data, bug fixes, and updated assumptions for selected sectors and regions. For a more complete list of CEDS changes and updates see the release notes.

System updates in the v_2019_12_23 release were focused on changes necessary for the public release (e.g., removing use of non-public datasets) and system enhancements. The CEDS team is currently working on extending the CEDS estimates to 2018. Further changes to emissions, particularly to the most recent several years in this dataset, will occur as part of the update to 2018.

For additional information on CEDS and this data system release, please see https://github.com/JGCRI/CEDS.

The graphs below compare the CMIP6 (v_16_07_2016) and the v_2019_12_23 release versions. The changes visible on the global and regional scale, seen in the figures below, are largely from four updates:

- Updated residential waste burning estimates
- Improved data for historical energy consumption, particularly coal in Germany, U.K., and USA.
- Fixed an error in 1960s USA SO2 emissions.
- Change in India emissions inventory calibration

The change in historical energy data results in slightly larger emissions for BC, CO, NMVOC, NOx, CO, and SO2 in the mid-20th century. There is also a different sectoral distribution over this time.

The waste sector update reduces emissions of all air pollutant species, particularly BC and OC emissions in lower income countries (Figures S2, S4, S6). India waste sector emissions are similar in both dataset versions, with a lower fraction burnt offset by higher per-capita waste generation, as found in recent literature (Sharma et al. 2019 Environ. Sci. Technol. 2019, 53, 4765—4774).

Indian combustion emissions other than BC and OC are now calibrated to GAINS emissions factors, rather than scaled to the Regional Emission inventory in ASia (REAS, Kurokawa et al. 2013). This has resulted in lower emissions than previously estimated for CO, NH3, NMVOC, NOx, and SO2 (Figures S6 and S8).

There are also small differences in USA emissions after 2011, particularly NH3, due to scaling to more recent EPA Trends data (Figures S6 and S8).
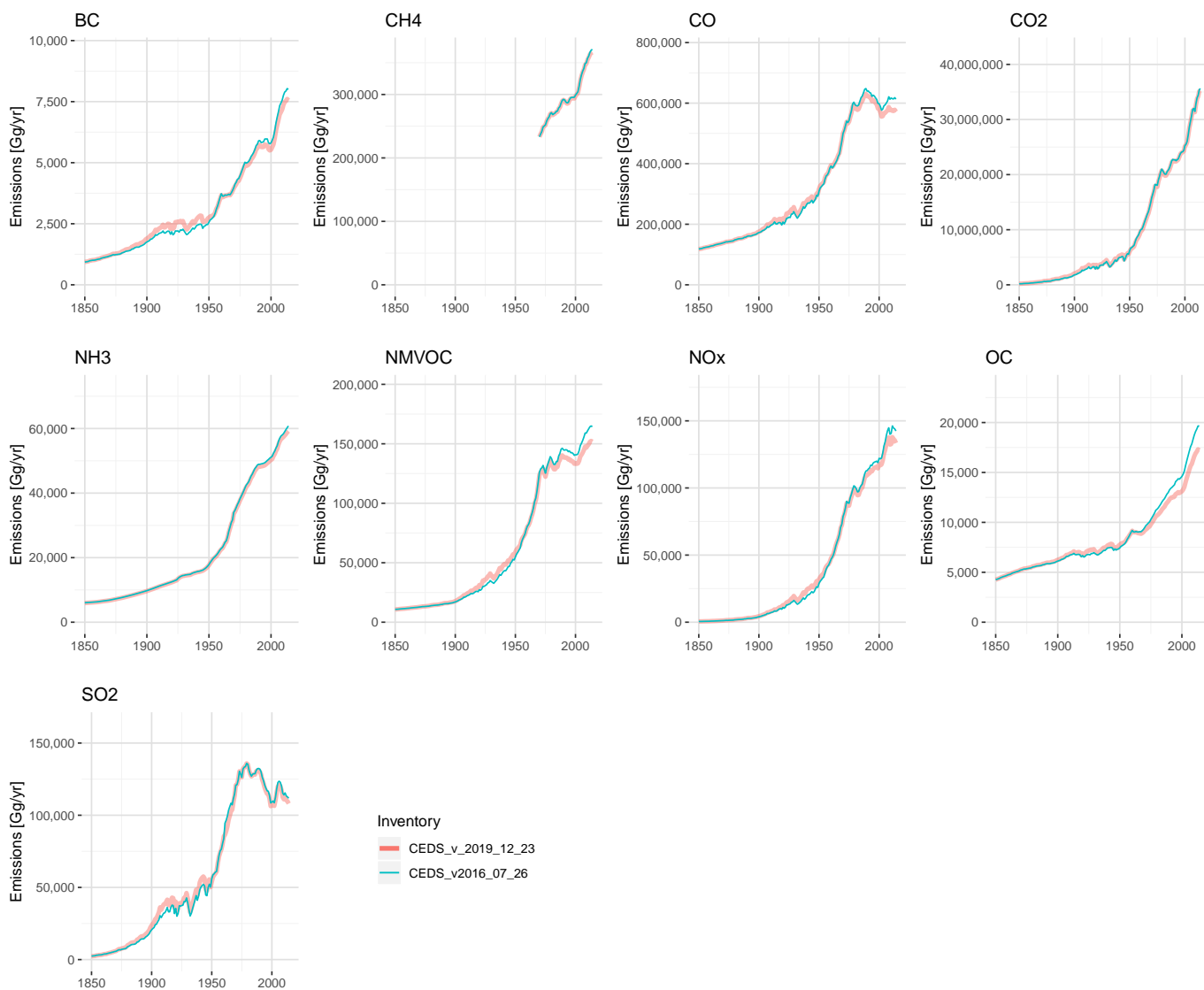
Figure S1: Global historical emissions by emissions species (1850-2014).
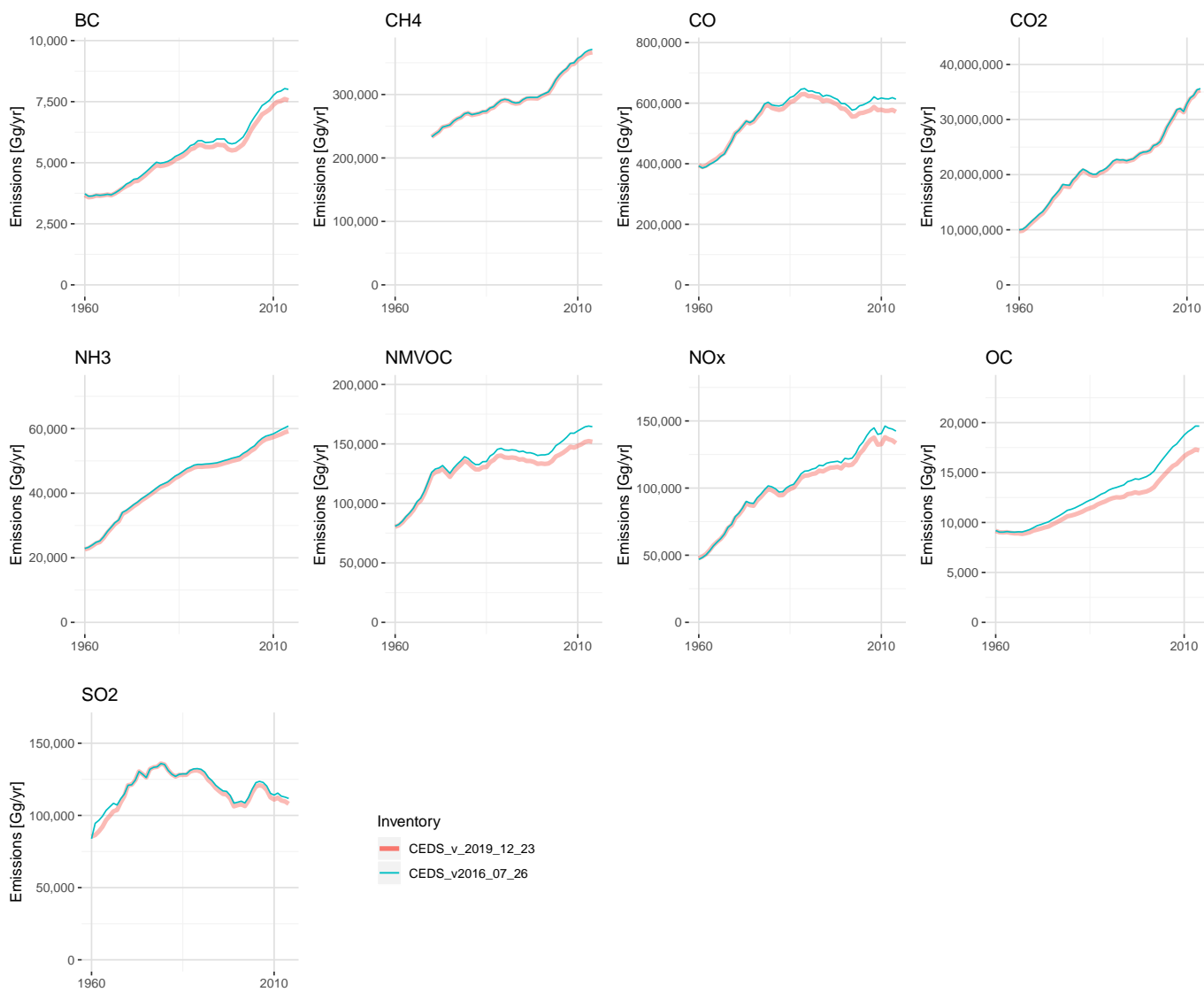
Figure S2: Global historical emissions by emissions species over recent decades (1960-2014).
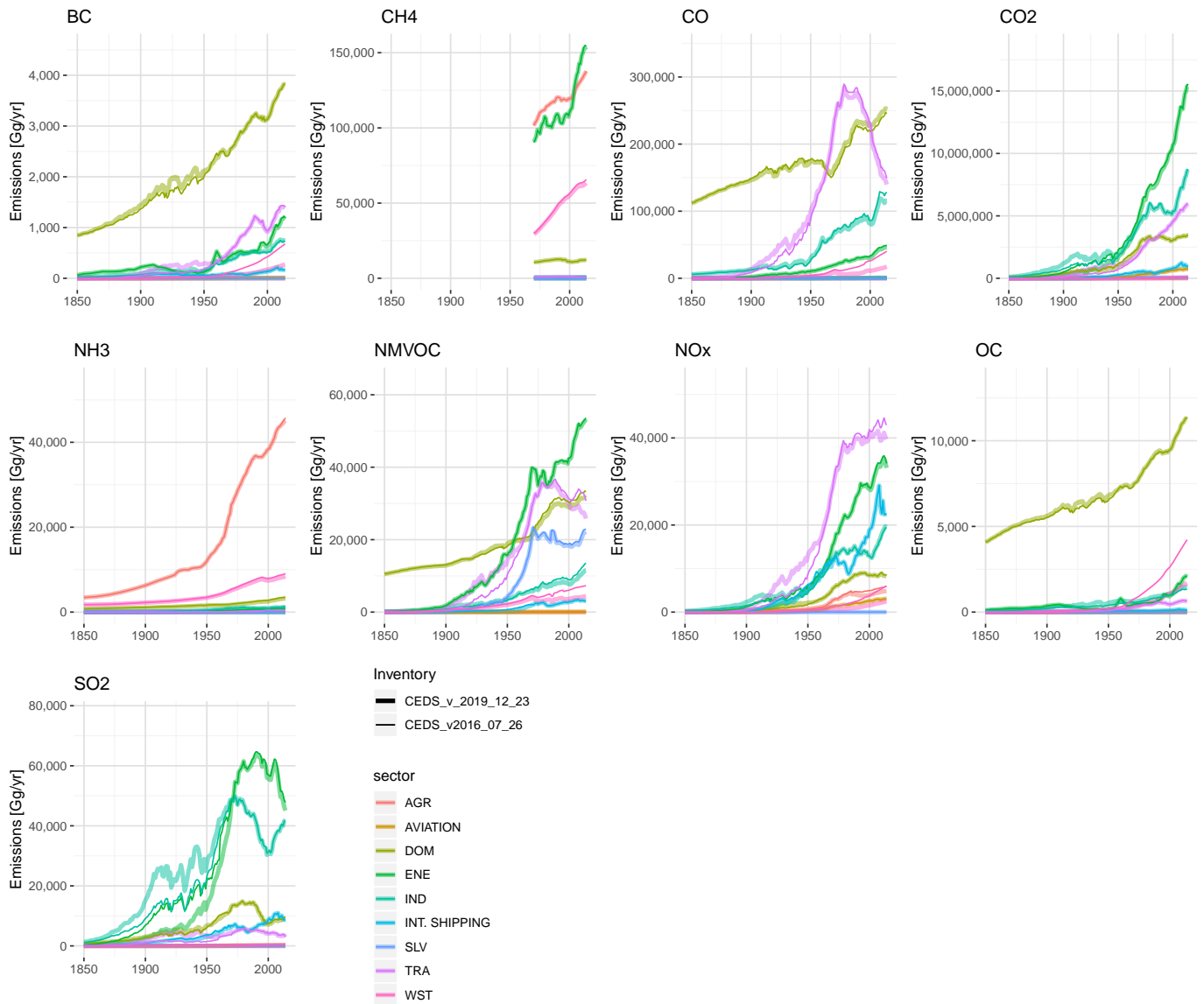
Figure S3: Global historical emissions by aggregate sector (1850-2014).
Note: See Table S2 for mapping of CEDS working sectors to aggregate sectors graphed here.

Figure S4: Global historical emissions by aggregate sector over recent decades (1960-2014).
Note: See Table S2 for mapping of CEDS working sectors to aggregate sectors graphed here.

Figure S5: Regional emissions by emissions species (1850-2014).
Note: See Table S3 for mapping of CEDS regions to aggregate regions graphed here.
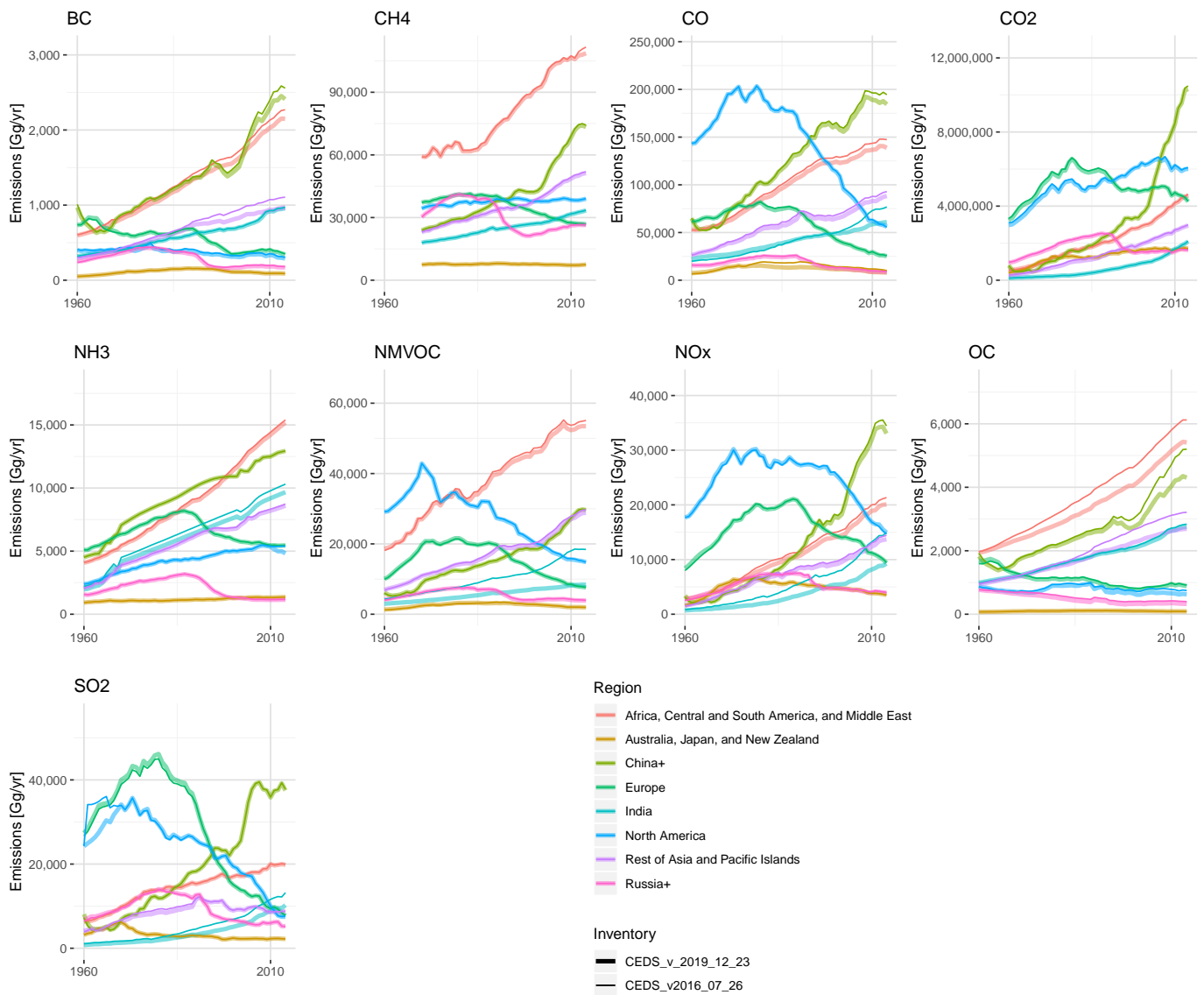
Figure S6: Regional emissions by emissions species over recent decades (1960-2014).
Note: See Table S3 for mapping of CEDS regions to aggregate regions graphed here.
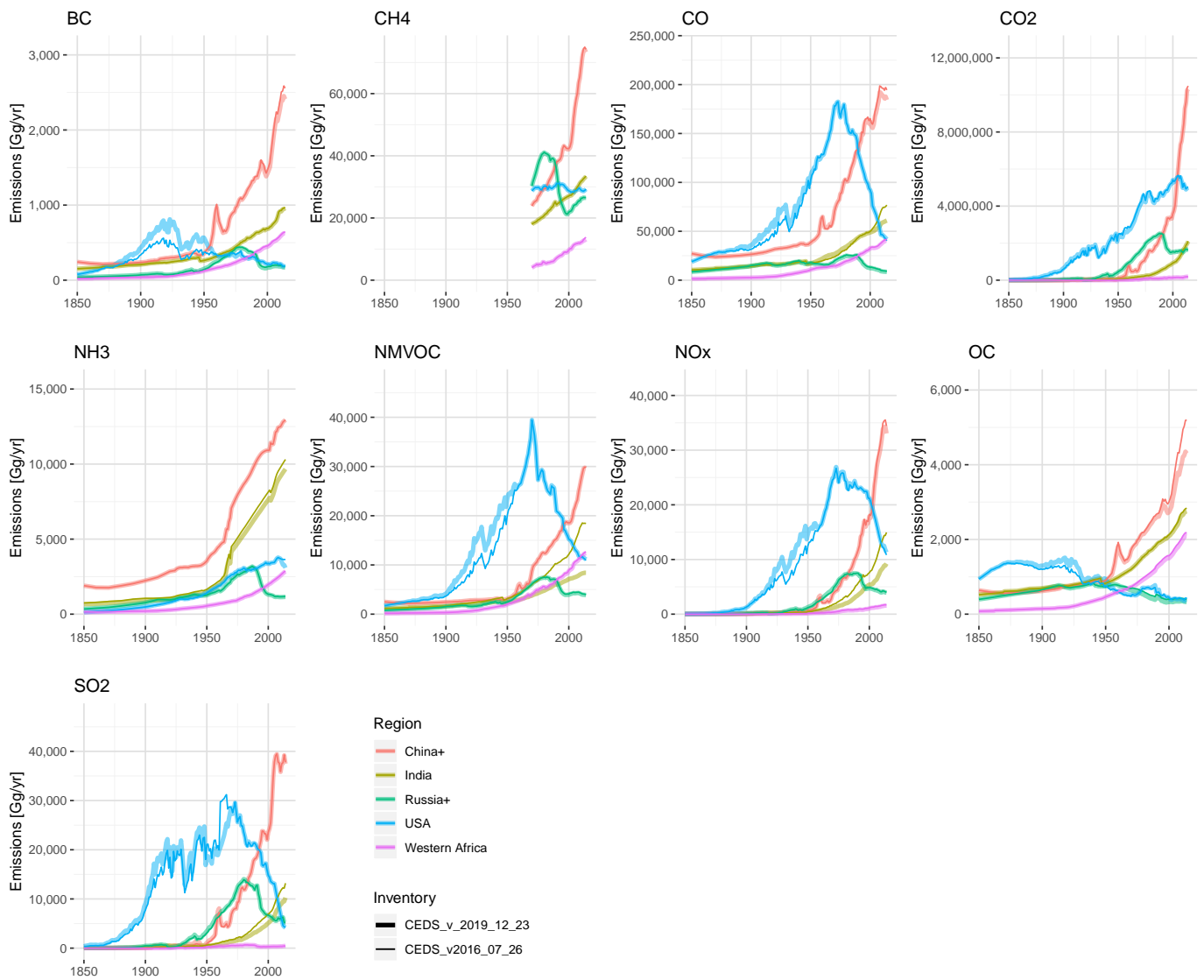
Figure S7: Top emitting regions by emissions species (1850-2014).
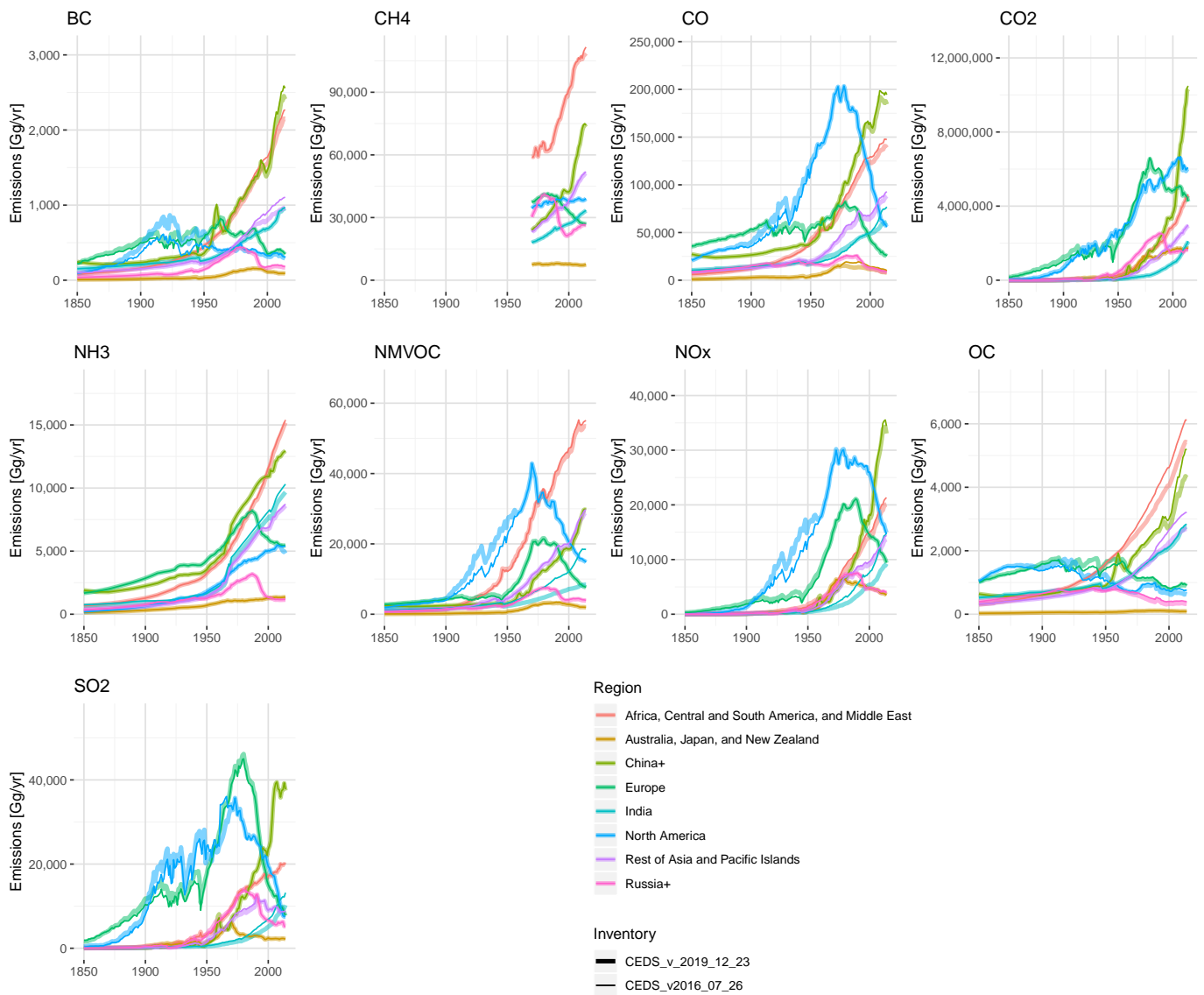Note: See Table S4 for mapping of CEDS regions to aggregate regions graphed here.
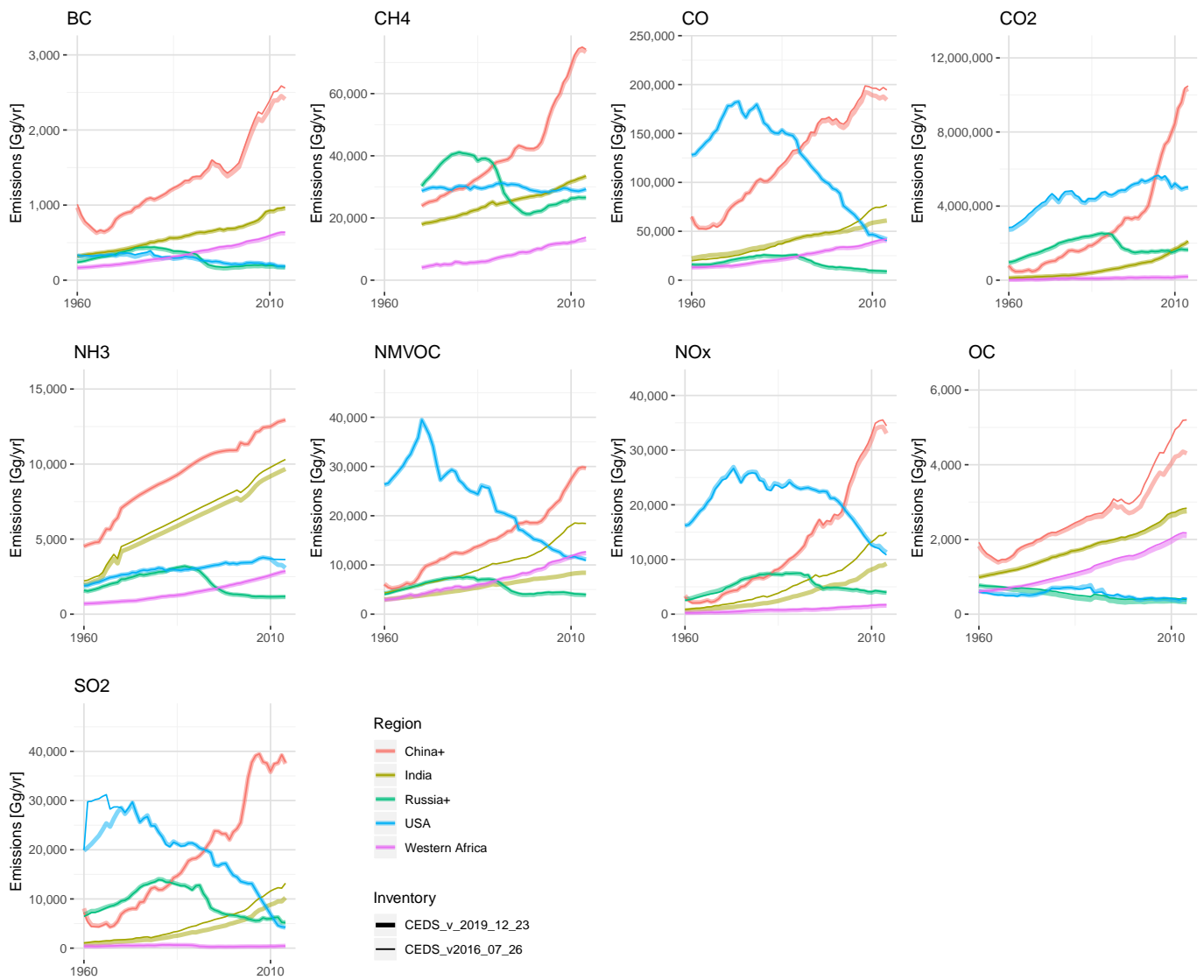
Figure S8: Top emitting regions by emissions species over recent decades (1960-2014).
Note: See Table S4 for mapping of CEDS regions to aggregate regions graphed here.

Table S1: CEDS Updated sector names.

CEDS CMIP Sector	CEDS Updated Sector
1A3di_Oil_tanker_loading	1A3di_Oil_Tanker_Loading
2Ax_Other-minerals	2A6_Other-minerals
2D_Chemical-products-manufacture-processing	2D3_Chemical-products-manufacture-processing
2D_Other-product-use	2D3_Other-product-use
5C_Waste-combustion	5C_Waste-incineration

Table S2: Mapping of CEDS working sectors to aggregate figure sectors.

Aggregate Sector	CEDS Working Sector
Agriculture (AGR)	3B__Manure-management 3D__Rice-Cultivation 3D__Soil-emissions 3E__Enteric-fermentation 3I__Agriculture-other
Aviation	1A3ai__International-aviation 1A3aii__Domestic-aviation
Residential, Commercial, Other (DOM)	1A4a__Commercial-institutional 1A4b__Residential 1A4c__Agriculture-forestry-fishing 1A5__Other-unspecified
Energy Transformation and Production (ENE)	1A1a__Electricity-autoproducer 1A1a__Electricity-public 1A1a__Heat-production 1A1bc__Other-transformation 1B1__Fugitive-solid-fuels 1B2__Fugitive-petr-and-gas 1B2d__Fugitive-other-energy 7A__Fossil-fuel-fires
Industry (IND)	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-metalic-minerals 1A2g__Ind-Comb-Construction 1A2g__Ind-Comb-machinery 1A2g__Ind-Comb-mining-quarrying 1A2g__Ind-Comb-other 1A2g__Ind-Comb-textile-leather 1A2g__Ind-Comb-transpequip 1A2g__Ind-Comb-wood-products 2A1__Cement-production 2A2__Lime-production 2A6__Other-minerals 2B__Chemical-industry 2C__Metal-production 2H__Pulp-and-paper-food-beverage-wood 2H__Pulp-and-paper-food-beverage-wood 2L__Other-process-emissions
Solvents (SLV)	2D__Degreasing-Cleaning 2D__Paint-application 2D3__Chemical-products-manufacture-processing 2D3__Other-product-use
Transportation (TRA)	1A3b__Road 1A3c__Rail 1A3dii__Domestic-navigation 1A3eii__Other-transp
Int. Shipping	1A3di__International-shipping 1A3di__Oil_Tanker__Loading
Waste (WST)	5A__Solid-waste-disposal 5C__Waste-incineration 5D__Wastewater-handling 5E__Other-waste-handling 6A__Other-in-total

Table S3: Mapping of CEDS regions to aggregate figure regions in Section D.

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

Table S4: Mapping of CEDS regions to aggregate figure regions in Section E.

Aggregate Region	CEDS Region
China+	Cambodia, China, Hong Kong, Macao, Mongolia
India	India
Russia+	Armenia, Azerbaijan, Georgia, Russia
USA	United States
Western Africa	Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Cote dIvoire, Democratic Republic of Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo