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Supplement of

Country-resolved combined emission and socio-economic pathways based on the Representative Concentration Pathway (RCP) and Shared Socio-Economic Pathway (SSP) scenarios

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Abstract. This supplementary information contains detailed information on data coverage and additional plots for individual gases and scenarios not covered by the plots in the main manuscript.

Contents

S1 Data coverage

This section gives an overview over countries covered by historical data (Section S1.1), the SSP basic elements country data (Section S1.2), and the SSPv2 IAM data from the different modeling groups (Section S1.3). The section also explains the data requirements for the downscaling (Section S1.4.1) and the country coverage of the final time series (Section S1.4.2), including a table with all countries and modeling groups (Table S2).

The country definitions of the PRIMAP-hist v2.1 emissions time series (Gütschow et al., 2019) are the basis for the country definitions used in this work. PRIMAP-hist v2.1 covers 208 countries and territories. In the following sections we list differences in country coverage in the present dataset compared with the PRIMAP-hist v2.1 emissions time series.

S1.1 Historical socioeconomic data

S1.1.1 Historical GDP data

The PRIMAP-hist GDP time series covers 204 countries and territories. However, 7 of these countries and territories are not included as independent countries in the country definitions of the emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: Bermuda; Curacao; Cayman Is.; Montserrat; Puerto Rico; Palestine; Palestine. One country / territory is made available through summing: Antilles. 10 countries / territories with emissions data are missing in the GDP data: Andorra; Antarctica; Cook Is.; Liechtenstein; Monaco; Niue; Pitcairn Is.; St. Helena; Tokelau; Vatican City.

S1.1.2 Historical population data

The PRIMAP-hist population time series covers 233 countries and territories. However, 28 of these countries and territories are not included as independent countries in the country definitions of the emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: American Samoa; Bonaire, Sint Eustatius & Saba; Bermuda; CHANNEL ISLANDS; Curacao; Cayman Is.; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; French Guiana; Guam; Isle of Man; Mariana Is.; Montserrat; Martinique; Mayotte; New Caledonia; Puerto Rico; Palestine; French Polynesia; Reunion; St. Pierre & Miquelon; Sint Maarten; U.S. Virgin Is.; U.S. Virgin Is.. One country / territory is made available through summing: Antilles. 2 countries / territories with emissions data are missing in the population data: Antarctica; Pitcairn Is..

S1.2 SSP country data

S1.2.1 IIASA Population

The SSP IIASA Population time series covers 193 countries and territories. However, 11 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: Guadeloupe; French Guiana; Guam; Martinique; Mayotte; New Caledonia; Puerto Rico; Palestine; French Polynesia; Reunion; U.S. Virgin Is.. 26 countries / territories with historical emissions data are missing in the IIASA Population data: Anguilla; Andorra; Antilles; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Kiribati; St. Kitts & Nevis; Liechtenstein; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; San Marino; South Sudan; Seychelles; Turks & Caicos Is.; Tokelau; Tuvalu; Taiwan; Vatican City; Brit. Virgin Is..

S1.2.2 OECD GDP

The SSP OECD GDP time series covers 184 countries and territories. However, 4 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: New Caledonia; Puerto Rico; Palestine; French Polynesia. 28 countries / territories with historical emissions data are missing in the OECD GDP data: Anguilla; Andorra; Antilles; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Micronesia; Grenada; Kiribati; St. Kitts & Nevis; Liechtenstein; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; North Korea; St. Helena; San Marino; South Sudan; Seychelles; Turks & Caicos Is.; Tokelau; Tuvalu; Vatican City; Brit. Virgin Is..

S1.2.3 IIASA GDP

The SSP IIASA GDP time series covers 172 countries and territories. However, one of these countries and territories is not included as an independent country in the country definitions of the historical emissions data and are therefore summed with another country to reach the same country definitions. This country is: Puerto Rico. 37 countries / territories with historical emissions data are missing in the IIASA GDP data: Aruba; Afghanistan; Angola; Anguilla; Albania; Andorra; Antilles; United Arab Emirates; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Micronesia; Kiribati; St. Kitts & Nevis; Liechtenstein; Macao; Monaco; Marshall Is.; Myanmar; Montenegro; Niue; Nauru; Pitcairn Is.; Palau; North Korea; Qatar; St. Helena; San Marino; South Sudan; Seychelles; Turks & Caicos Is.; Tokelau; Tuvalu; Taiwan; Vatican City; Brit. Virgin Is..

S1.2.4 Combined GDP

The SSP Combined GDP time series covers 186 countries and territories. However, 4 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: New Caledonia; Puerto Rico; Palestine; French Polynesia. 26 countries / territories with historical emissions data are missing in the Combined GDP data: Anguilla; Andorra; Antilles; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Micronesia; Kiribati; St. Kitts & Nevis; Liechtenstein; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; North Korea; St. Helena; San Marino; Seychelles; Turks & Caicos Is.; Tokelau; Tuvalu; Vatican City; Brit. Virgin Is..

S1.2.5 PIK GDP

PIK GDP data is available on a level of 32 regions. It is downscaled using the GDP data from OECD. Missing countries are taken from IIASA GDP data where available. Thus, the country availability is governed by the OECD and IIASA GDP data as well as the region definitions. A total of 20 countries / territories present in the historical emissions data are not covered by the region definitions.The SSP PIK GDP time series covers 186 countries and territories. However, 4 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: New Caledonia; Puerto Rico; Palestine; French Polynesia. 26 countries / territories with historical emissions data are missing in the PIK GDP data: Anguilla; Andorra; Antilles; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Micronesia; Kiribati; St. Kitts & Nevis; Liechtenstein; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; North Korea; St. Helena; San Marino; Seychelles; Turks & Caicos Is.; Tokelau; Tuvalu; Vatican City; Brit. Virgin Is..

S1.3 SSP IAM scenarios

S1.3.1 AIM/CGE

The SSP IAM scenarios from the AIM/CGE model cover 201 countries and territories. However, 17 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: French Southern Territories; Bermuda; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; French Guiana; Guam; Martinique; Mayotte; New Caledonia; Puerto Rico; French Polynesia; Reunion; U.S. Virgin Is.. 24 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the AIM/CGE model: Anguilla; Andorra; Antarctica; Cook Is.; Dominica; Kiribati; St. Kitts & Nevis; St. Lucia; Macao; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

S1.3.2 GCAM

The SSP IAM scenarios from the GCAM model cover 201 countries and territories. However, 16 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: Bermuda; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; French Guiana; Guam; Martinique; Mayotte; New Caledonia; Puerto Rico; French Polynesia; Reunion; U.S. Virgin Is.. 23 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the GCAM model: Anguilla; Andorra; Antarctica;

Cook Is.; Dominica; Kiribati; St. Kitts & Nevis; St. Lucia; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

S1.3.3 IMAGE

The SSP IAM scenarios from the IMAGE model cover 203 countries and territories. However, 18 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: French Southern Territories; Bermuda; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; French Guiana; Guam; Martinique; Mayotte; New Caledonia; Puerto Rico; Palestine; French Polynesia; Reunion; U.S. Virgin Is.. 23 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the IMAGE model: Anguilla; Andorra; Antarctica; Cook Is.; Dominica; Kiribati; St. Kitts & Nevis; St. Lucia; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

S1.3.4 MESSAGE-GLOBIOM

The SSP IAM scenarios from the MESSAGE-GLOBIOM model cover 196 countries and territories. However, 14 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: French Southern Territories; Bermuda; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; Guam; Martinique; New Caledonia; Puerto Rico; French Polynesia; Reunion. 26 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the MESSAGE-GLOBIOM model: Aruba; Anguilla; Andorra; Antarctica; Cook Is.; Dominica; Micronesia; Grenada; Kiribati; St. Kitts & Nevis; St. Lucia; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

S1.3.5 ReMIND-MAGPIE

The SSP IAM scenarios from the ReMIND-MAGPIE model cover 184 countries and territories. However, 8 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: Bermuda; West. Sahara; Guadeloupe; French Guiana; Martinique; New Caledonia; Puerto Rico; Reunion. 32 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the ReMIND-MAGPIE model: Aruba; Anguilla; Andorra; Antilles; Antarctica; Cook Is.; Dominica; Micronesia; Kiribati; St. Kitts & Nevis; St. Lucia; Liechtenstein; Macao; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; San Marino; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is.; Vanuatu; Samoa.

S1.3.6 WITCH-GLOBIOM

The SSP IAM scenarios from the WITCH-GLOBIOM model cover 201 countries and territories. However, 16 of these countries and territories are not included as independent countries in the country definitions of the historical emissions data and are therefore summed with other countries to reach the same country definitions. These countries and territories are: Bermuda; West. Sahara; Falkland Is.; Faroe Is.; Gibraltar; Guadeloupe; Greenland; French Guiana; Guam; Martinique; Mayotte; New Caledonia; Puerto Rico; French Polynesia; Reunion; U.S. Virgin Is.. 23 countries / territories with historical emissions data are missing in the SSP IAM scenarios from the WITCH-GLOBIOM model: Anguilla; Andorra; Antarctica; Cook Is.; Dominica; Kiribati; St. Kitts & Nevis; St. Lucia; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; St. Helena; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

S1.4 Downscaled data

S1.4.1 Data requirements for downscaling

To downscale the regional SSP IAM socioeconomic data to country level the SSP country level data is used, as it is also the basis of the SSP IAM simulations. Population data is taken from IIASA, GDP data from OECD. We use GDP data from IIASA to fill countries missing in the OECD data. For the downscaling of emissions data we need GDP time series and thus to be present in the downscaled SSP IAM emissions time series of a specific model, a country / territory needs to be both present in the models regional definitions as well as the GDP time series of OECD or IIASA. The following 30 countries / territory are present in (some) regional definitions, but are missing in the country data and are consequently not included in the downscaled emissions data: Anguilla; Andorra; Antilles; Antarctica; Antigua & Barbuda; Cook Is.; Dominica; Micronesia; Kiribati; St. Kitts & Nevis; St. Lucia; Liechtenstein; Monaco; Marshall Is.; Niue; Nauru; Pitcairn Is.; Palau; North Korea; St. Helena; San Marino; Sao Tome & Principe; Seychelles; Turks & Caicos Is.; Tokelau; Tonga; Tuvalu; Vatican City; St. Vincent & Grenadines; Brit. Virgin Is..

Most of the present countries are taken from OECD data with some exceptions. The following 10 countries / territories are taken from IIASA GDP data: Aruba; Afghanistan; Angola; Albania; United Arab Emirates; Macao; Myanmar; Montenegro; Qatar; Taiwan. One country / territory is added using downscaling: South Sudan.

S1.4.2 Country coverage of final timeseries

The time series presented in this paper cover a total of 182 countries which represent 99.8 percent of the world's fossil fuel and industrial greenhouse gas emissions (2011 - 2017 average). Table S1 gives detailed per regions and gas coverage numbers.

Some countries / territories are not present in the time series from all modeling groups. Table S2 gives an overview over the inclusion of countries / territories in the final time series and the individual models.

Gas	Global	Asia	Latin America America	Middle East and Africa	OECD	Reforming Economies
Kyoto Gases (AR4)	99.8%	99.7%	99.9%	100.0%	100.0%	100.0%
CO_2	99.8%	99.8%	99.9%	100.0%	100.0%	100.0%
CH_4	99.8%	99.6%	100.0%	100.0%	100.0%	100.0%
N_2O	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%
F-gases (AR4)	99.3%	98.9%	100.0%	100.0%	100.0%	100.0%

Table S1. Emissions shares covered by the dataset for each region and gas. Shares are calculated using the (2011 – 2017) average.

Country ISO3	Historical GDP	Historical Population	This work	SSP IIASA Pop.	SSP IIASA GDP	SSP OECD GDP	SSP comb. GDP	SSP PIK GDP	SSPIAM AIM/CGE	SSPIAM GCAM	SSPIAM WITCH-GLOBIOM	SSPIAM ReMIND-MAGPIE	SSPIAM MESSAGE-GLOBIOM	SSPIAM IMAGE
ABW	1	1	6	1	1	0	1	1	1	1	1	0	0	1
AFG	1	1	8	1	1	0	1	1	1	1	1	1	1	1
AGO	1	1	8	1	1	0	1	1	1	1	1	1	1	1
AIA	1	1	0	0	0	0	0	0	0	0	0	0	0	0
ALB	1	1	8	1	1	0	1	1	1	1	1	1	1	1
AND	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ANT	1	1	0	0	0	0	0	0	1	1	1	1	0	1
ARE	1	1	8	1	1	0	1	1	1	1	1	1	1	1
ARG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ARM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ATA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ATG	1	1	0	0	0	0	0	0	1	1	1	1	1	1
AUS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
AUT	1	1	9	1	1	1	1	1	1	1	1	1	1	1
AZE	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BDI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BEL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BEN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BFA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BGD	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BGR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BHR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BHS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BIH	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BLR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BLZ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BOL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BRA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BRB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BRN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BTN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
BWA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CAF	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CAN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CHE	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CHL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CHN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CIV	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CMR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
COD	1	1	9	1	1	1	1	1	1	1	1	1	1	1
COG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
COK	0	1	0	0	0	0	0	0	0	0	0	0	0	0
COL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
COM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CPV	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CRI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CUB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CYP	1	1	9	1	1	1	1	1	1	1	1	1	1	1
CZE	1	1	9	1	1	1	1	1	1	1	1	1	1	1
DEU	1	1	9	1	1	1	1	1	1	1	1	1	1	1
DJI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
DMA	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DNK	1	1	9	1	1	1	1	1	1	1	1	1	1	1
DOM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
DZA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ECU	1	1	9	1	1	1	1	1	1	1	1	1	1	1
EGY	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ERI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ESP	1	1	9	1	1	1	1	1	1	1	1	1	1	1
EST	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ETH	1	1	9	1	1	1	1	1	1	1	1	1	1	1
FIN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
FJI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
FRA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
FSM	1	1	0	1	0	0	0	0	1	1	1	0	0	1
GAB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GBR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GEO	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GHA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GIN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GMB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GNB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GNQ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GRC	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GRD	1	1	7	1	0	1	1	1	1	1	1	0	1	1
GTM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
GUY	1	1	9	1	1	1	1	1	1	1	1	1	1	1
HKG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
HND	1	1	9	1	1	1	1	1	1	1	1	1	1	1
HRV	1	1	9	1	1	1	1	1	1	1	1	1	1	1
HTI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
HUN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
IDN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
IND	1	1	9	1	1	1	1	1	1	1	1	1	1	1
IRL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
IRN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
IRQ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ISL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ISR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ITA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
JAM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
JOR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
JPN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KAZ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KEN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KGZ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KHM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KIR	1	1	0	0	0	0	0	0	0	0	0	0	0	0
KNA	1	1	0	0	0	0	0	0	0	0	0	0	0	0
KOR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
KWT	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LAO	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LBN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LBR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LBY	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LCA	1	1	4	1	1	1	1	1	0	0	0	0	0	0
LIE	0	1	0	0	0	0	0	0	1	1	1	1	0	1

Country ISO3	Historical GDP	Historical Population	This work	SSP IIASA Pop.	SSP IIASA GDP	SSP OECD GDP	SSP comb. GDP	SSP PIK GDP	SSPIAM AIM/CGE	SSPIAM GCAM	SSPIAM WITCH-GLOBIOM	SSPIAM ReMIND-MAGPIE	SSPIAM MESSAGE-GLOBIOM	SSPIAM IMAGE
LKA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LSO	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LTU	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LUX	1	1	9	1	1	1	1	1	1	1	1	1	1	1
LVA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MAC	1	1	6	1	1	0	1	1	0	1	1	1	0	1
MAR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MCO	0	1	0	0	0	0	0	0	1	1	1	1	0	1
MDA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MDG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MDV	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MEX	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MHL	1	1	0	0	0	0	0	0	0	0	0	0	0	0
MKD	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MLI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MLT	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MMR	1	1	8	1	1	0	1	1	1	1	1	1	1	1
MNE	1	1	8	1	1	0	1	1	1	1	1	1	1	1
MNG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MOZ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MRT	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MUS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MWI	1	1	9	1	1	1	1	1	1	1	1	1	1	1
MYS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NAM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NER	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NGA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NIC	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NIU	0	1	0	0	0	0	0	0	0	0	0	0	0	0
NLD	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NOR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NPL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
NRU	1	1	0	0	0	0	0	0	0	0	0	0	0	0
NZL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
OMN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PAK	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PAN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PCN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PER	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PHL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PLW	1	1	0	0	0	0	0	0	0	0	0	0	0	0
PNG	1	1	9	1	1	1	1	1	1	1	1	1	1	1
POL	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PRK	1	1	0	1	0	0	0	0	1	1	1	1	1	1
PRT	1	1	9	1	1	1	1	1	1	1	1	1	1	1
PRY	1	1	9	1	1	1	1	1	1	1	1	1	1	1
QAT	1	1	8	1	1	0	1	1	1	1	1	1	1	1
ROU	1	1	9	1	1	1	1	1	1	1	1	1	1	1
RUS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
RWA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SAU	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SDN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SEN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SGP	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SHN	0	1	0	0	0	0	0	0	0	0	0	0	0	0
SLB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SLE	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SLV	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SMR	1	1	0	0	0	0	0	0	1	1	1	1	0	1
SOM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SRB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SSD	1	1	1	0	0	0	1	1	1	1	1	1	1	1
STP	1	1	4	1	1	1	1	1	0	0	0	0	0	0
SUR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SVK	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SVN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SWE	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SWZ	1	1	9	1	1	1	1	1	1	1	1	1	1	1
SYC	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SYR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TCA	1	1	0	0	0	0	0	0	0	0	0	0	0	0
TCD	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TGO	1	1	9	1	1	1	1	1	1	1	1	1	1	1
THA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TJK	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TKL	0	1	0	0	0	0	0	0	0	0	0	0	0	0
TKM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TLS	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TON	1	1	4	1	1	1	1	1	0	0	0	0	0	0
TTO	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TUN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TUR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
TUV	1	1	0	0	0	0	0	0	0	0	0	0	0	0
TWN	1	1	8	0	1	0	1	1	1	1	1	1	1	1
TZA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
UGA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
UKR	1	1	9	1	1	1	1	1	1	1	1	1	1	1
URY	1	1	9	1	1	1	1	1	1	1	1	1	1	1
USA	1	1	9	1	1	1	1	1	1	1	1	1	1	1
UZB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
VAT	0	1	0	0	0	0	0	0	0	0	0	0	0	0
VCT	1	1	4	1	1	1	1	1	0	0	0	0	0	0
VEN	1	1	9	1	1	1	1	1	1	1	1	1	1	1
VGB	1	1	0	0	0	0	0	0	0	0	0	0	0	0
VNM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
VUT	1	1	8	1	1	1	1	1	1	1	1	1	0	1
WSM	1	1	8	1	1	1	1	1	1	1	1	1	0	1
YEM	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ZAF	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ZMB	1	1	9	1	1	1	1	1	1	1	1	1	1	1
ZWE	1	1	9	1	1	1	1	1	1	1	1	1	1	1

Country ISO3	Historical GDP	Historical Population	This work	SSP IIASA Pop.	SSP IIASA GDP	SSP OECD GDP	SSP comb. GDP	SSP PIK GDP	SSPIAM AIM/CGE	SSPIAM GCAM	SSPIAM WITCH-GLOBIOM	SSPIAM ReMIND-MAGPIE	SSPIAM MESSAGE-GLOBIOM	SSPIAM IMAGE

Table S2: Availability of data for individual countries / territories in data from the different models. The number in the column "This work" indicates the number of models where data are available. Final data for SSP IAM runs are only available if a country / territory is both present in the region definitions of the model and in the country resolved SSP data of at least one modeling group.

S2 Additional figures

S2.1 RCP and SSPv2 overview

This section contains the RCP and SSPv2 scenario overview figures for individual gases. A figure for aggregate Kyoto GHGs is presented in the main text (Figure 3).

S2.2 Harmonization of emissions data

This section contains figures illustrating the effect of harmonization for individual gases. Figure S5 shows scenario harmonization for CO_2, Figure S6 for N_2O, Figure S7 for CH_4, and Figure S8 for fluorinated gases. Harmonization factors are similar for all RCP forcing levels as the IAM groups use the same historical data for all their scenarios. Thus only one RCP is used in the figures. The discrepancies between the historical emissions in some of the downscaled scenarios and PRIMAP-hist emissions are due to model region definitions that do not cover all countries covered by PRIMAP-hist.

S2.3 Harmonization of GDP data

Here we show the effect of harmonization on regional GDP time series. The harmonization is the same for all SSPs and thus we present only SSP 3 (Figure S9) where the effects is best visible because of the lowest GDP growth of all SSPs.

S2.4 Results for all RCPs and individual gases

In this section we present the downscaling results for all RCP and SSPs including individual gases for the example countries. Results for other countries can be provided. Figures S10 to S19 provide the data for RCP 1.9.

Figures S20 to S29 provide the data for RCP 2.6.

Figures S30 to S39 provide the data for RCP 3.4.

Figures S40 to S49 provide the data for RCP 4.5.

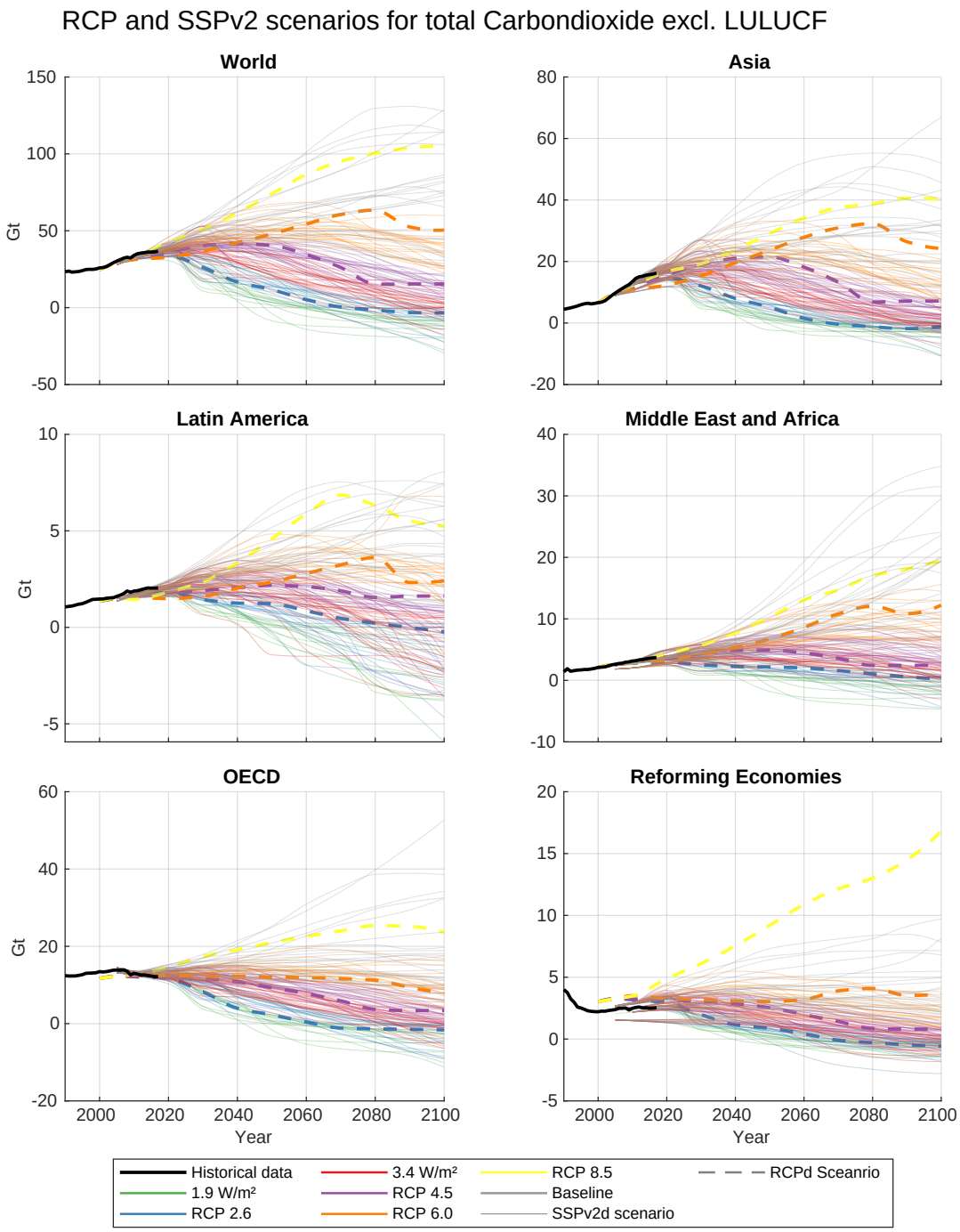

Figure S1. RCP and SSPv2 scenarios for total CO_2 emissions excluding LULUCF. Scenarios are not harmonized to historical data. Historical data shown is from PRIMAP-hist v2.1 with bunker fuel CO_2 emissions added from CDIAC data (Boden et al., 2017).

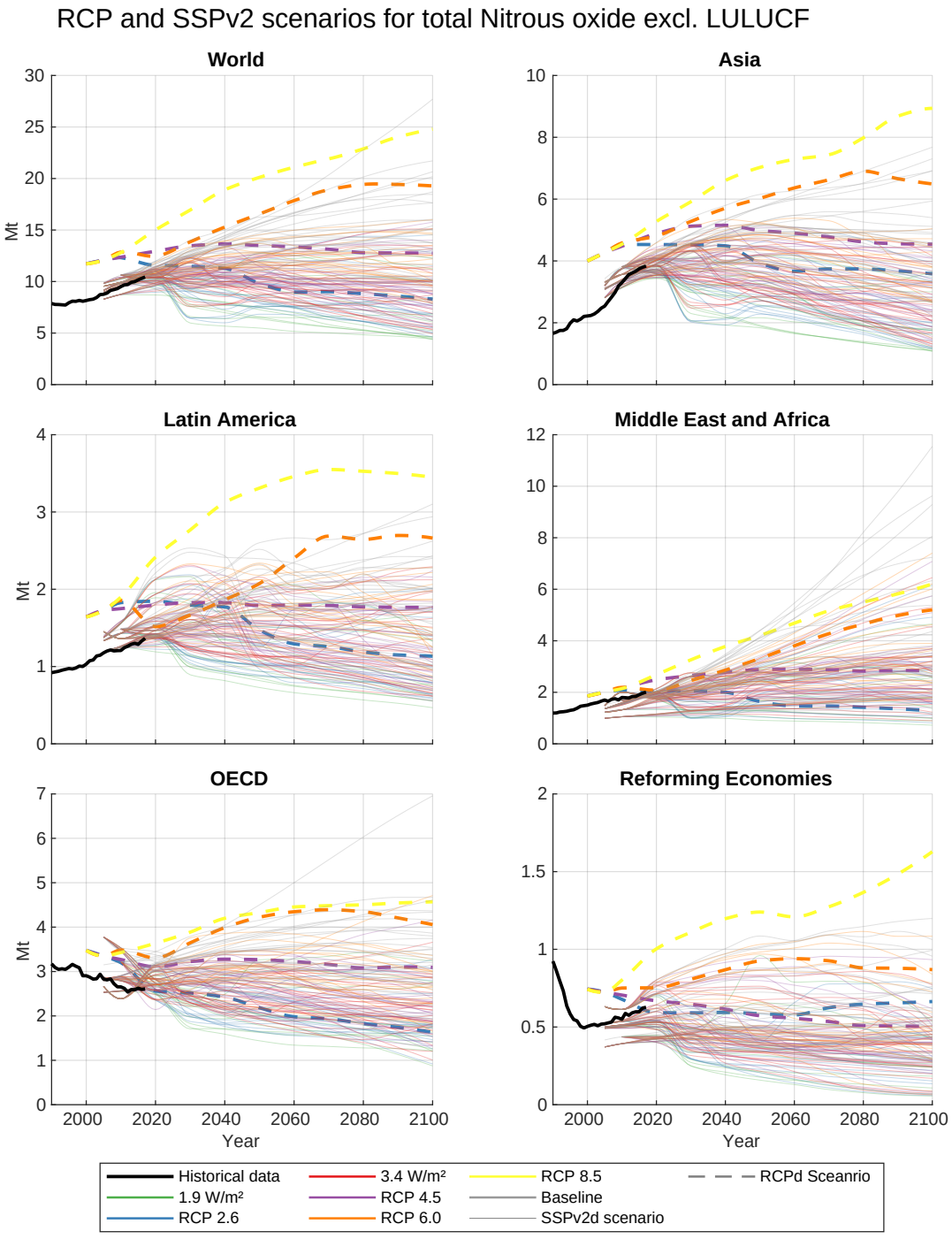

Figure S2. RCP and SSPv2 scenarios for total N_2O emissions excluding LULUCF. Scenarios are not harmonized to historical data. Historical data shown is from PRIMAP-hist v2.1.

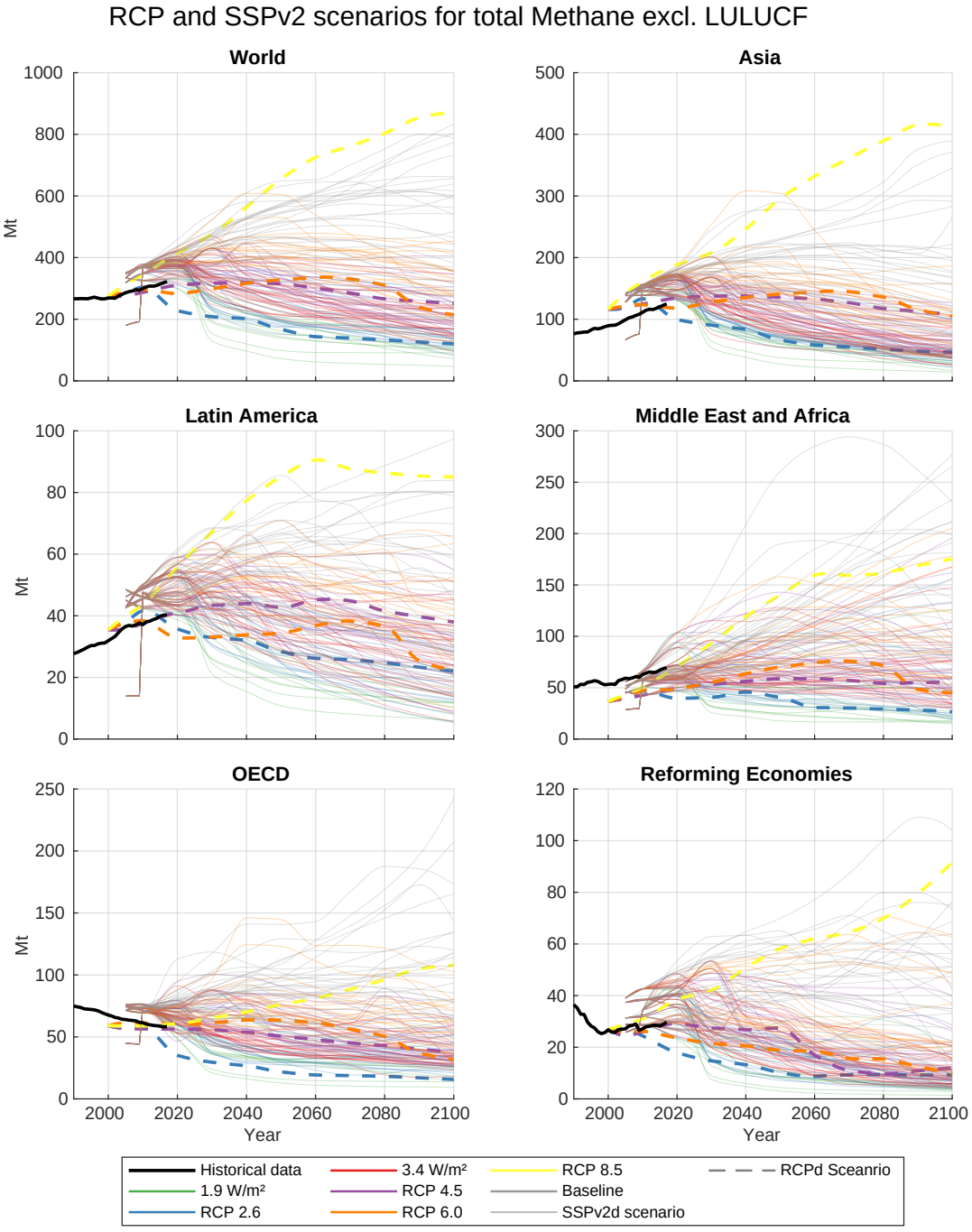

Figure S3. RCP and SSPv2 scenarios for total CH_4 emissions excluding LULUCF. Scenarios are not harmonized to historical data. Historical data shown is from PRIMAP-hist v2.1.

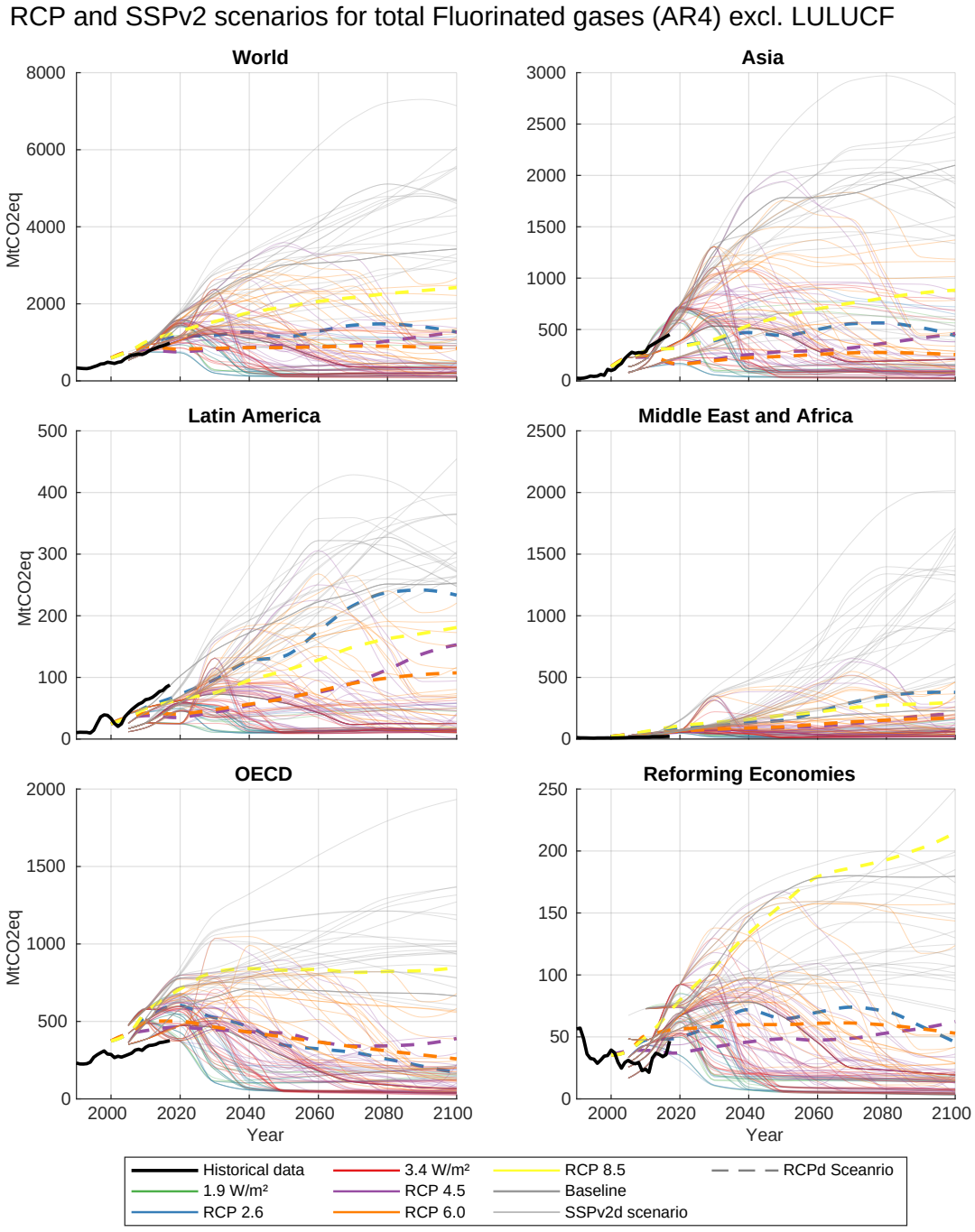

Figure S4. RCP and SSPv2 scenarios for total fluorinated gases emissions excluding LULUCF. Scenarios are not harmonized to historical data. Historical data shown is from PRIMAP-hist v2.1.

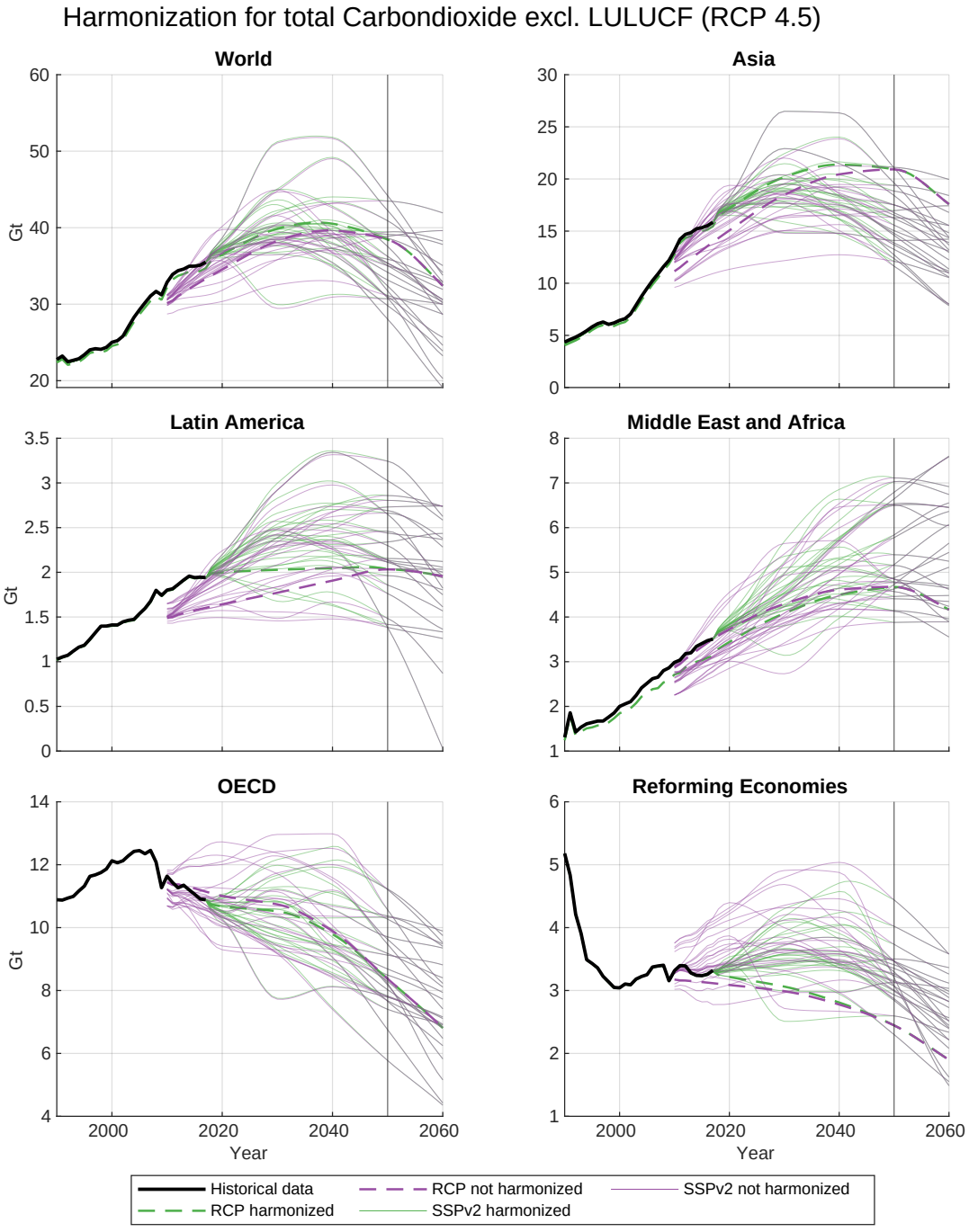

Figure S5. Harmonization of scenarios to historical data for CO_2 and RCP 4.5. The harmonization factor is phased out until 2050. The regions shown here are built from downscaled data to harmonize the region definitions of the SSPv2 scenarios to the RCP regions.

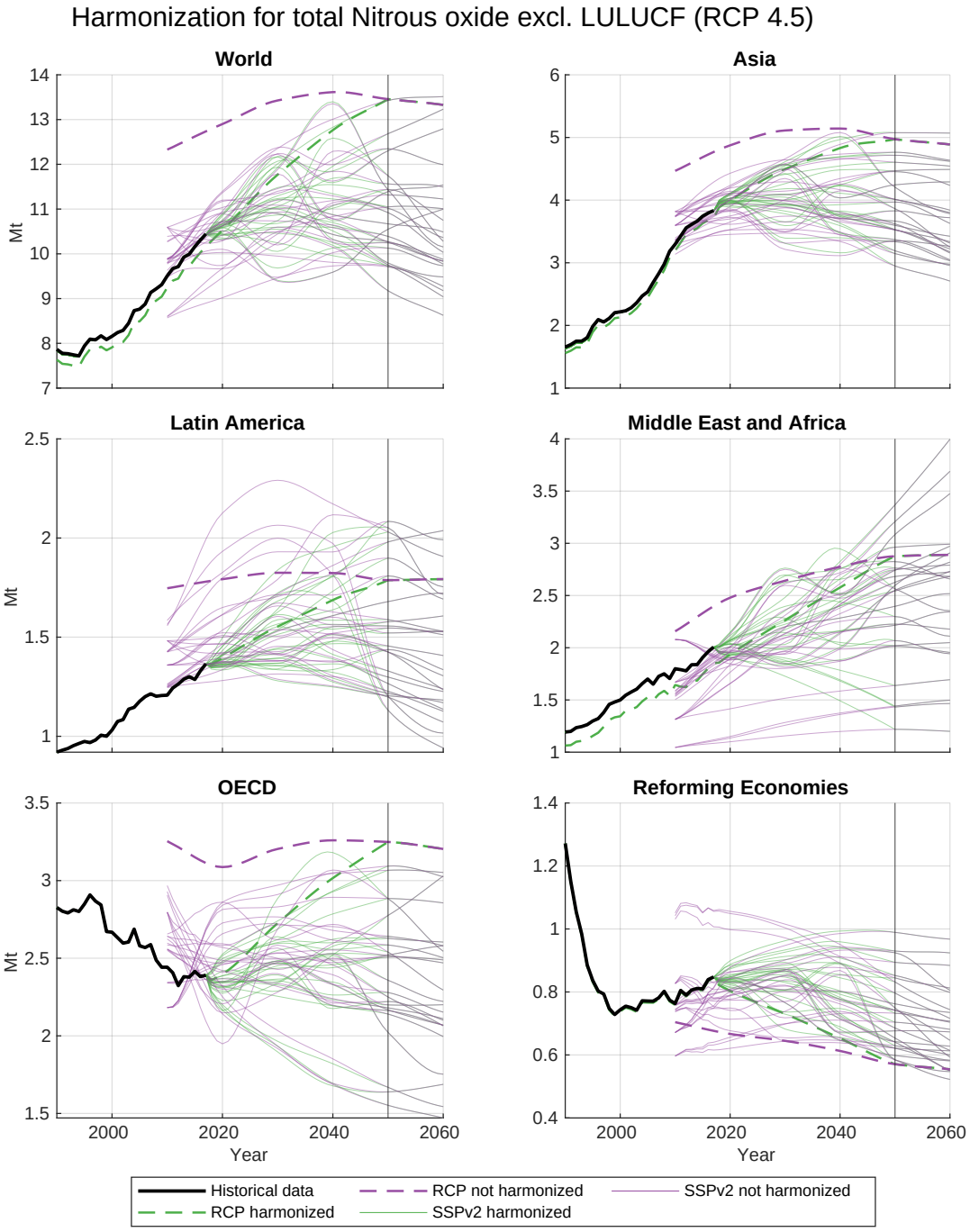

Figure S6. Harmonization of scenarios to historical data for N_2O and RCP 45. The harmonization factor is phased out until 2050. The regions shown here are built from downscaled data to harmonize the region definitions of the SSPv2 scenarios to the RCP regions.

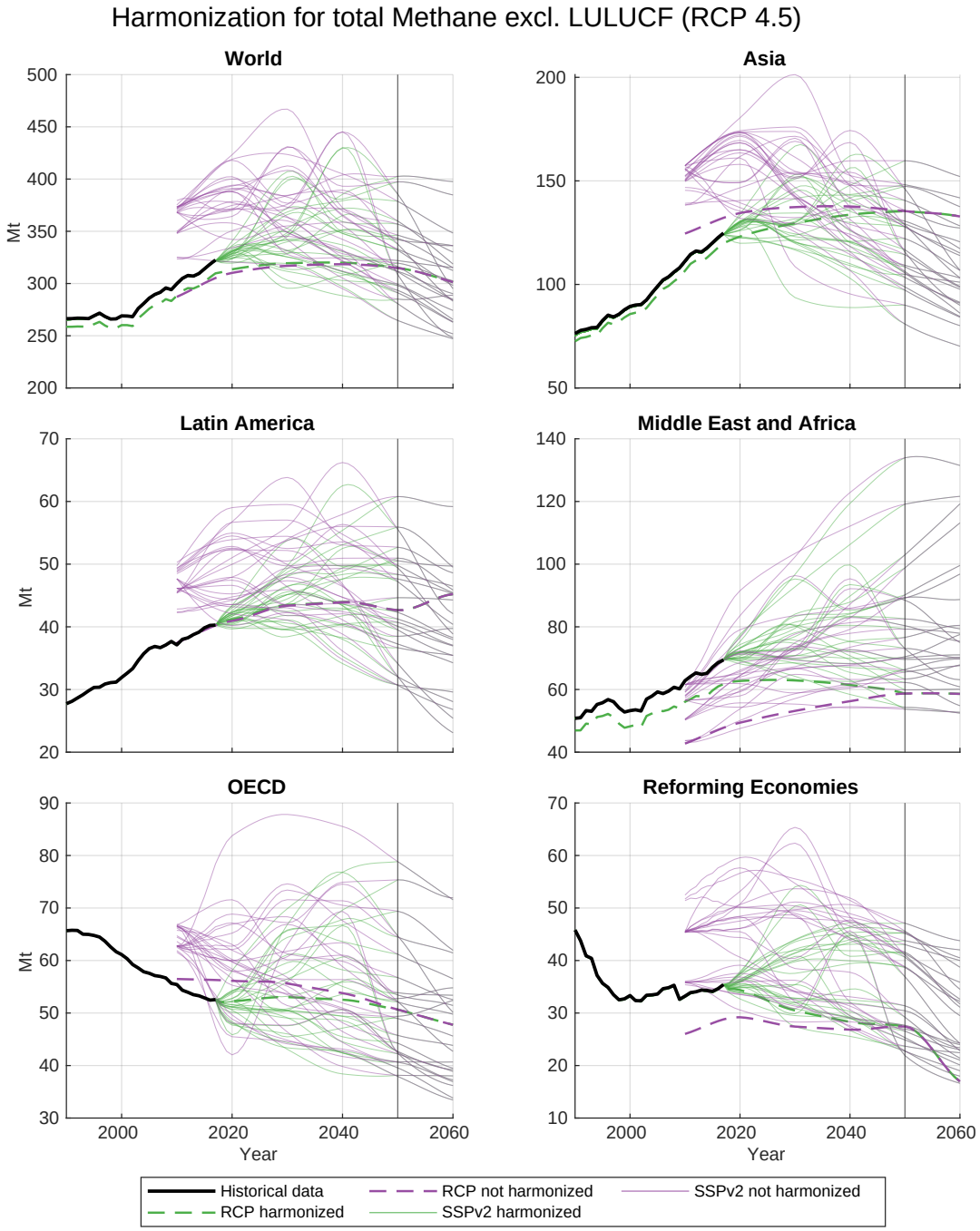

Figure S7. Harmonization of scenarios to historical data for CH_4 and RCP 45. The harmonization factor is phased out until 2050. The regions shown here are built from downscaled data to harmonize the region definitions of the SSPv2 scenarios to the RCP regions.

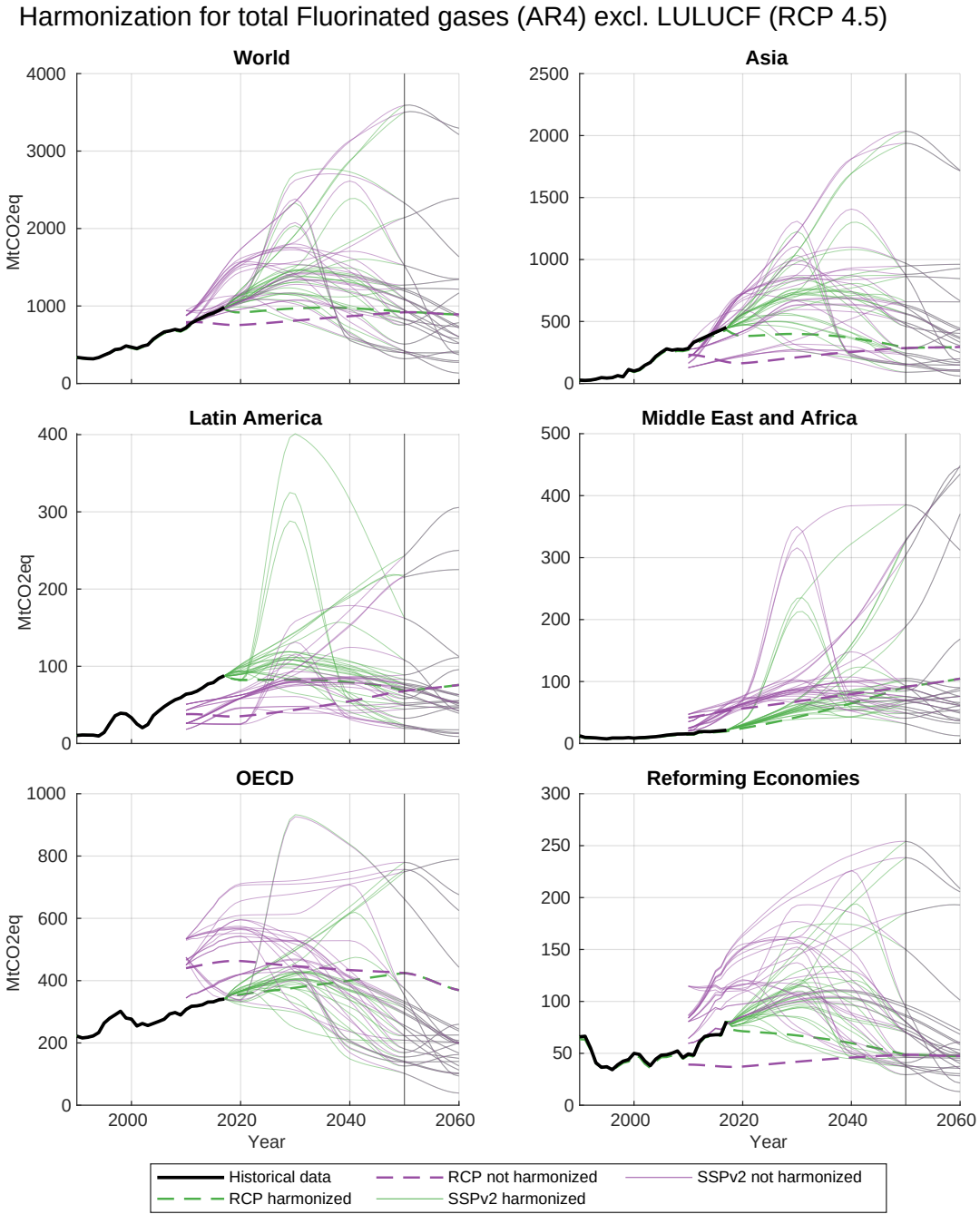

Figure S8. Harmonization of scenarios to historical data for fluorinated gases and RCP 45. The harmonization factor is phased out until 2050. The regions shown here are built from downscaled data to harmonize the region definitions of the SSPv2 scenarios to the RCP regions.

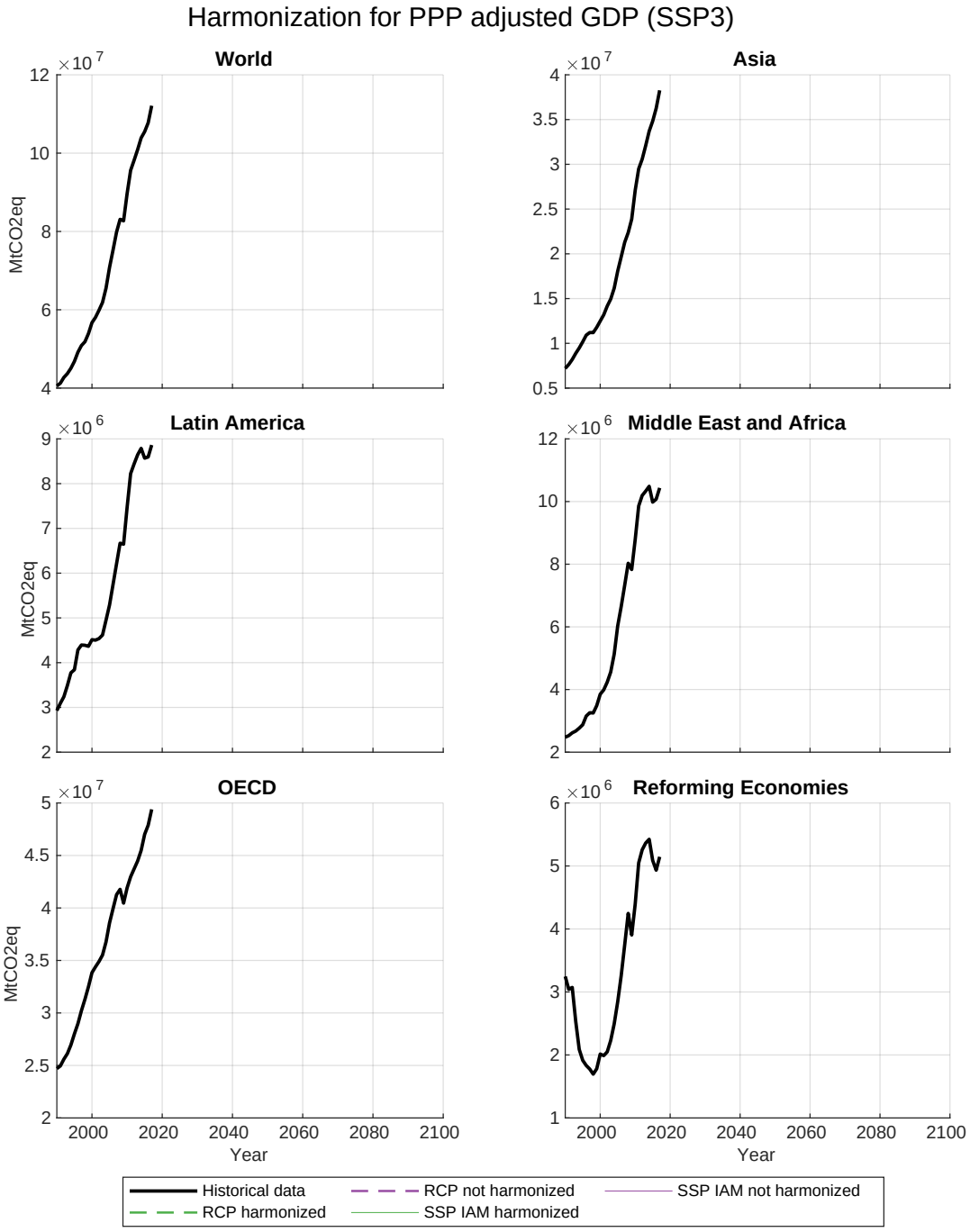

Figure S9. Harmonization of scenarios to historical data for GDP and SSP 3. The regions shown here are built from downscaled data to harmonize the region definitions of the SSPv2 scenarios to the RCP regions.

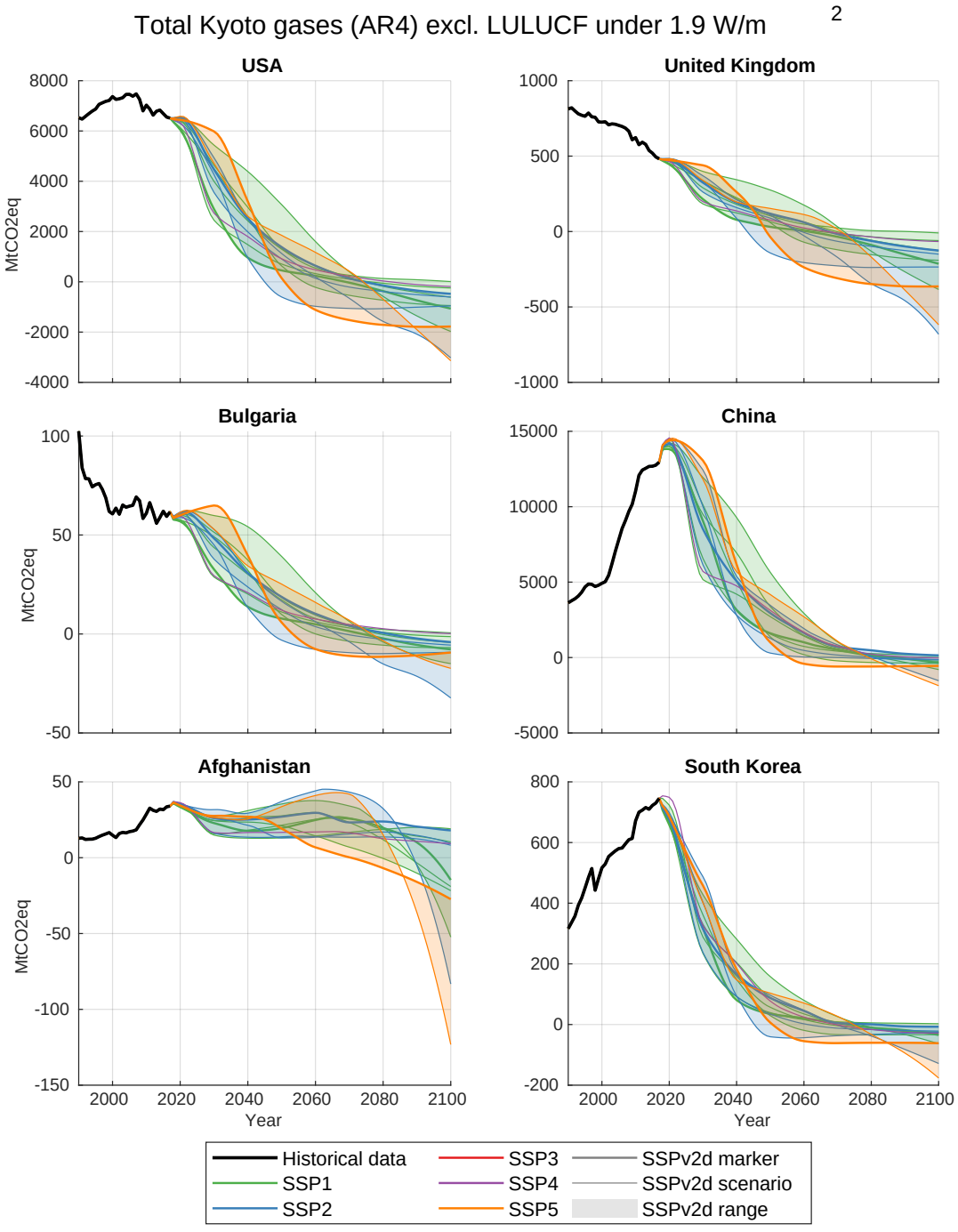

Figure S10. Kyoto GHG (AR4) results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

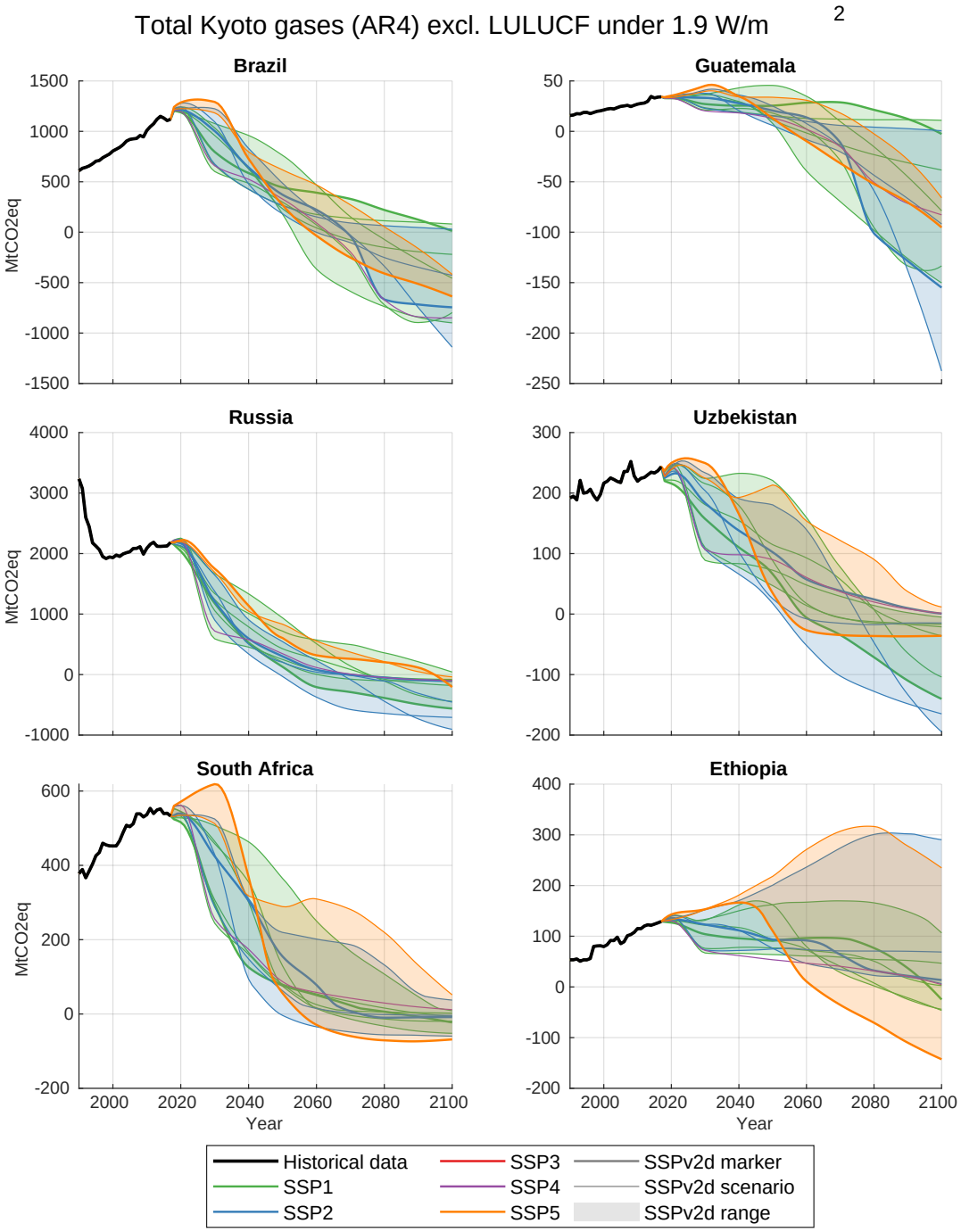

Figure S11. Kyoto GHG (AR4) results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

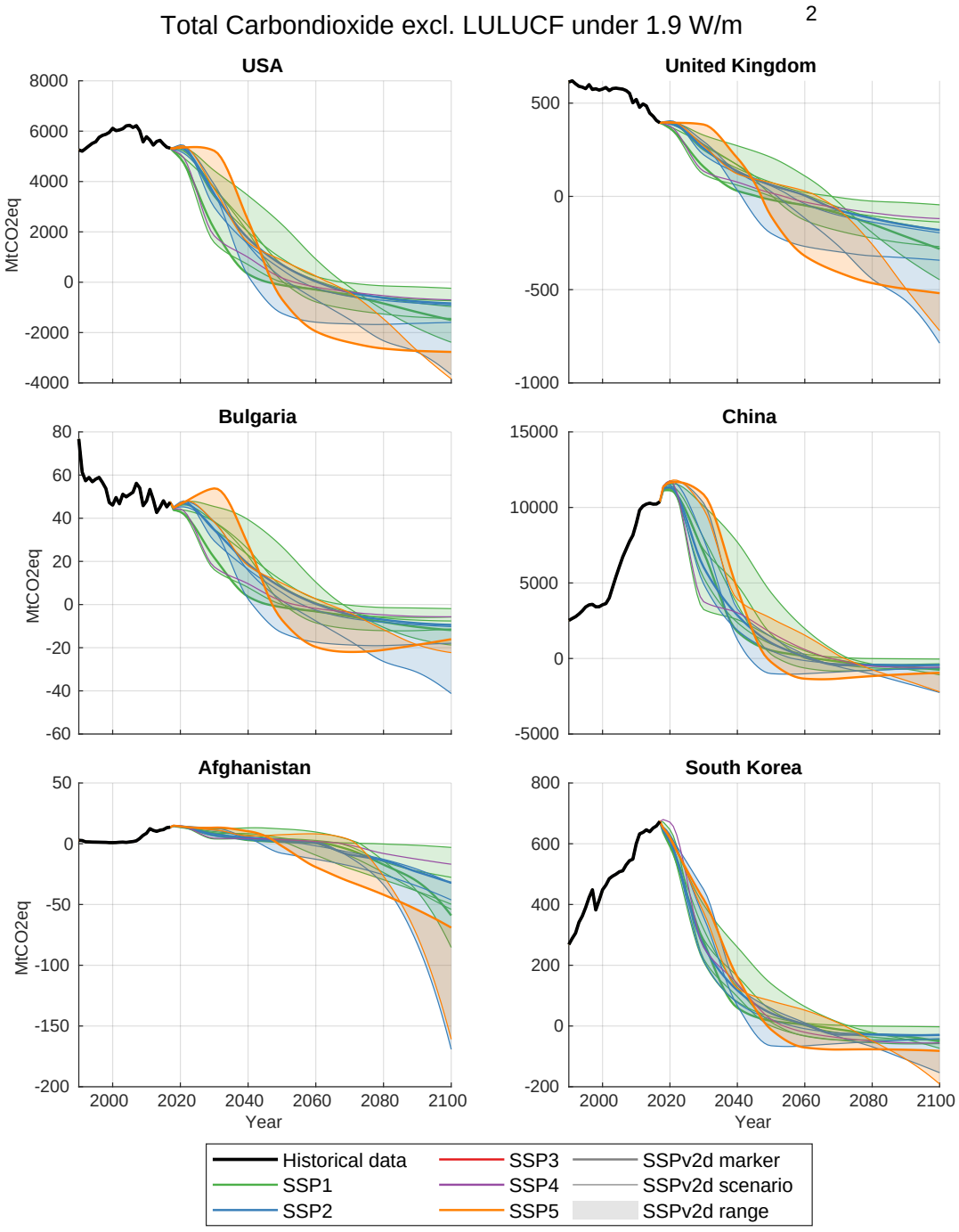

Figure S12. CO_2 results for $1.9W/m^2$ and all SSPs for SSP IAM scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

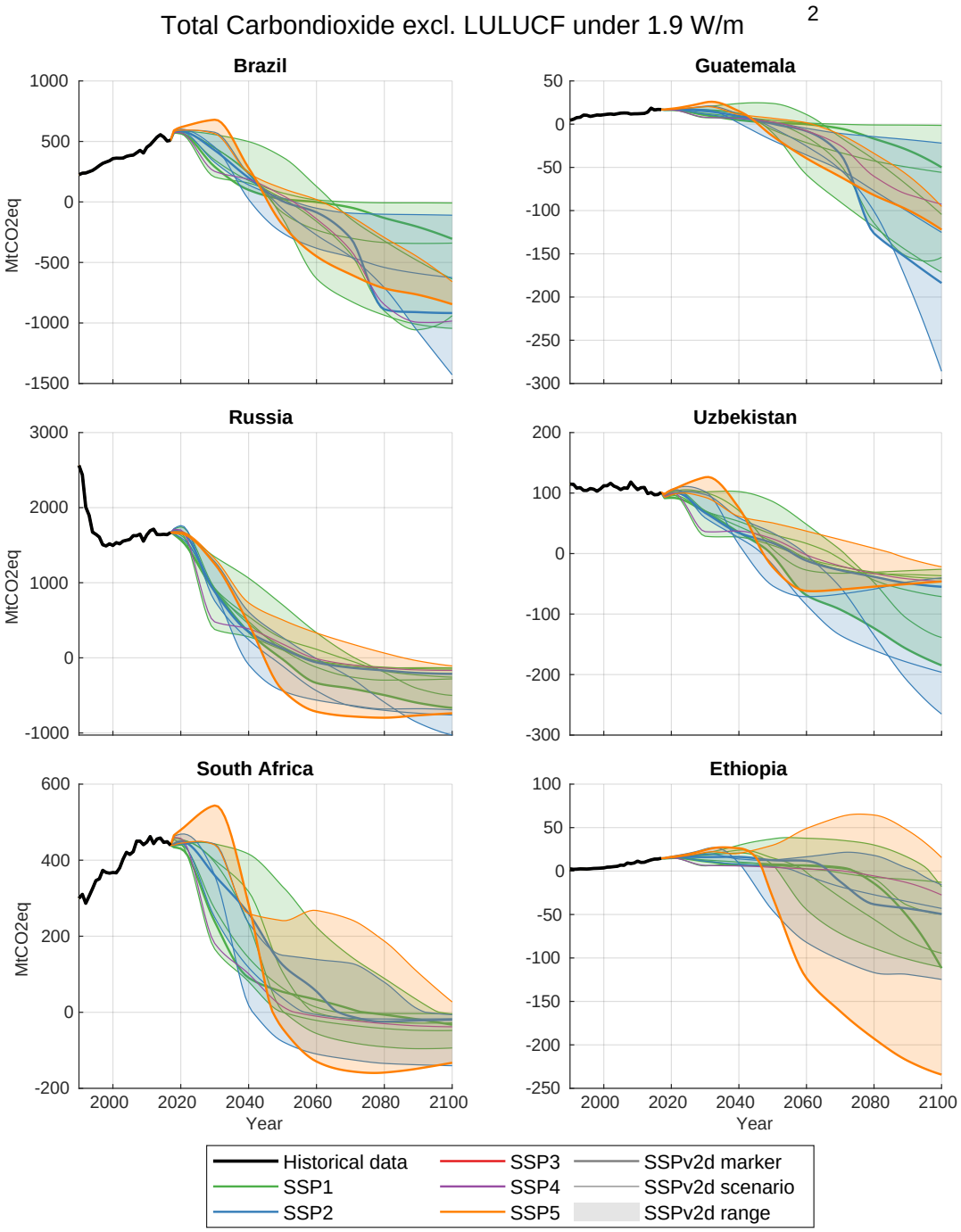

Figure S13. CO_2 results for $1.9W/m^2$ and all SSPs for SSP IAM scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

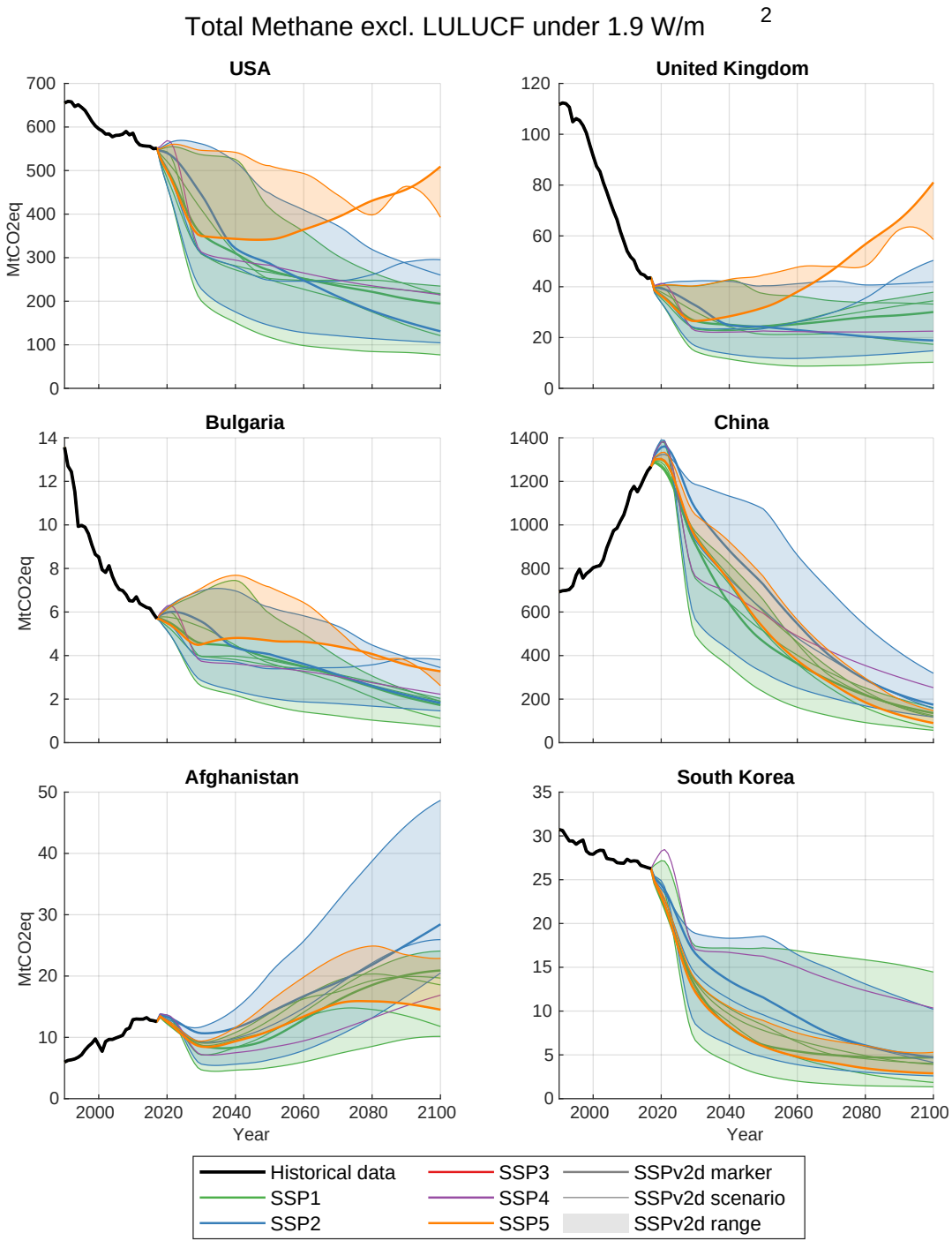

Figure S14. CH_4 results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

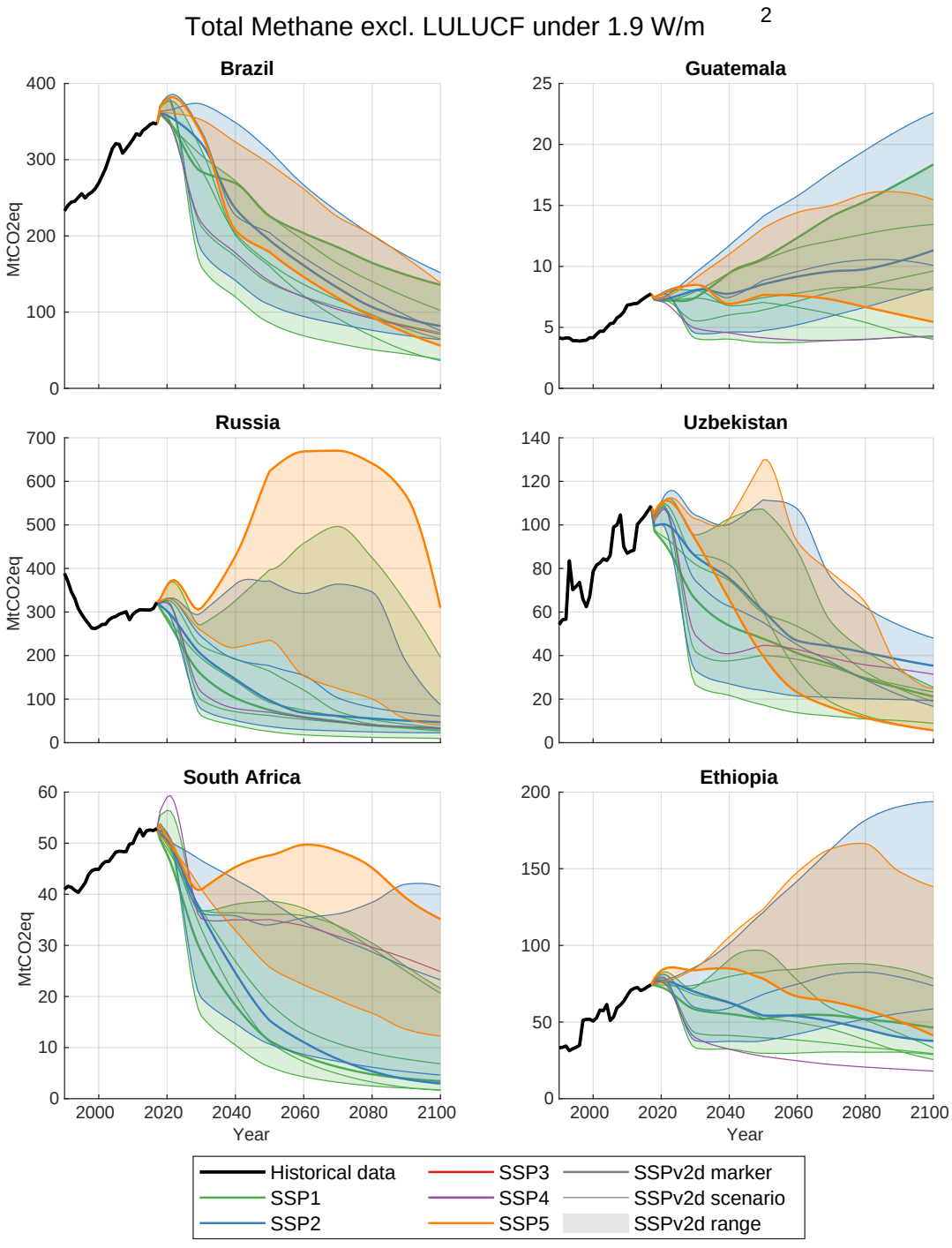

Figure S15. CH_4 results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

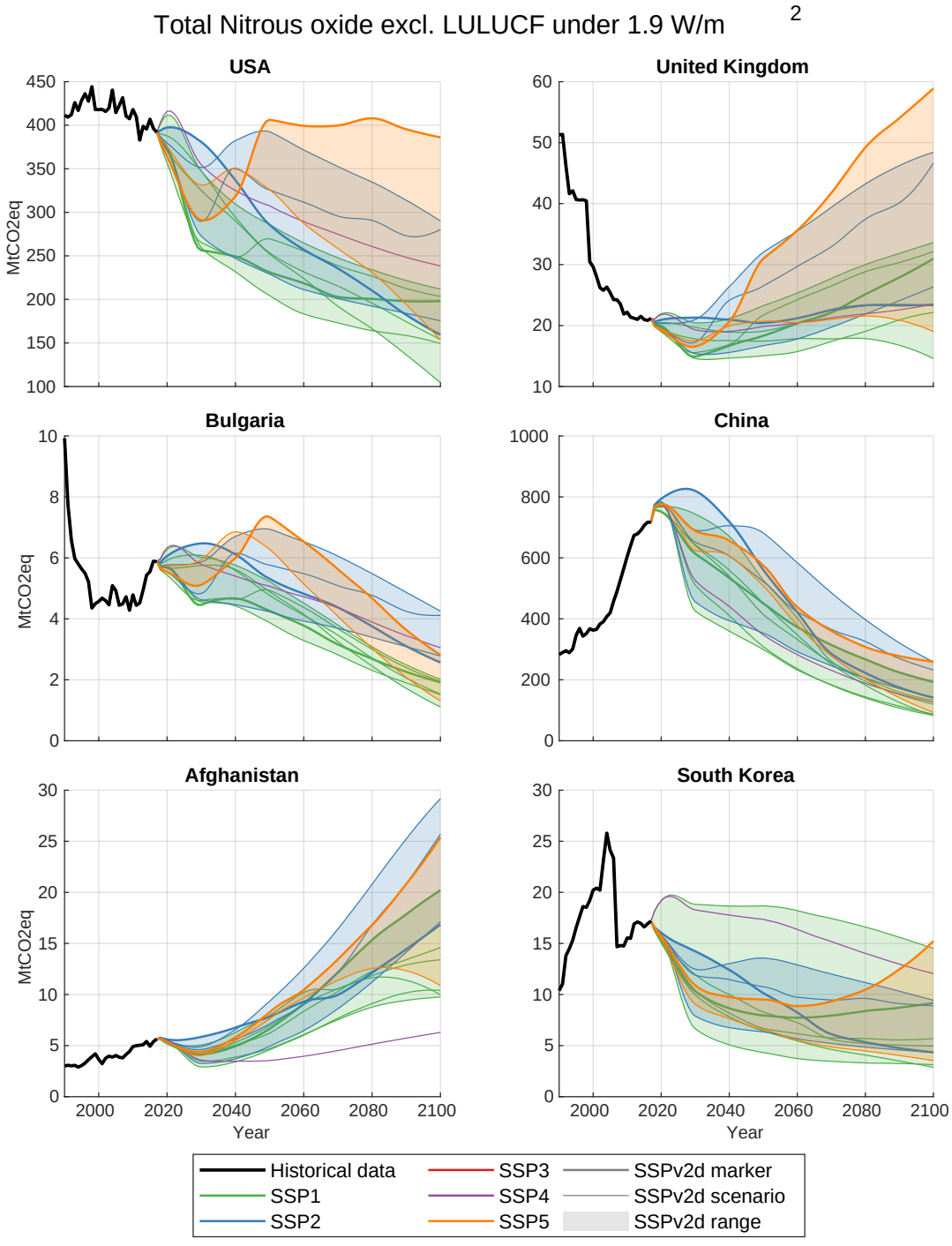

Figure S16. N_2O results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

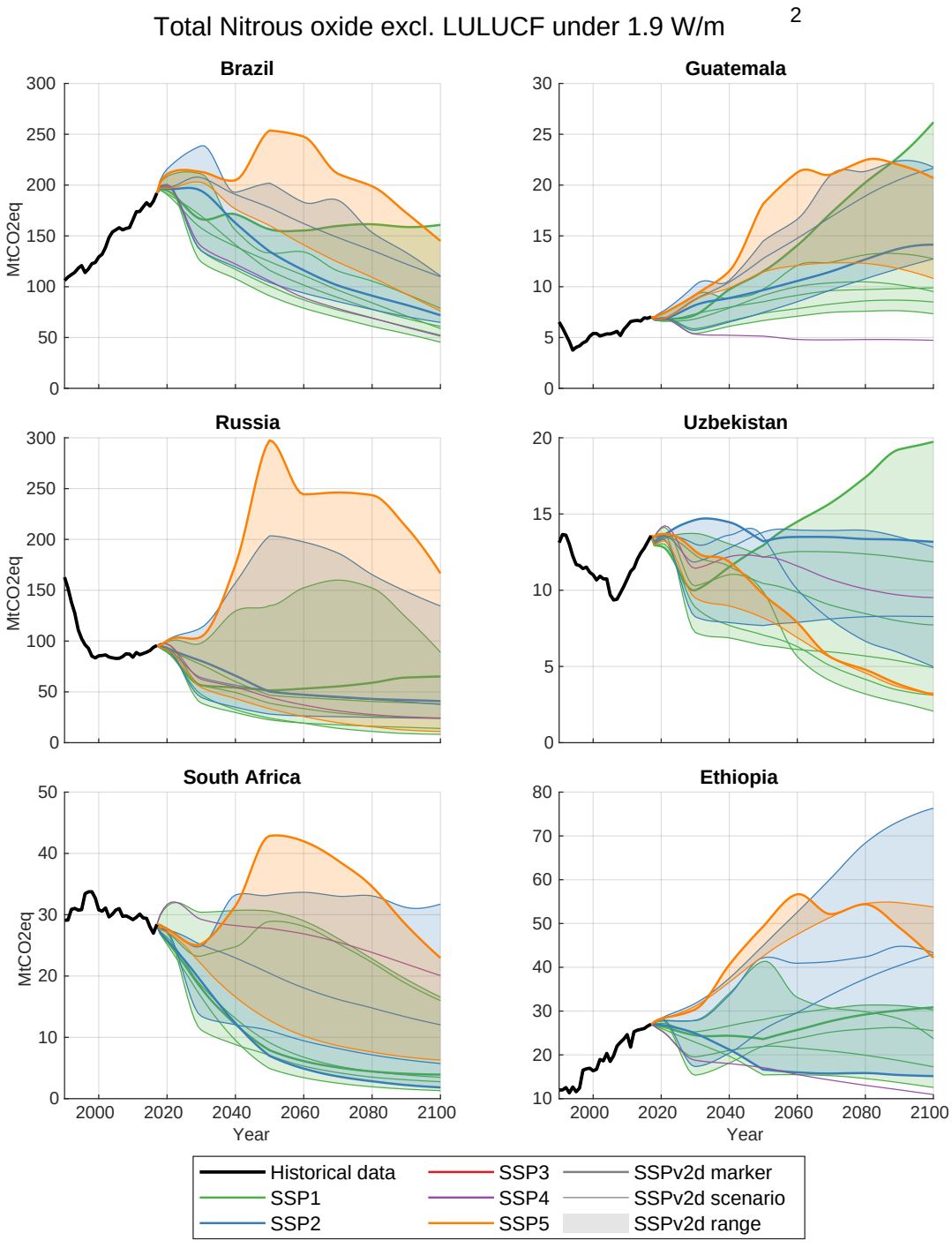

Figure S17. N_2O results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

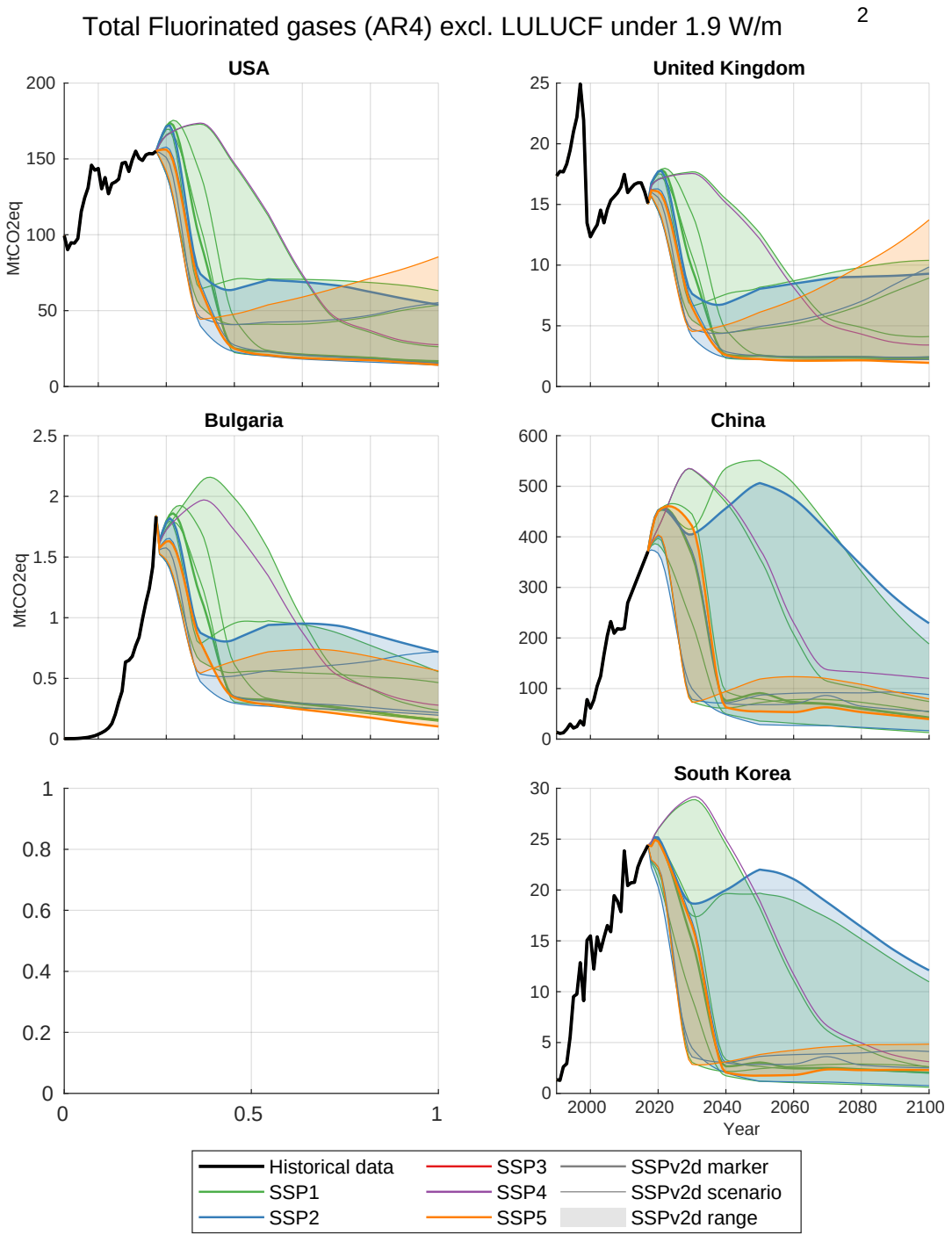

Figure S18. Fluorinated gases (AR4) results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

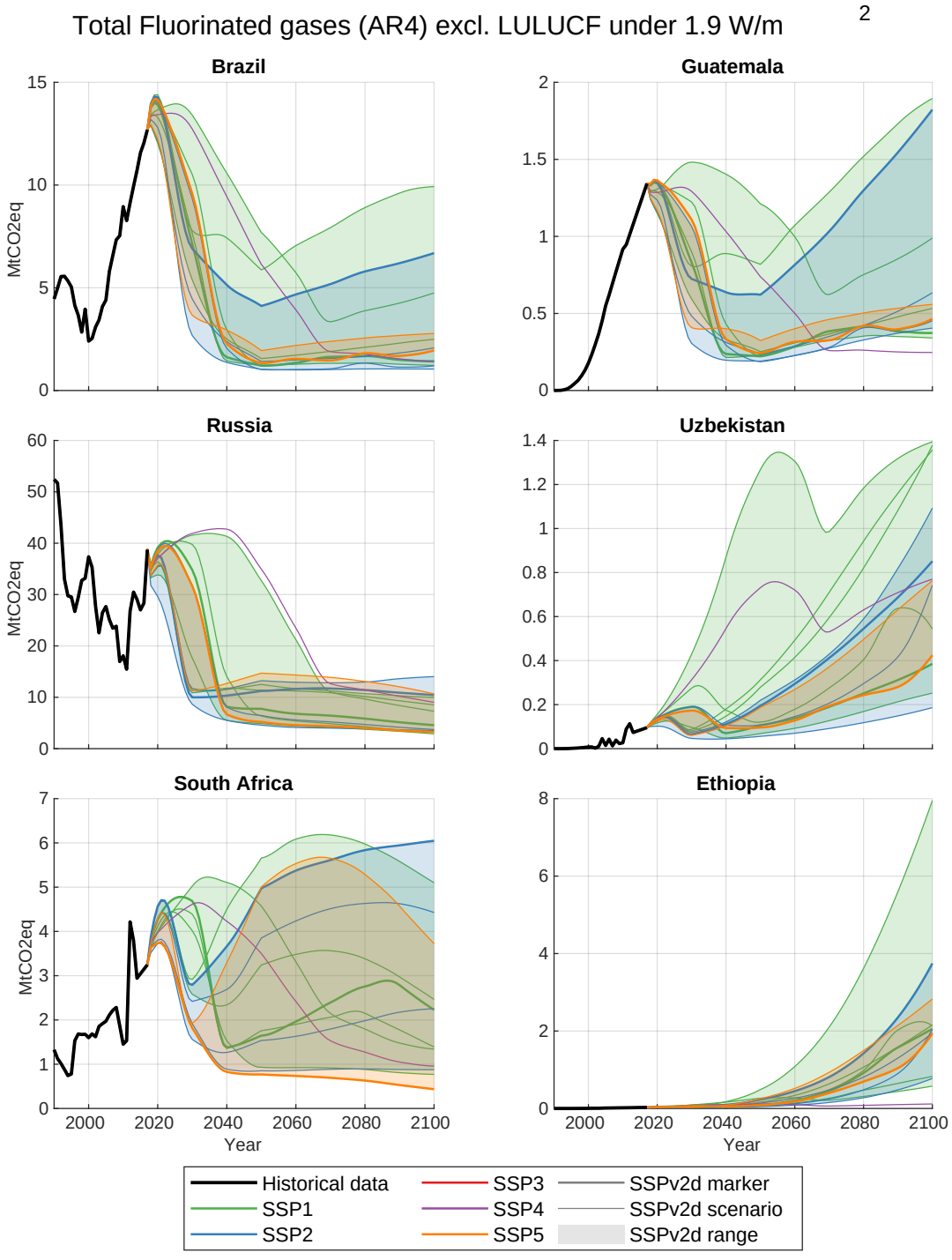

Figure S19. Fluorinated gases (AR4) results for $1.9 W/m^2$ and all SSPs for SSP IAM scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

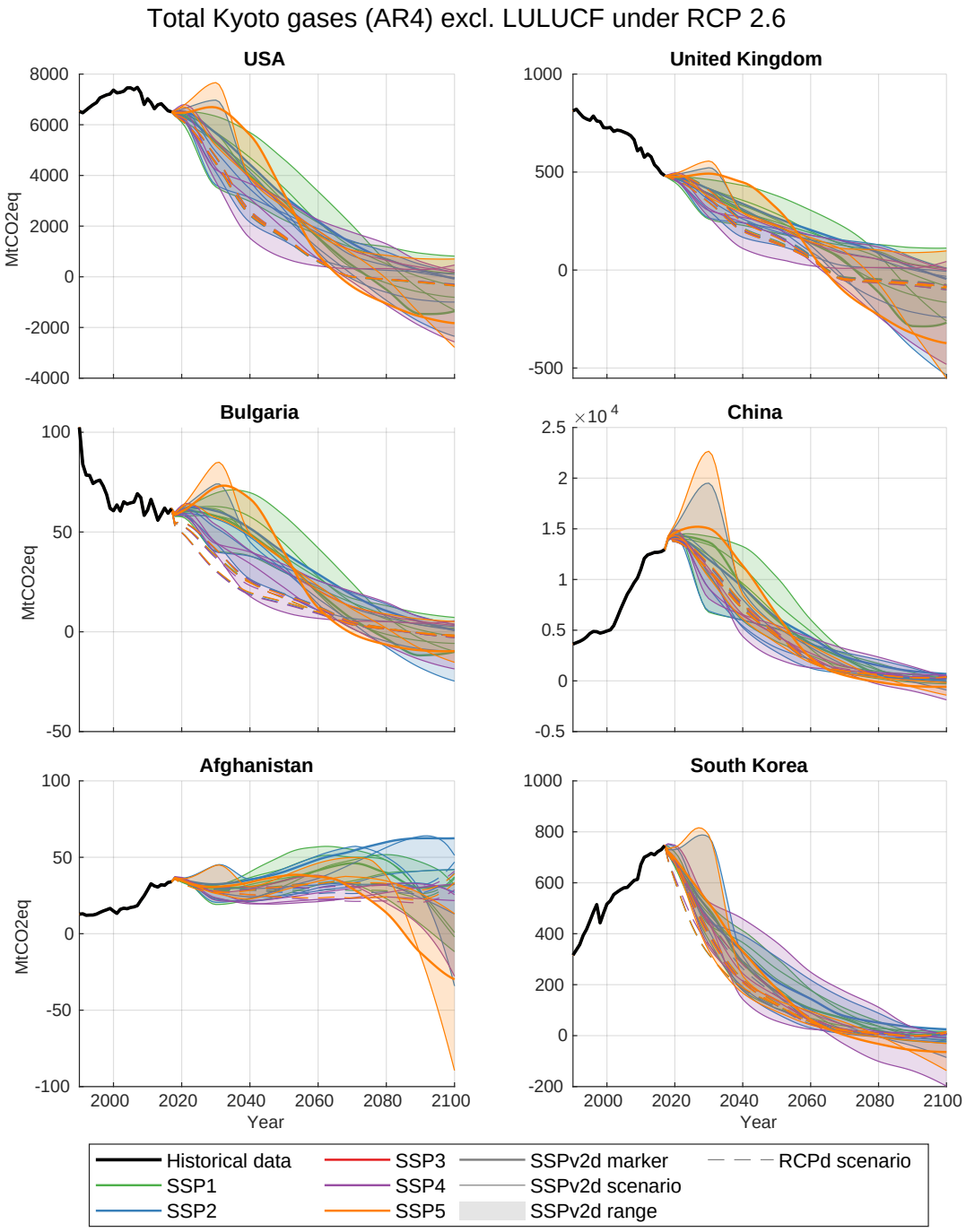

Figure S20. Kyoto GHG (AR4) results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

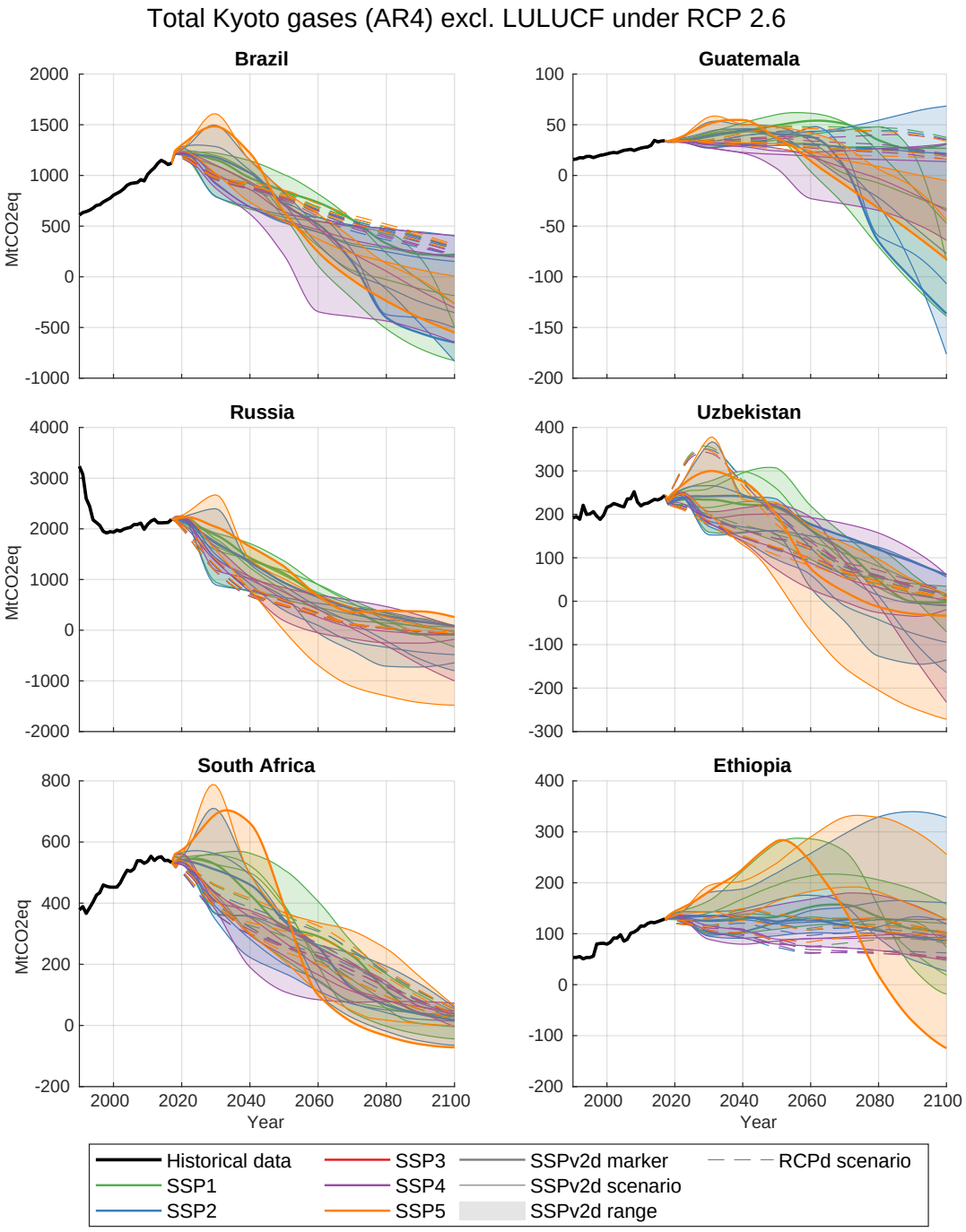

Figure S21. Kyoto GHG (AR4) results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

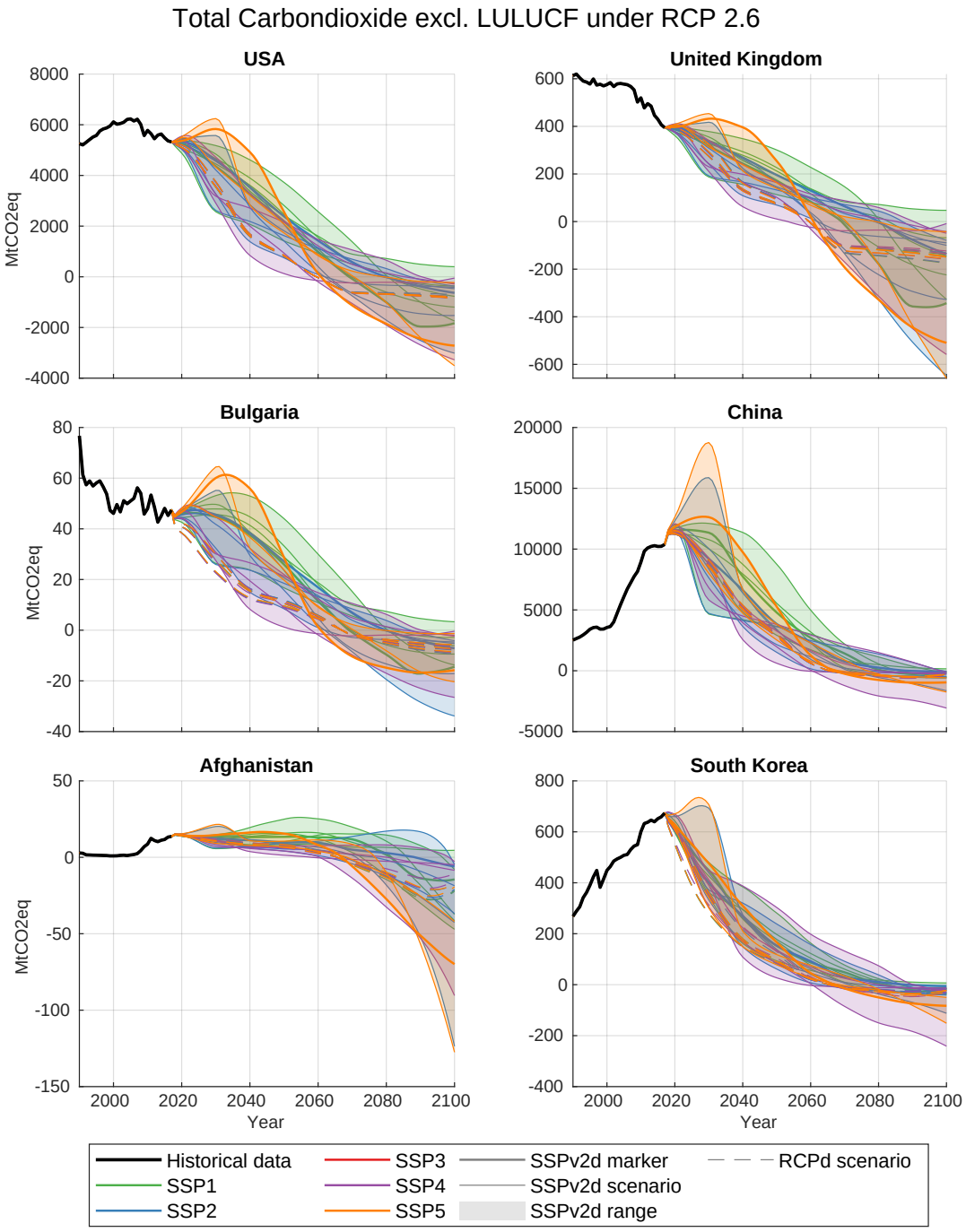

Figure S22. CO_2 results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

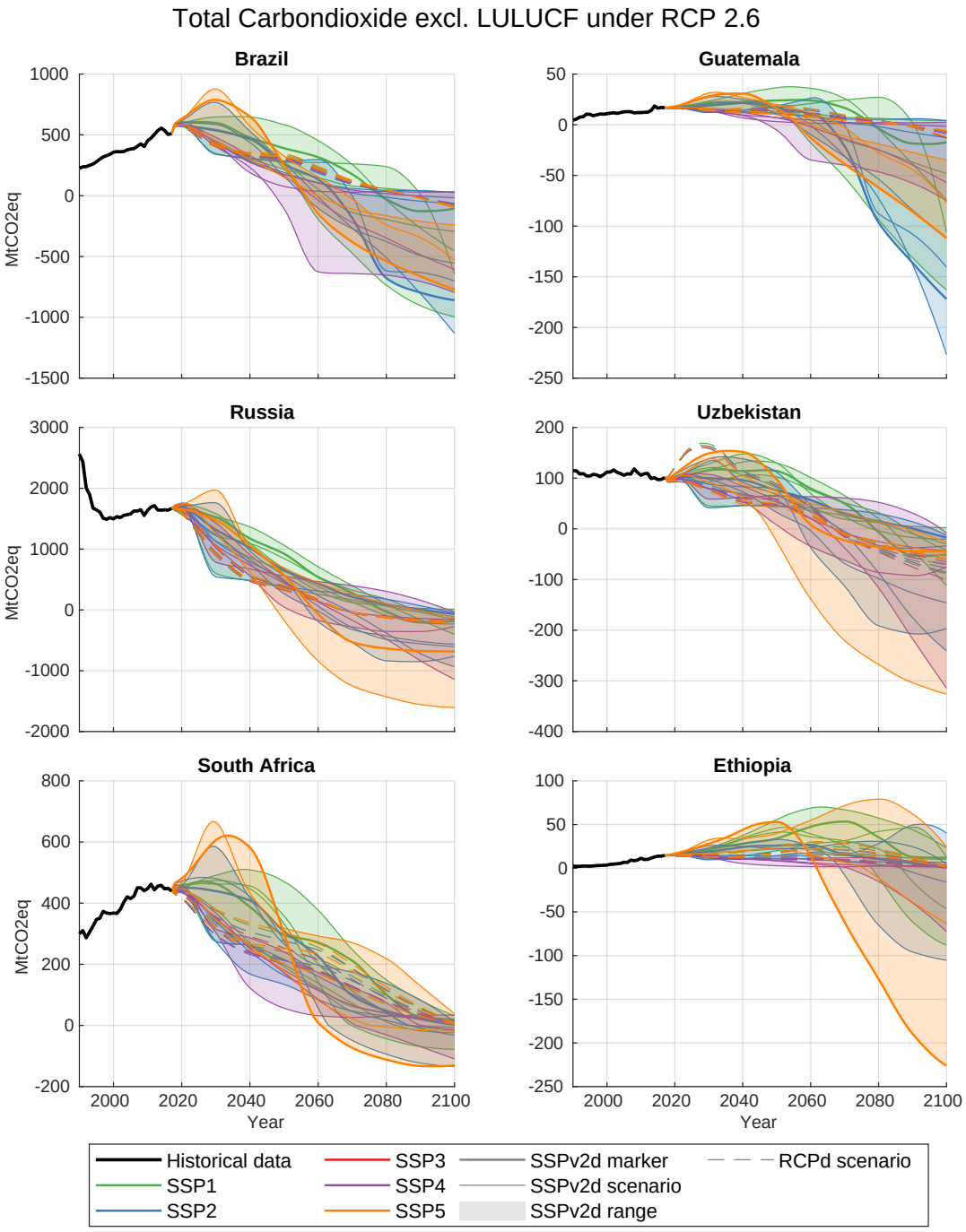

Figure S23. CO_2 results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

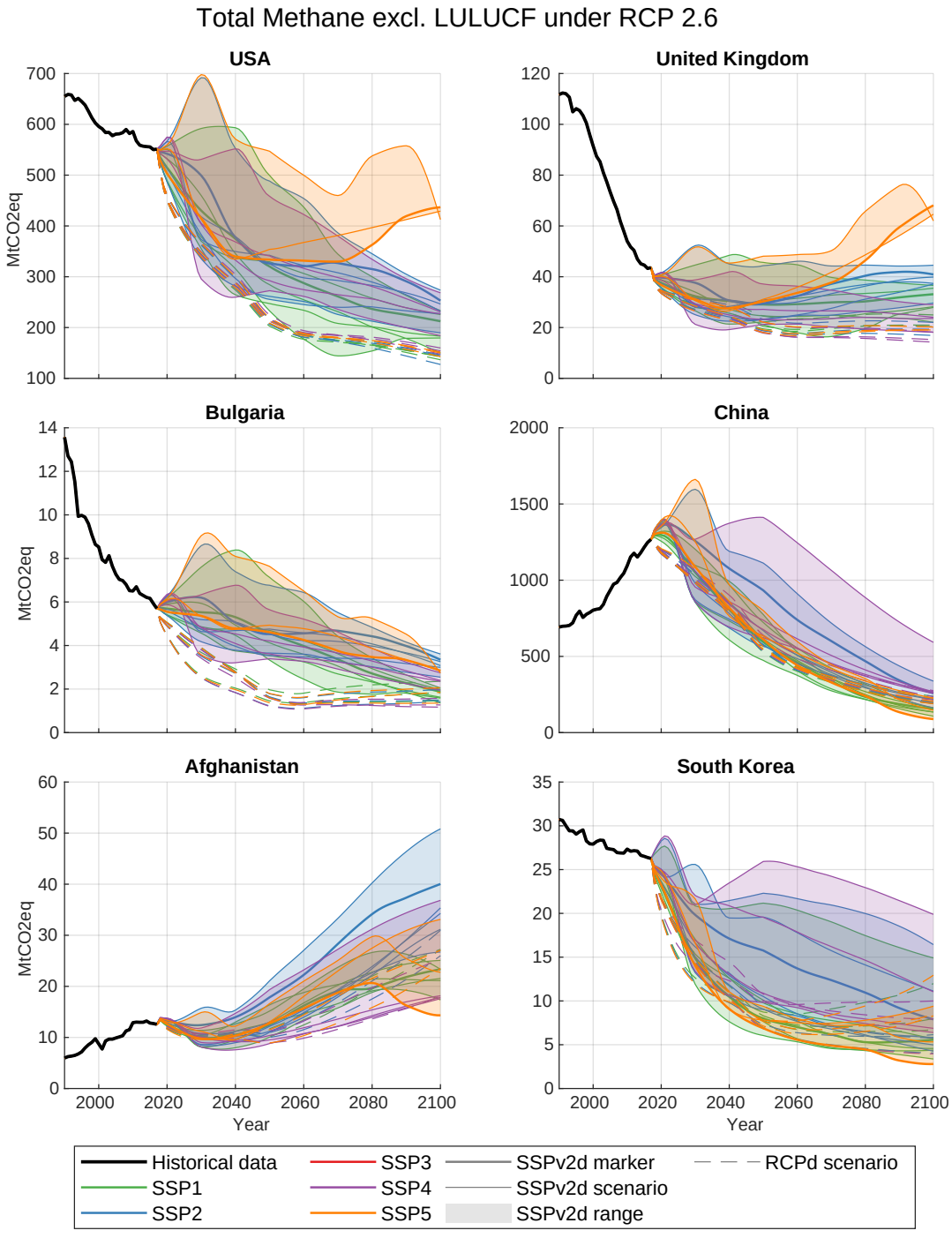

Figure S24. CH_4 results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

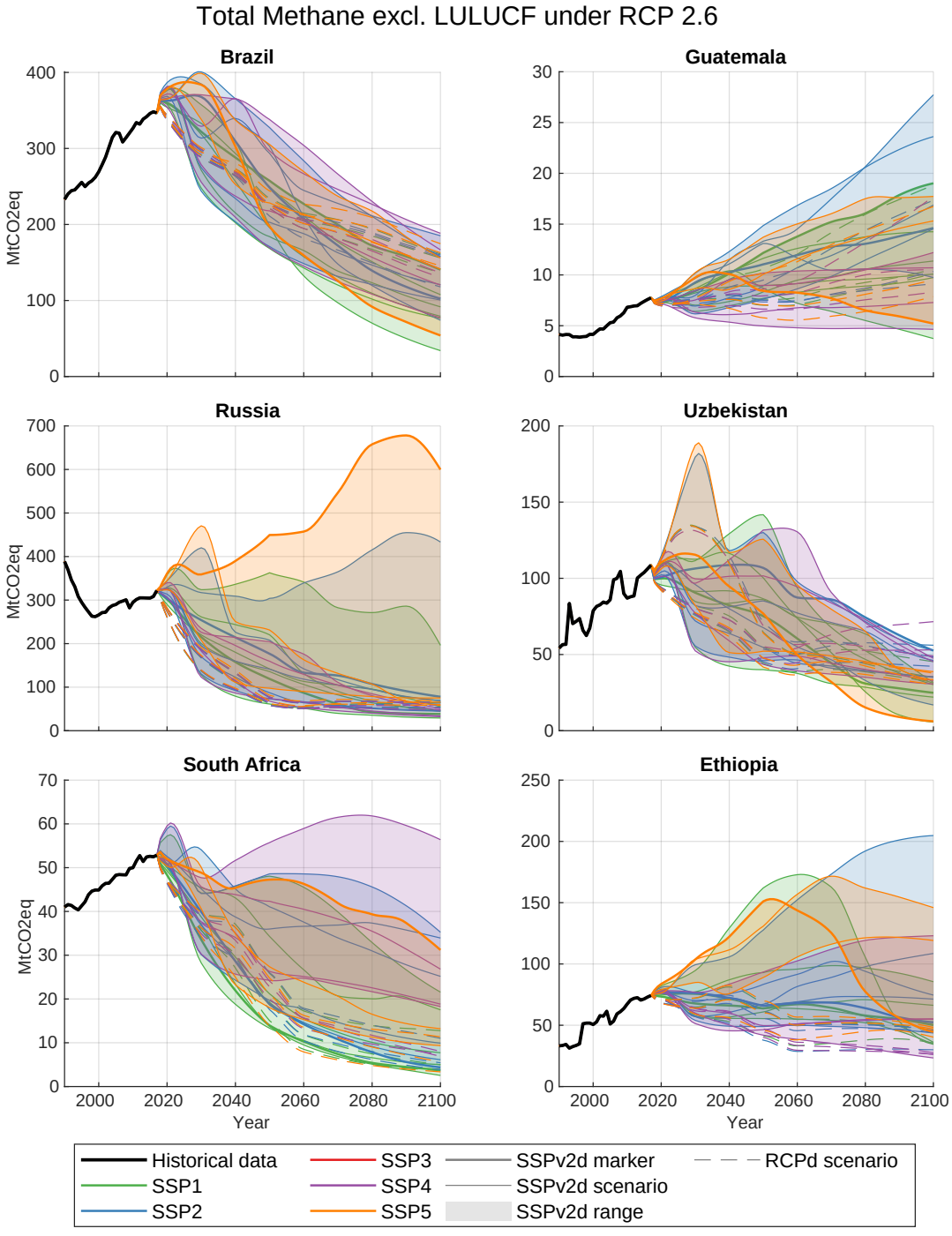

Figure S25. CH_4 results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

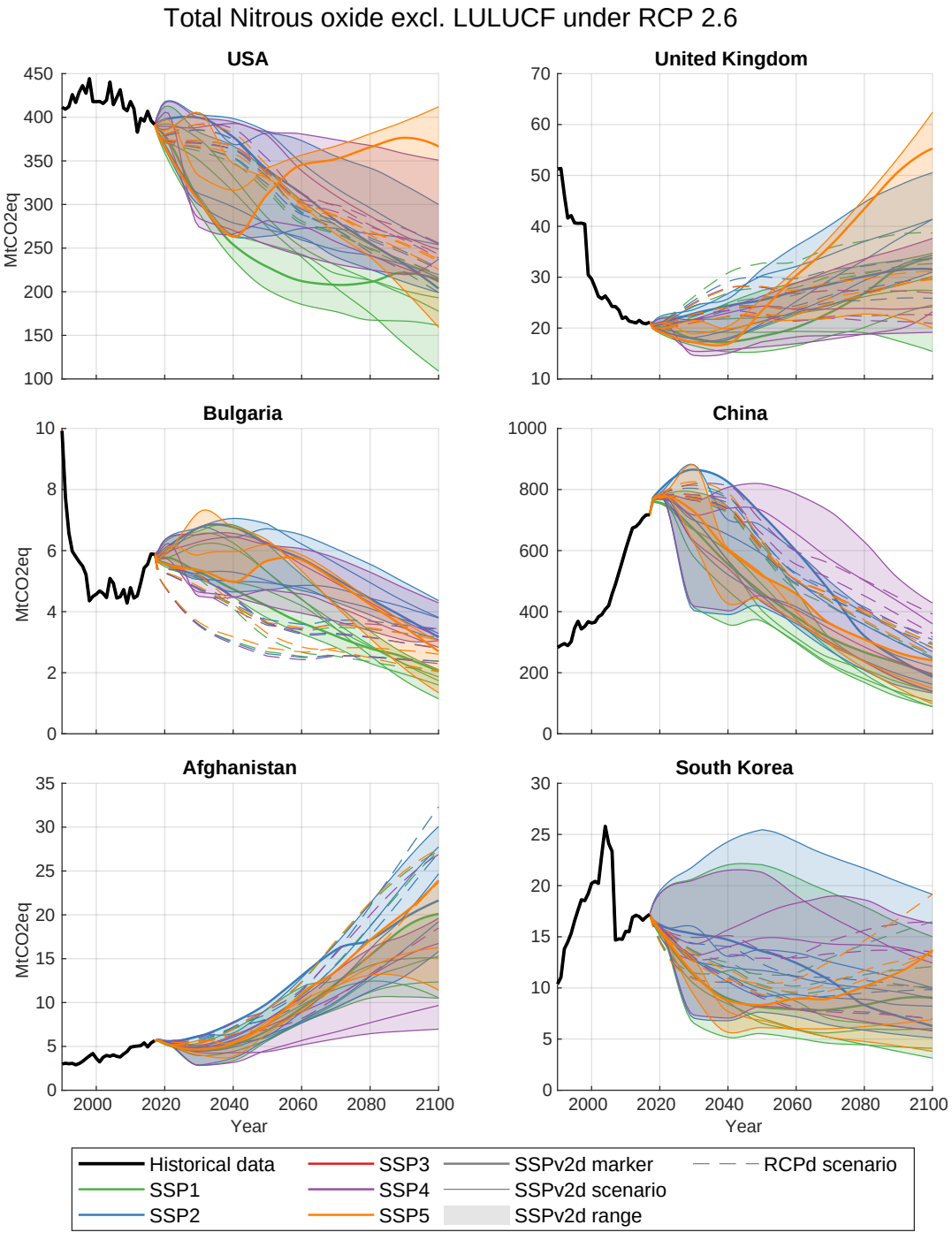

Figure S26. N_2O results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

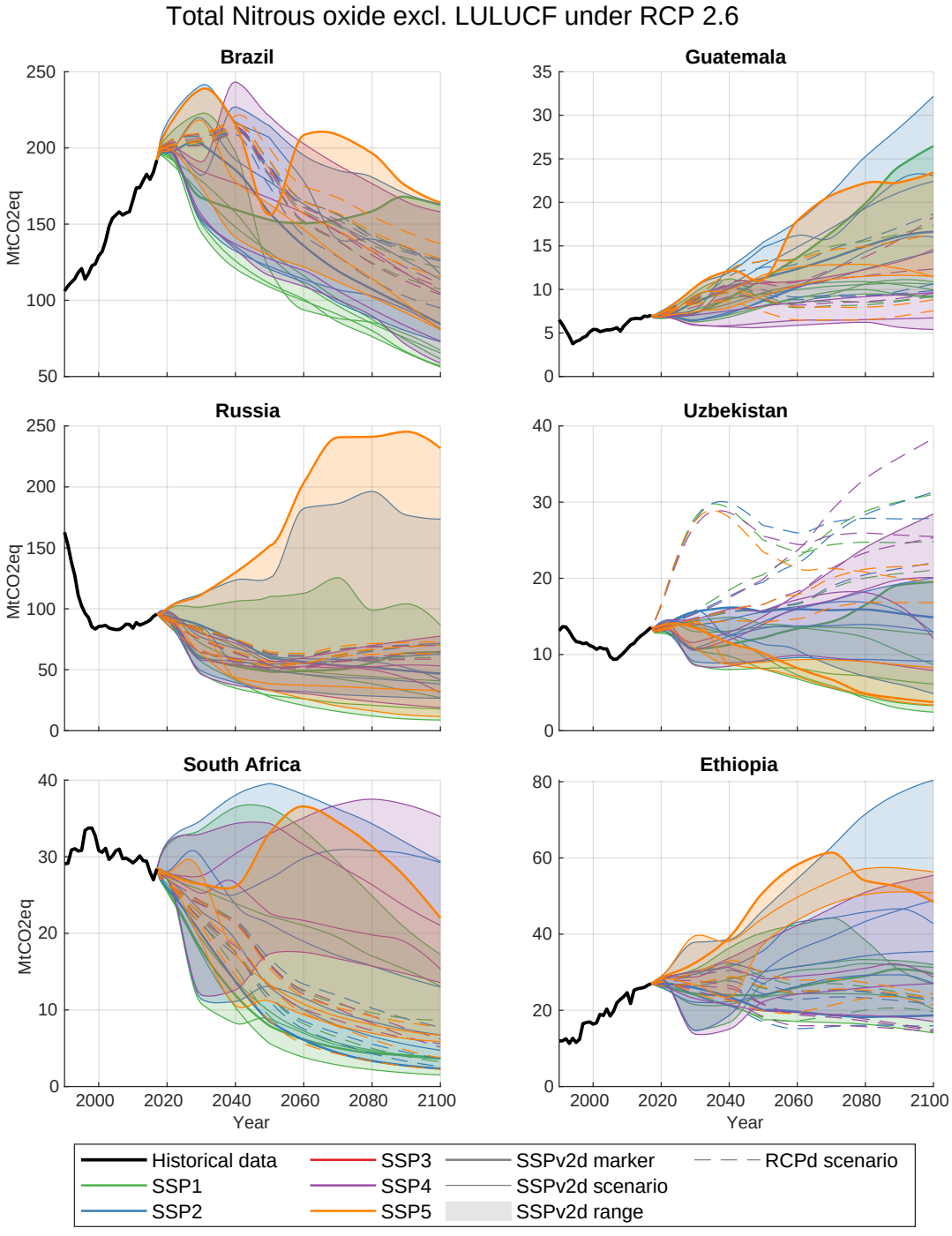

Figure S27. N_2O results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

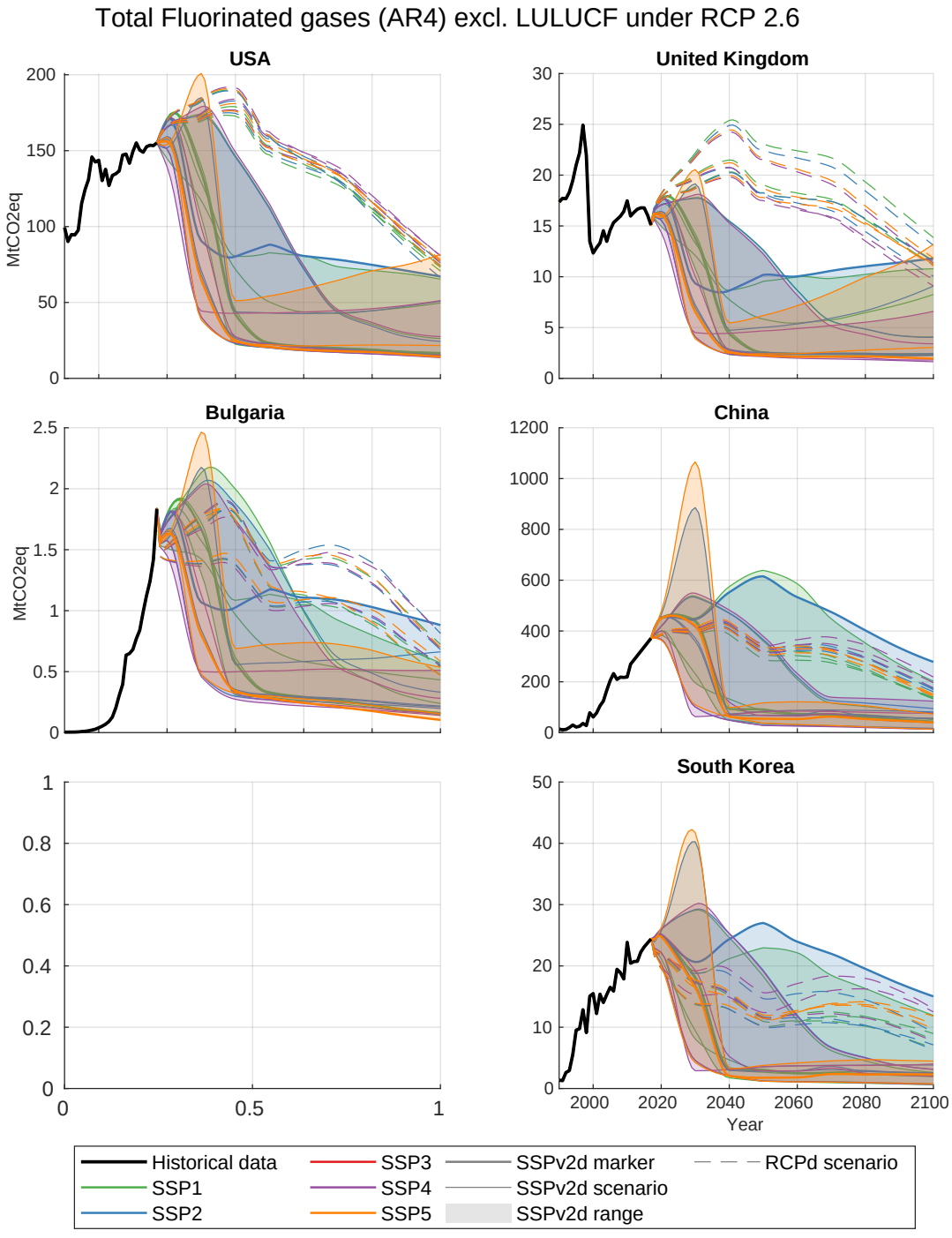

Figure S28. Fluorinated gases (AR4) results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

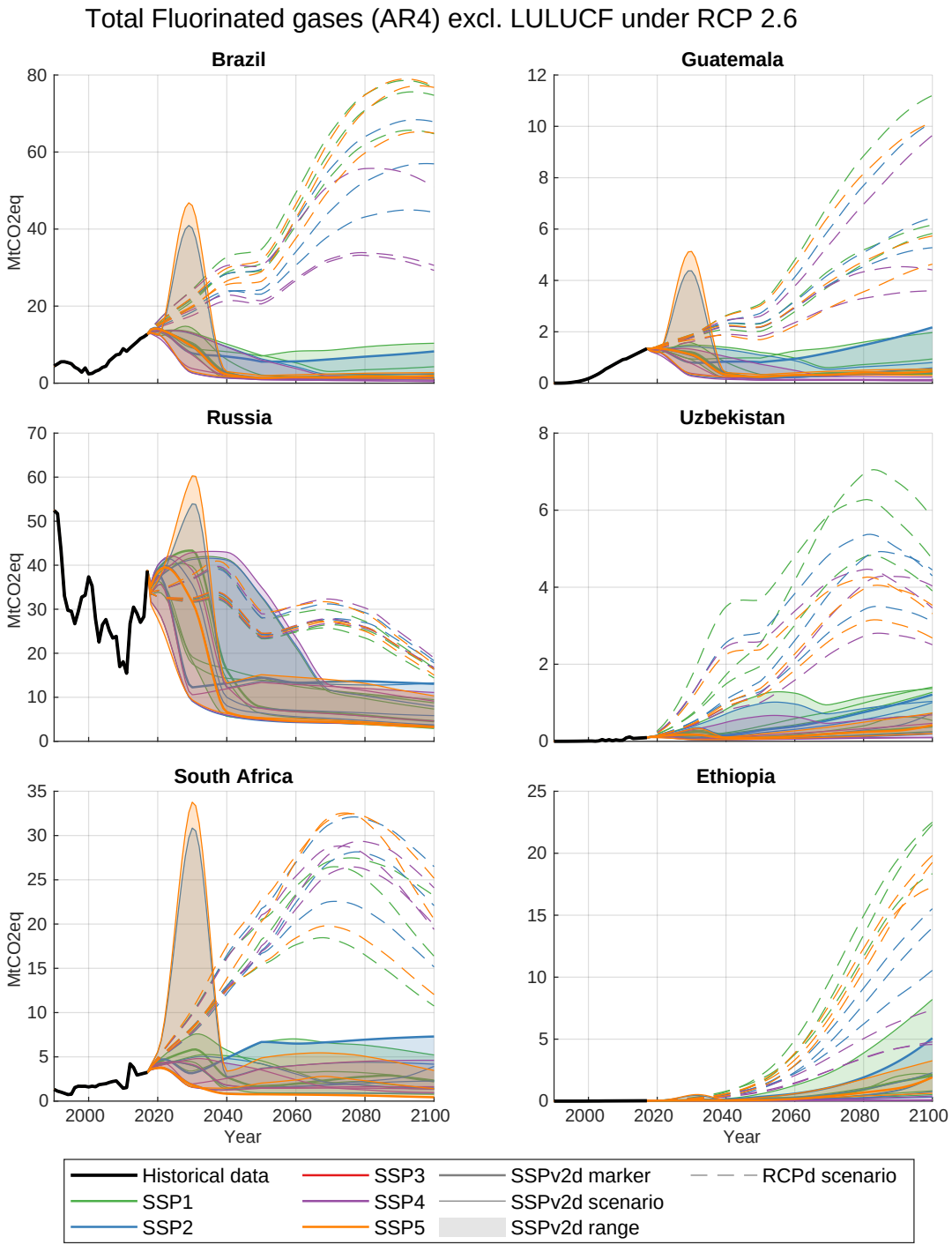

Figure S29. Fluorinated gases (AR4) results for RCP 2.6 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

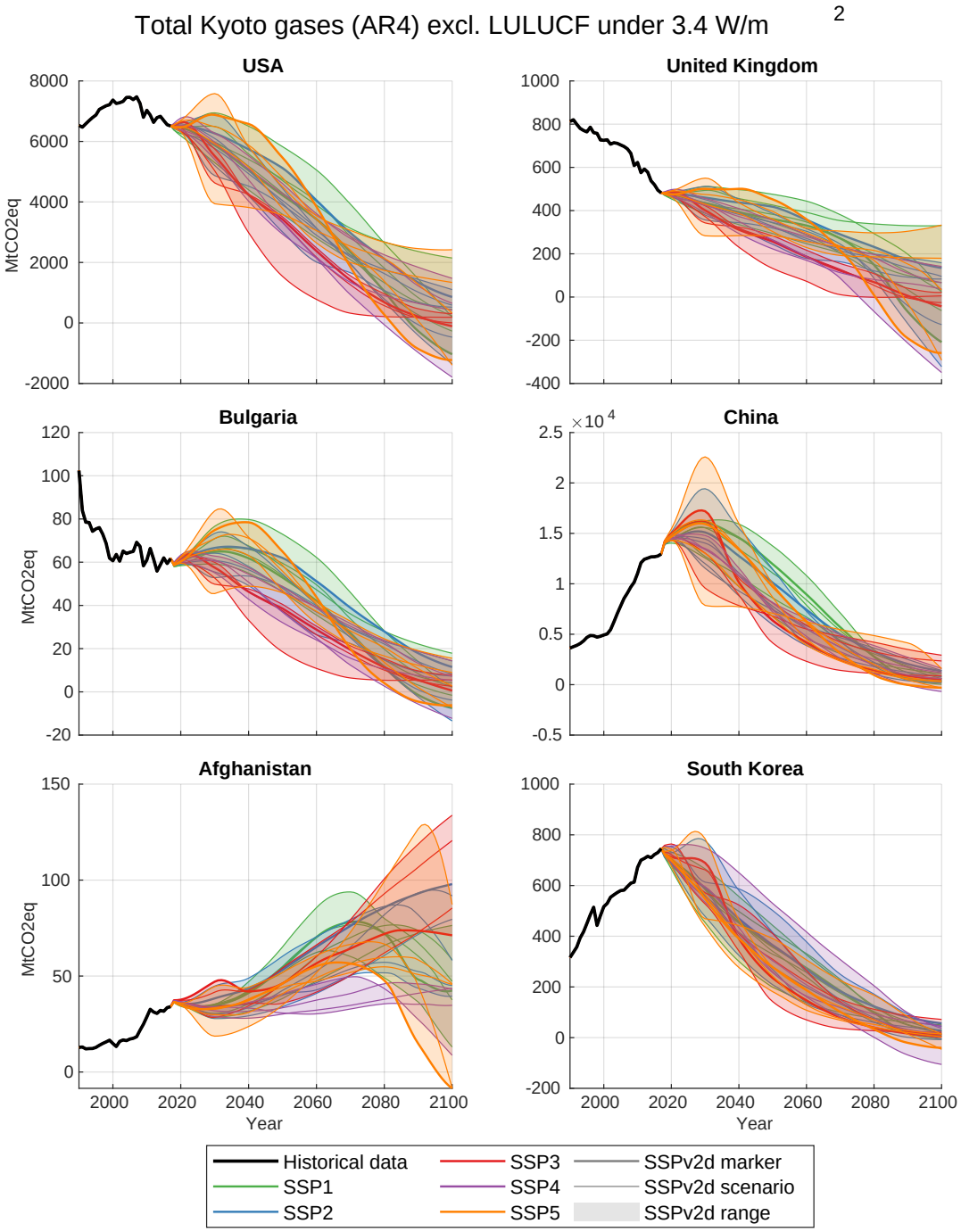

Figure S30. Kyoto GHG (AR4) results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

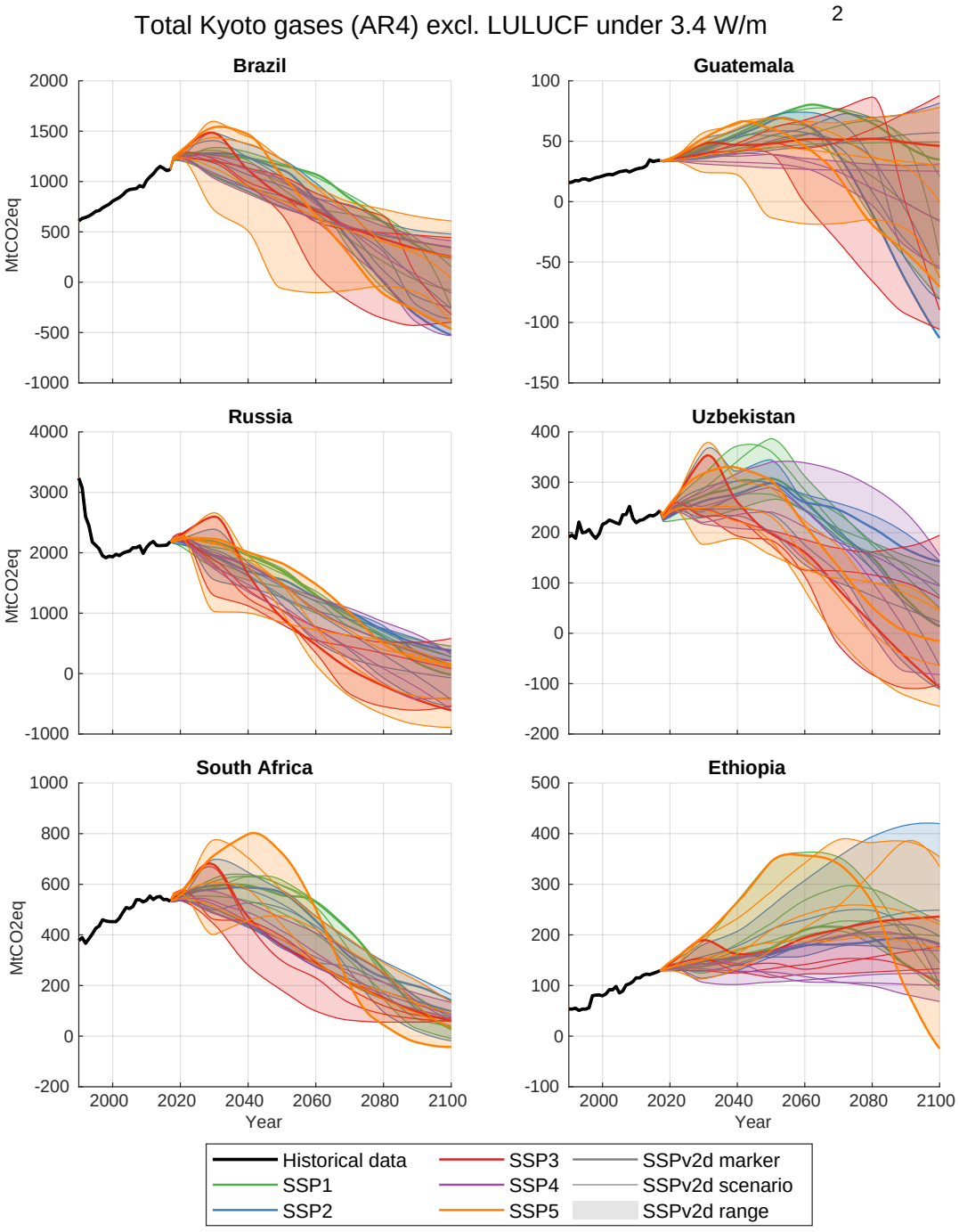

Figure S31. Kyoto GHG (AR4) results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

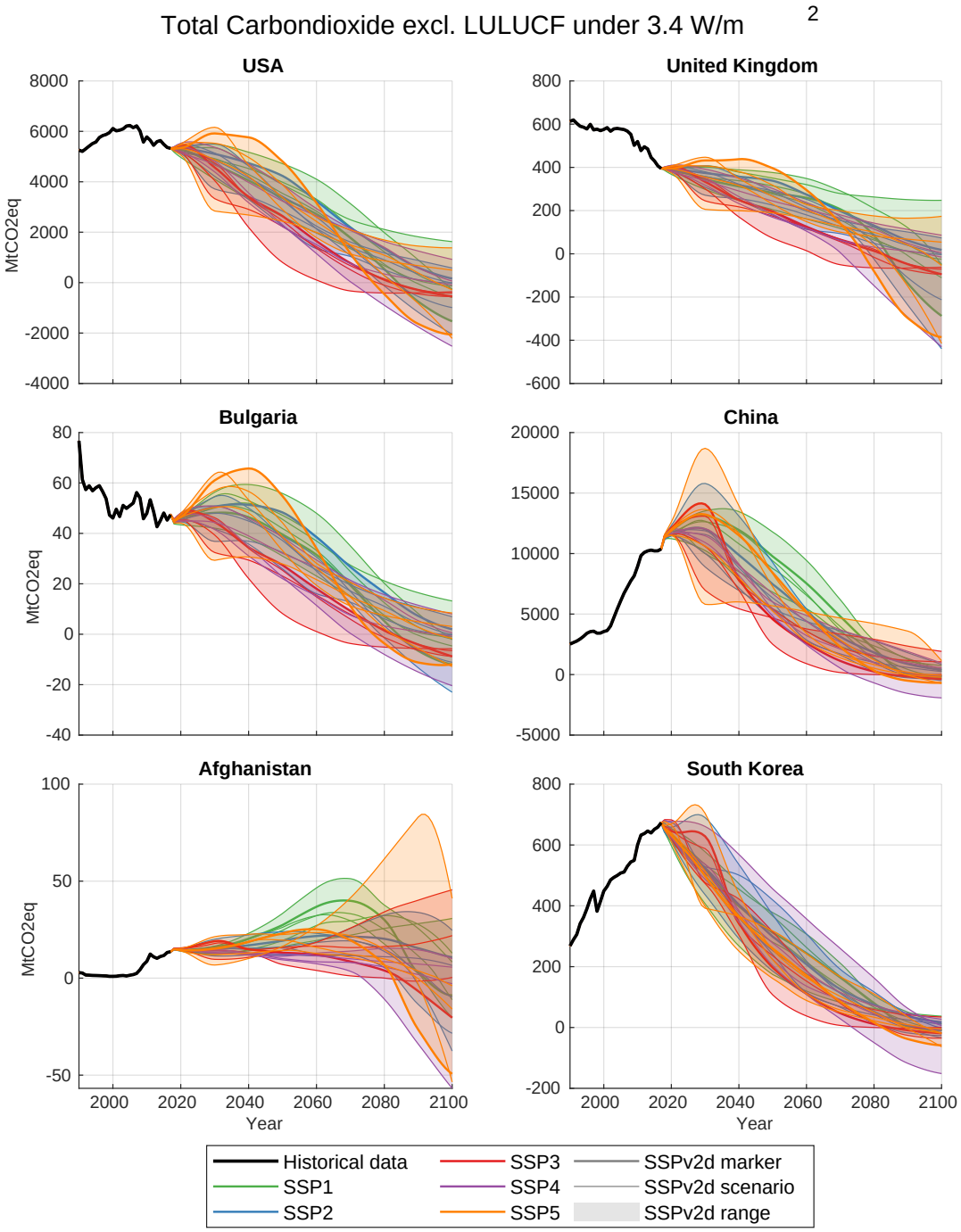

Figure S32. CO_2 results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

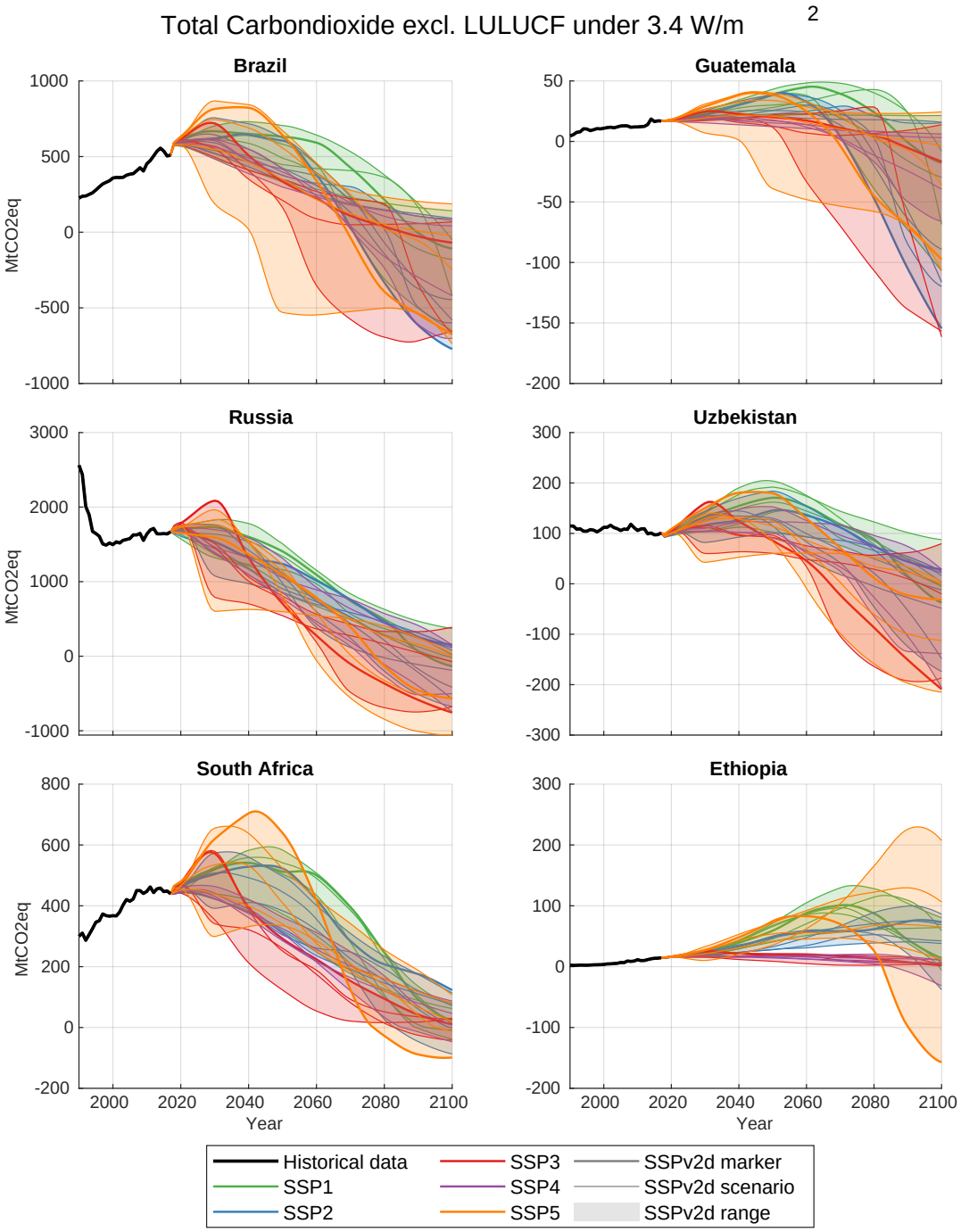

Figure S33. CO_2 results for $3.4W/m^2$ and all SSPs for SSPv2d scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

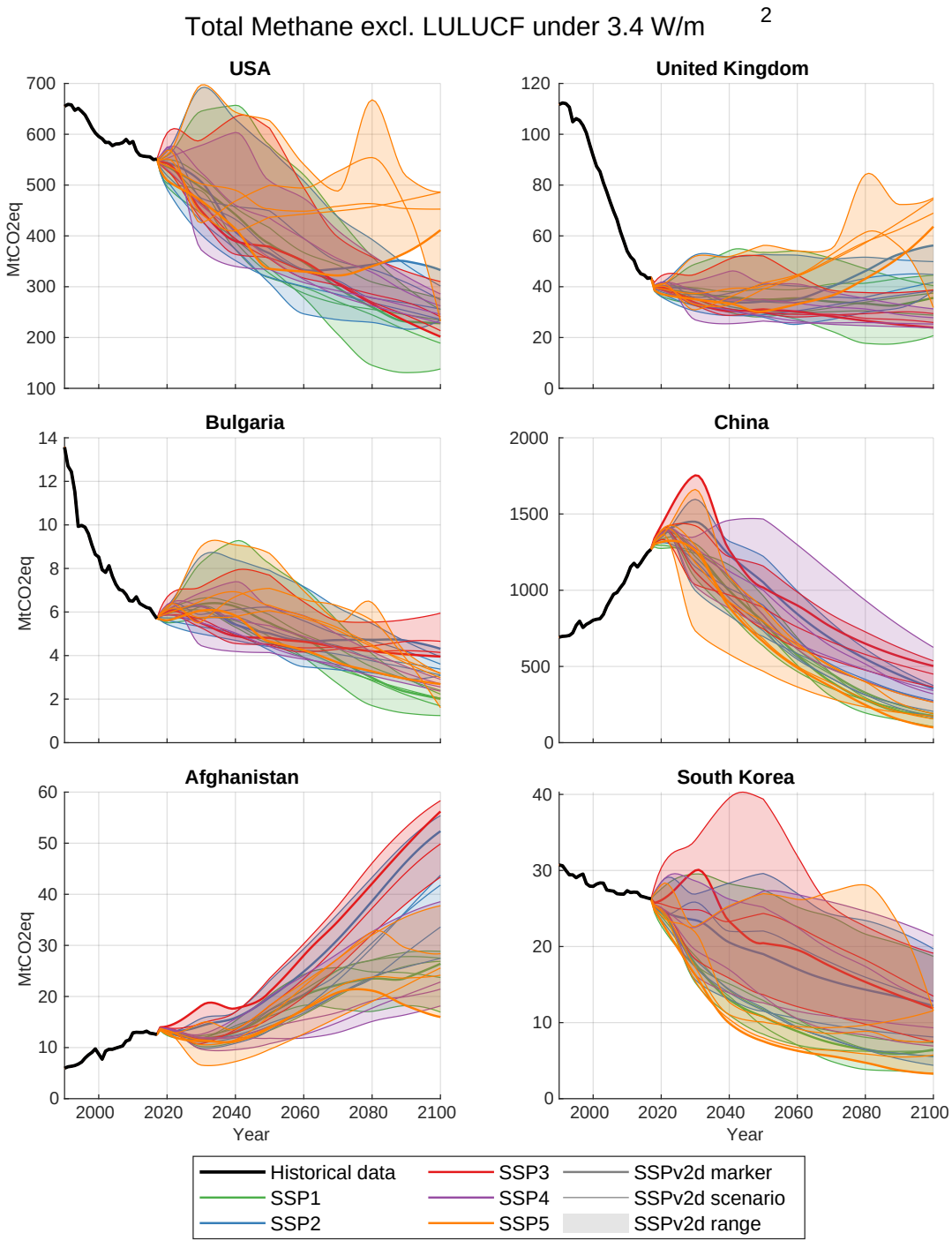

Figure S34. CH_4 results for $3.4W/m^2$ and all SSPs for SSPv2d scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

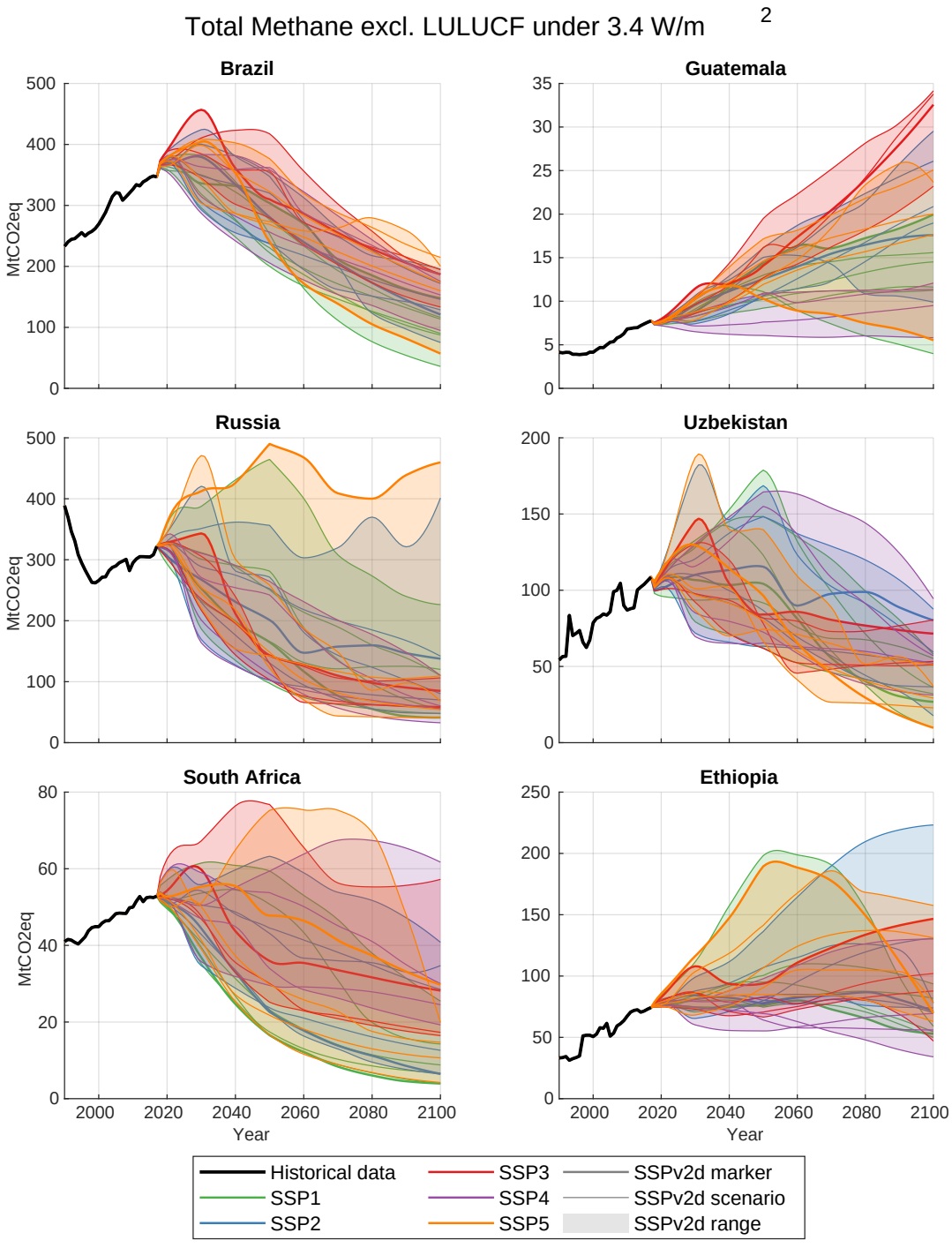

Figure S35. CH_4 results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

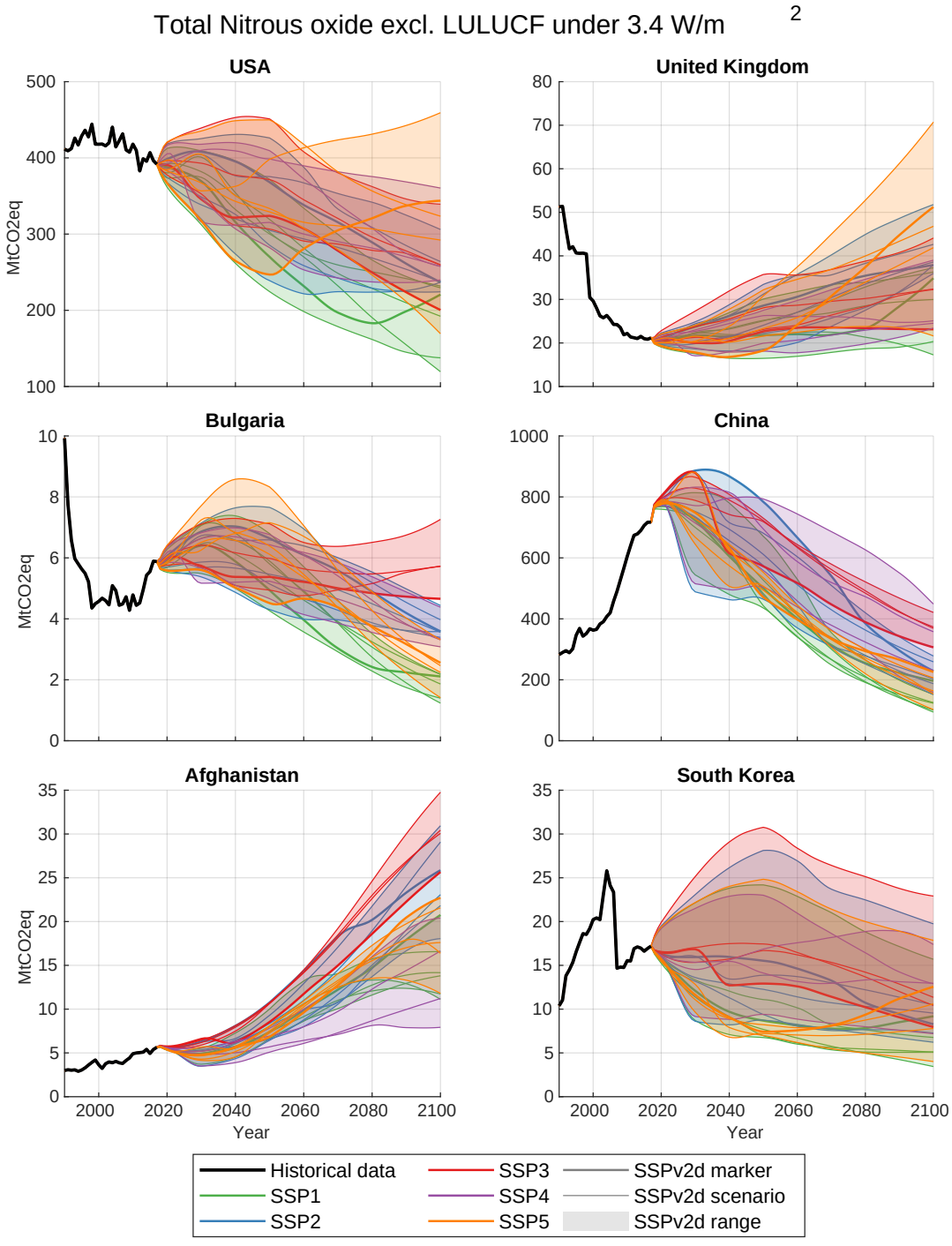

Figure S36. N_2O results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

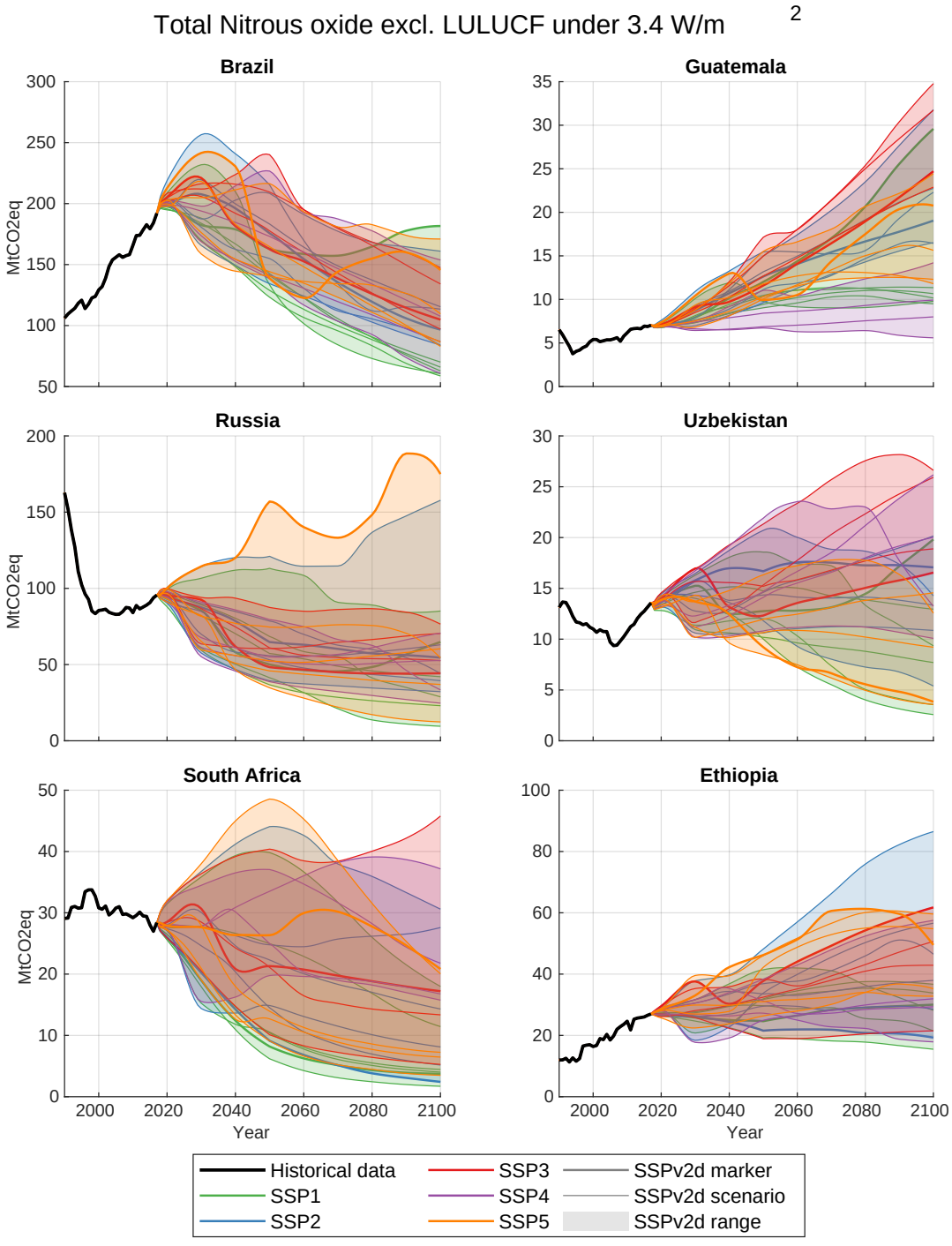

Figure S37. N_2O results for $3.4W/m^2$ and all SSPs for SSPv2d scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

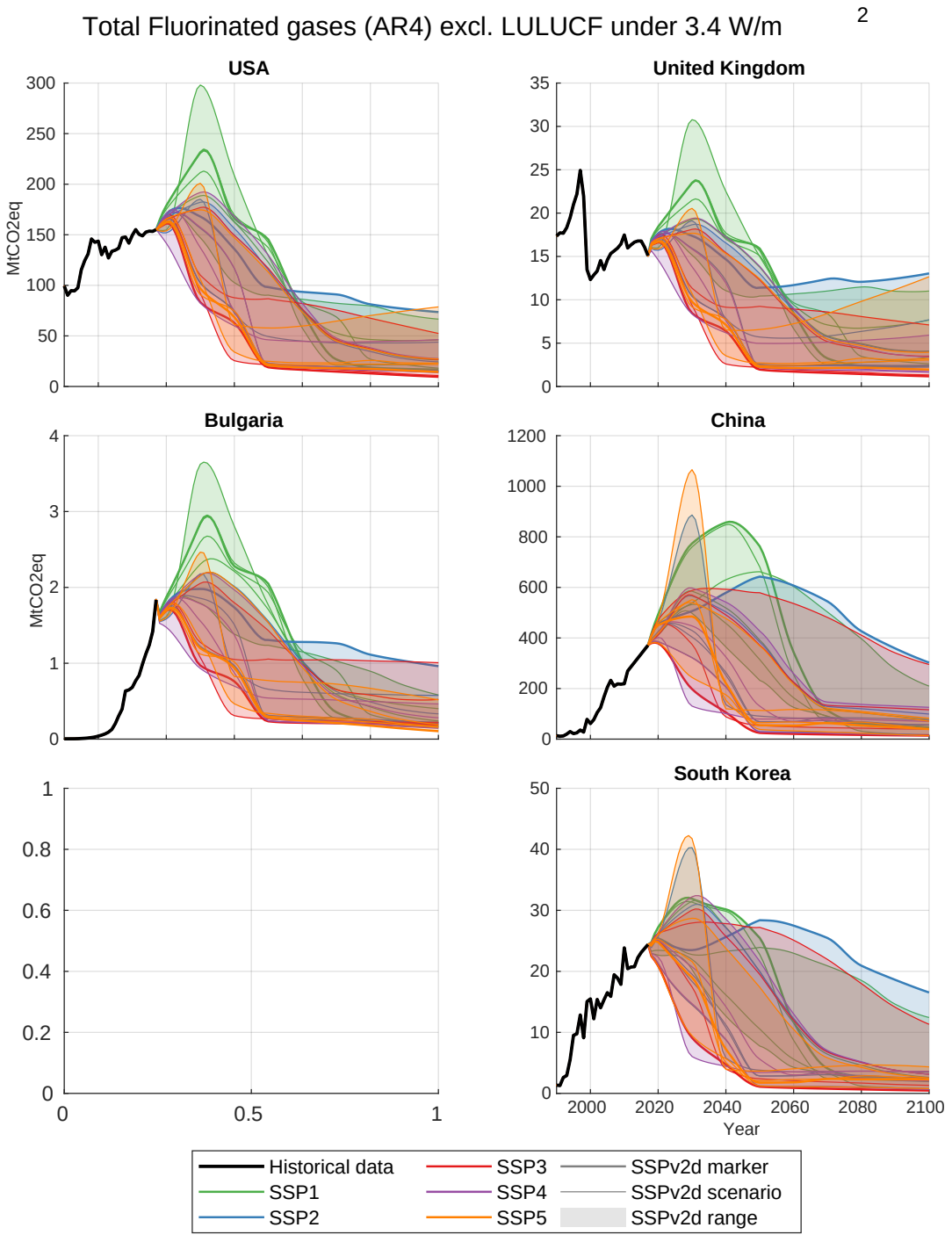

Figure S38. Fluorinated gases (AR4) results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

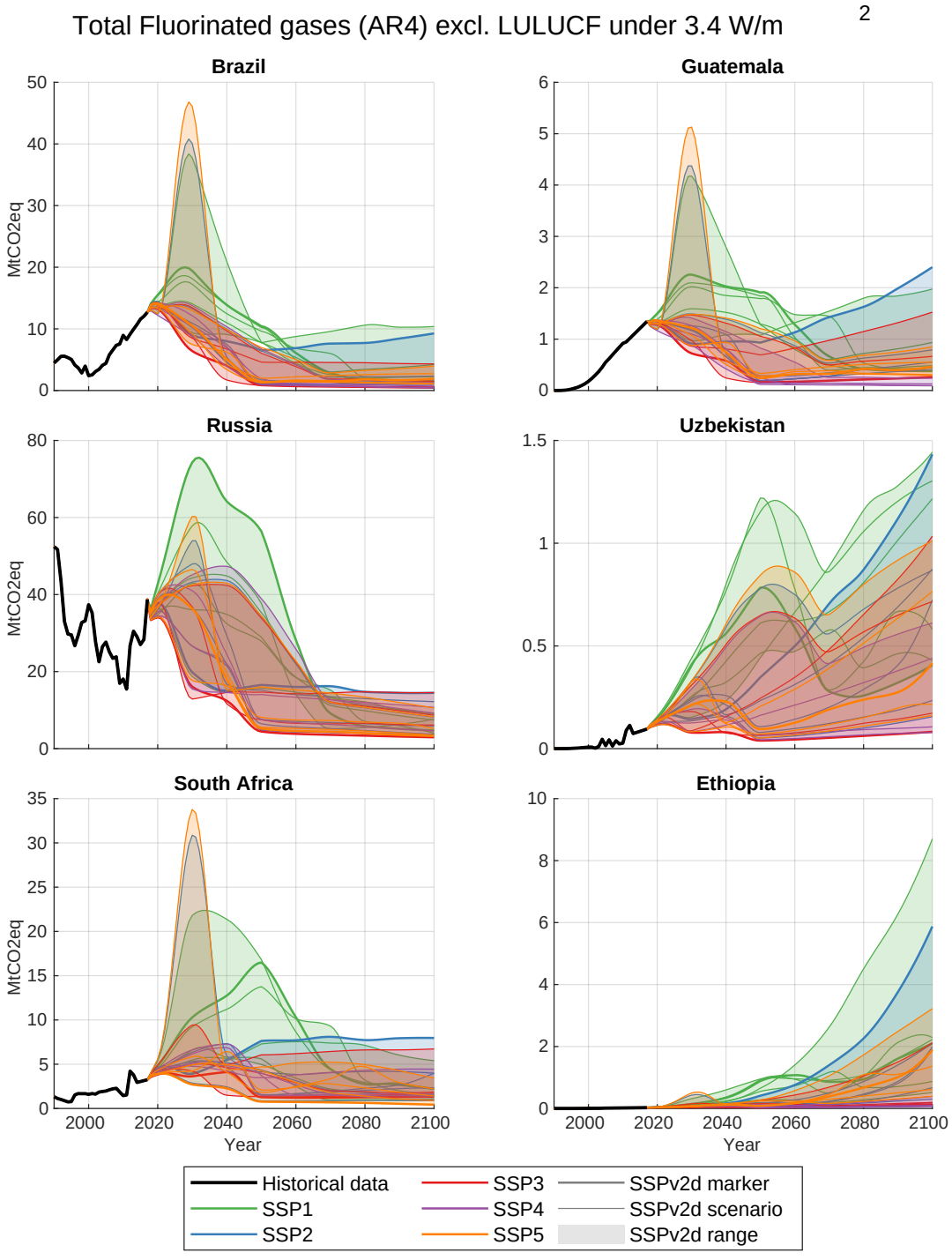

Figure S39. Fluorinated gases (AR4) results for $3.4 W/m^2$ and all SSPs for SSPv2d scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

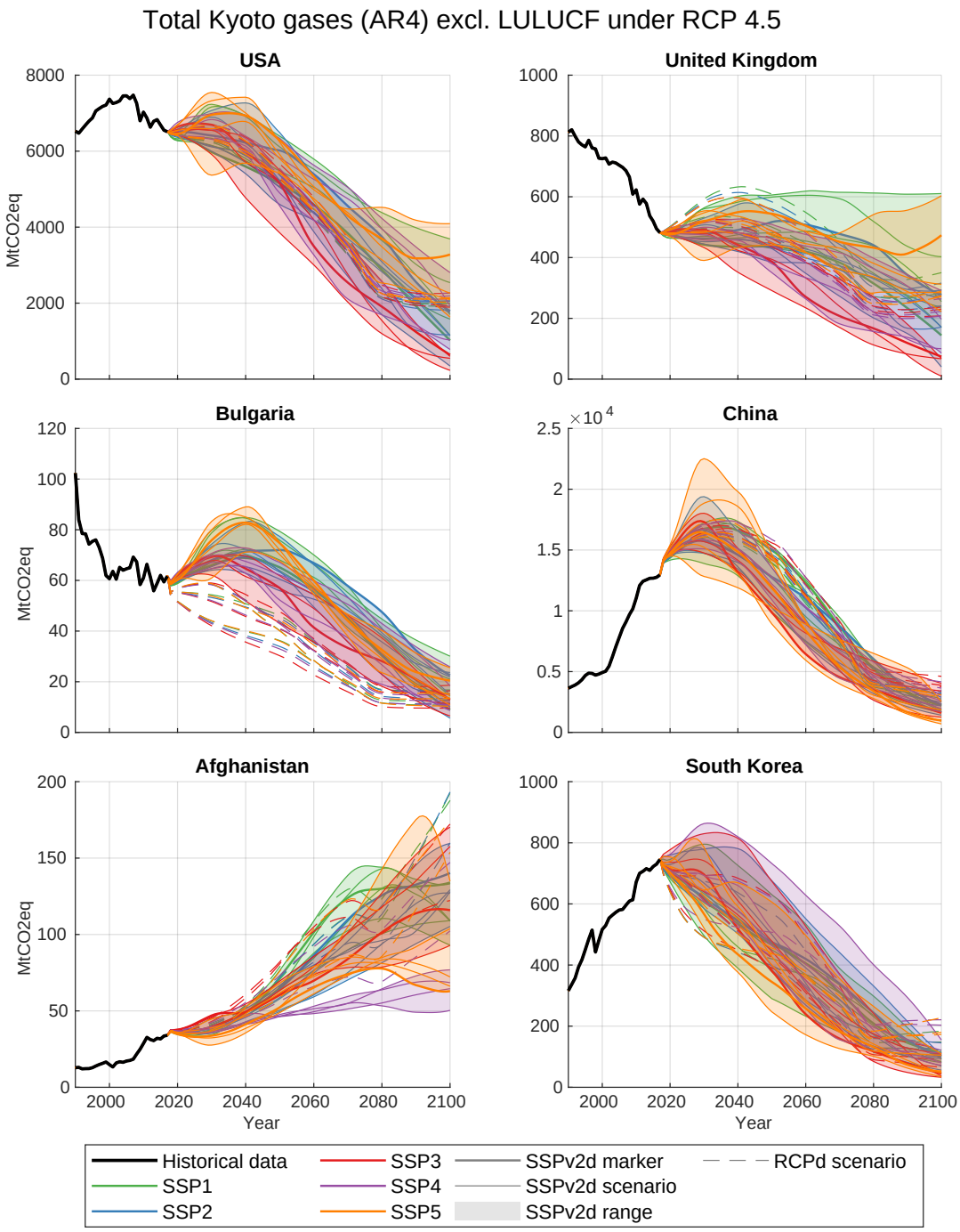

Figure S40. Kyoto GHG (AR4) results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

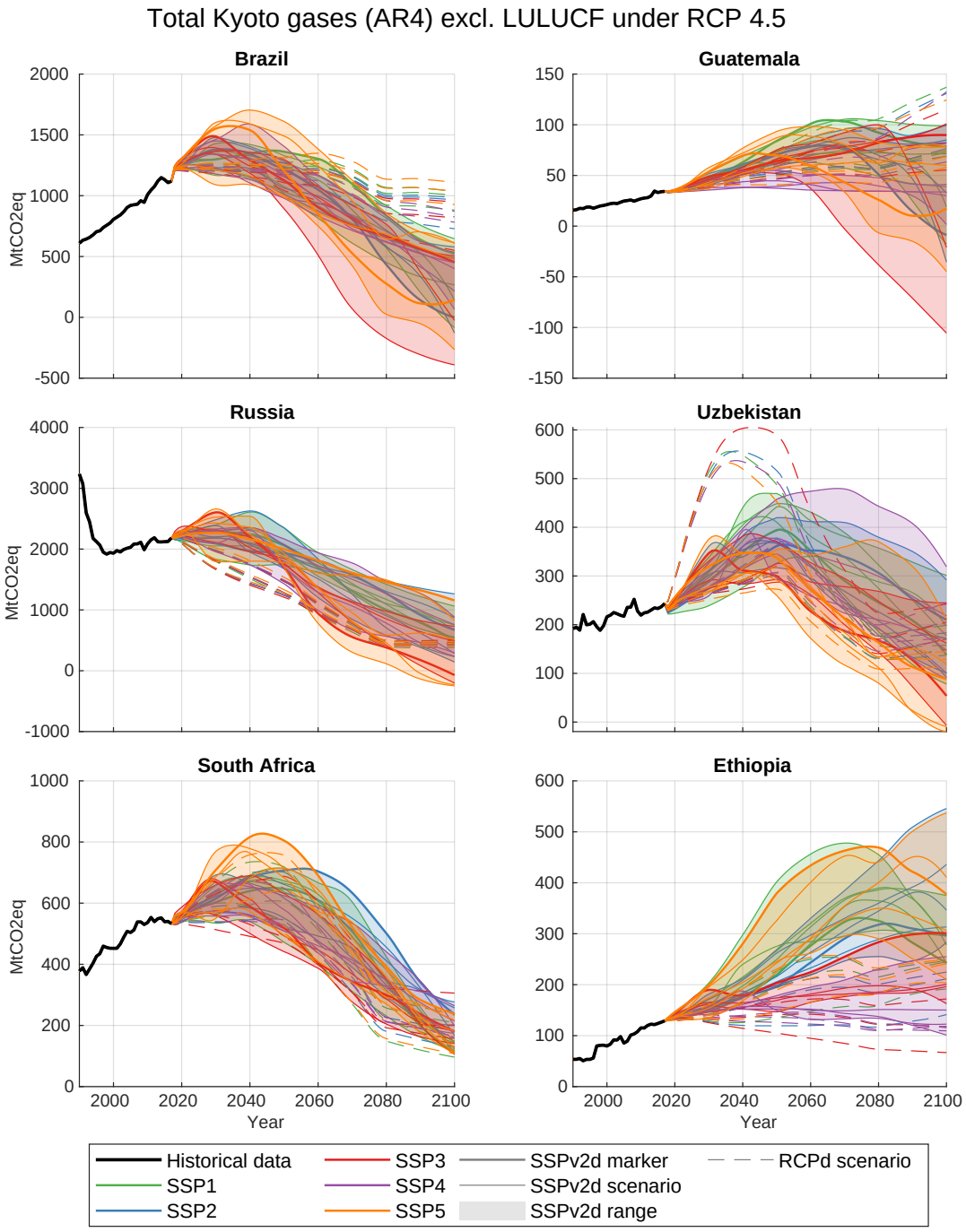

Figure S41. Kyoto GHG (AR4) results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

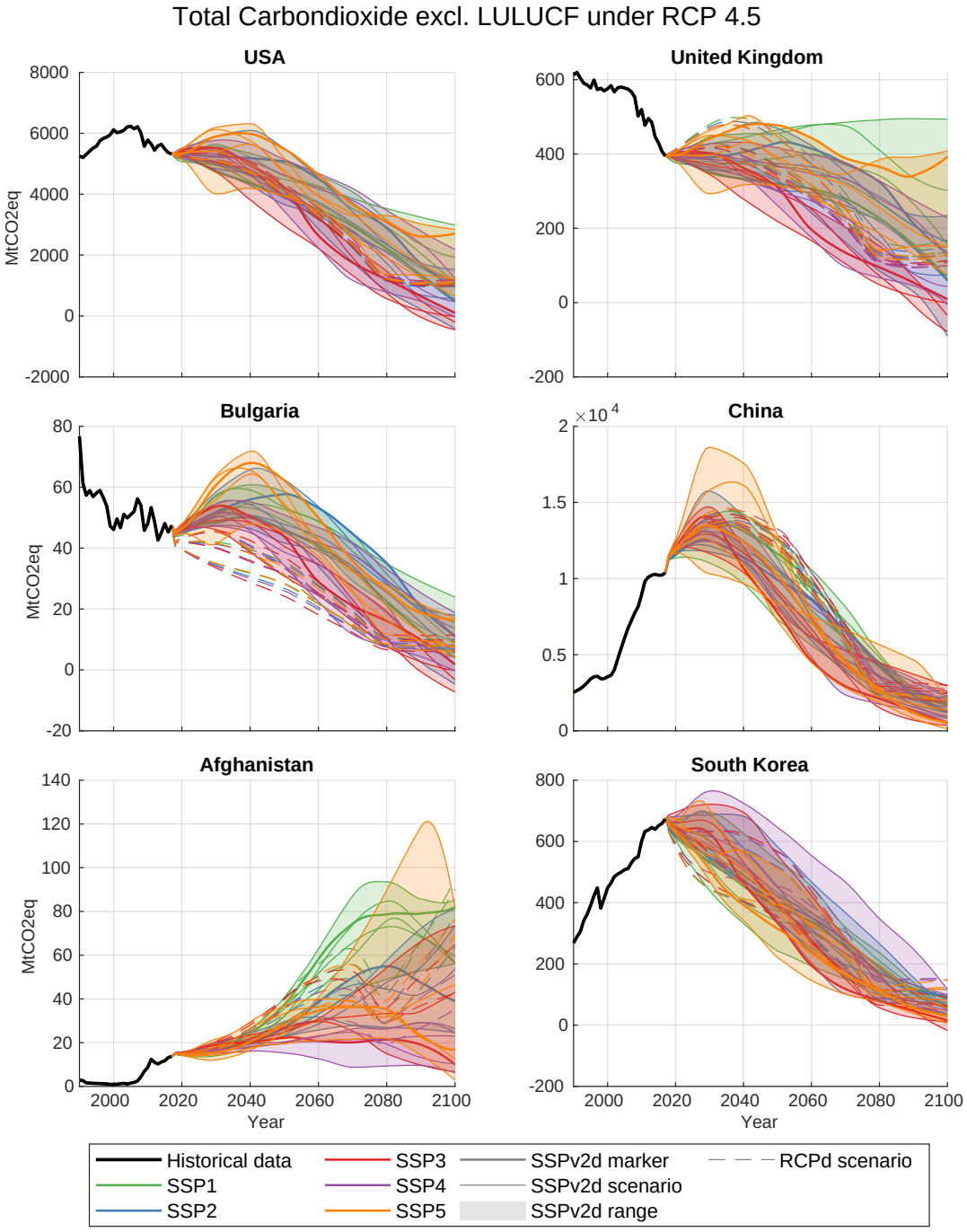

Figure S42. CO_2 results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

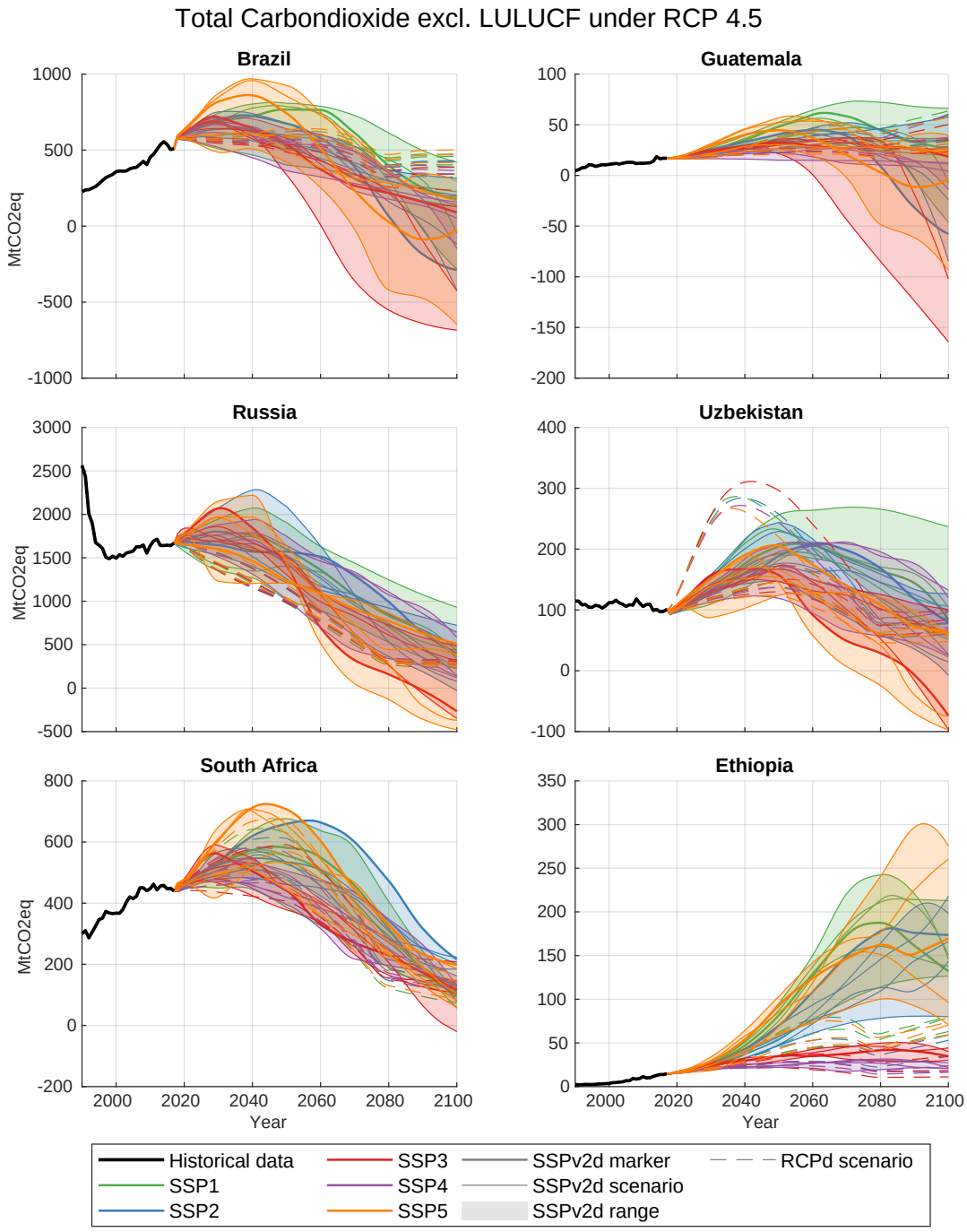

Figure S43. CO_2 results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

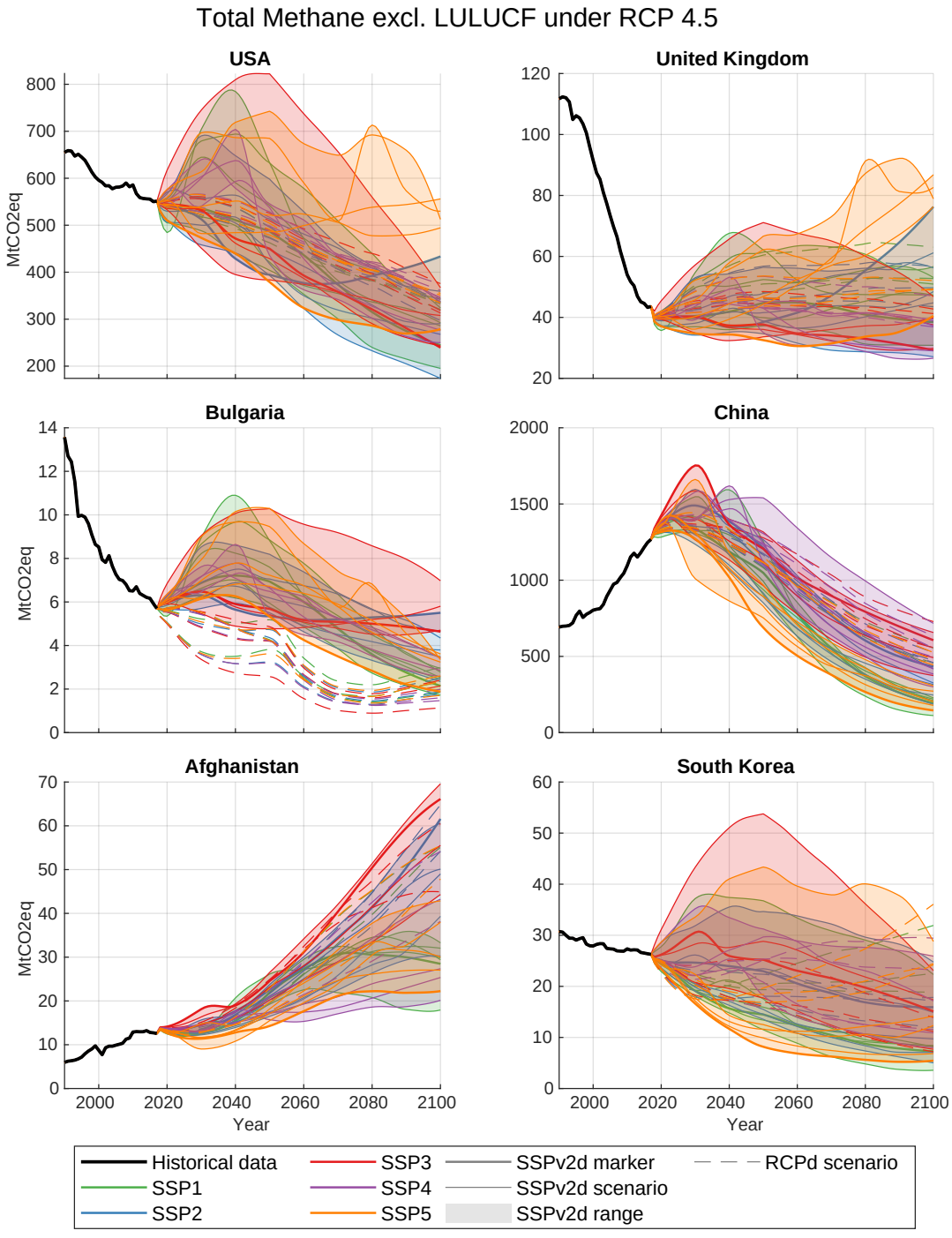

Figure S44. CH_4 results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

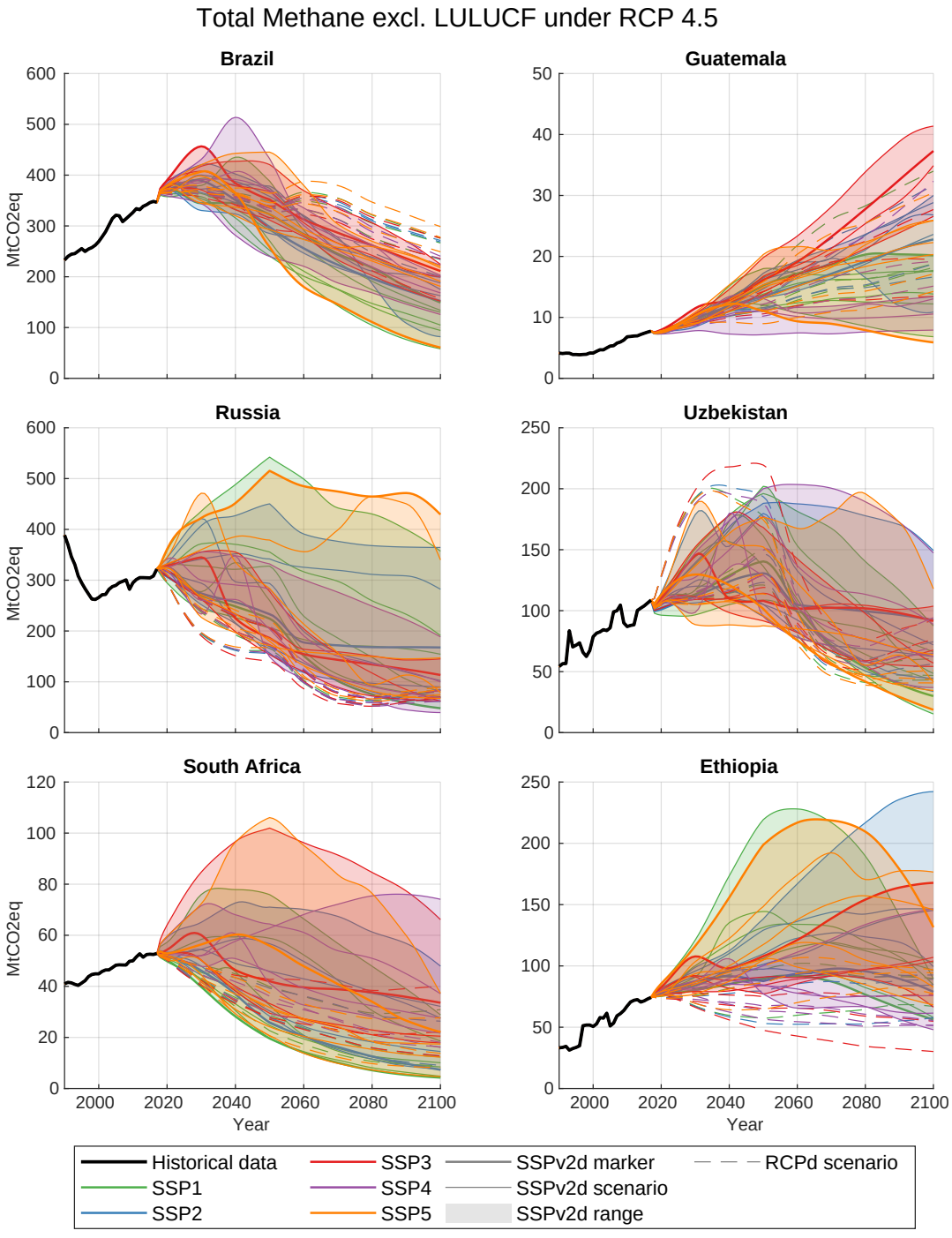

Figure S45. CH_4 results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

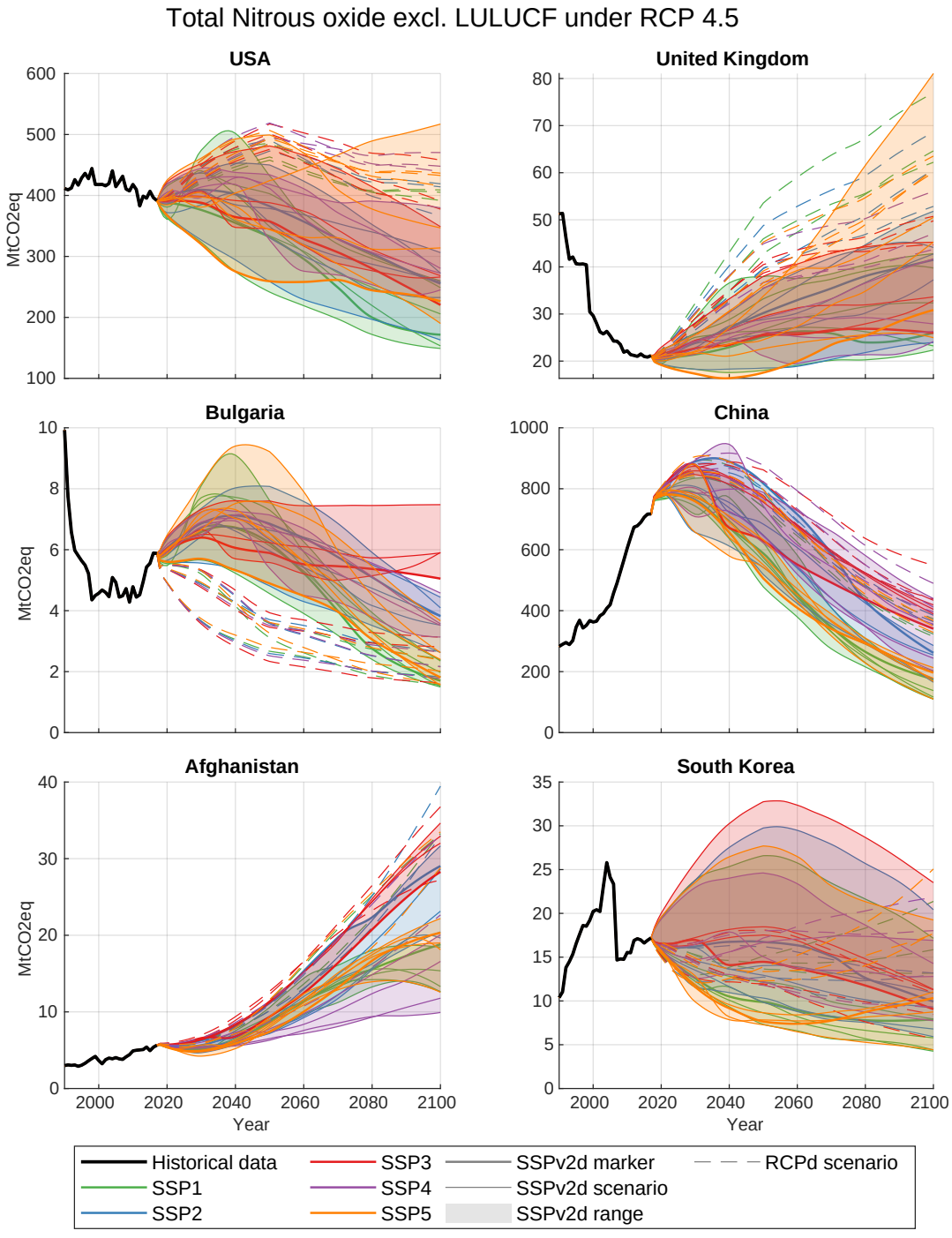

Figure S46. N_2O results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

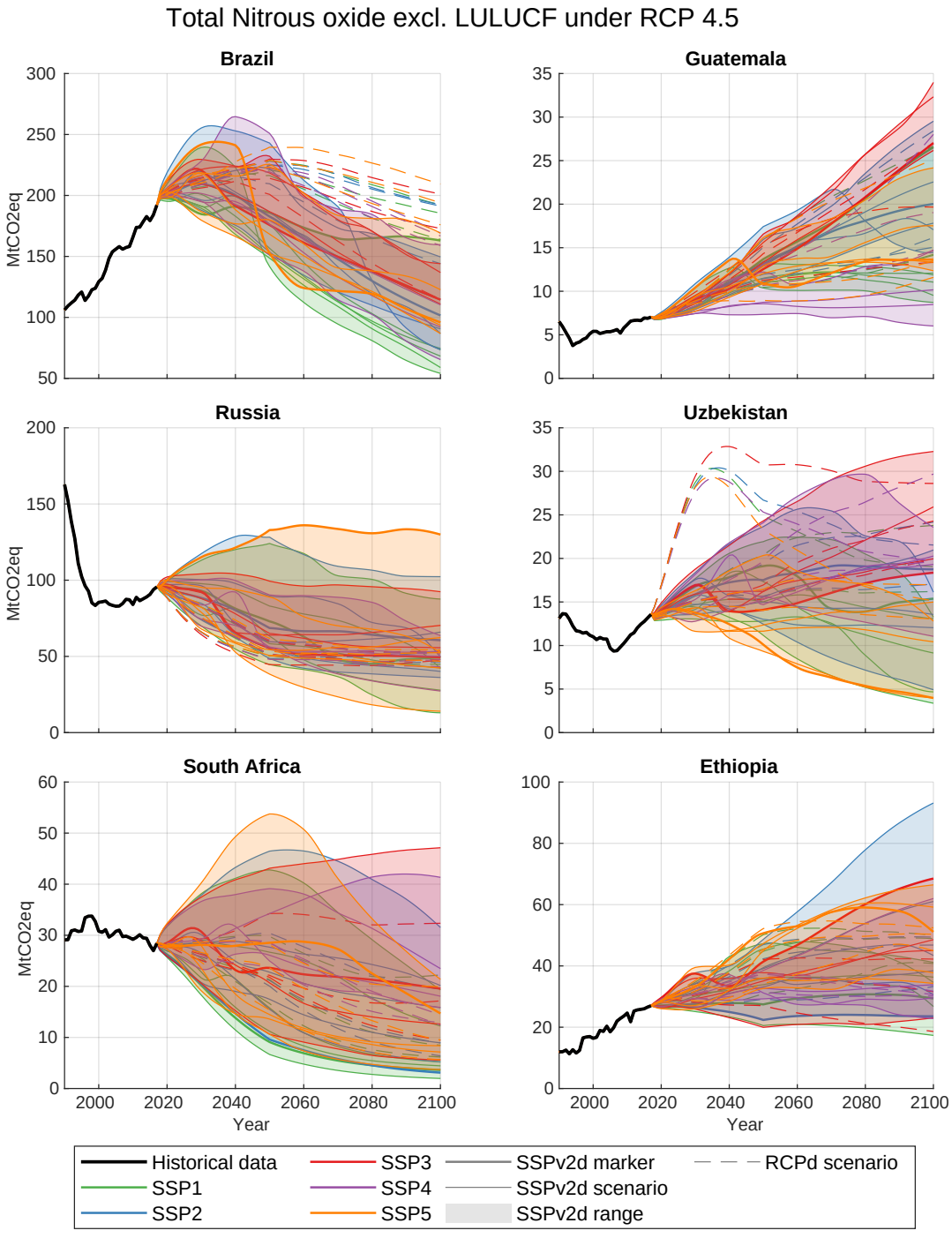

Figure S47. N_2O results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

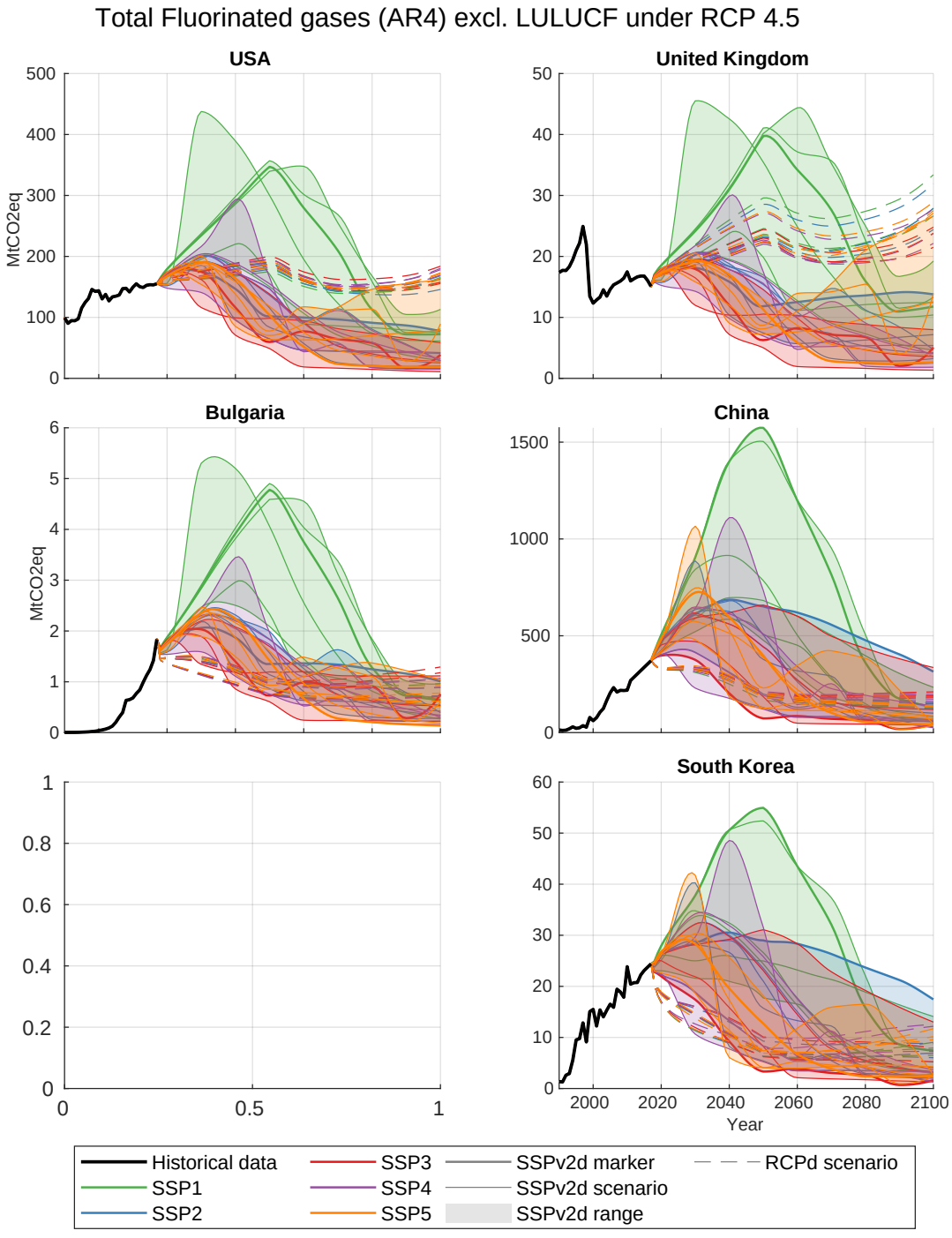

Figure S48. Fluorinated gases (AR4) results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

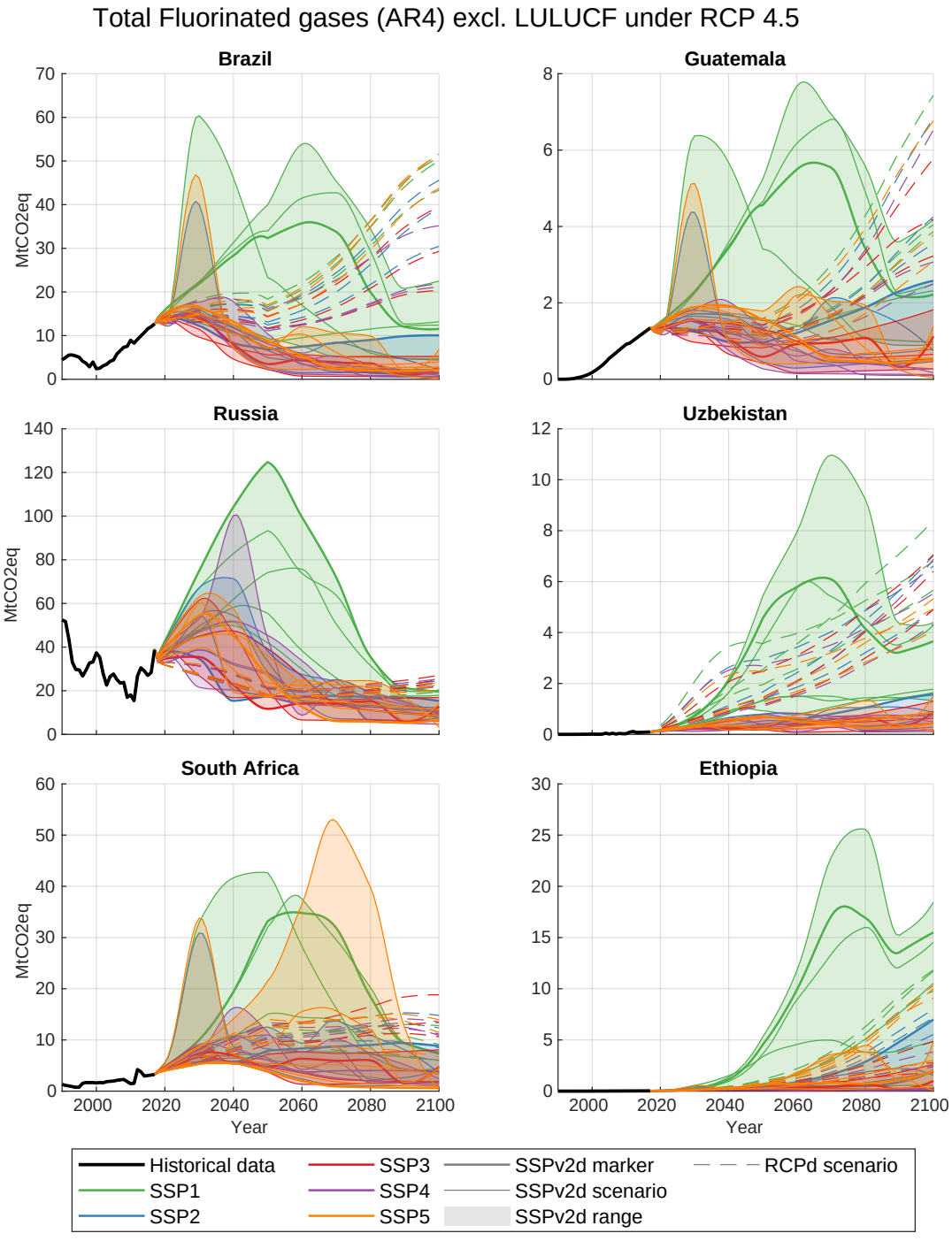

Figure S49. Fluorinated gases (AR4) results for RCP 4.5 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

Figures S50 to S59 provide the data for RCP 6.0.
Figures S60 to S69 provide the data for baseline scenarios.

Figures S70 to S79 provide the data for RCP 8.5.

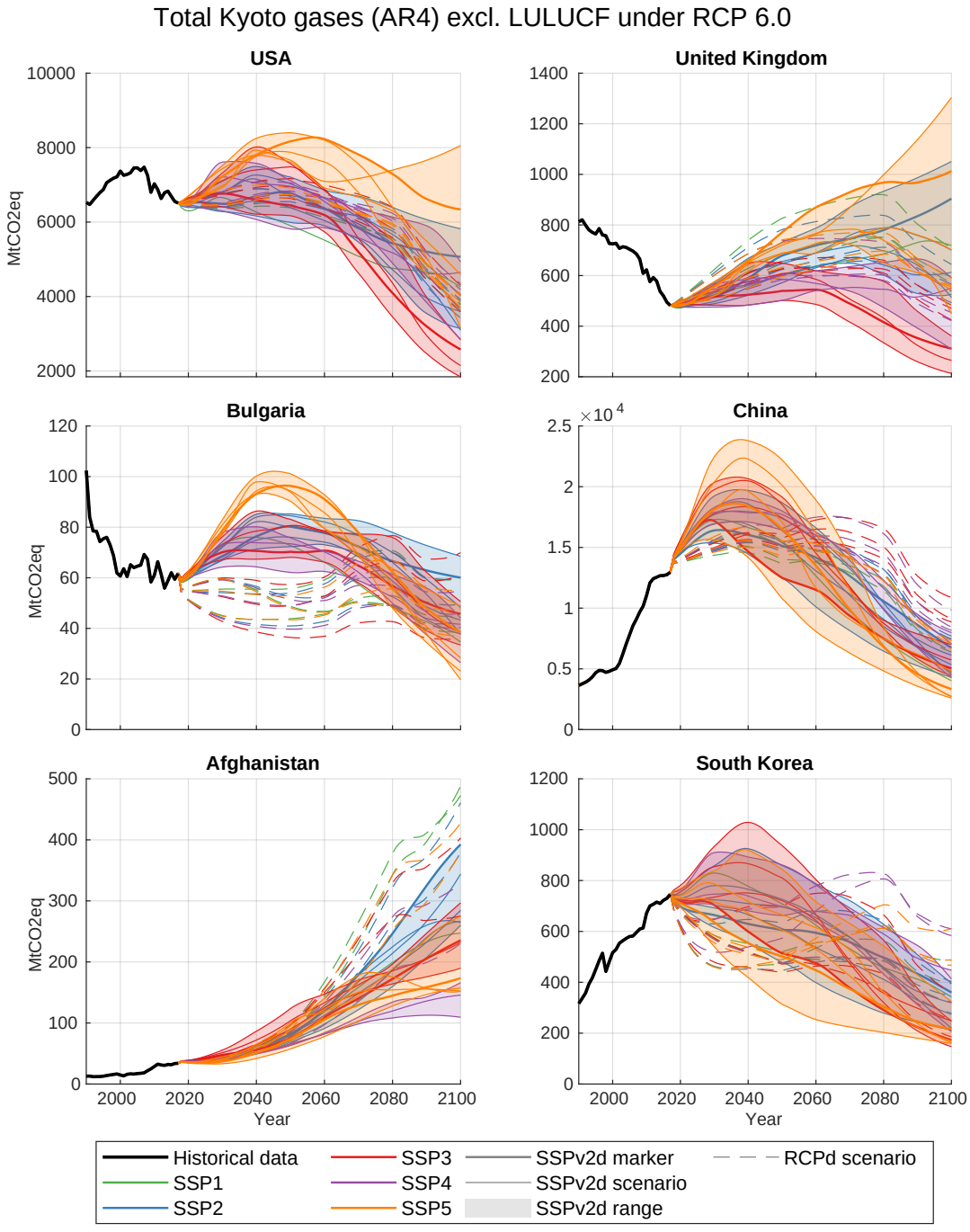

Figure S50. Kyoto GHG (AR4) results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

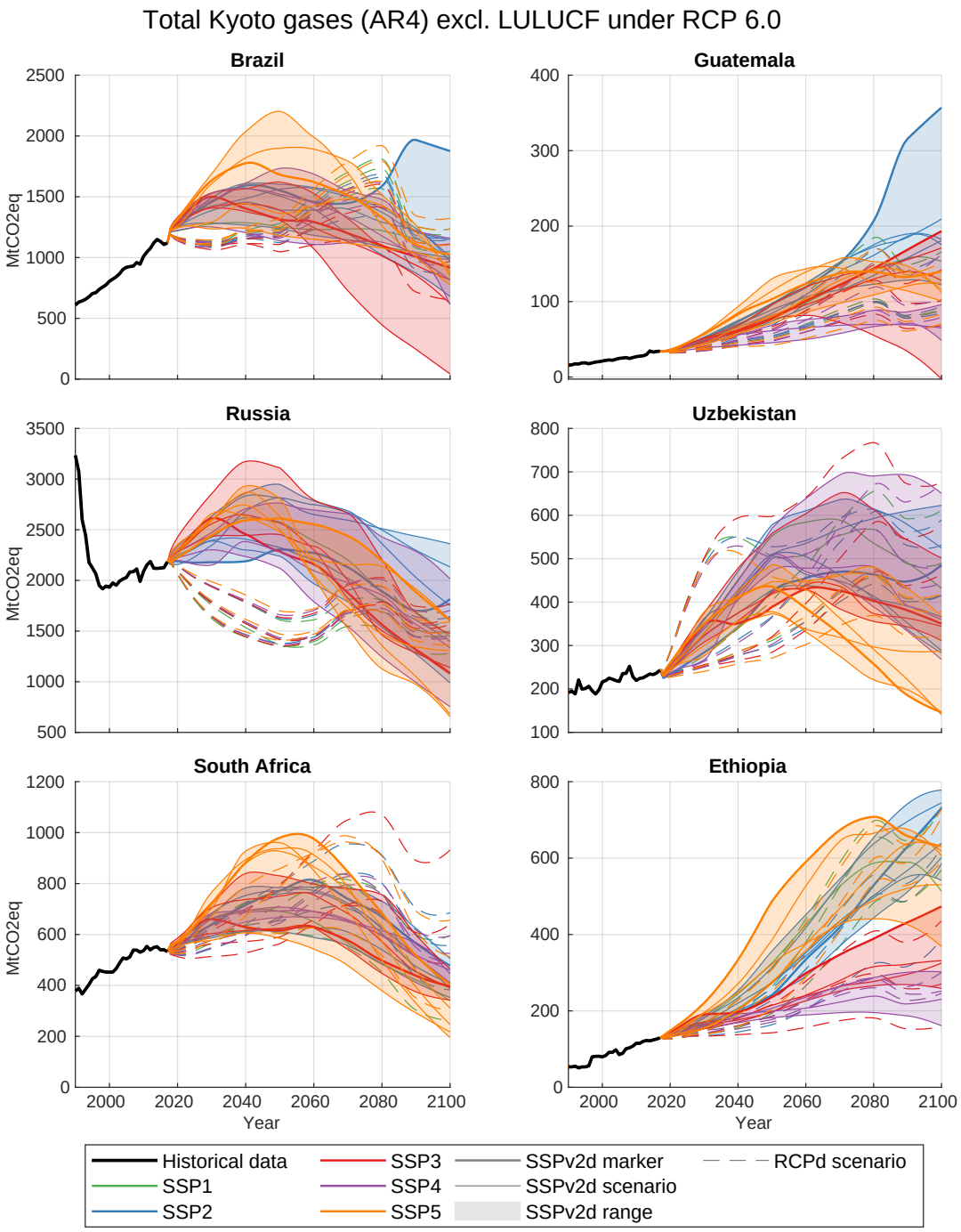

Figure S51. Kyoto GHG (AR4) results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

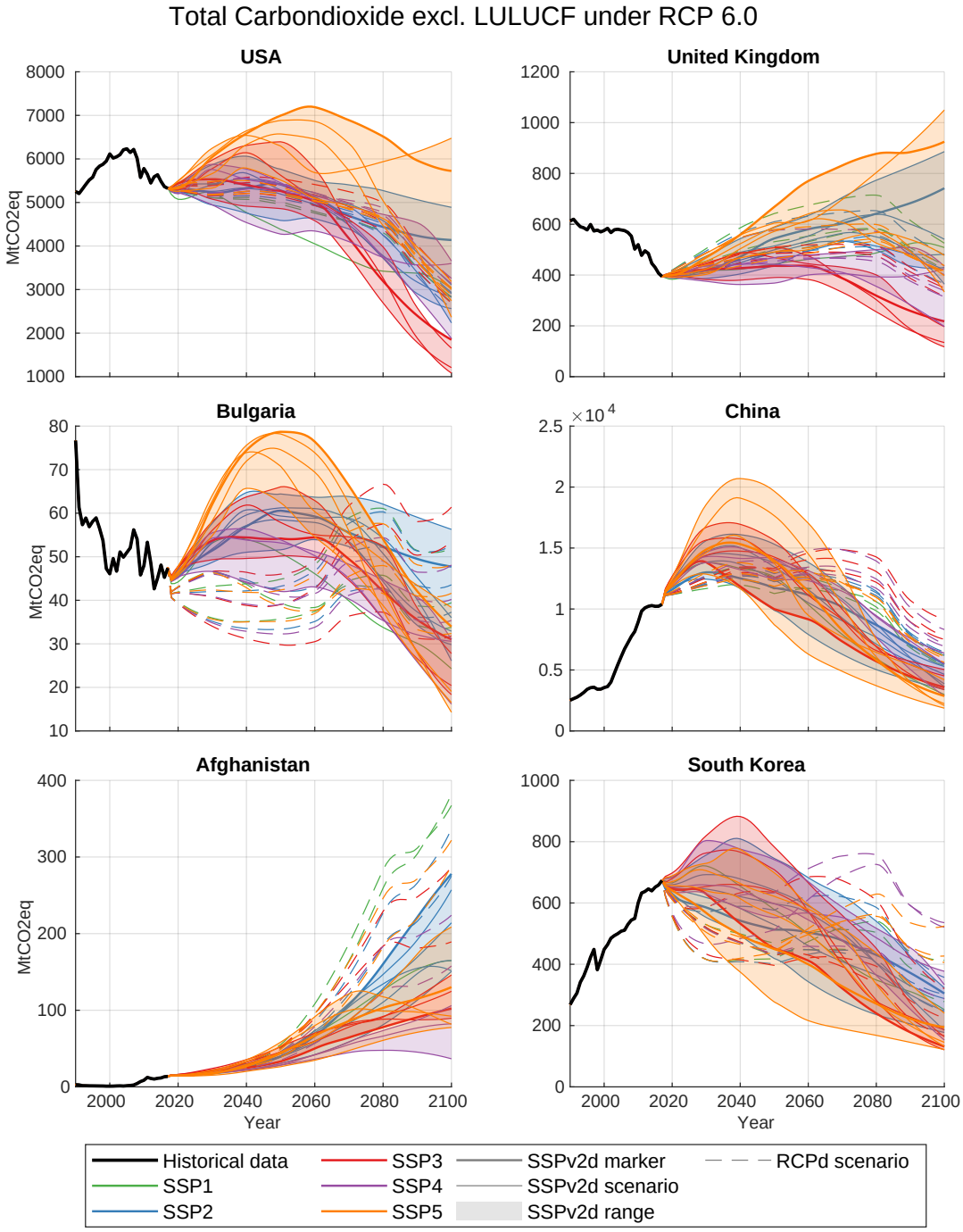

Figure S52. CO_2 results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

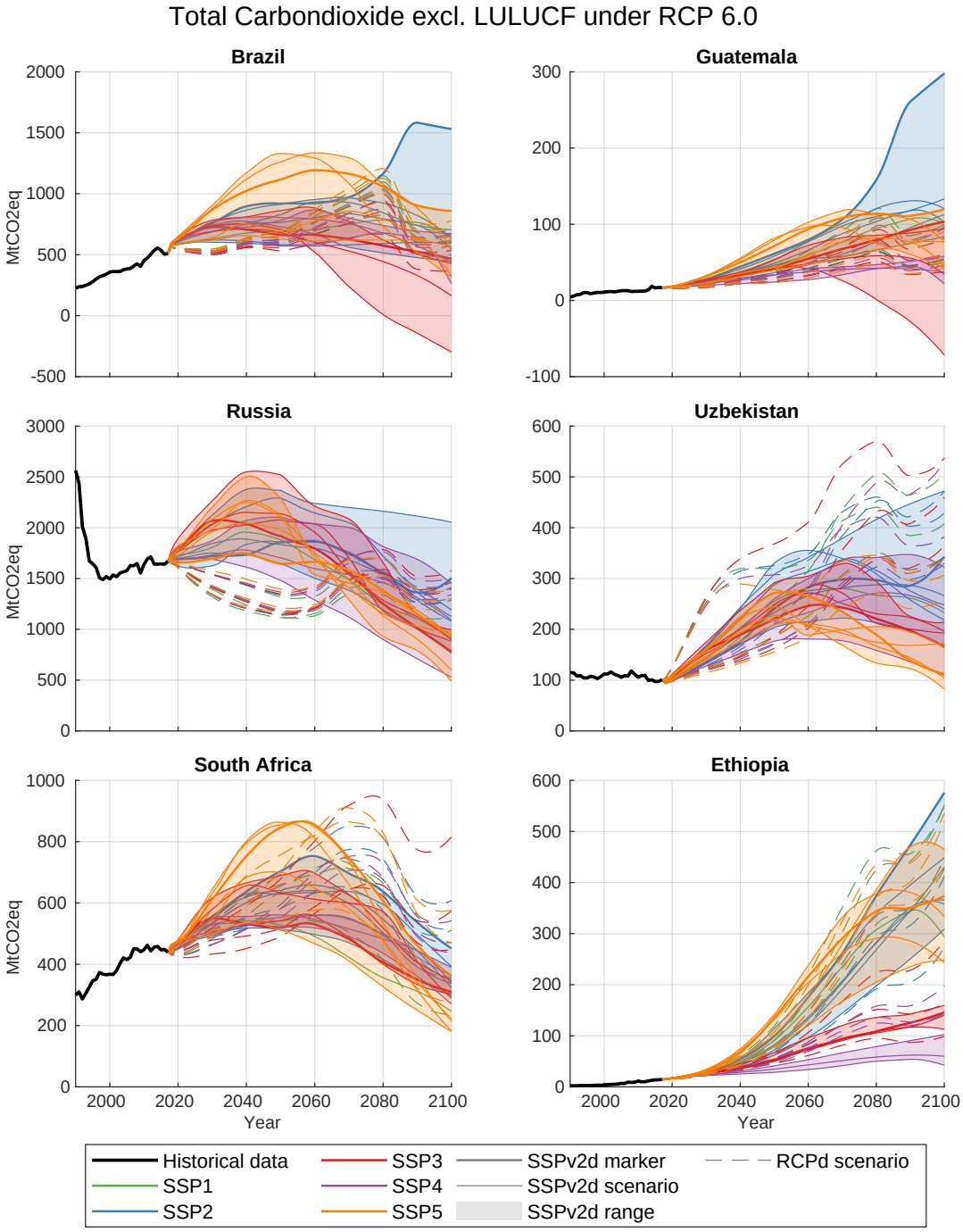

Figure S53. CO_2 results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

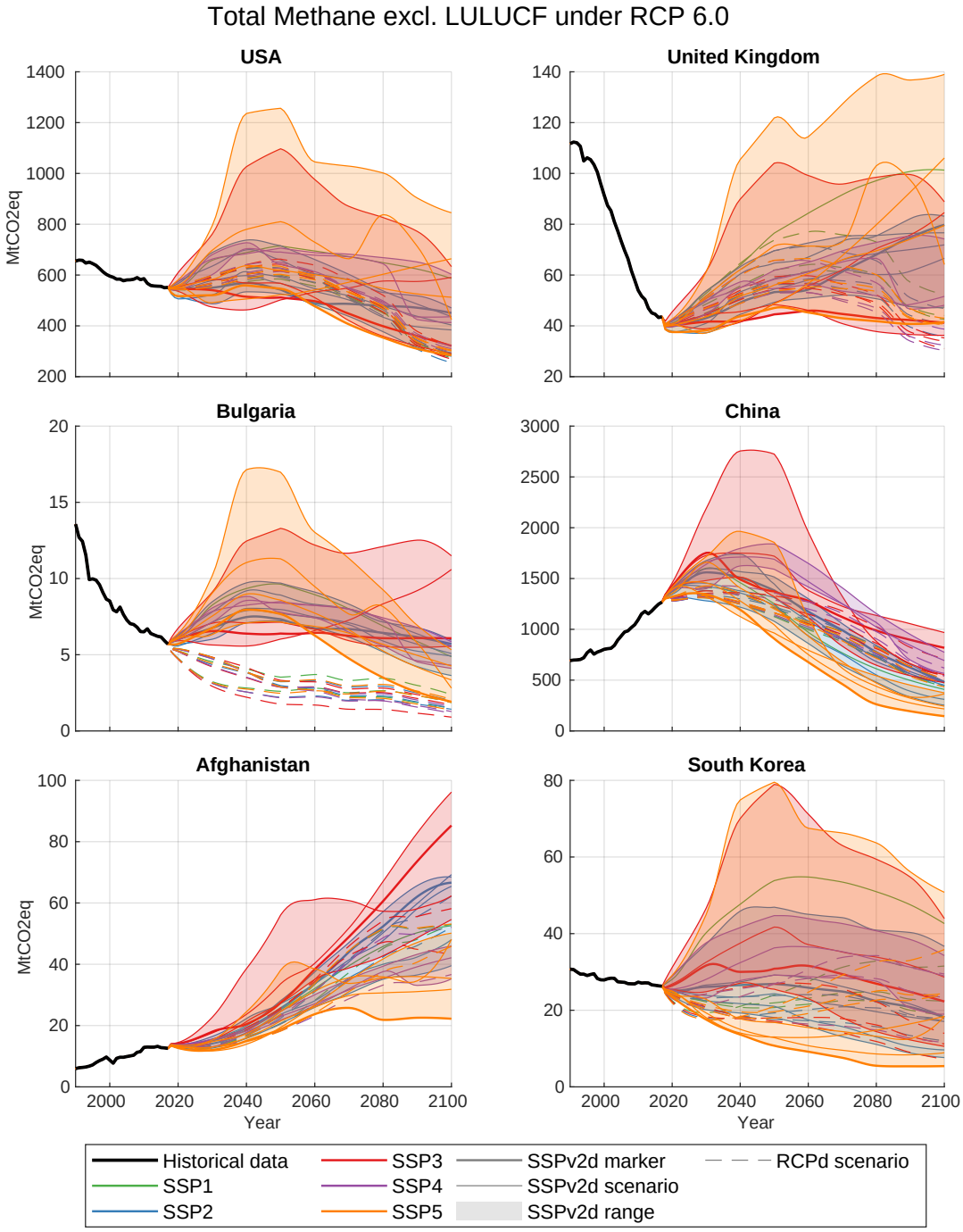

Figure S54. CH_4 results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

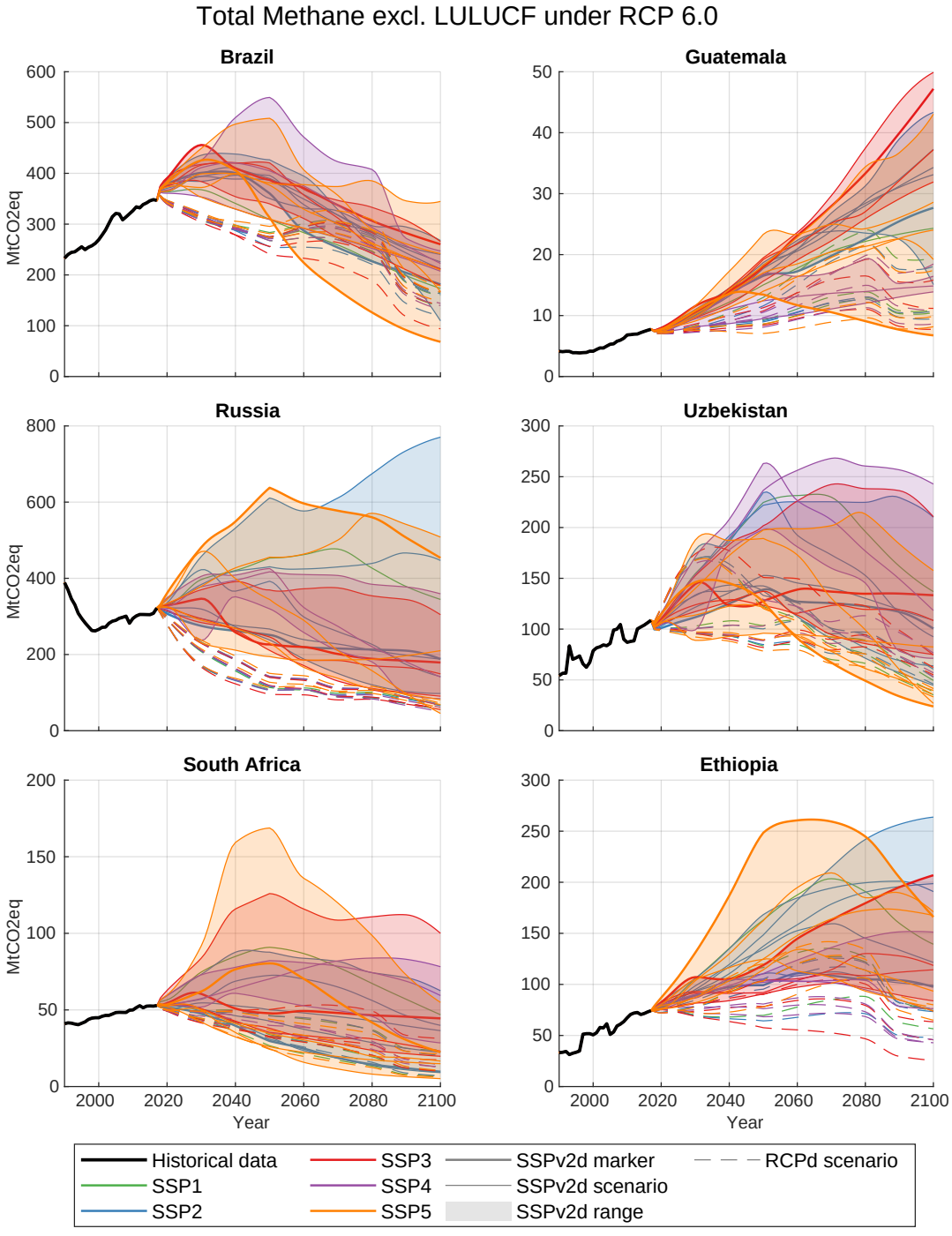

Figure S55. CH_4 results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

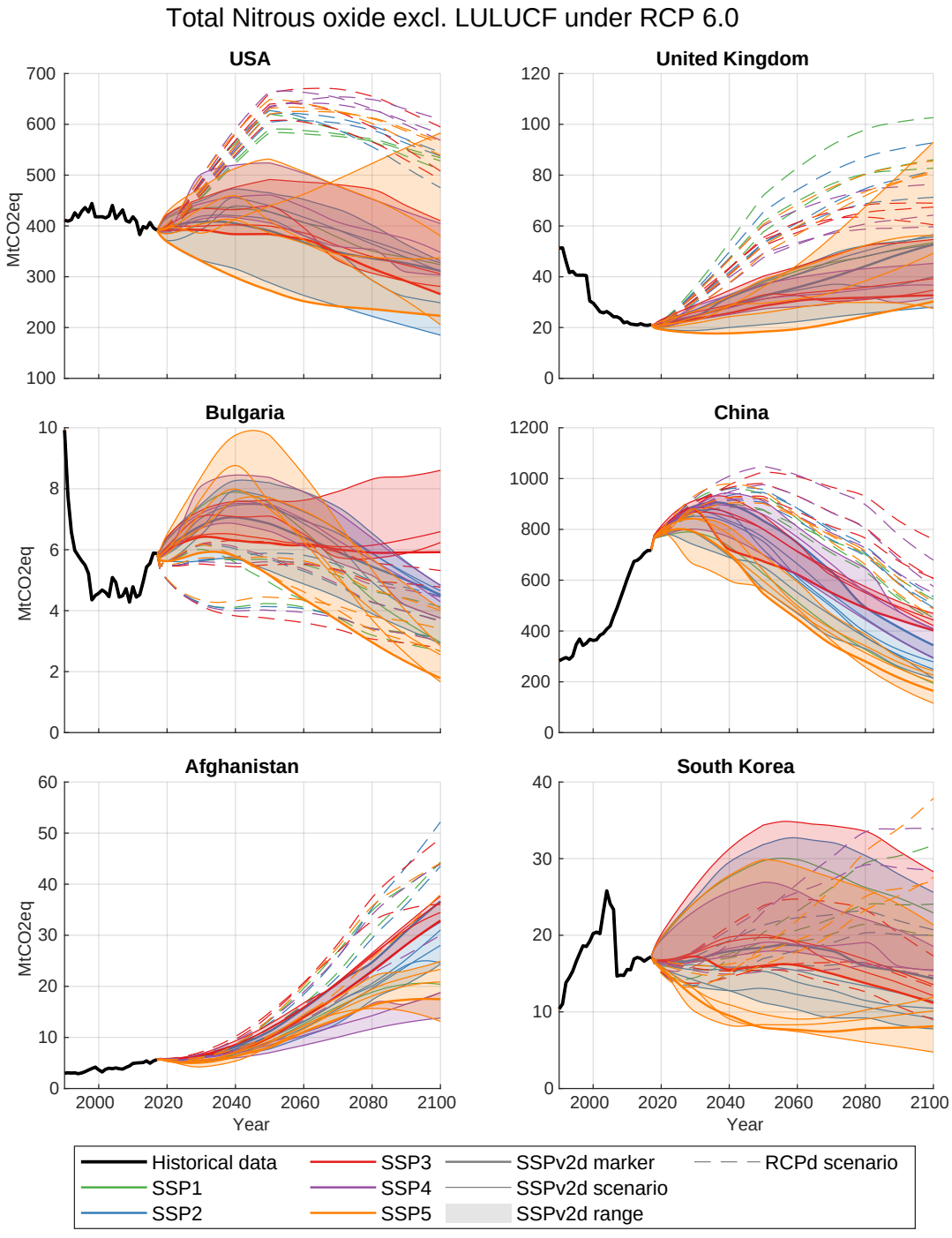

Figure S56. N_2O results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

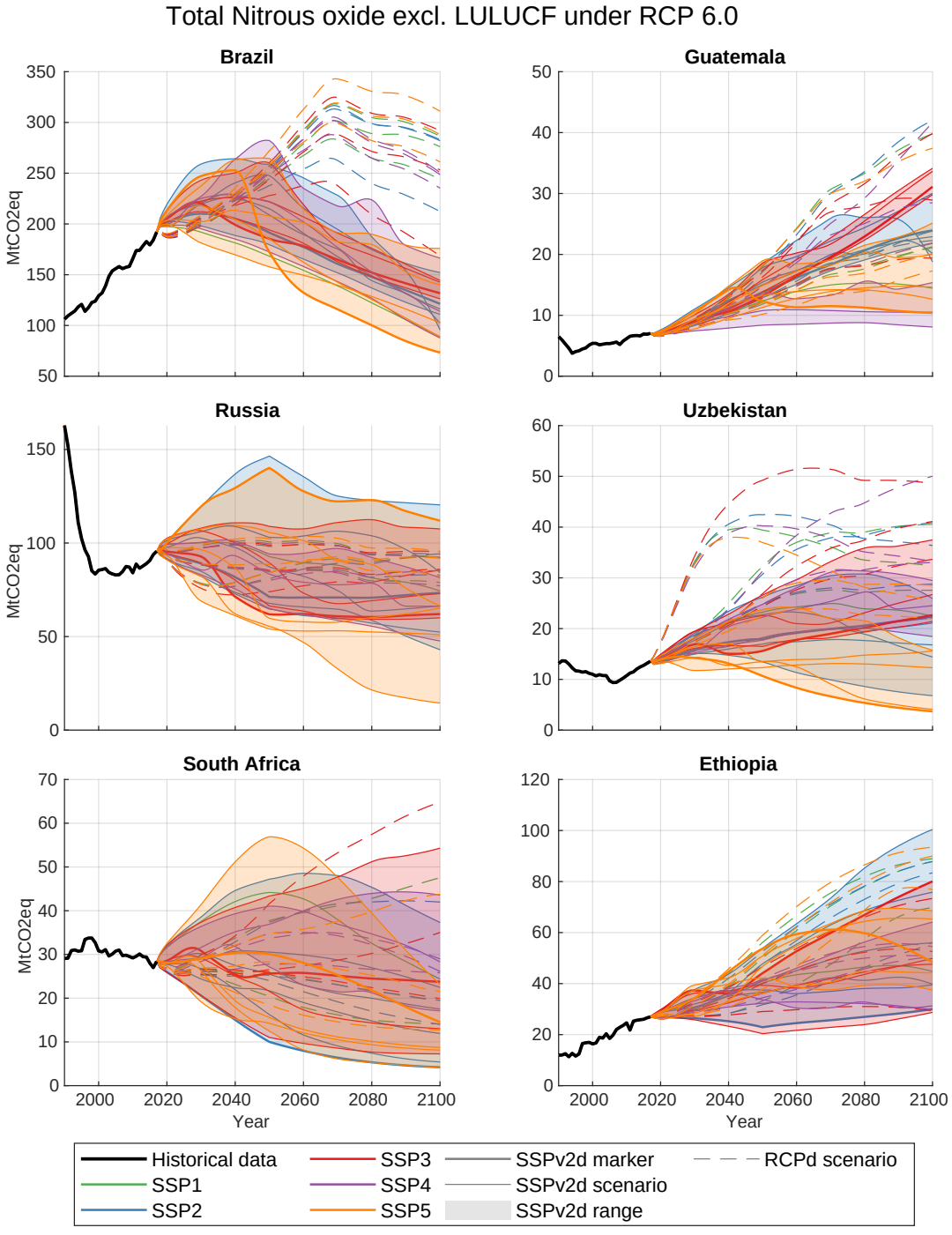

Figure S57. N_2O results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

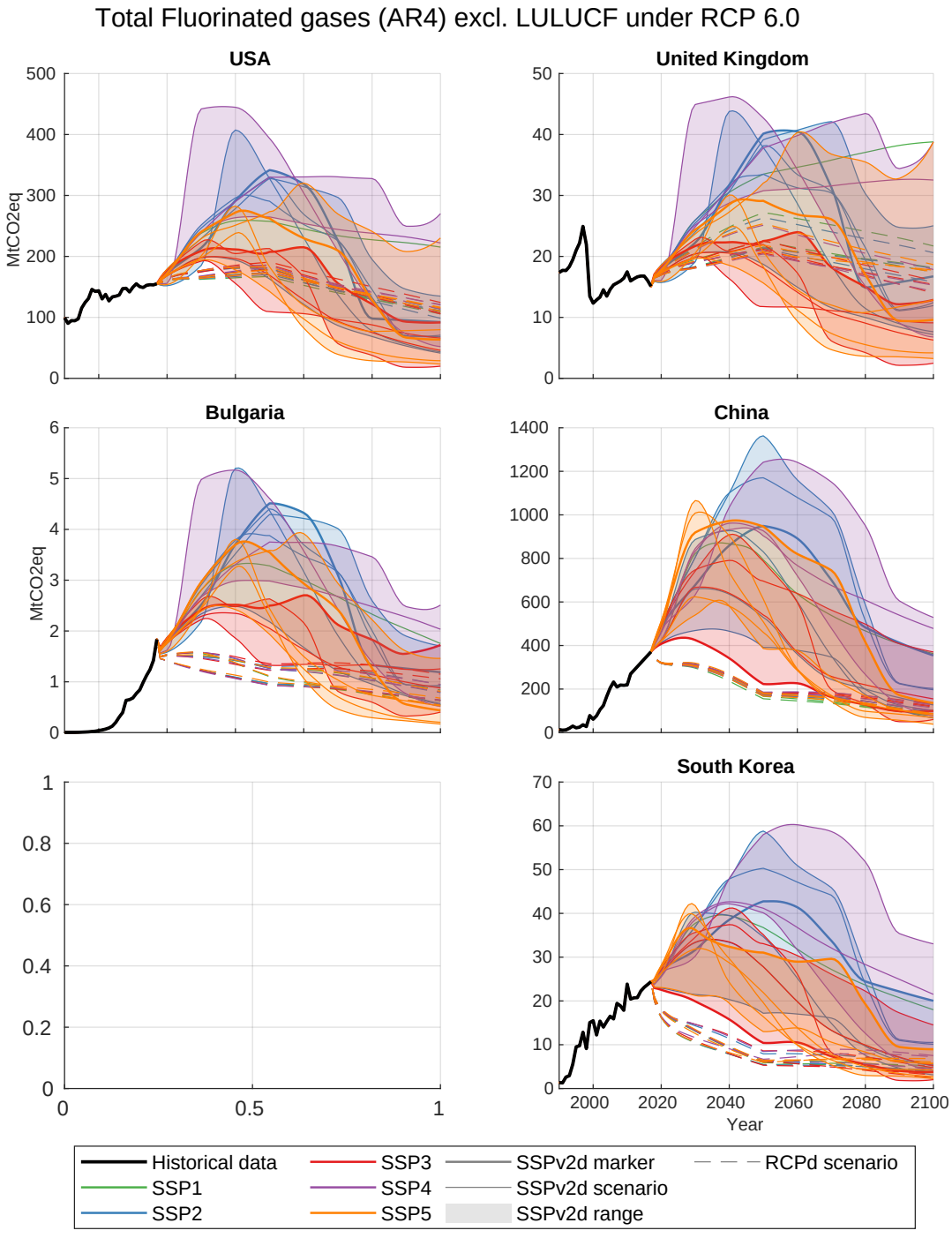

Figure S58. Fluorinated gases (AR4) results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

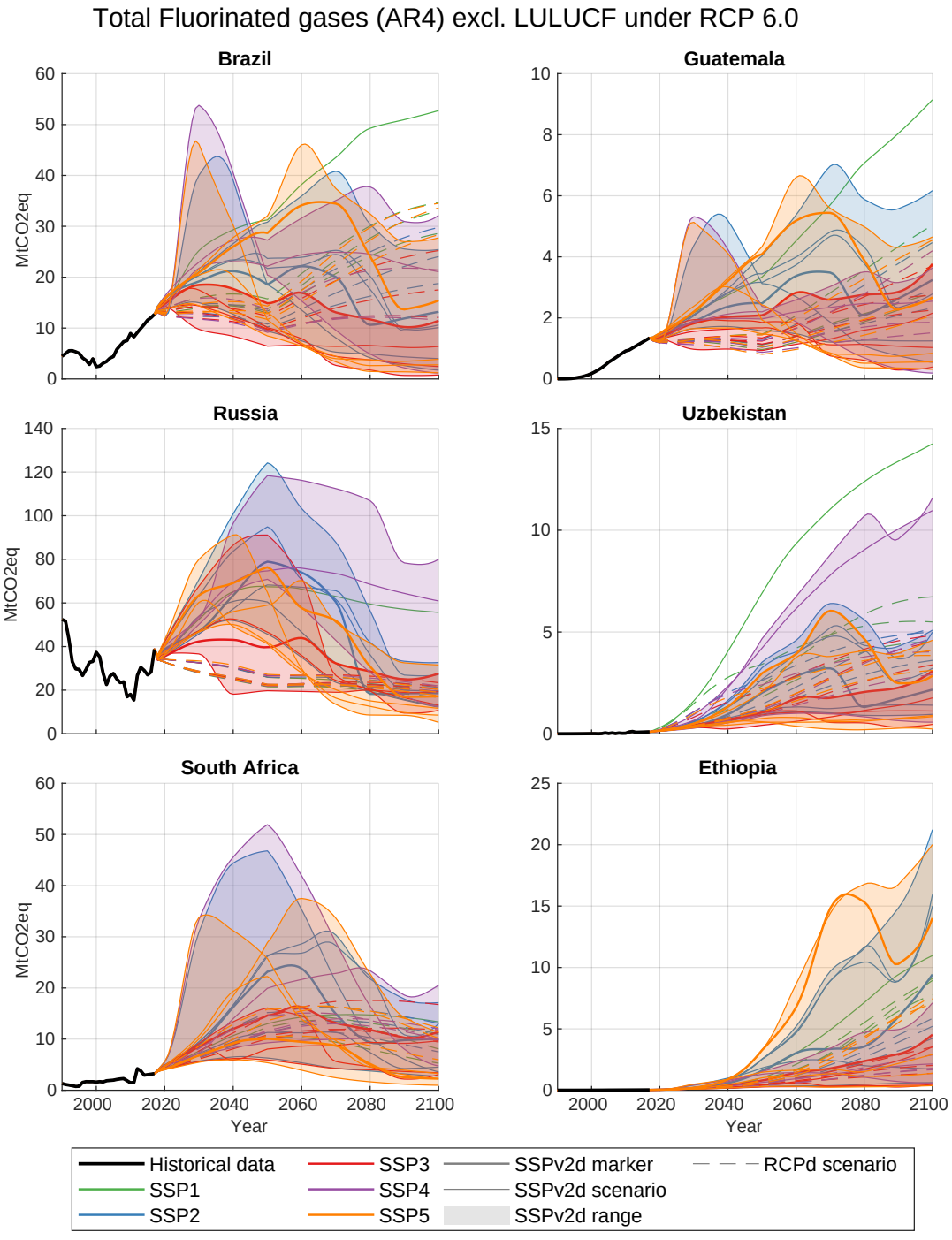

Figure S59. Fluorinated gases (AR4) results for RCP 6.0 and all SSPs for both SSPv2d and RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

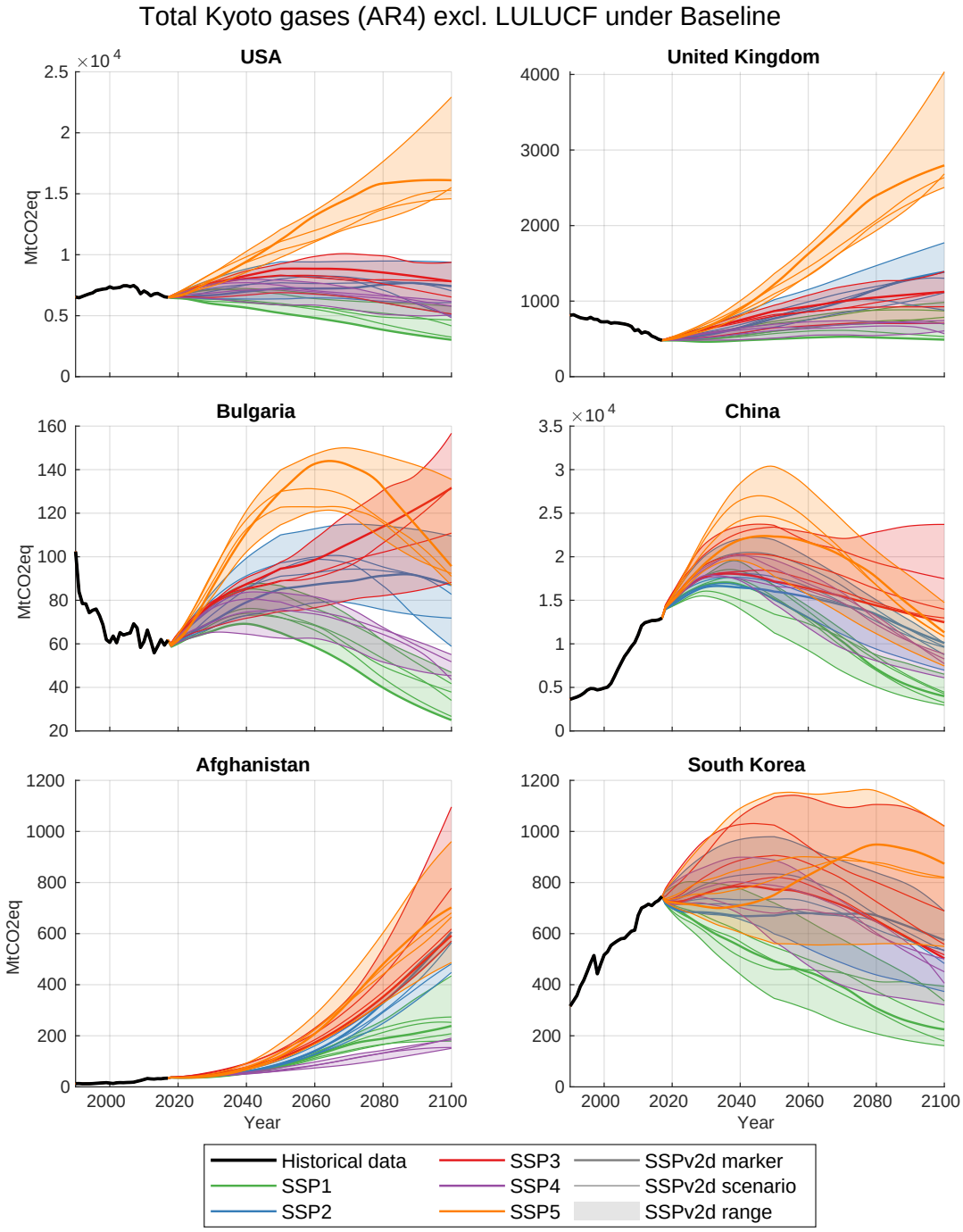

Figure S60. Kyoto GHG (AR4) results for SSPv2d baseline scenarios for all SSPs. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

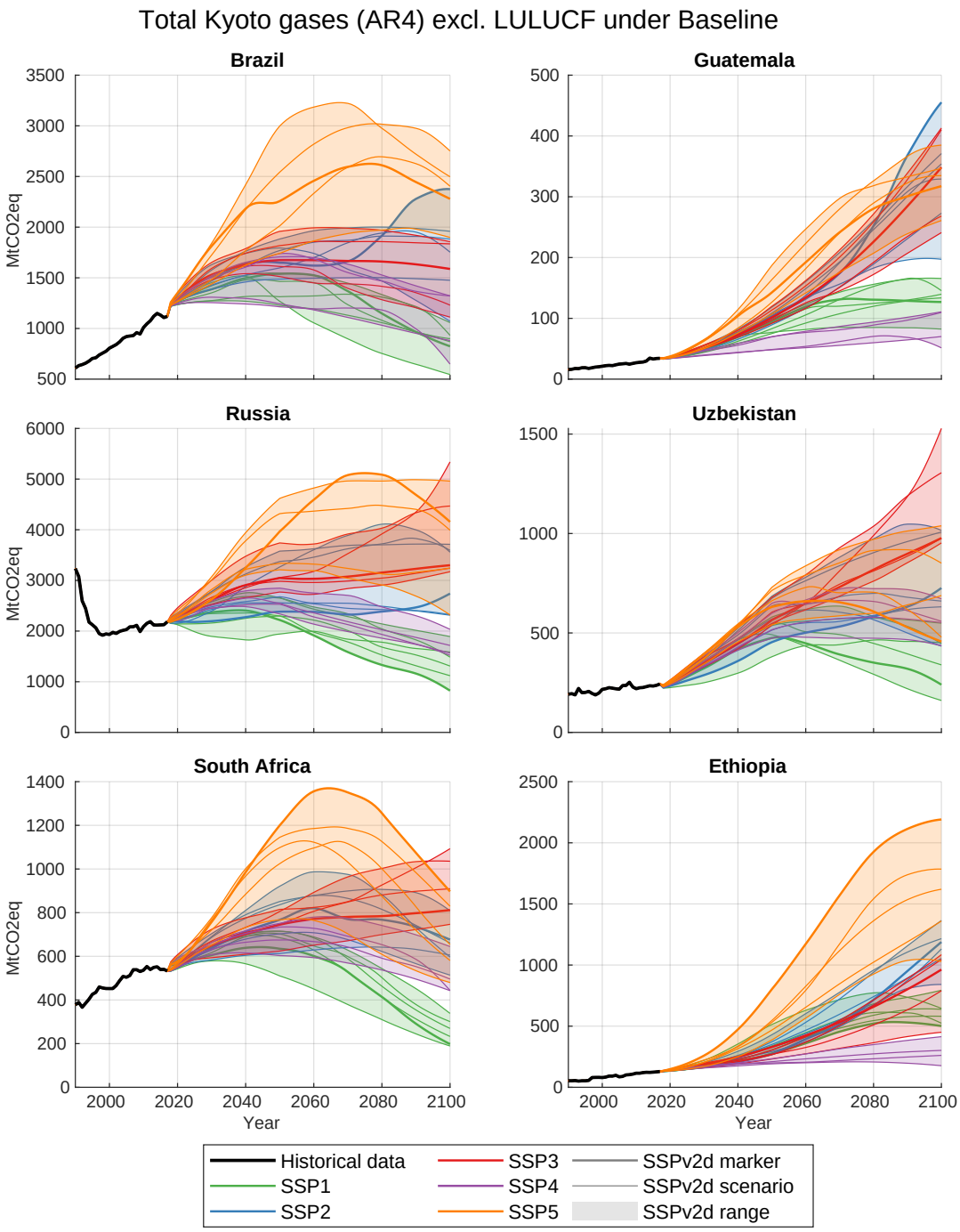

Figure S61. Kyoto GHG (AR4) results for SSPv2d baseline scenarios for all SSPs. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

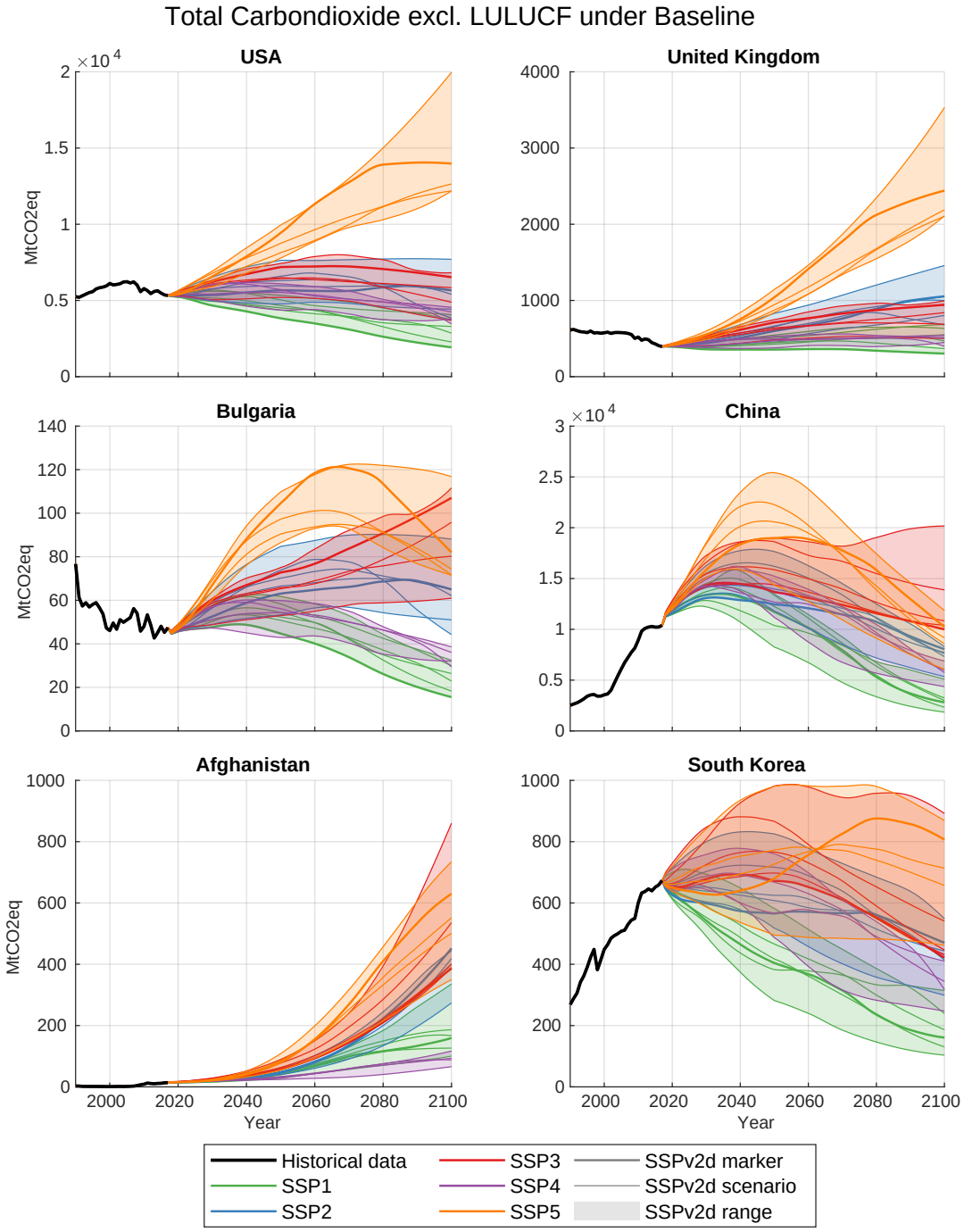

Figure S62. CO_2 results for SSPv2d baseline scenarios for all SSPs. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

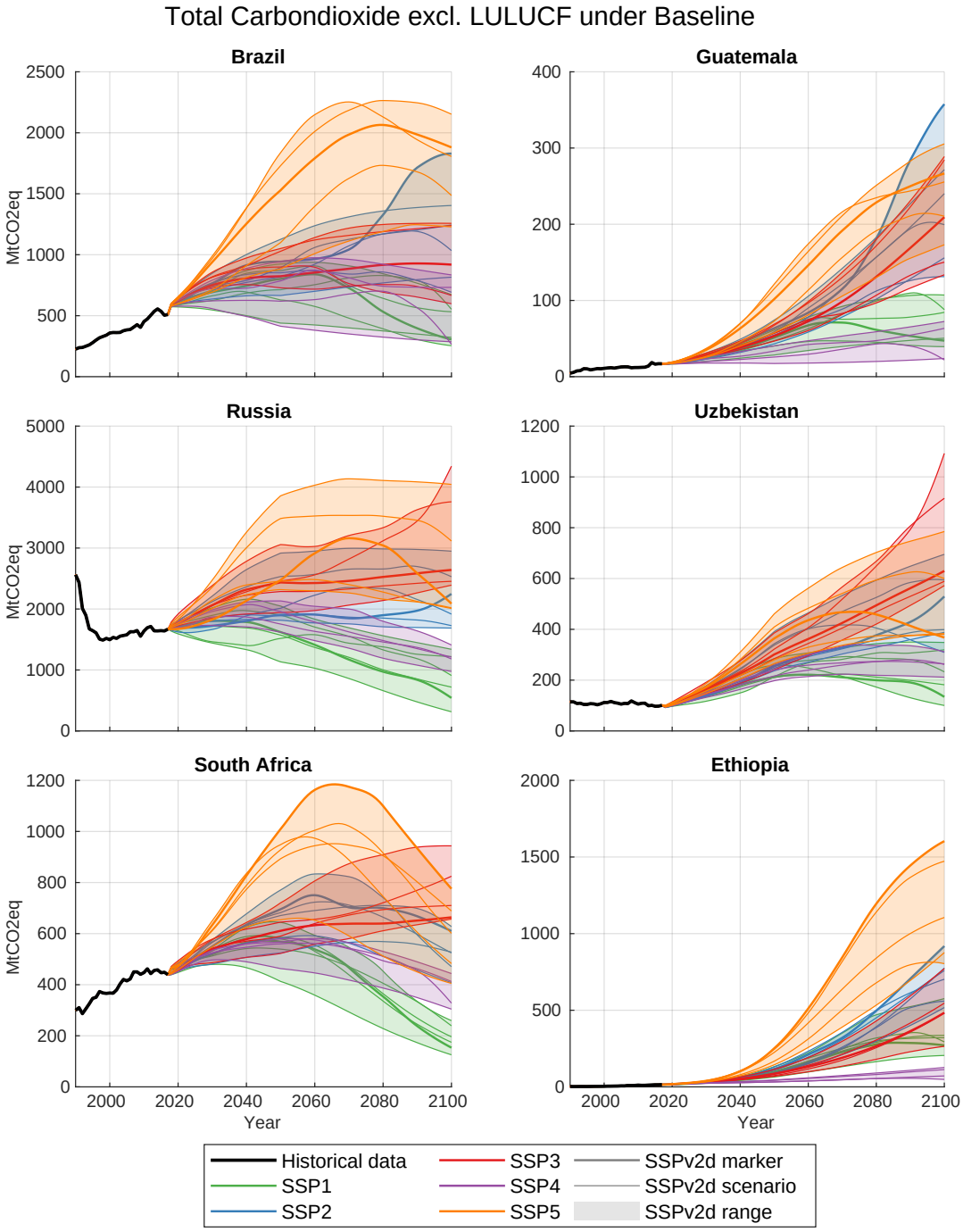

Figure S63. CO_2 results for SSPv2d baseline scenarios for all SSPs. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

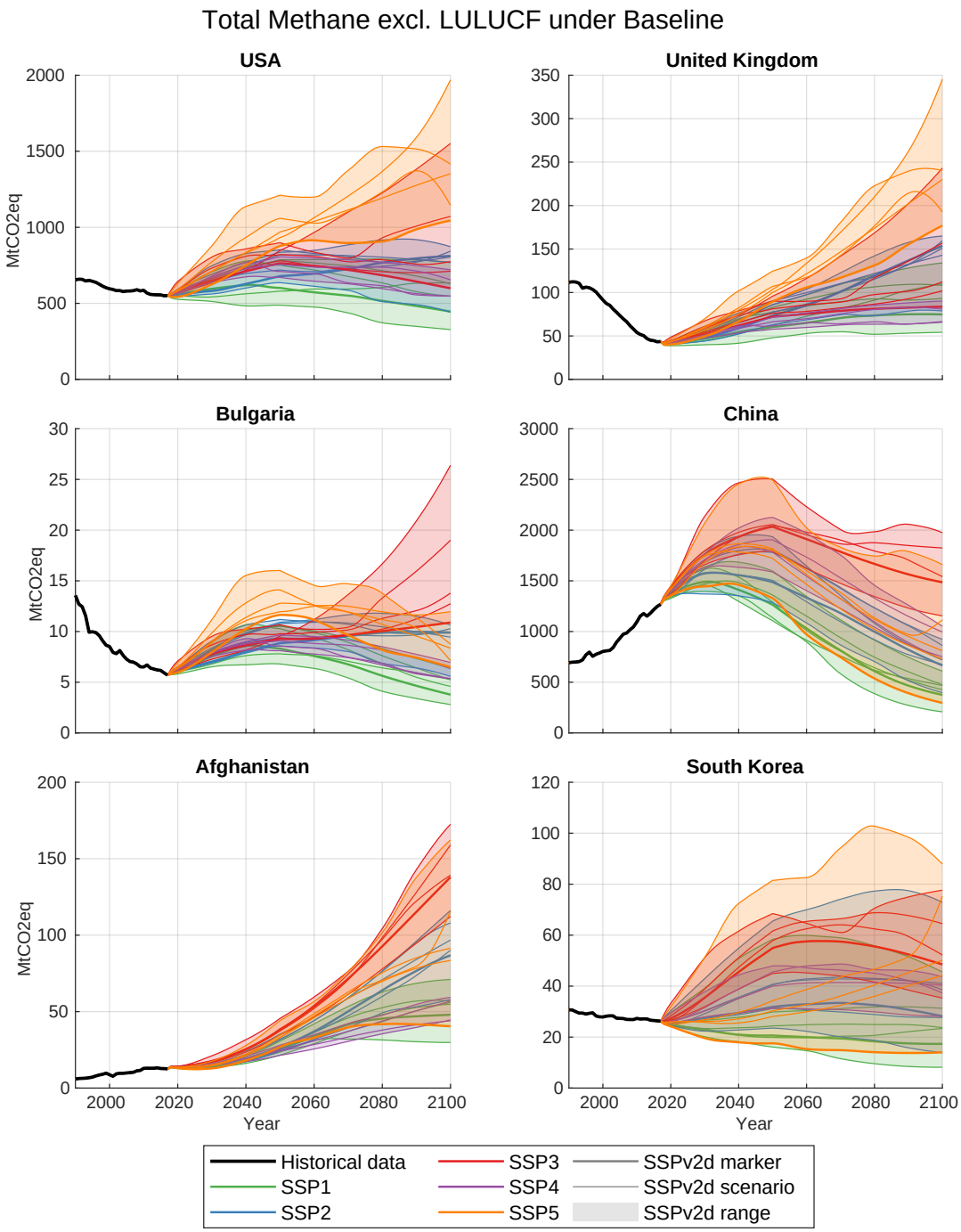

Figure S64. CH_4 results for SSPv2d baseline scenarios for all SSPs. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

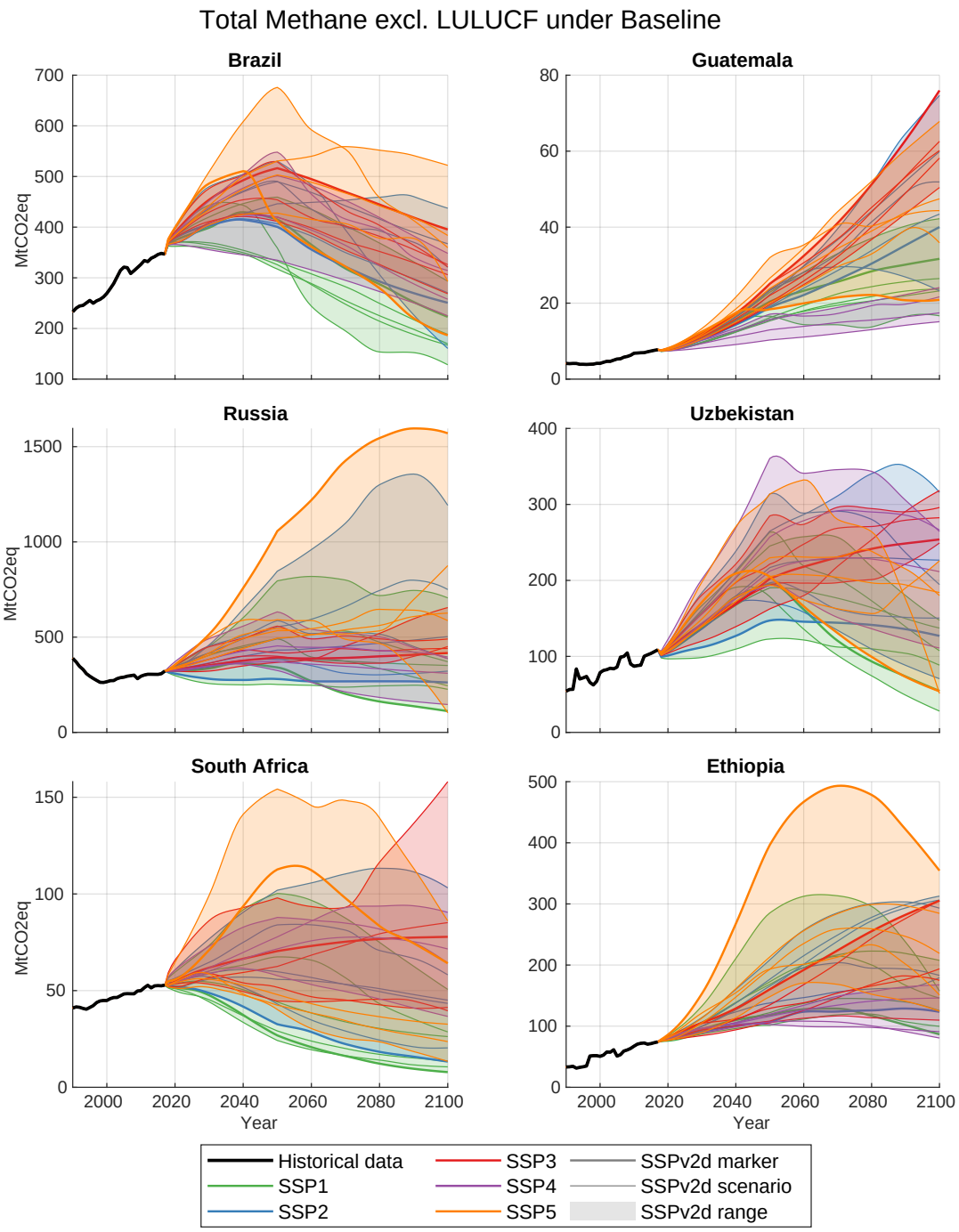

Figure S65. CH_4 results for SSPv2d baseline scenarios for all SSPs. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

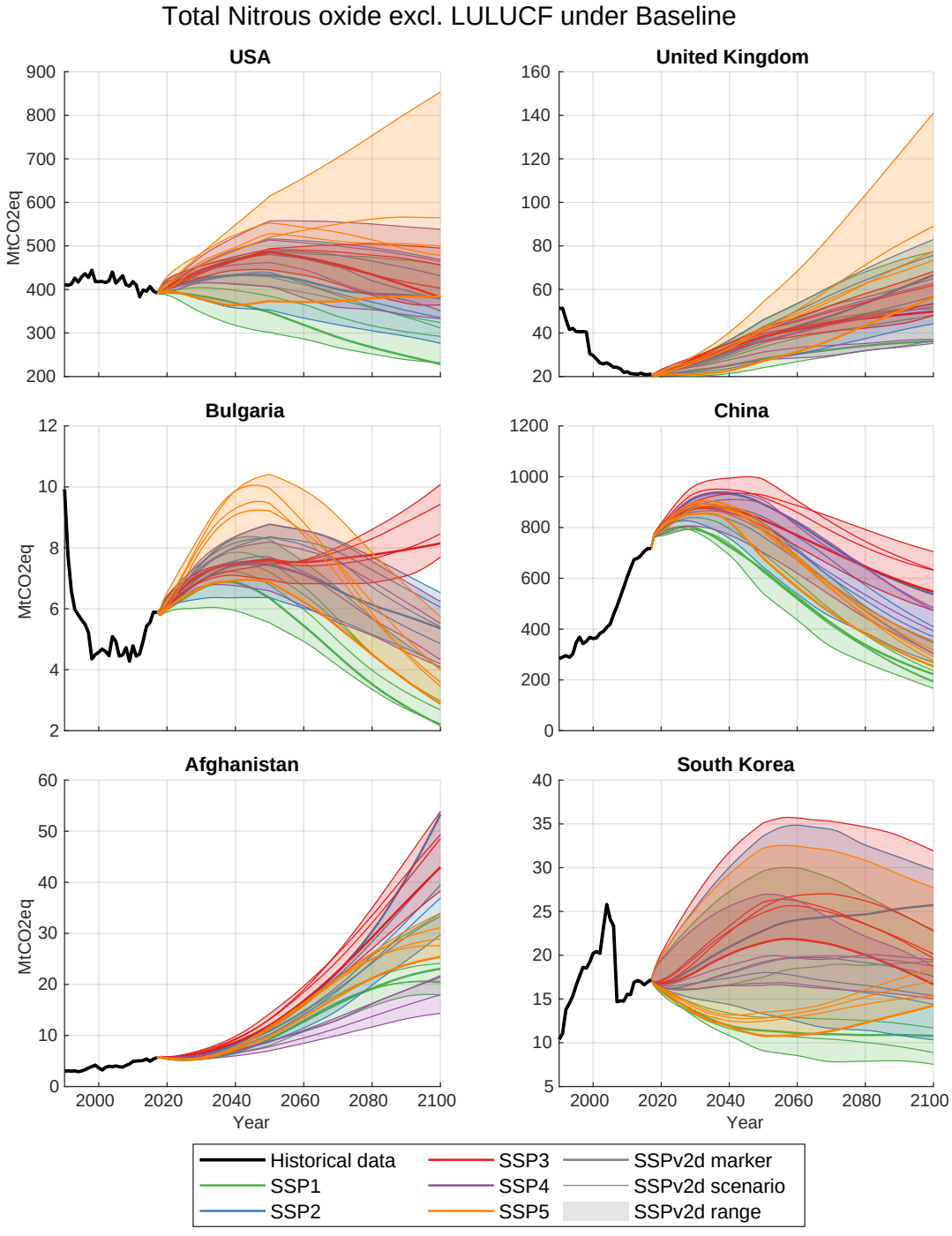

Figure S66. N_2O results for SSPv2d baseline scenarios for all SSPs. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

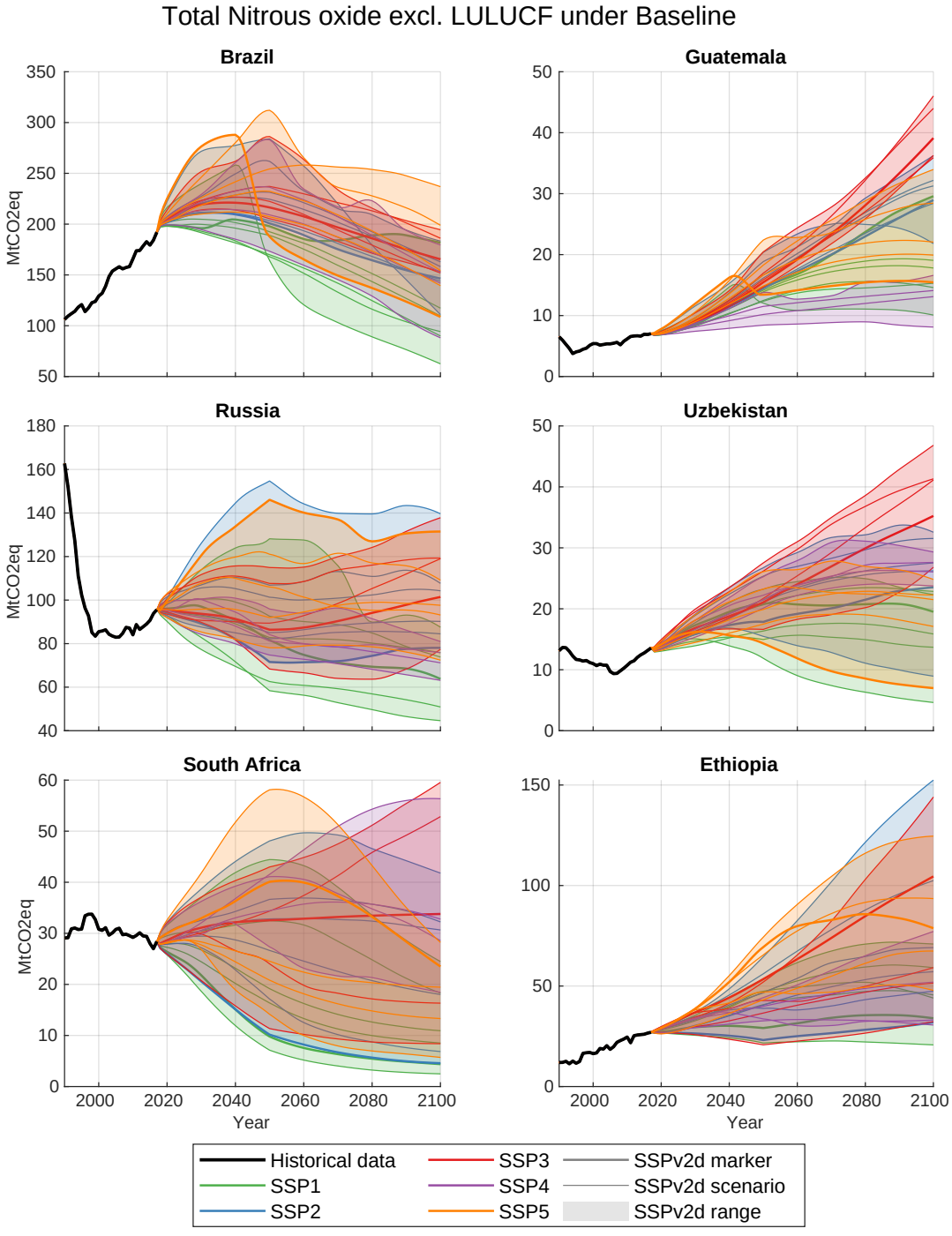

Figure S67. N_2O results for SSPv2d baseline scenarios for all SSPs. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

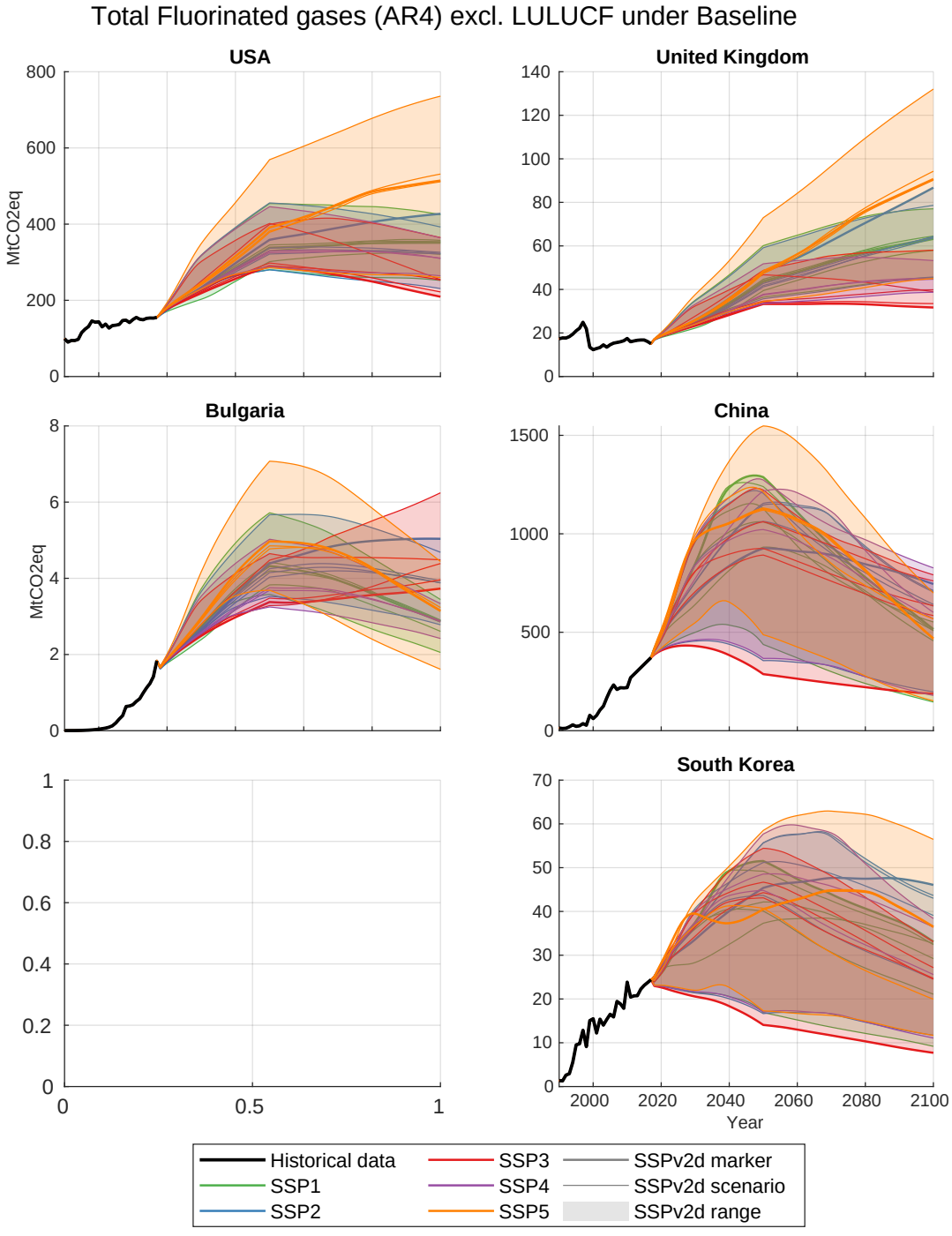

Figure S68. Fluorinated gases (AR4) results for SSPv2d baseline scenarios for all SSPs. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

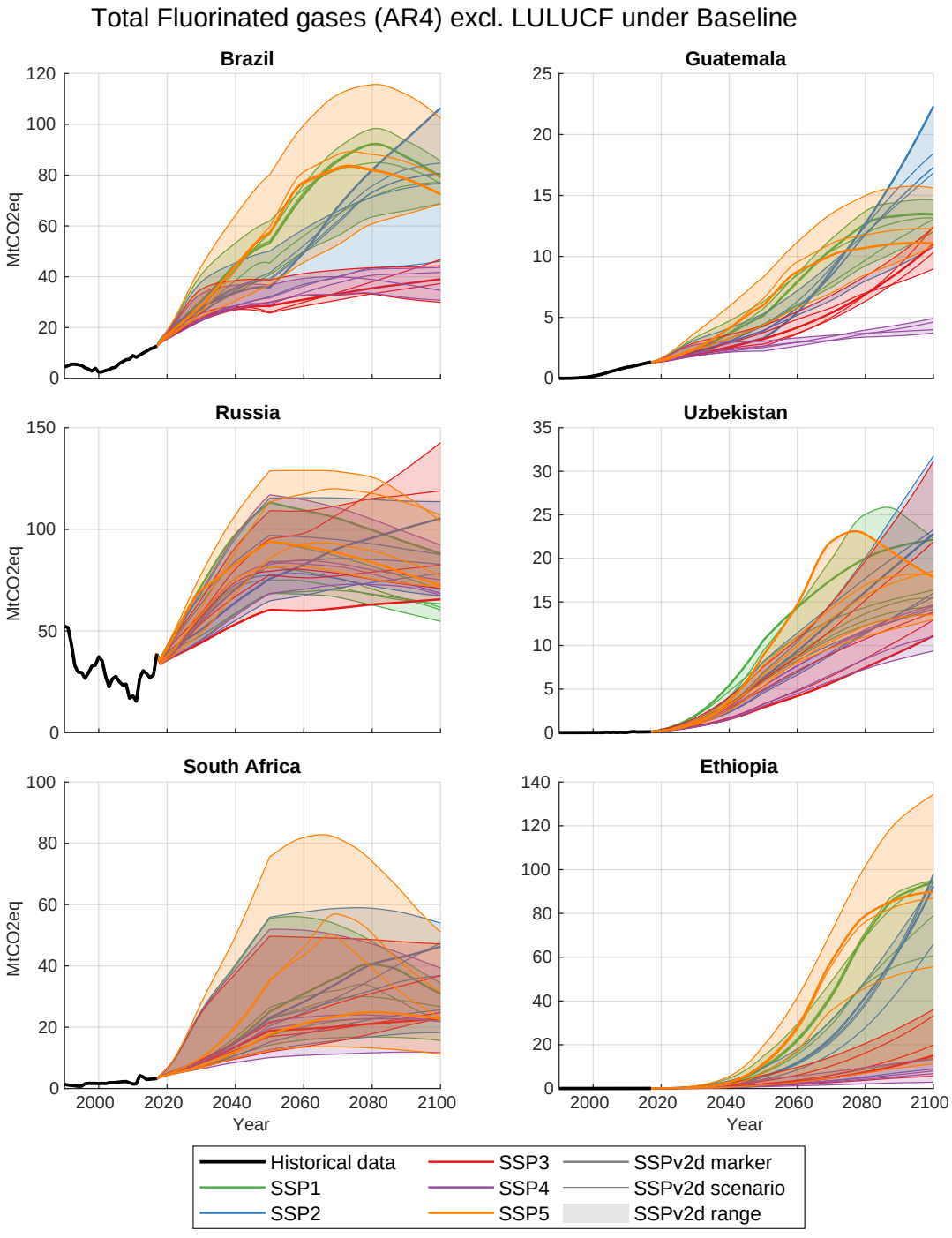

Figure S69. Fluorinated gases (AR4) results for SSPv2d baseline scenarios for all SSPs. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

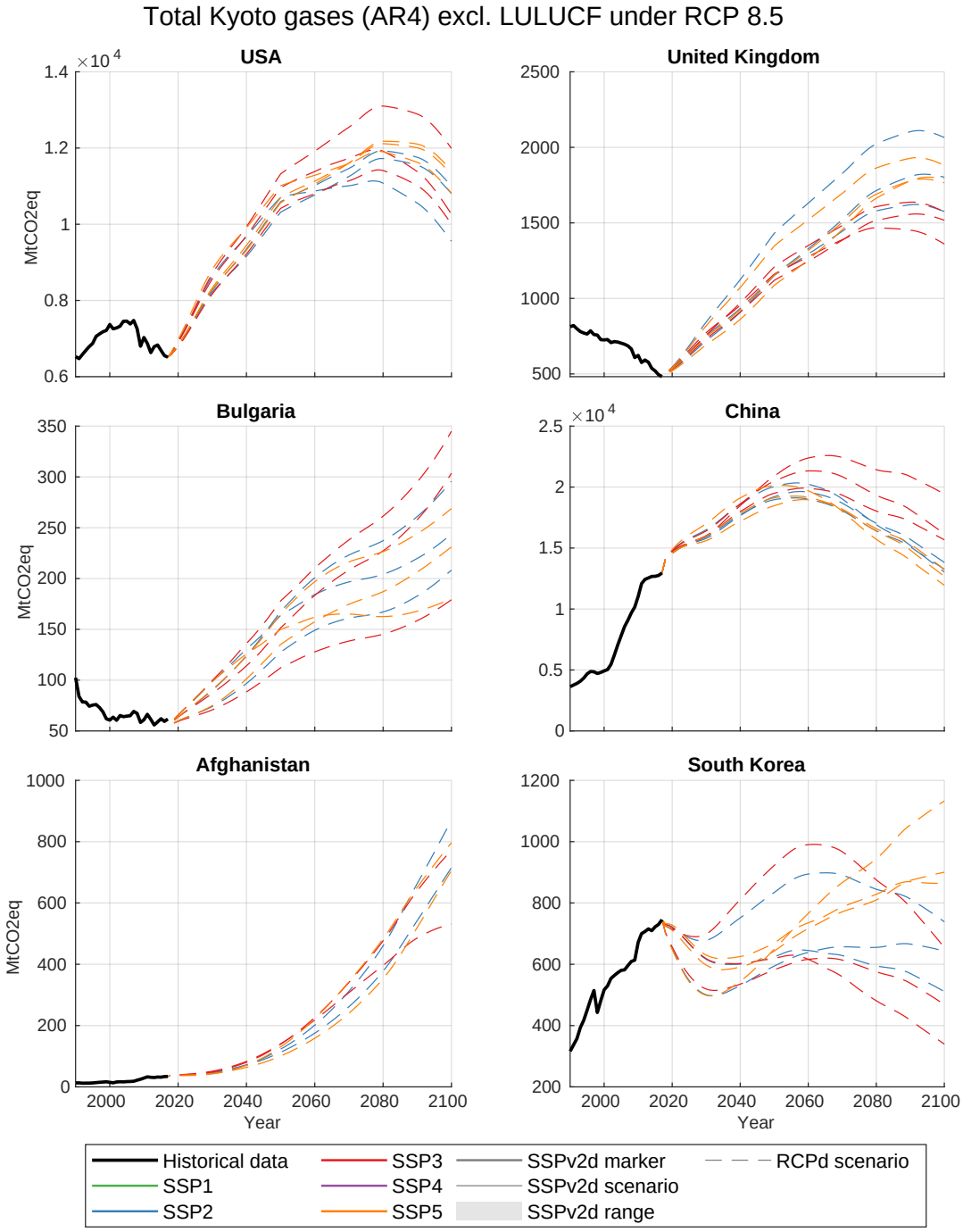

Figure S70. Kyoto GHG (AR4) results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

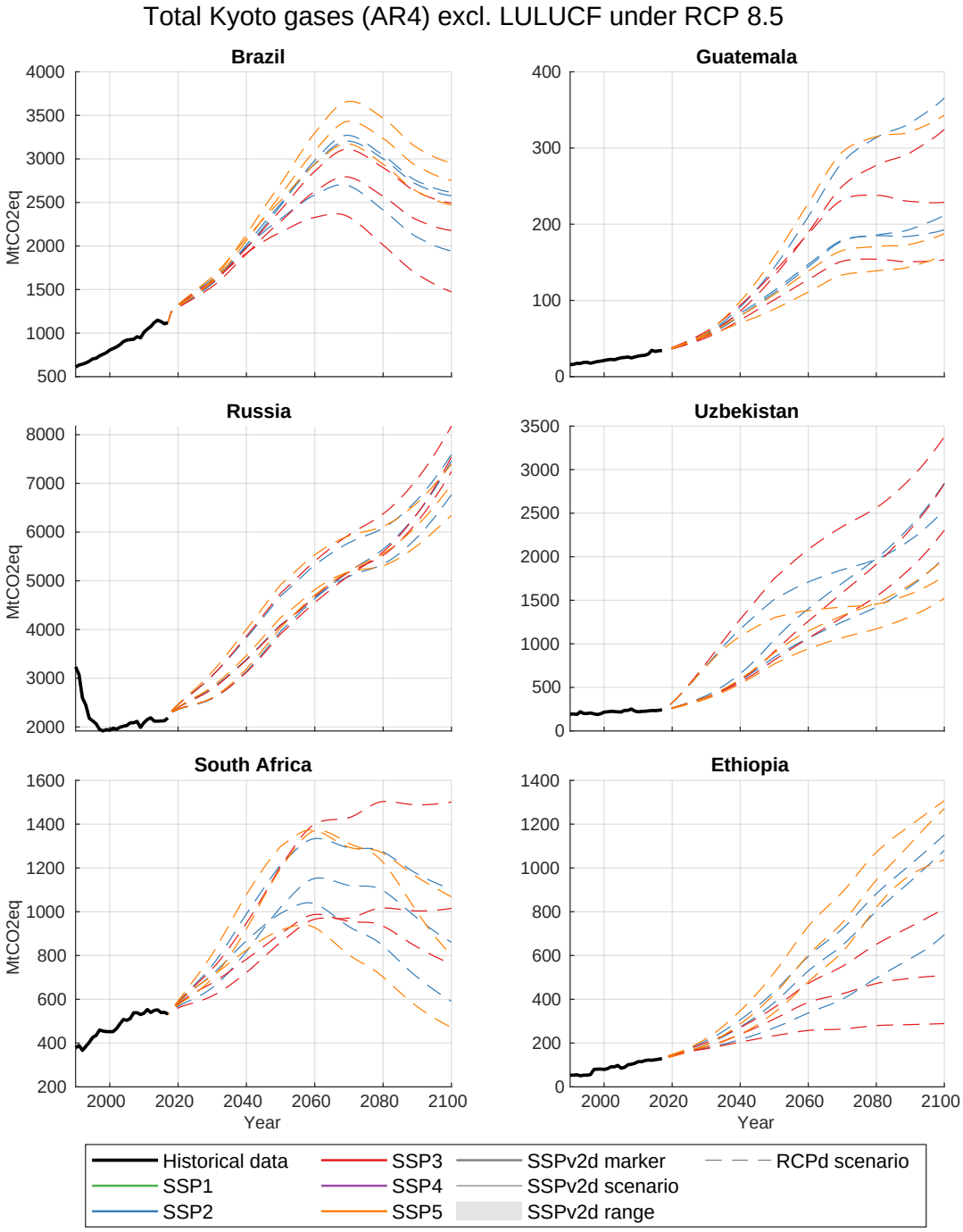

Figure S71. Kyoto GHG (AR4) results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

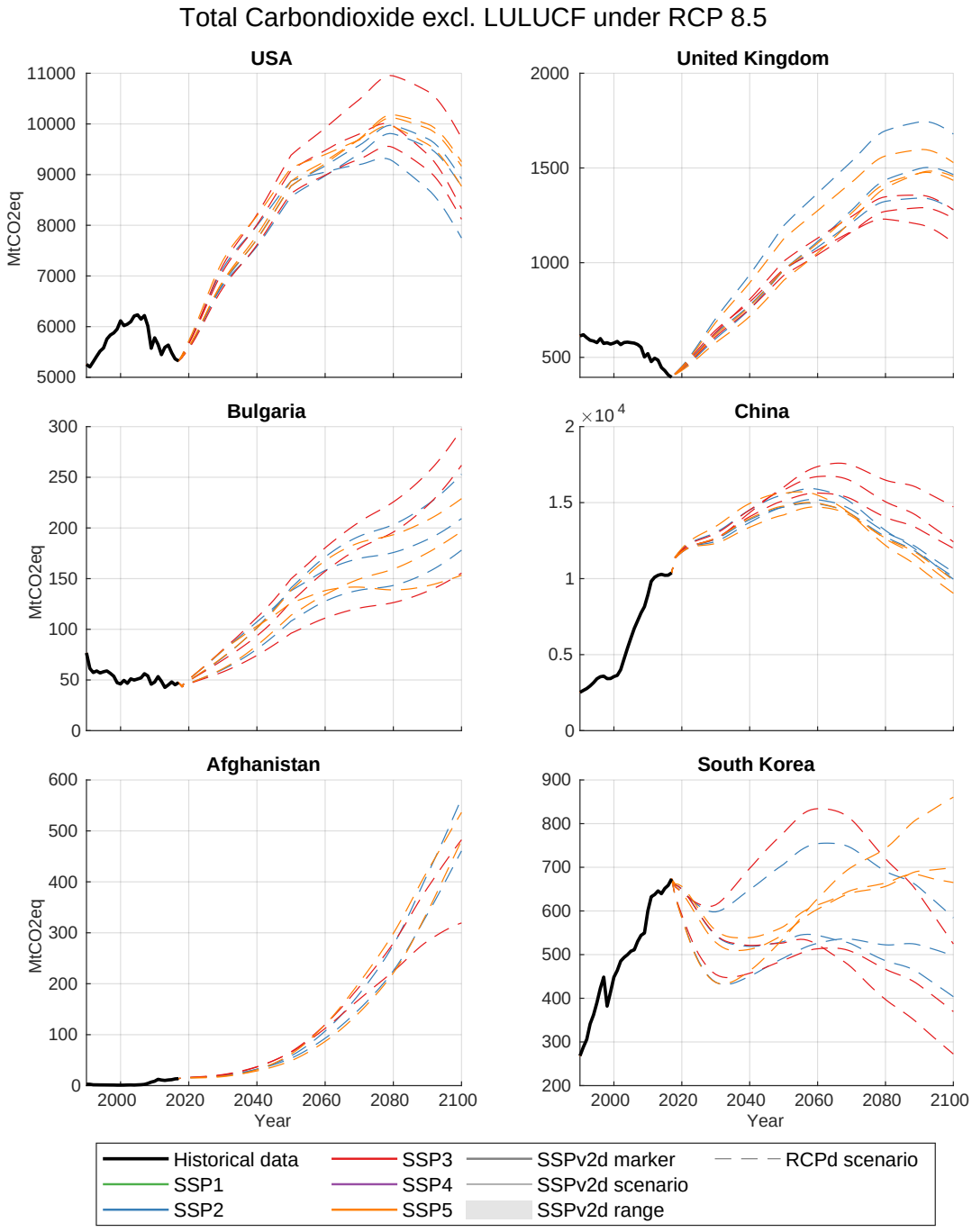

Figure S72. CO_2 results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

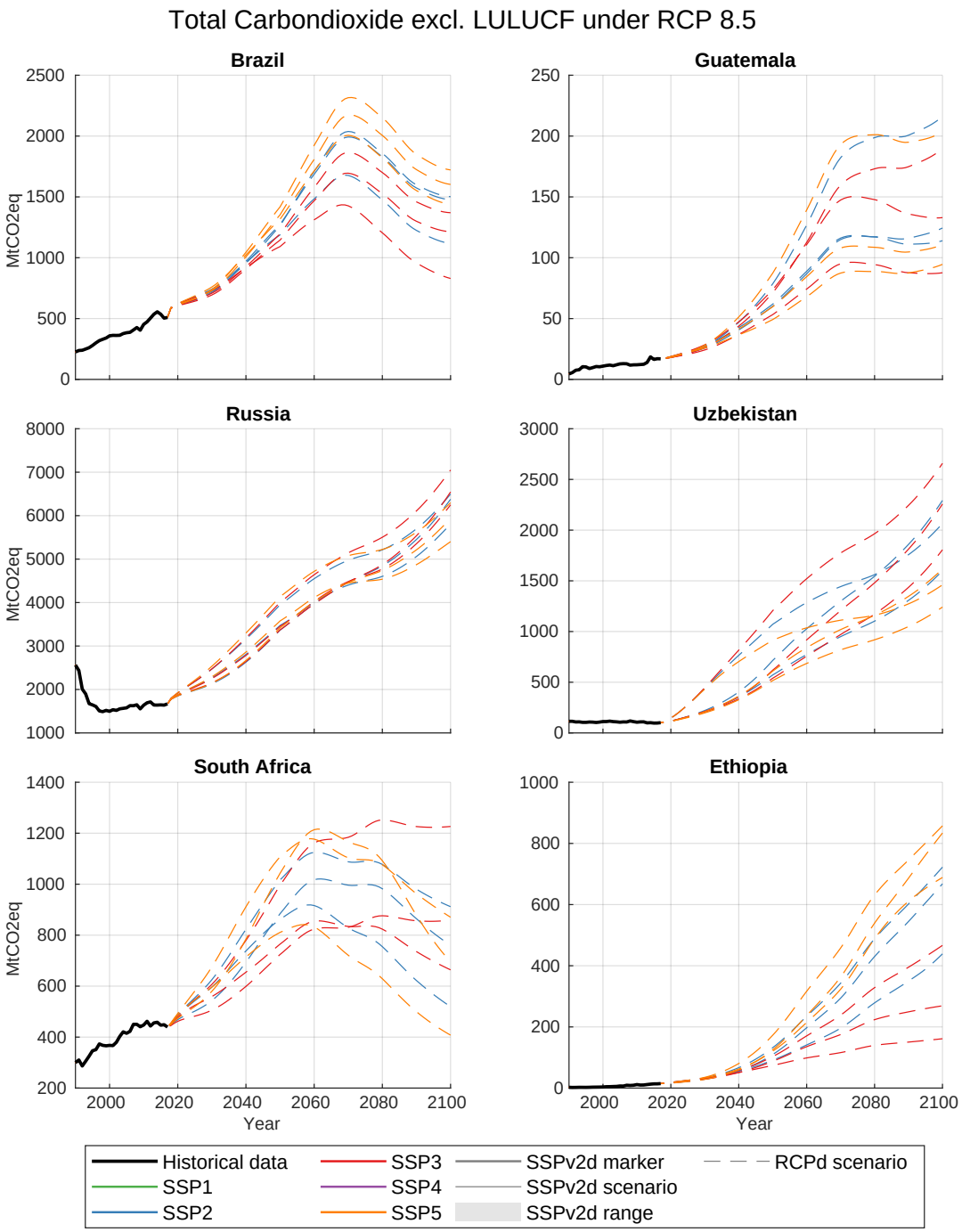

Figure S73. CO_2 results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

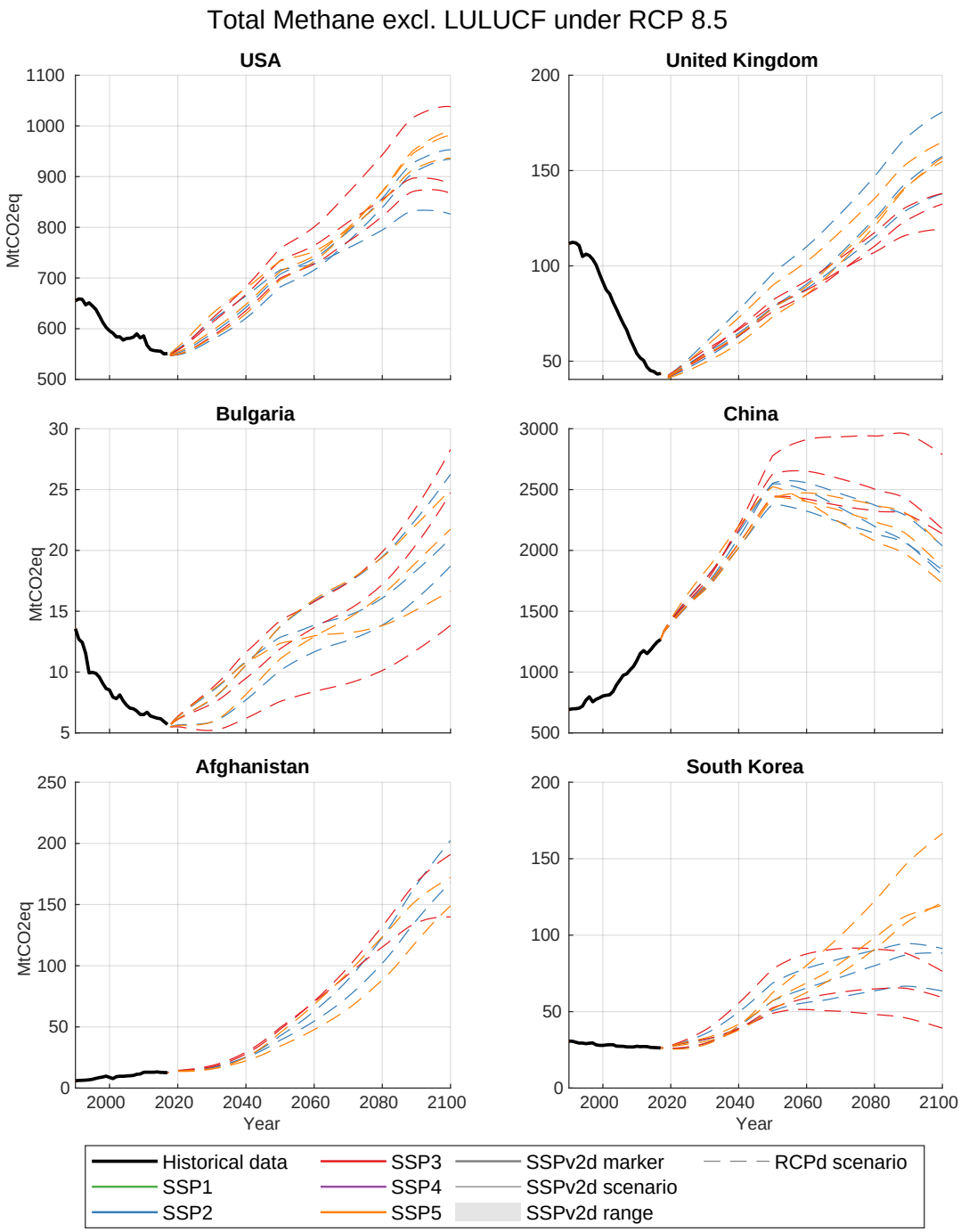

Figure S74. CH_4 results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

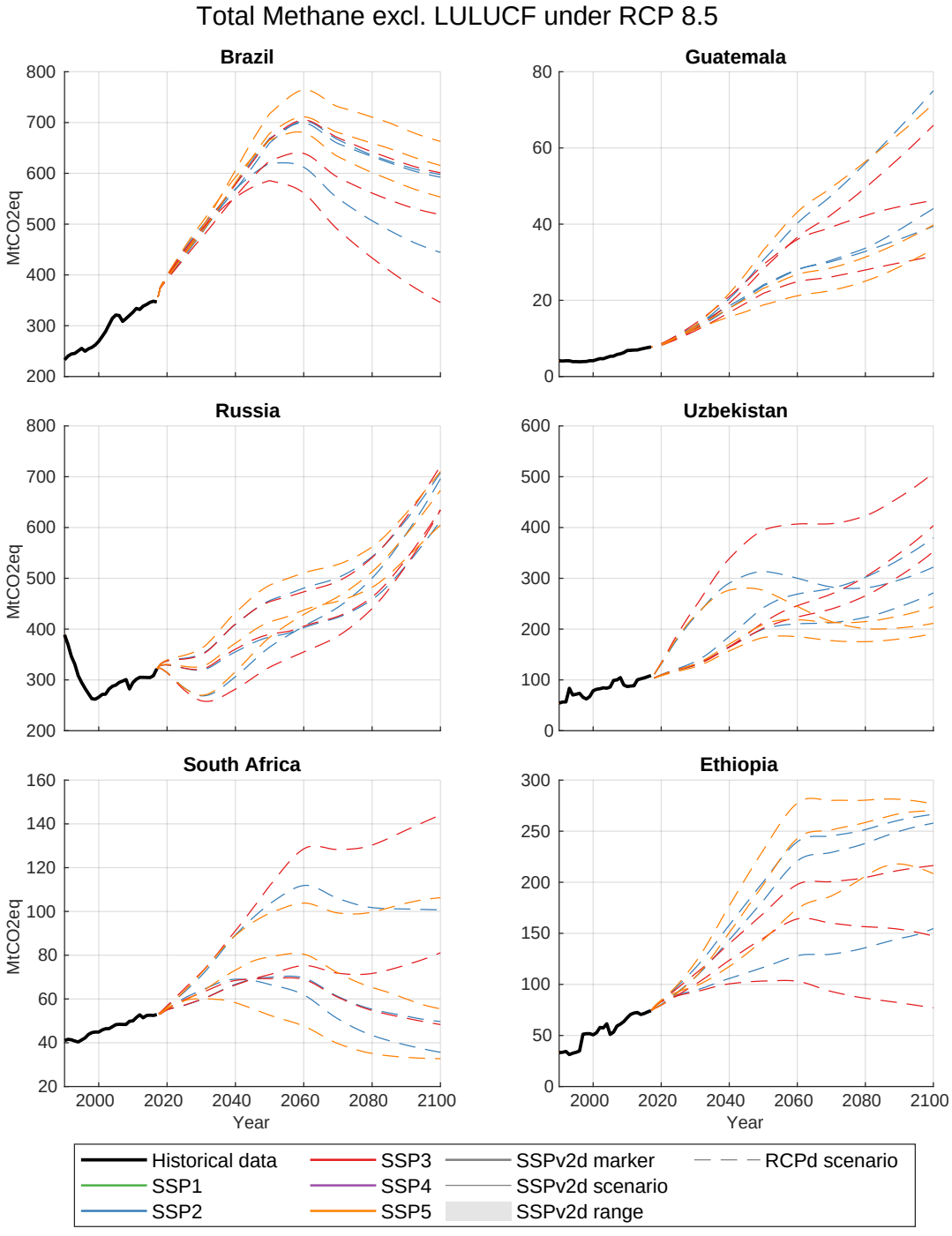

Figure S75. CH_4 results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

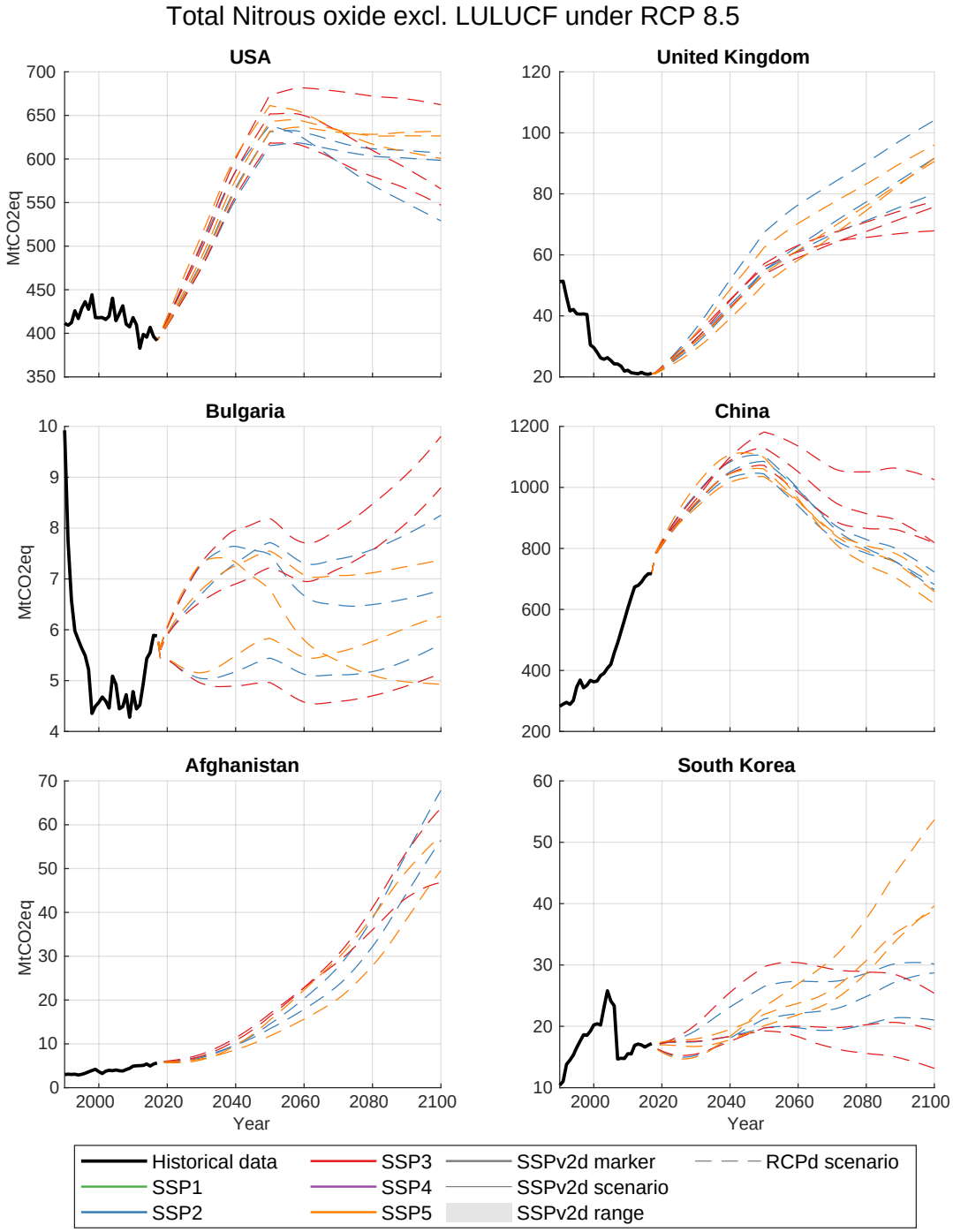

Figure S76. N_2O results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

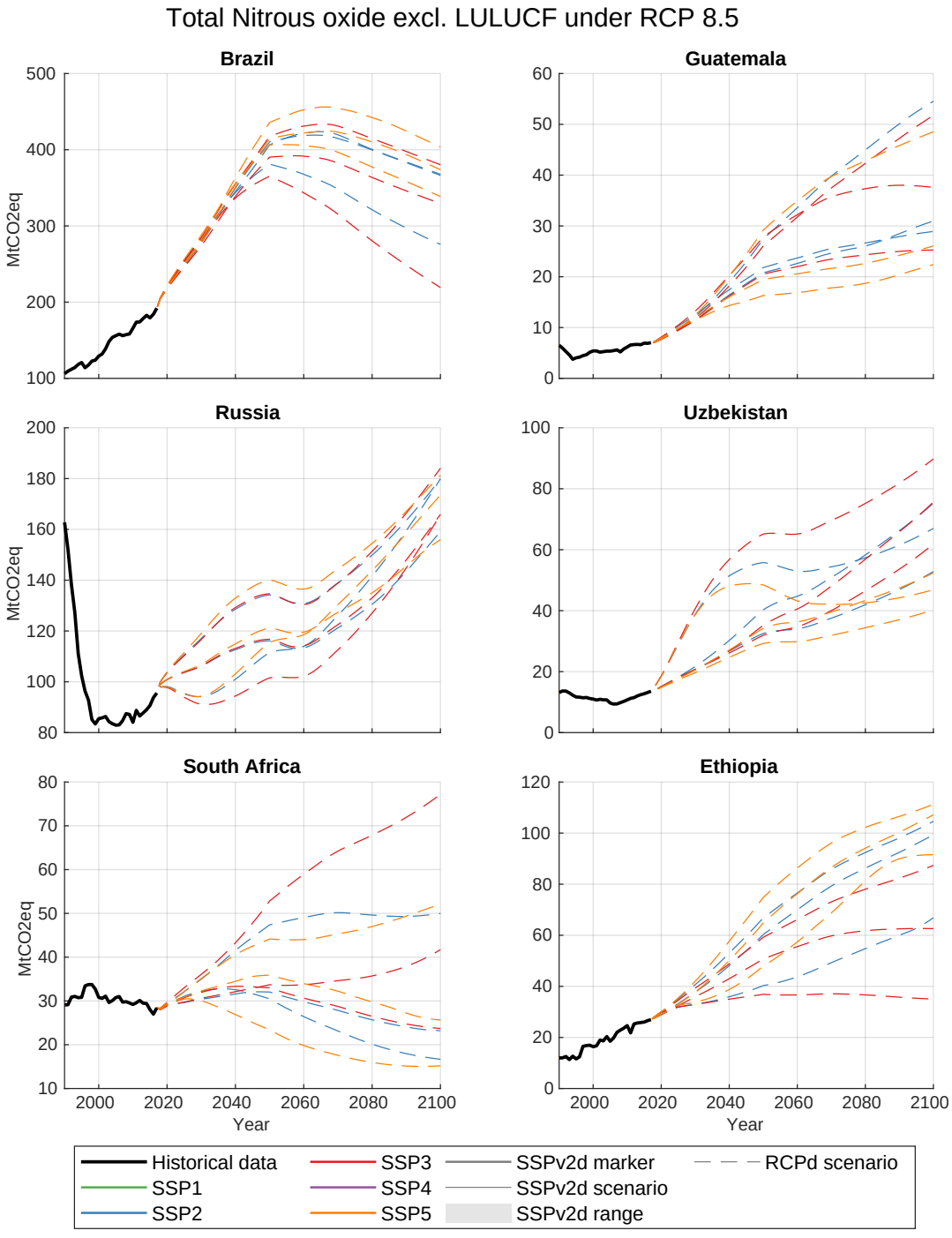

Figure S77. N_2O results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

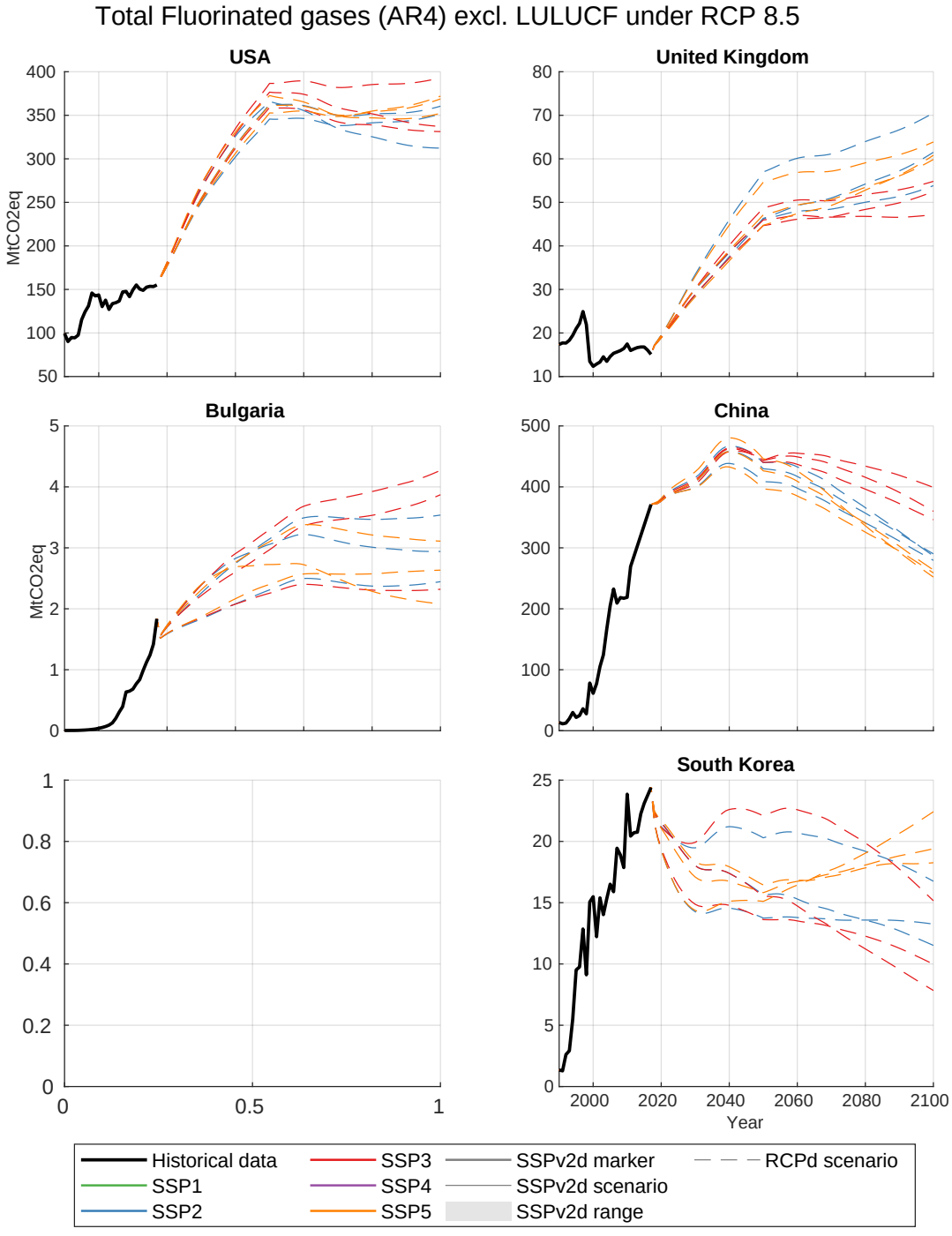

Figure S78. Fluorinated gases (AR4) results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from OECD and Asia regions. Note: Korea is in the OECD region for the WITCH GLOBIOM model.

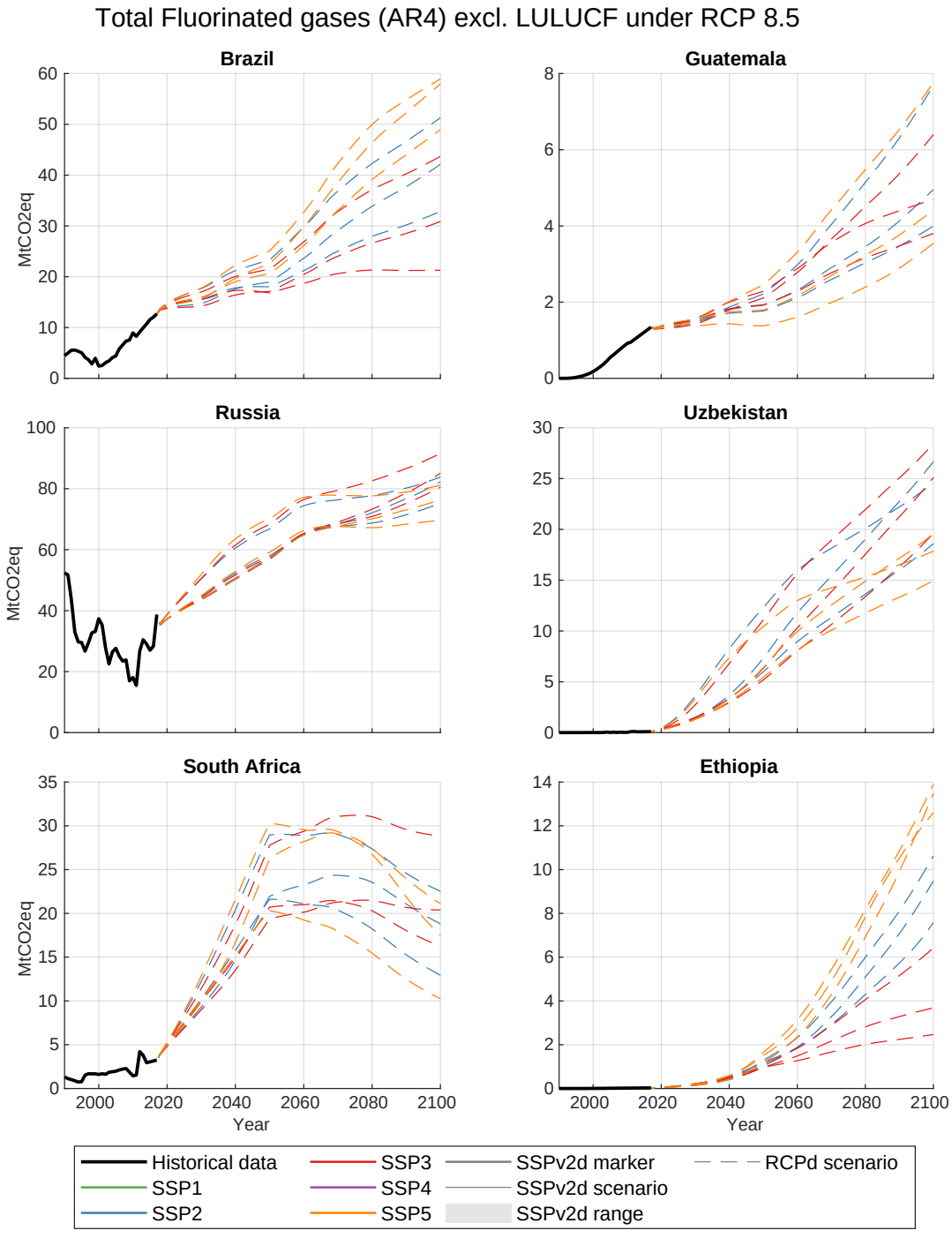

Figure S79. Fluorinated gases (AR4) results for RCP 8.5 and all SSPs for RCPd scenarios. Countries from Latin America, Reforming Economies and Middle East and Africa regions.

S2.5 Method comparison for individual gases

In this section we present individual gas figures for the comparison of downscaling methods for RCP 2.6, SSP 2 (also used in the main manuscript, Figures S80 to S89) and an additional high emissions - high growth scenario RCP 6.0, SSP 5 (Figures S90 to S99). Results for other RCP SSP combinations and countries can be provided.

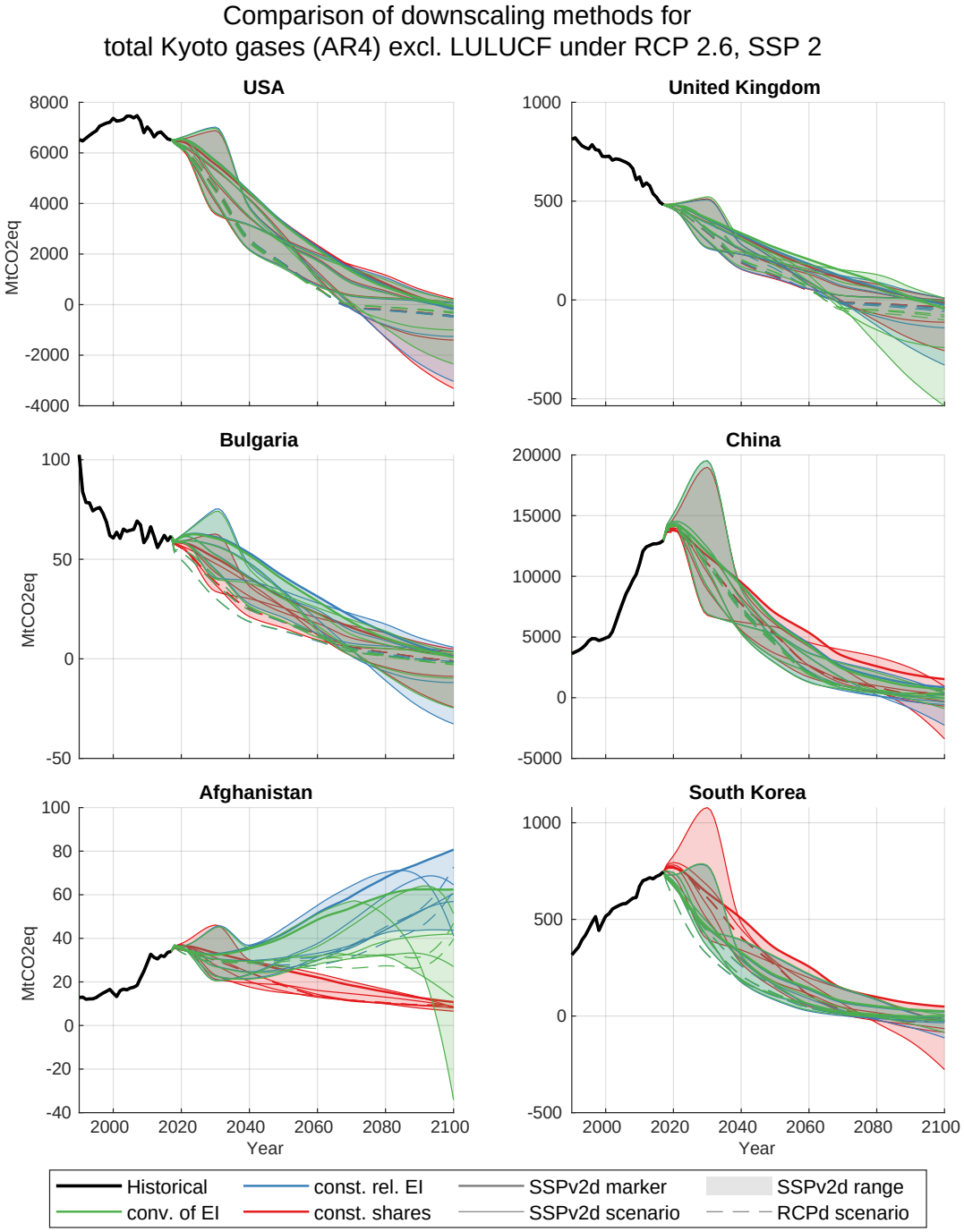

Figure S80. Influence of the downscaling method on country Kyoto GHG (AR4) emissions for RCP 2.6, SSP 2. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

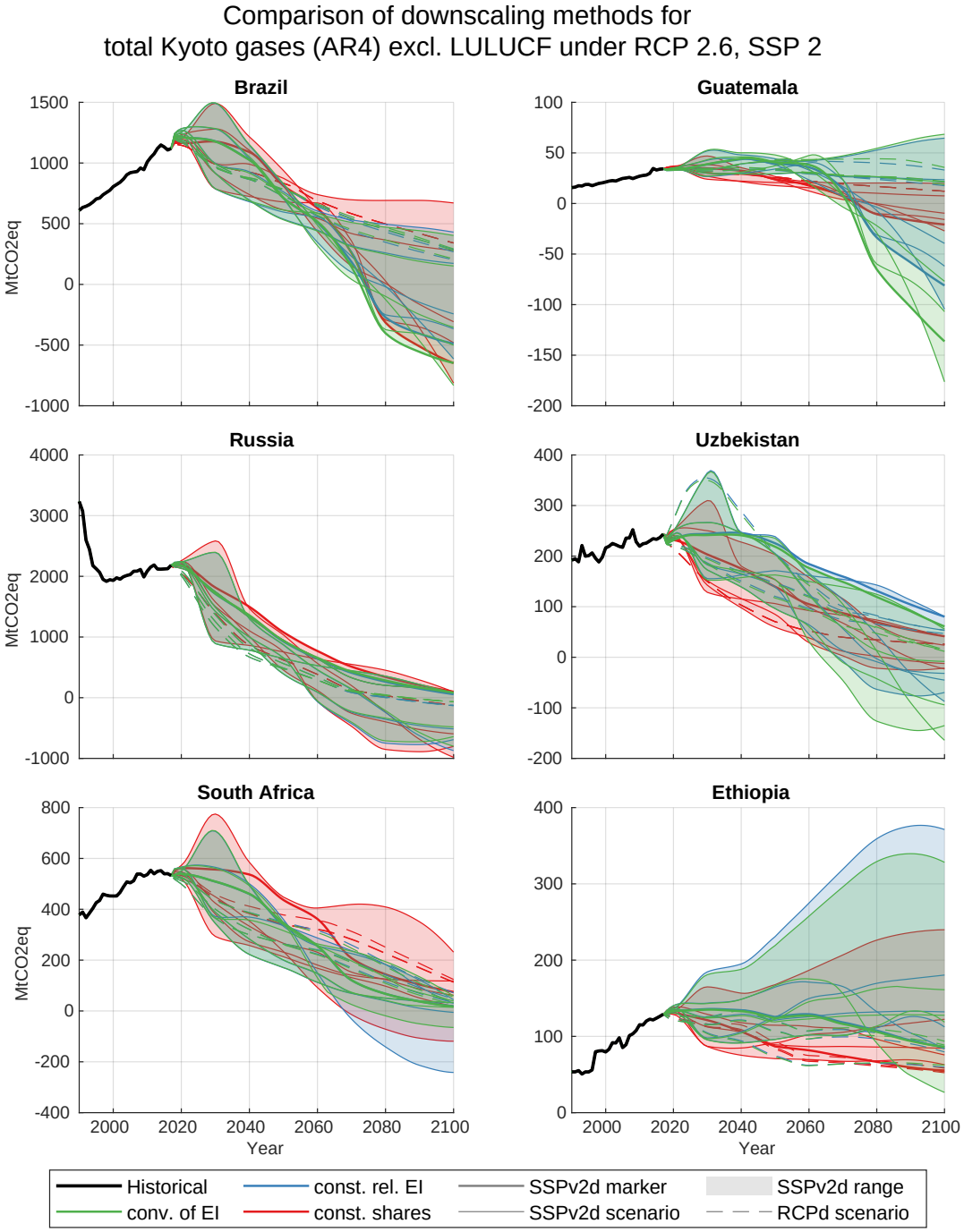

Figure S81. Influence of the downscaling method on country Kyoto GHG (AR4) emissions for RCP 2.6, SSP 2. Ranges and median are calculated over all SSP IAM implementations. RCP SSP scenarios are shown as individual lines only (dashed).

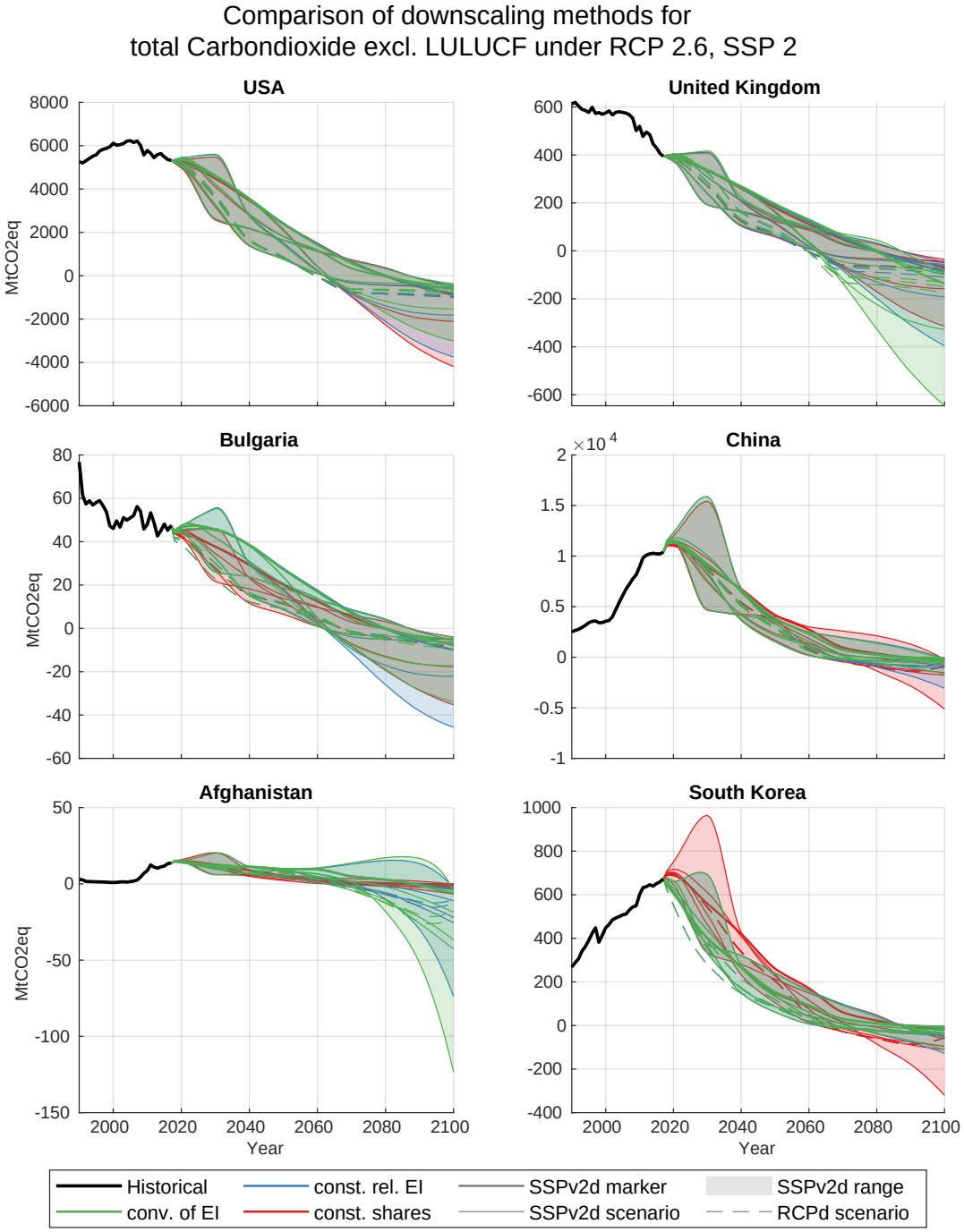

Figure S82. Influence of the downscaling method on country CO_2 emissions for RCP 2.6, SSP 2. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

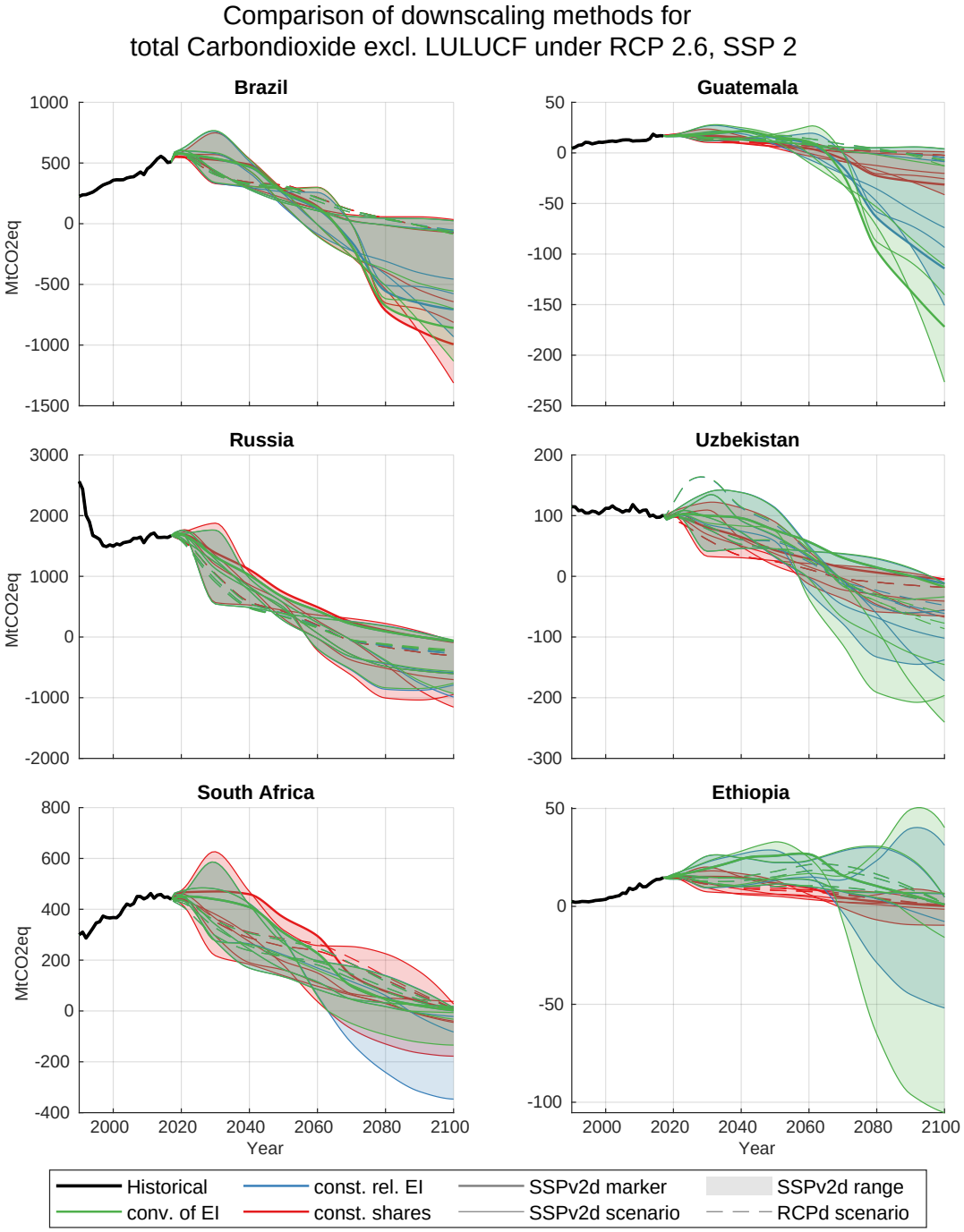

Figure S83. Influence of the downscaling method on country CO_2 emissions for RCP 2.6, SSP 2. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

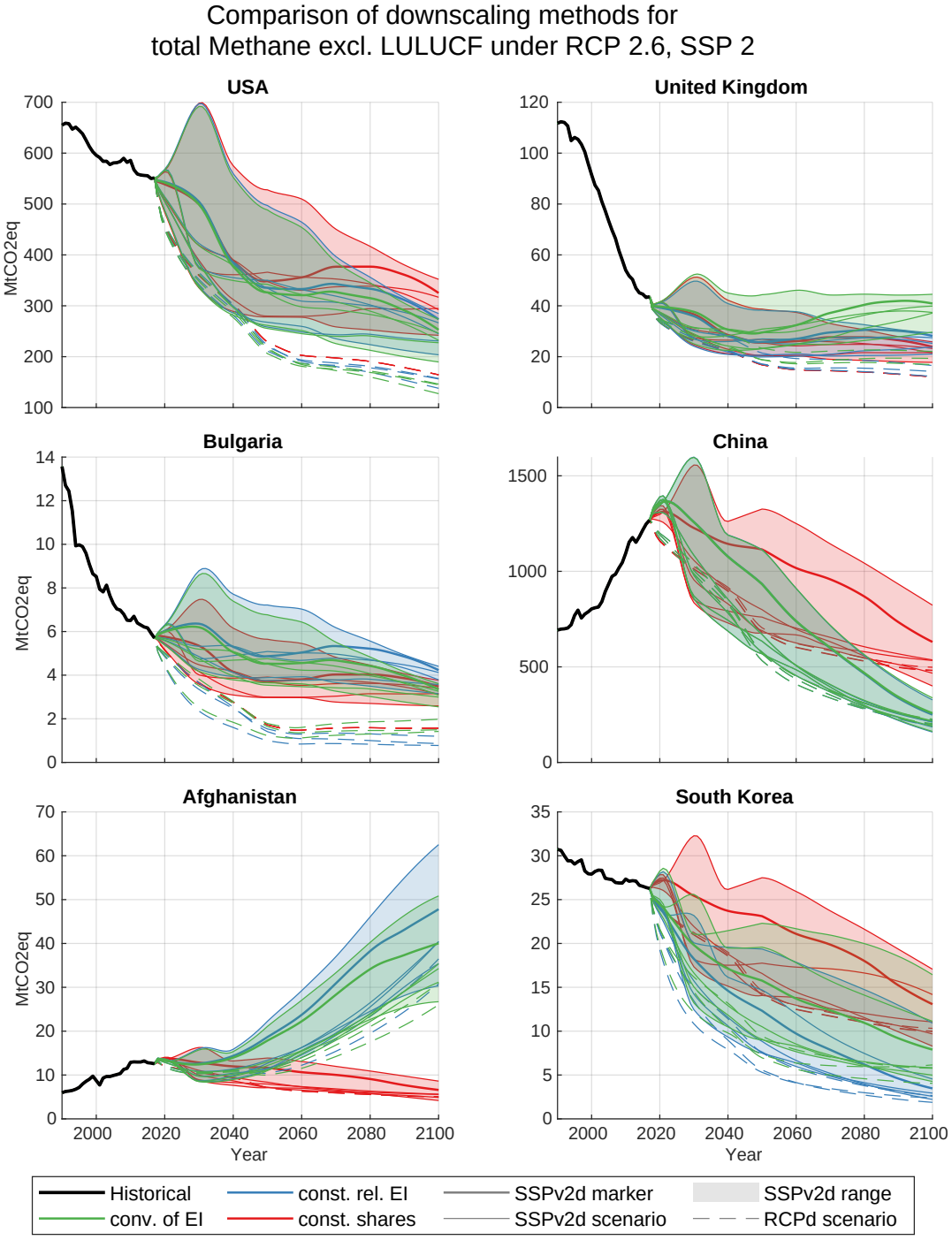

Figure S84. Influence of the downscaling method on country CH_4 emissions for RCP 2.6, SSP 2. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

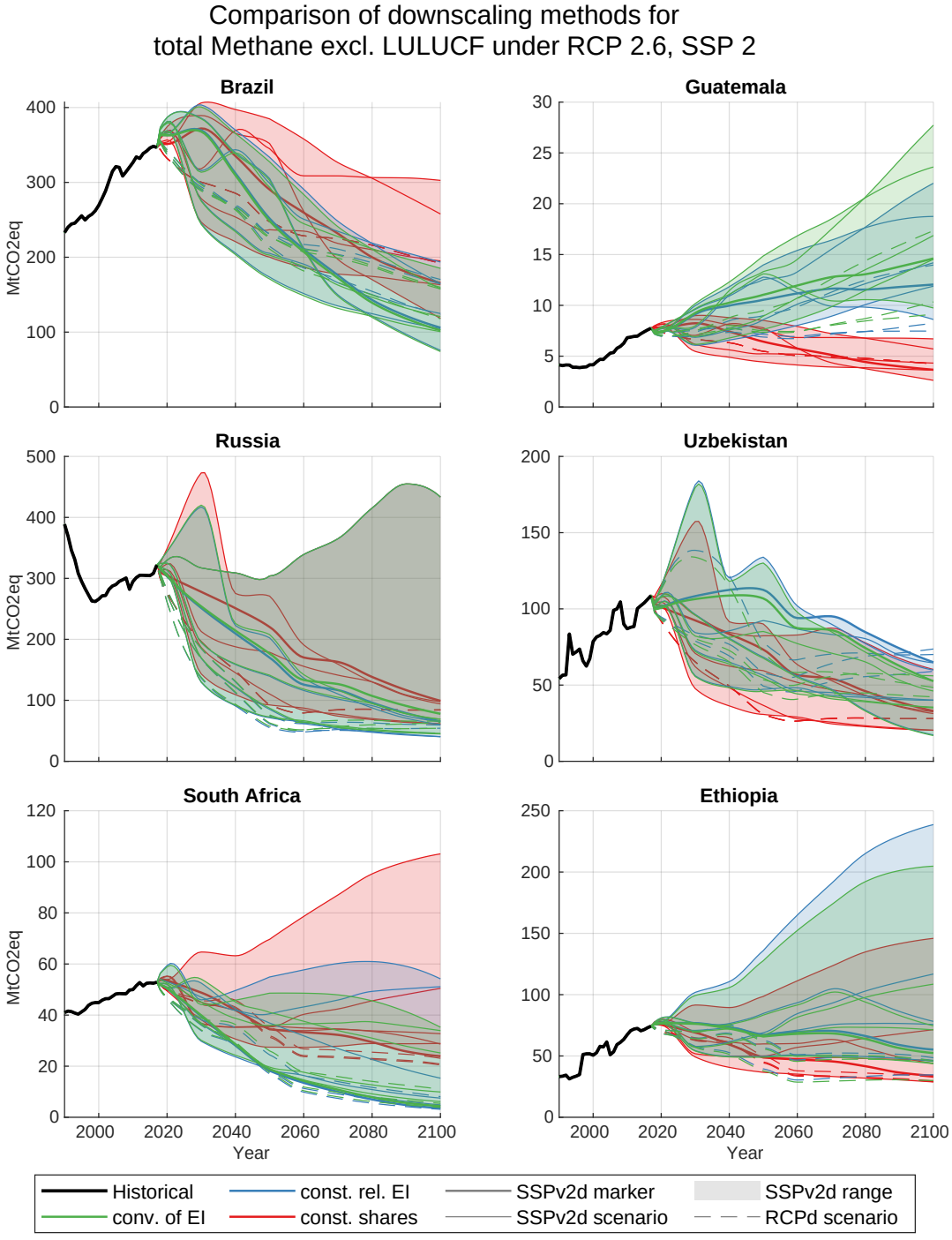

Figure S85. Influence of the downscaling method on country CH_4 emissions for RCP 2.6, SSP 2. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

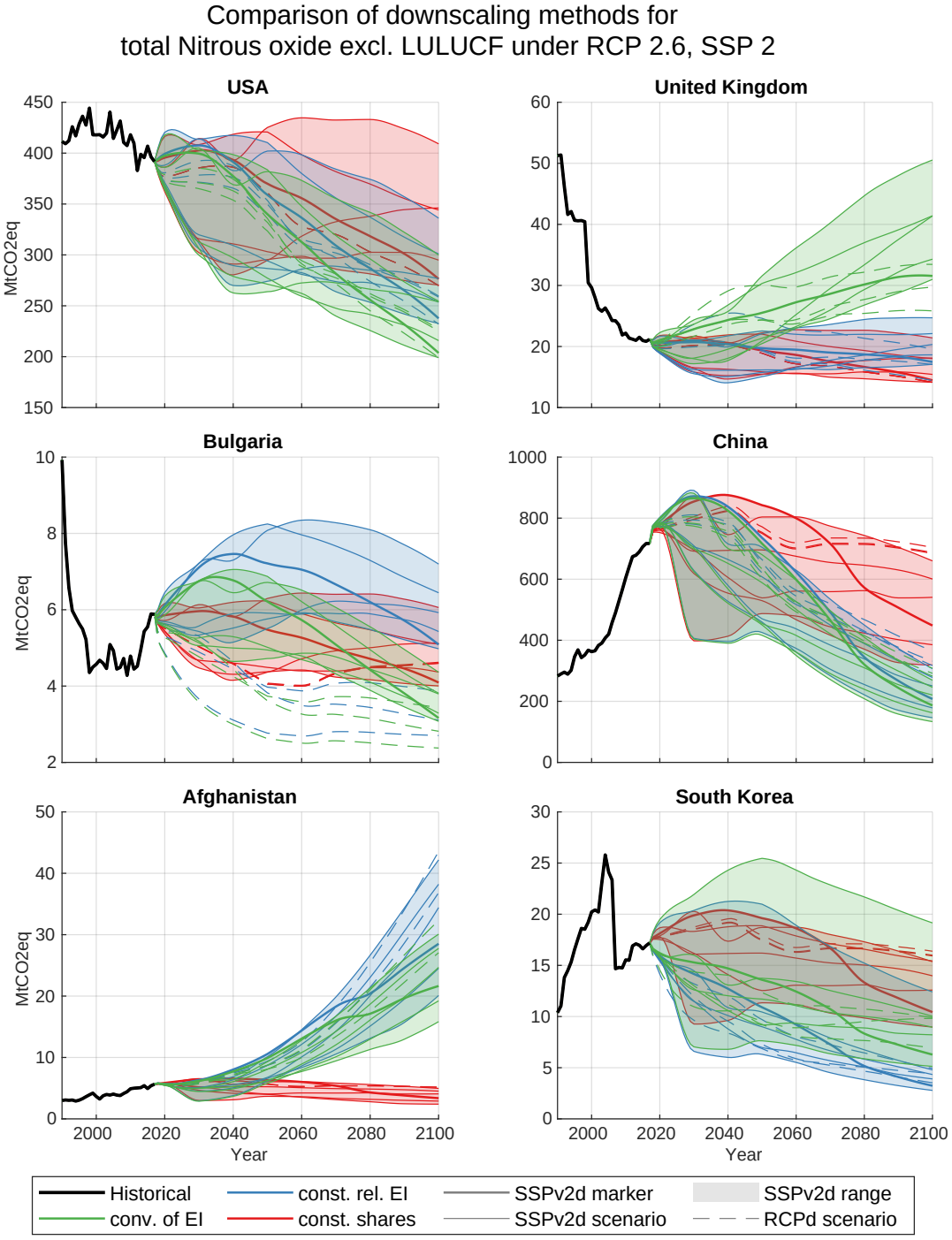

Figure S86. Influence of the downscaling method on country N_2O emissions for RCP 2.6, SSP 2. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

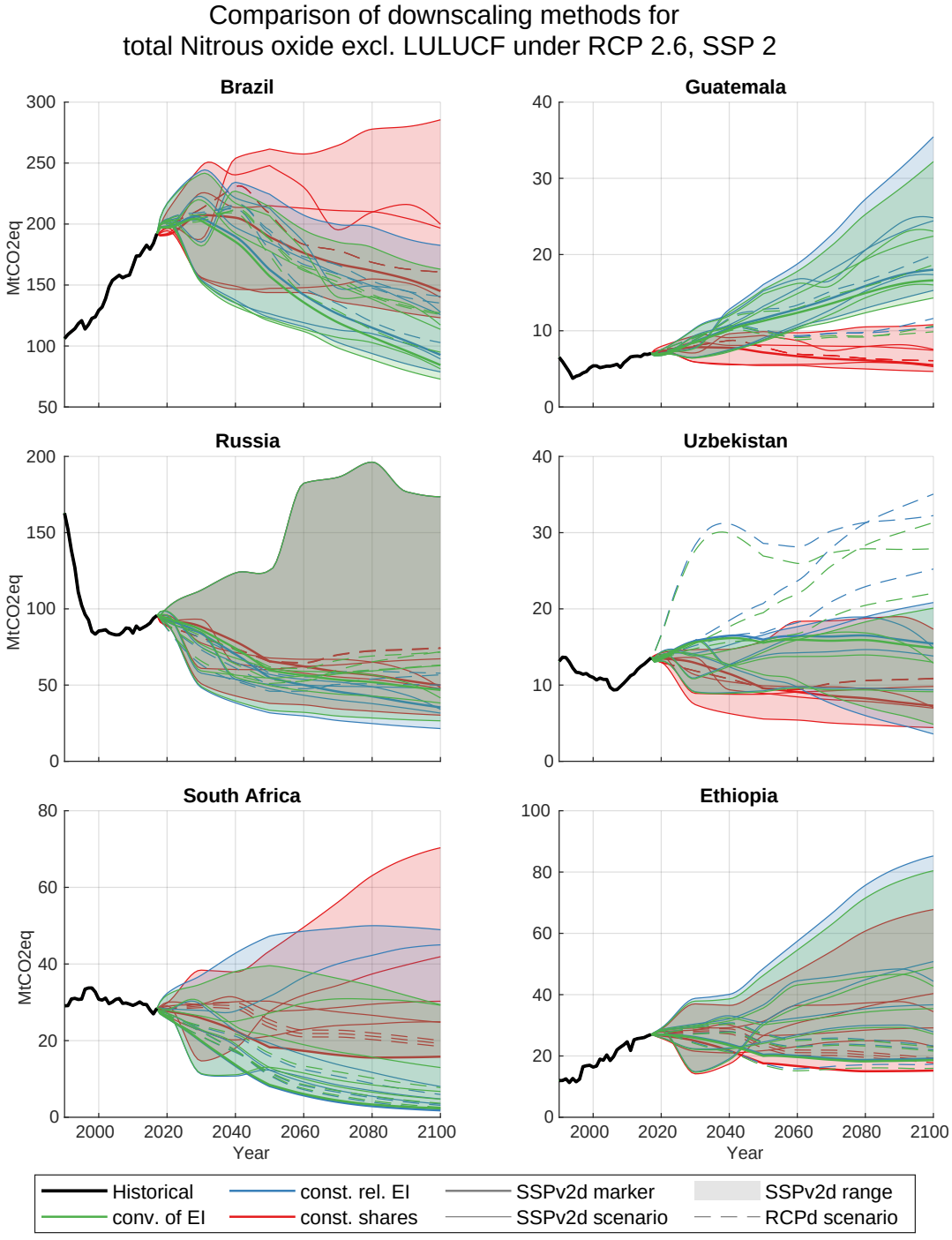

Figure S87. Influence of the downscaling method on country N_2O emissions for RCP 2.6, SSP 2. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

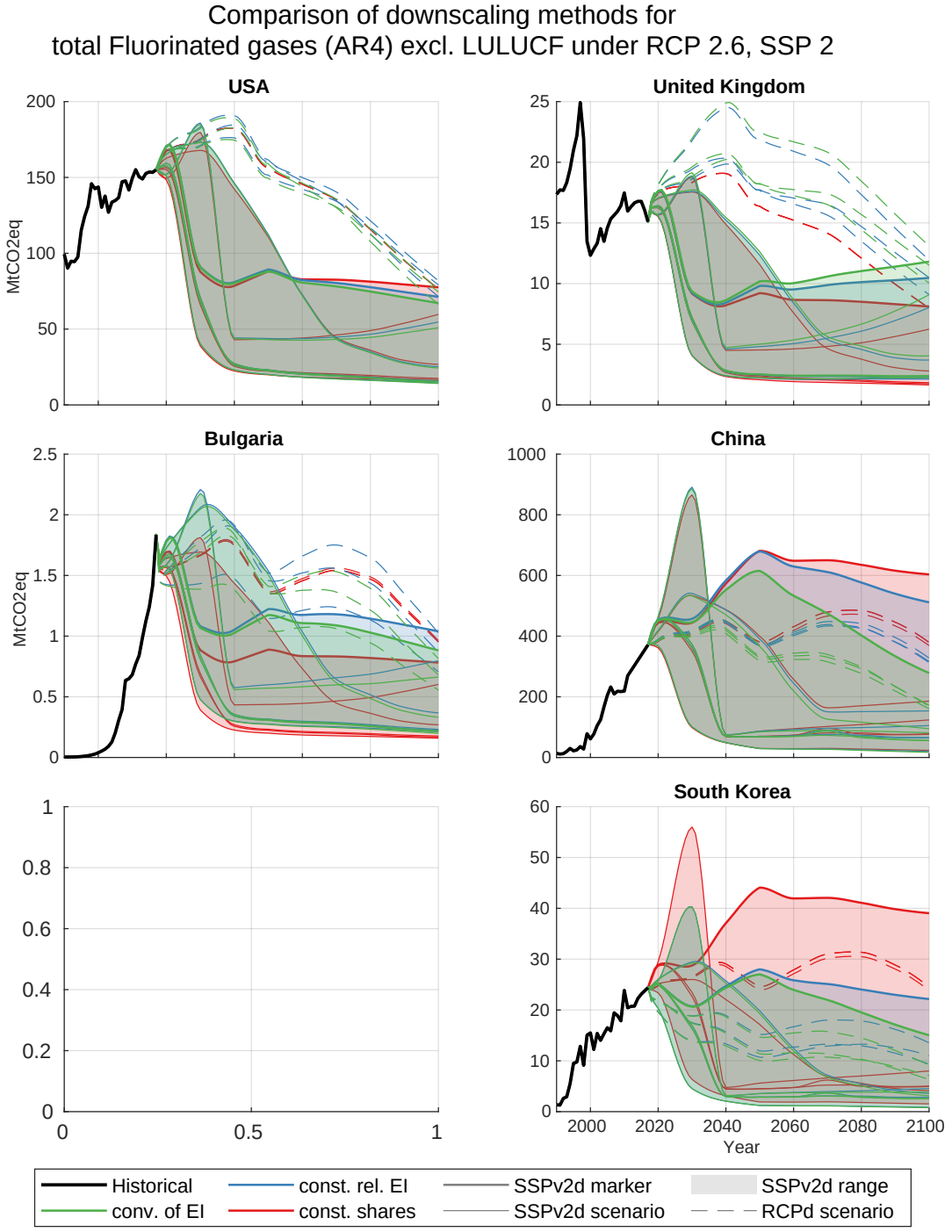

Figure S88. Influence of the downscaling method on country fluorinated gases (AR4) emissions for RCP 2.6, SSP 2. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

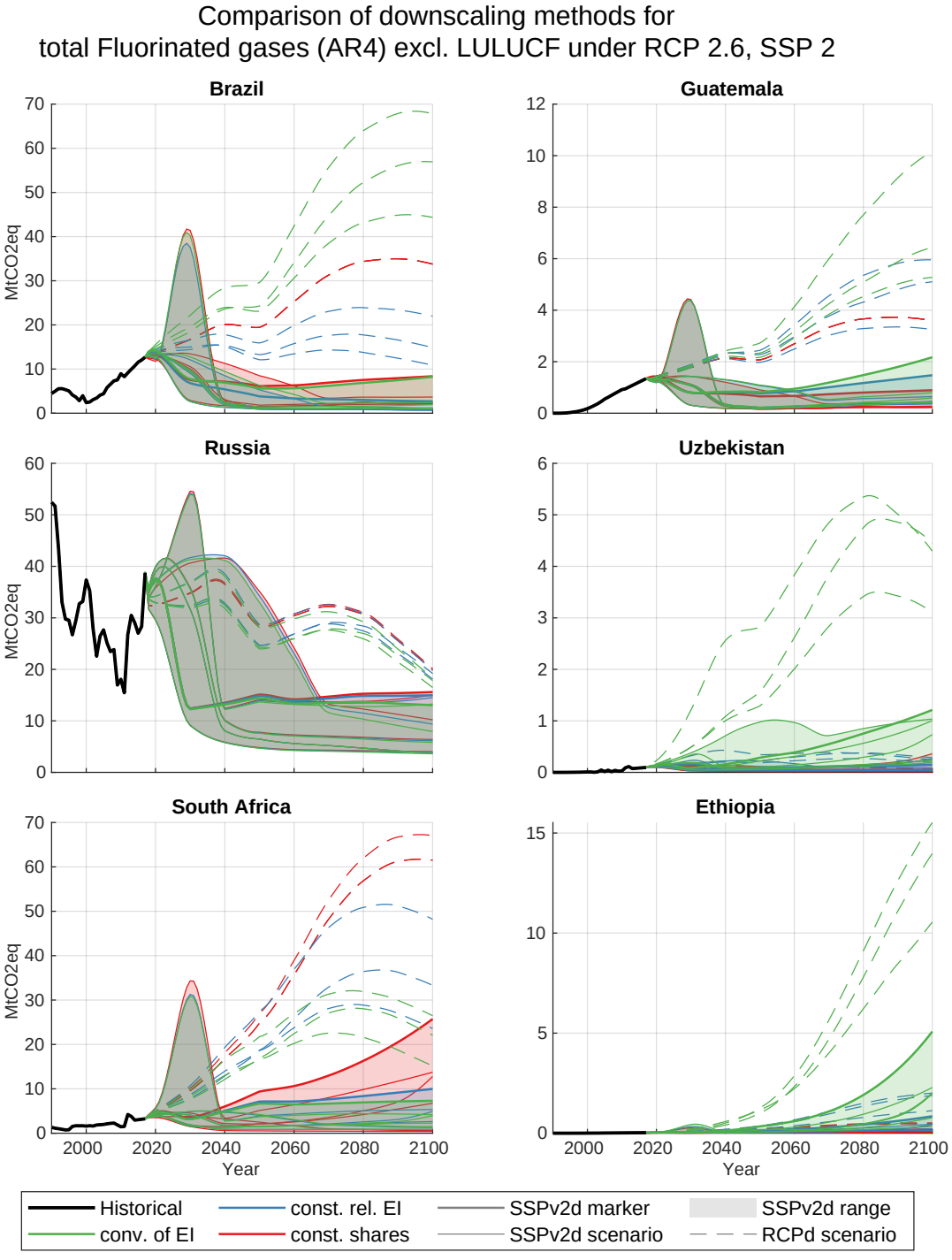

Figure S89. Influence of the downscaling method on country fluorinated gases (AR4) emissions for RCP 2.6, SSP 2. Ranges and median are calculated over all SSP IAM implementations. RCP SSP scenarios are shown as individual lines only (dashed).

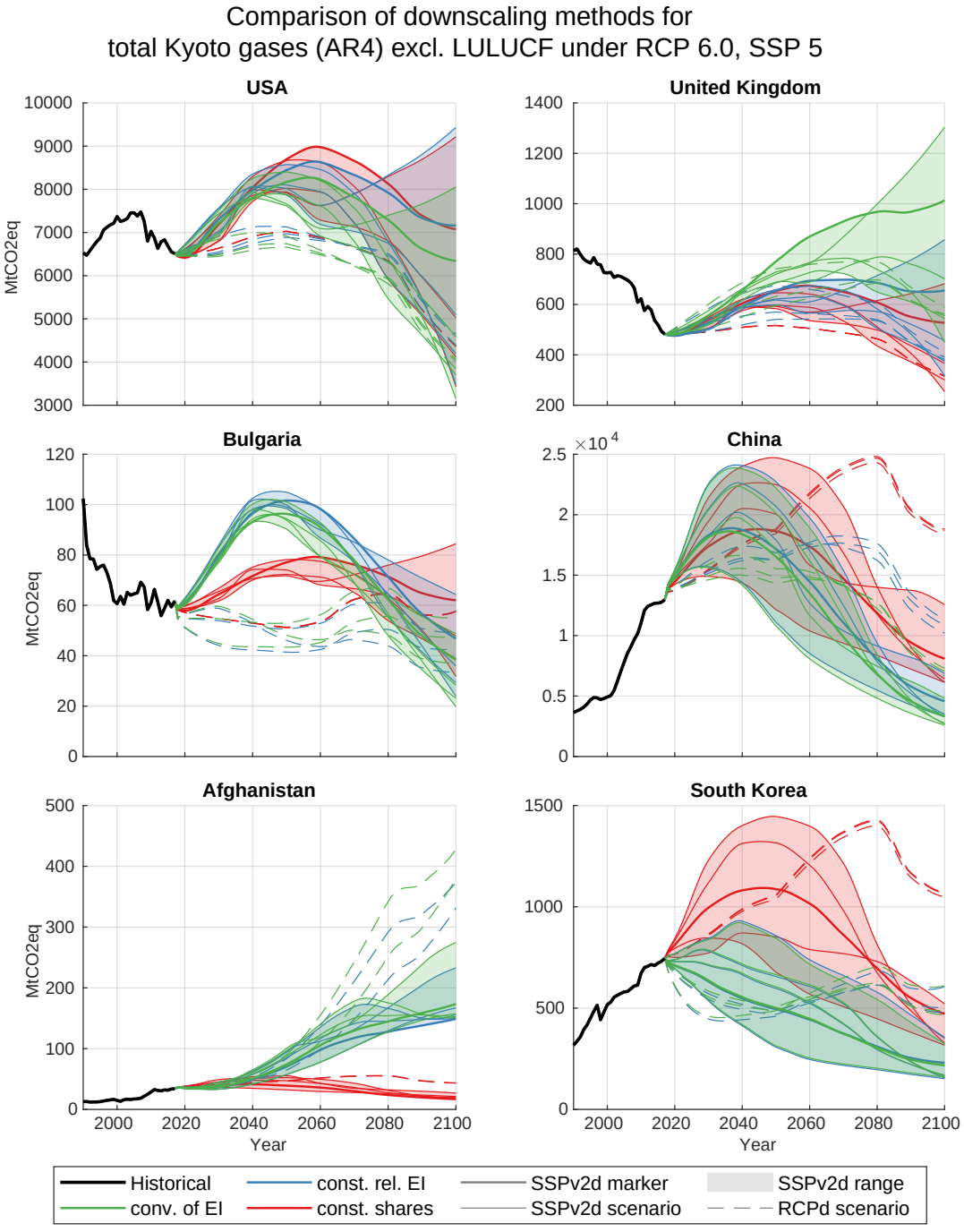

Figure S90. Influence of the downscaling method on country Kyoto GHG (AR4) emissions for RCP 6.0, SSP 5. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

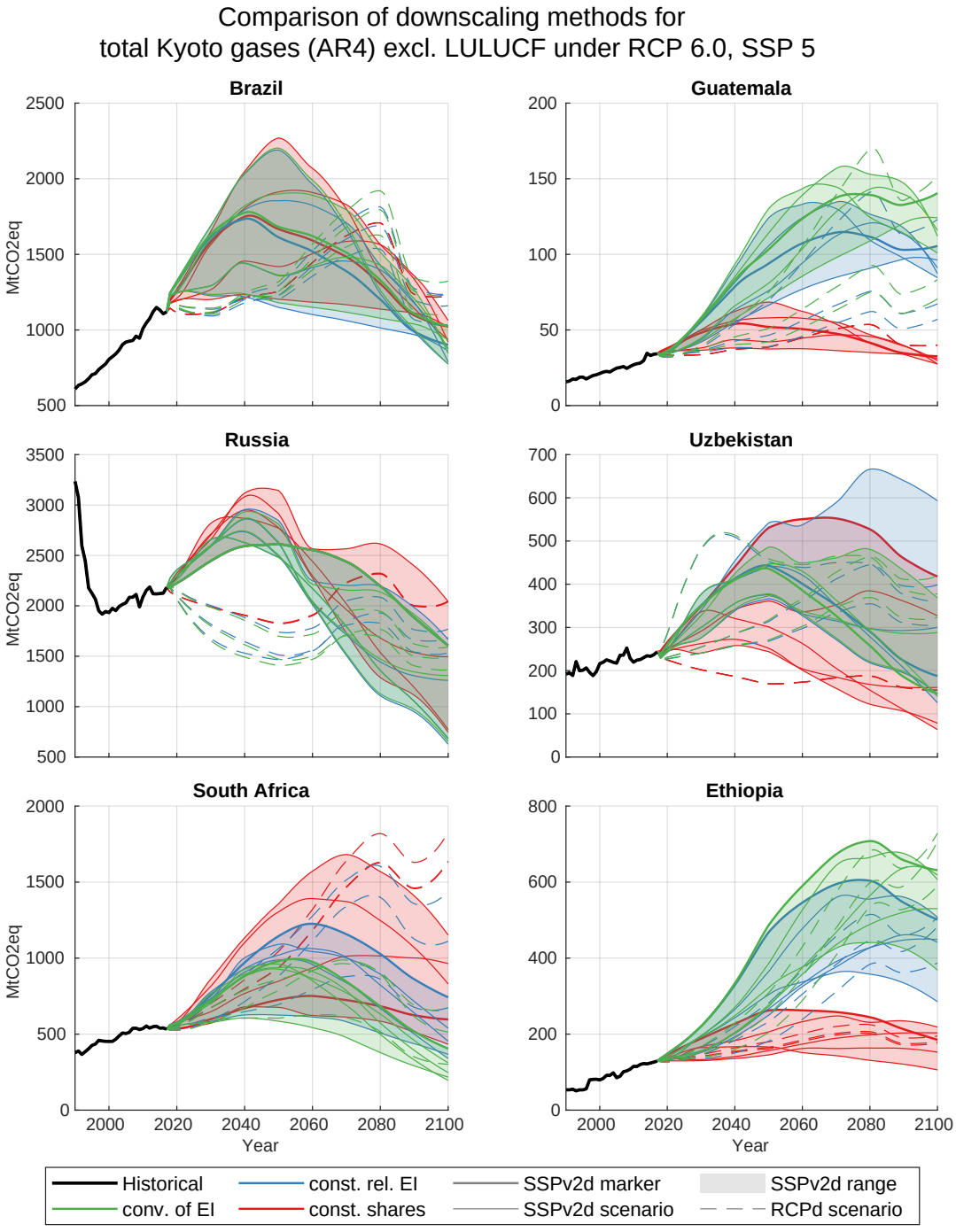

Figure S91. Influence of the downscaling method on country Kyoto GHG (AR4) emissions for RCP 6.0, SSP 5. Ranges and median are calculated over all SSP IAM implementations. RCP SSP scenarios are shown as individual lines only (dashed).

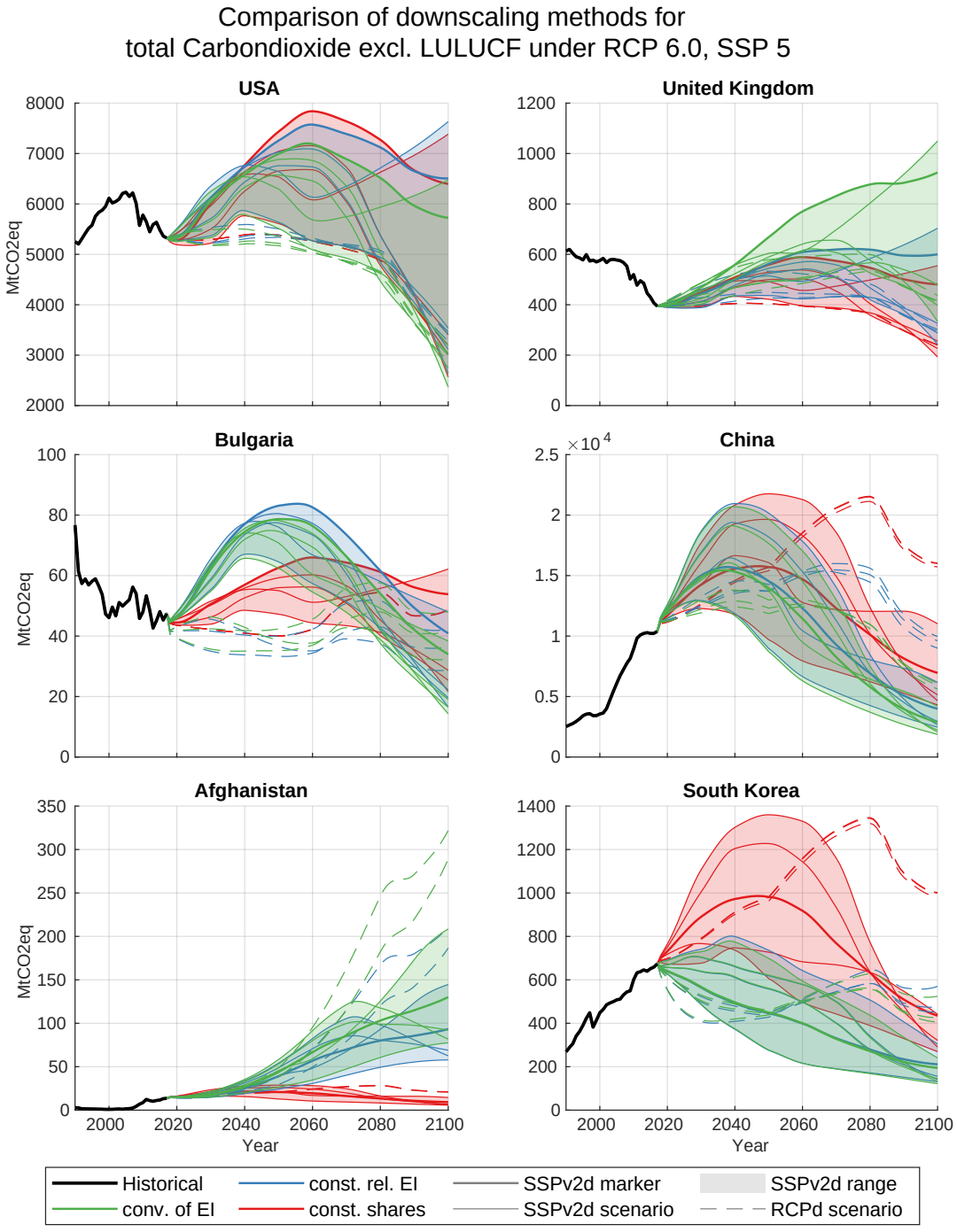

Figure S92. Influence of the downscaling method on country CO_2 emissions for RCP 6.0, SSP 5. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

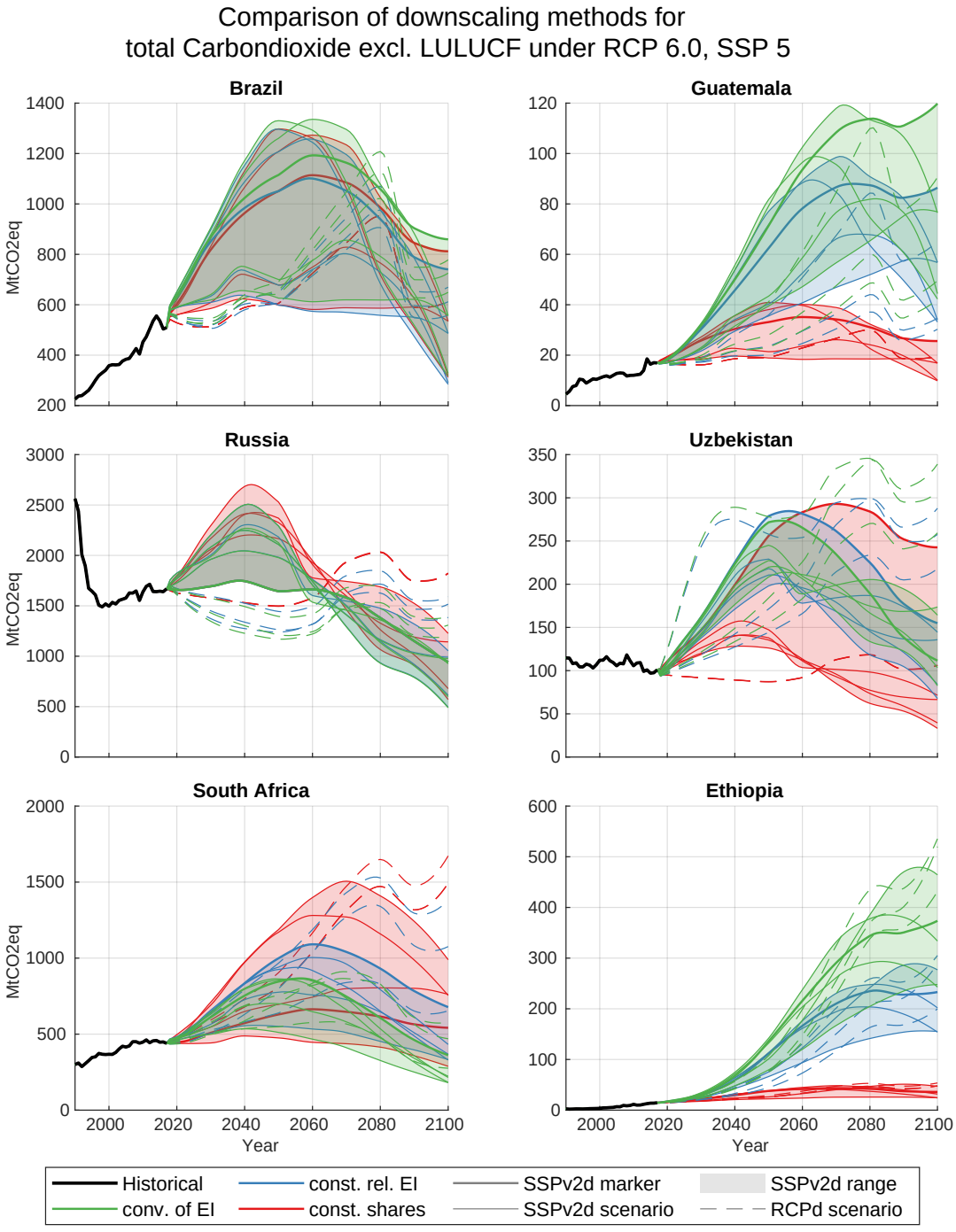

Figure S93. Influence of the downscaling method on country CO_2 emissions for RCP 6.0, SSP 5. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

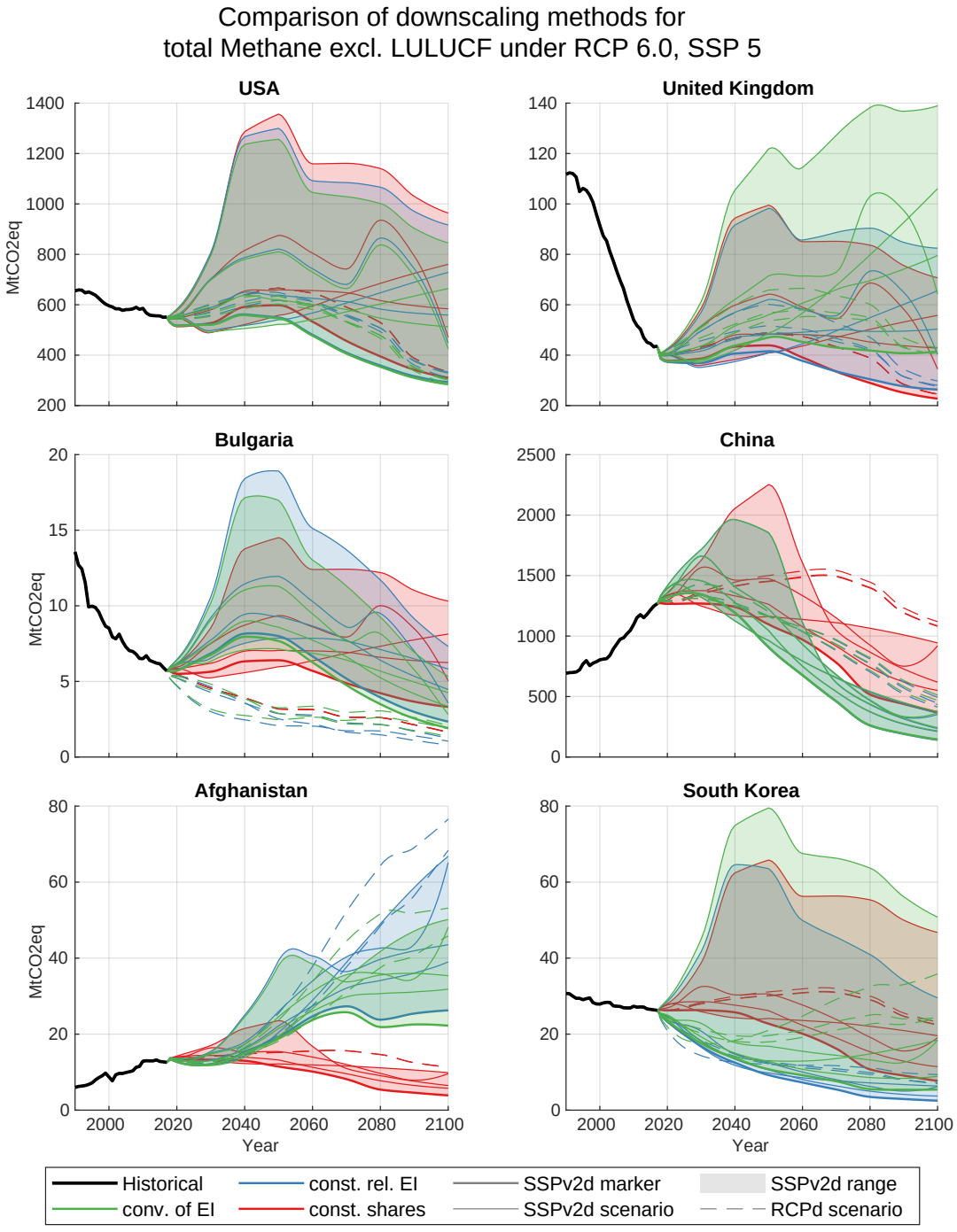

Figure S94. Influence of the downscaling method on country CH_4 emissions for RCP 6.0, SSP 5. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

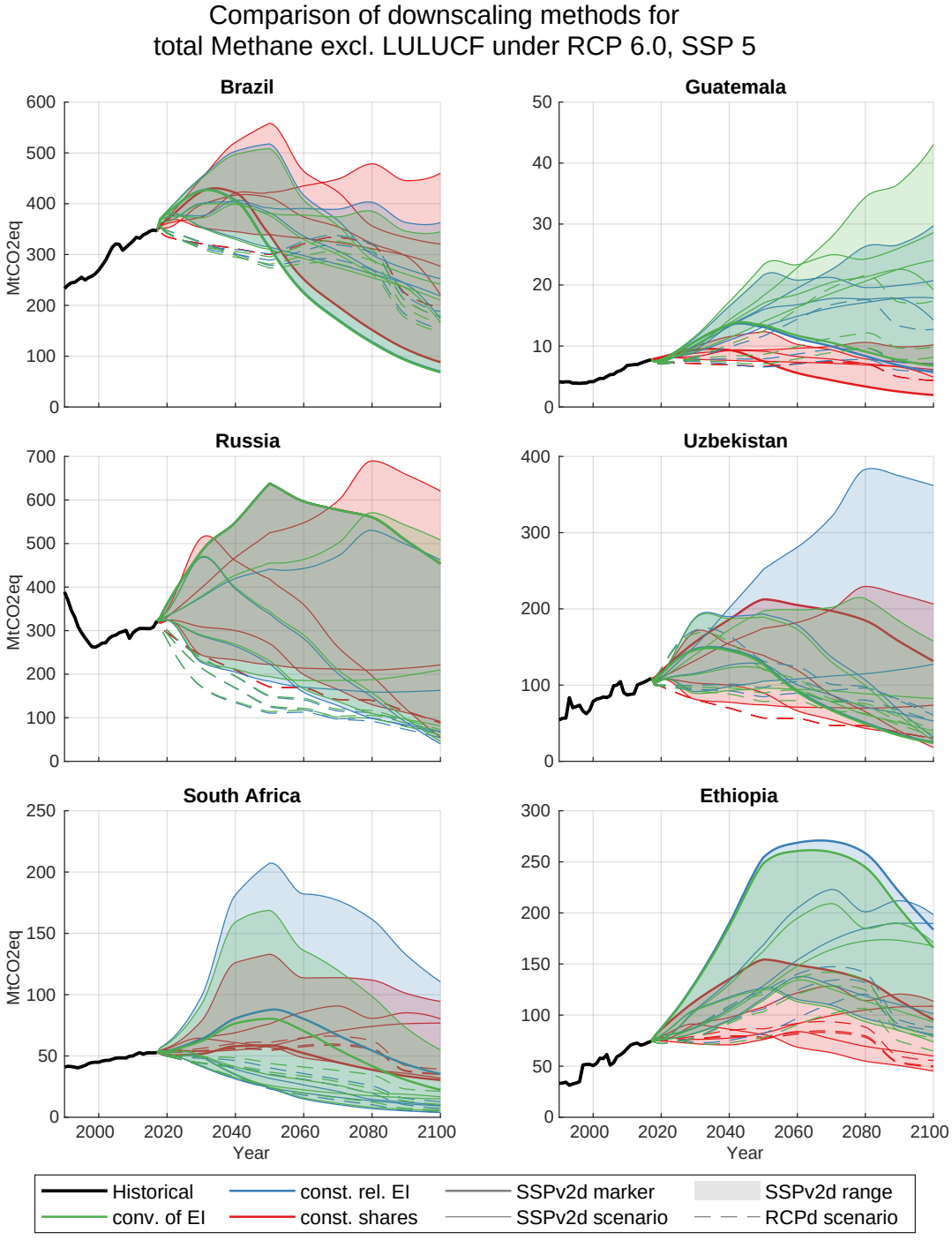

Figure S95. Influence of the downscaling method on country CH_4 emissions for RCP 6.0, SSP 5. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

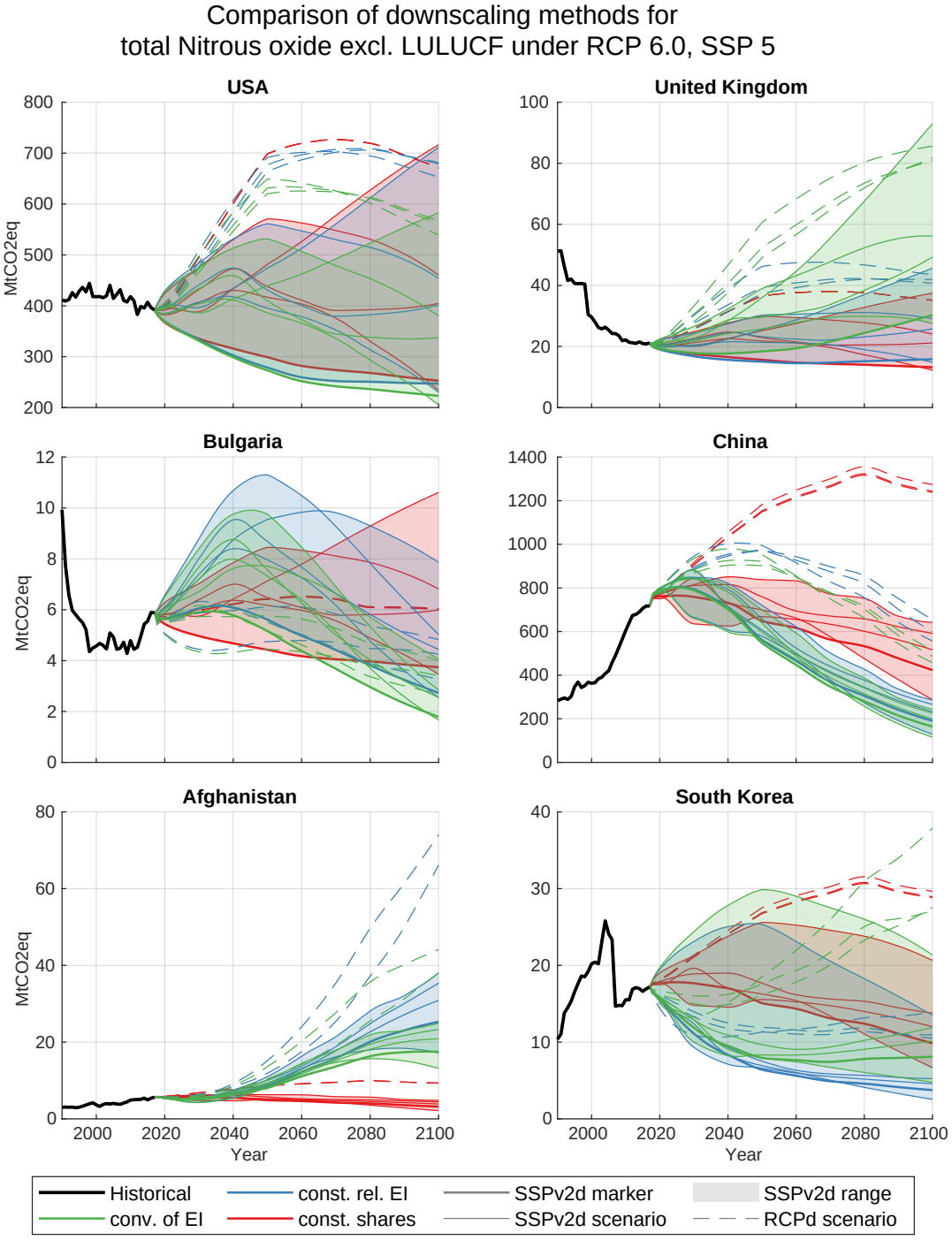

Figure S96. Influence of the downscaling method on country N_2O emissions for RCP 6.0, SSP 5. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

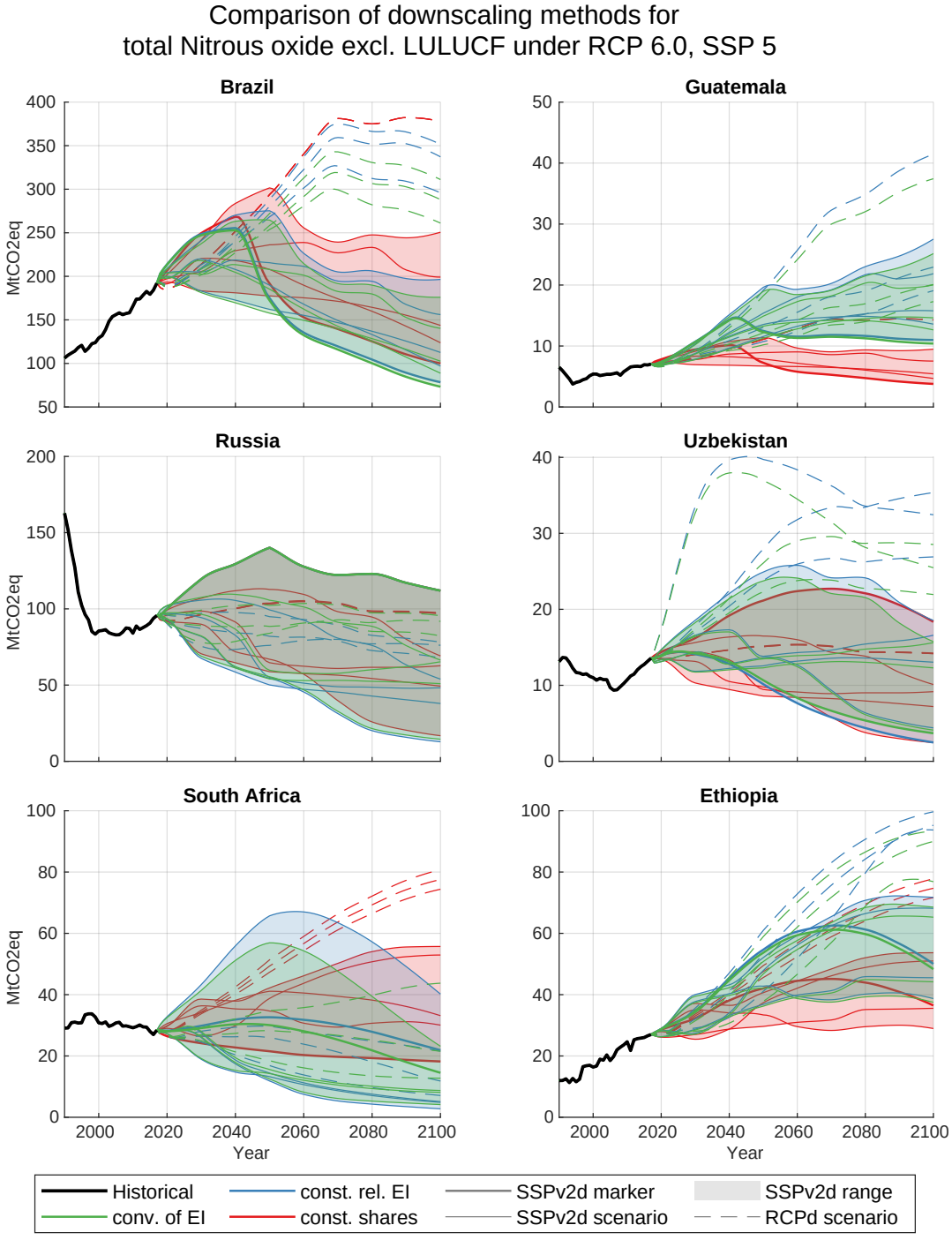

Figure S97. Influence of the downscaling method on country N_2O emissions for RCP 6.0, SSP 5. Ranges and median are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

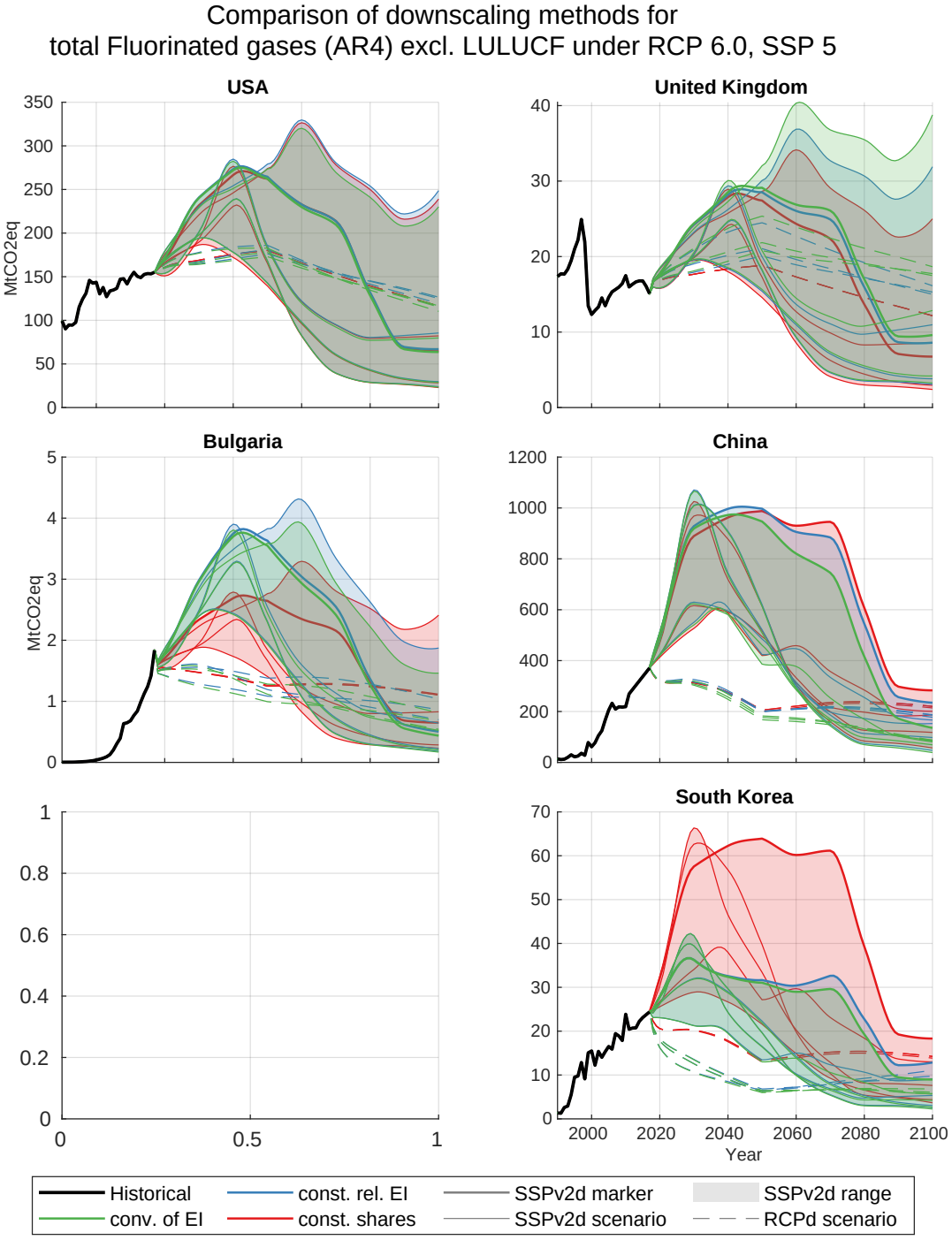

Figure S98. Influence of the downscaling method on country fluorinated gases (AR4) emissions for RCP 6.0, SSP 5. Ranges are calculated over all SSPv2d scenarios. RCPd scenarios are shown as individual lines only (dashed).

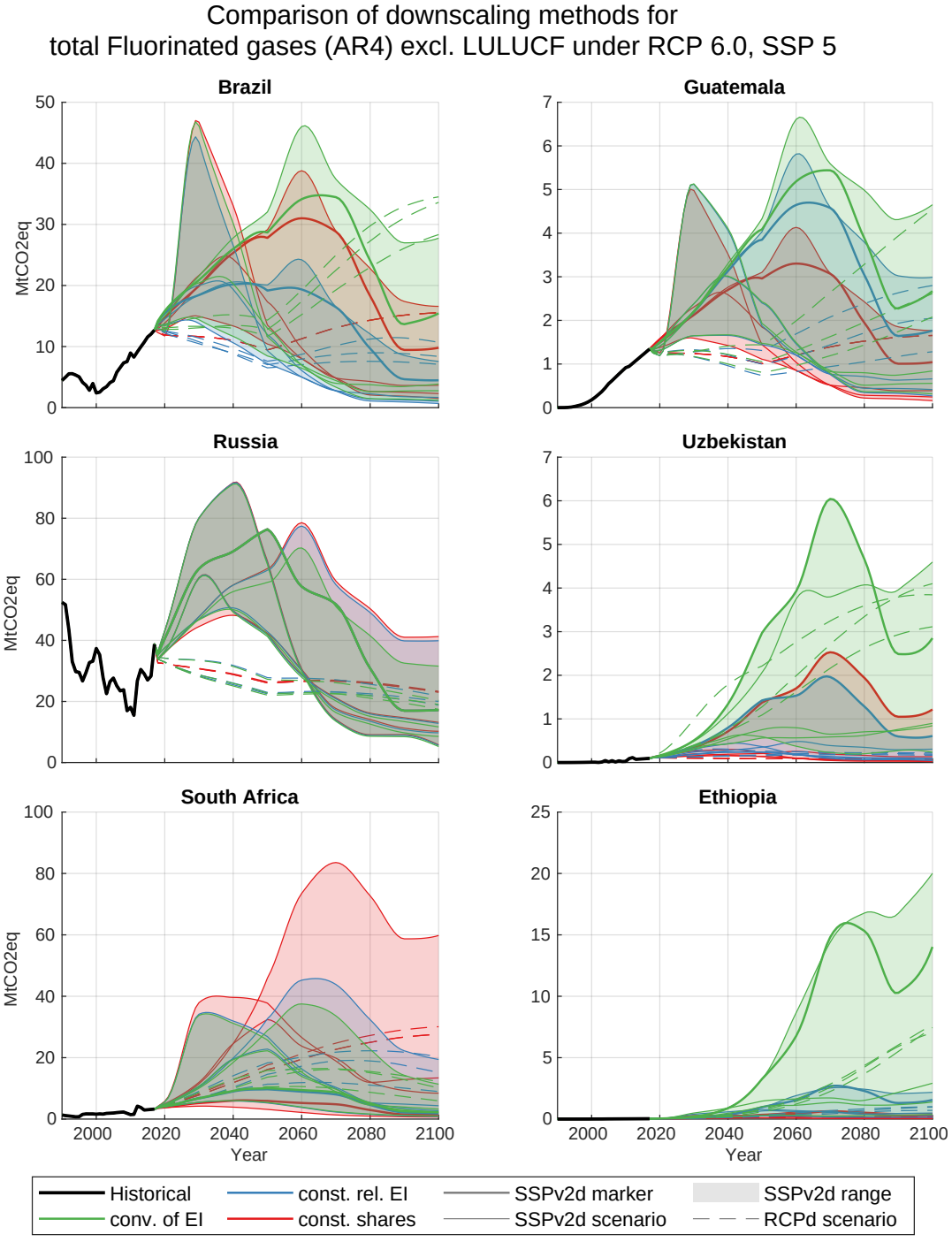

Figure S99. Influence of the downscaling method on country fluorinated gases (AR4) emissions for RCP 6.0, SSP 5. Ranges and median are calculated over all SSP IAM implementations. RCP SSP scenarios are shown as individual lines only (dashed).

S2.6 Bunkers influence for other example countries

In this section we provide figures illustration the influence of removal of bunkers emissions from the scenarios for the example countries not covered in the main manuscript. Results are shown in Figures S100 to S110. Results for other countries and individual gases can be provided.

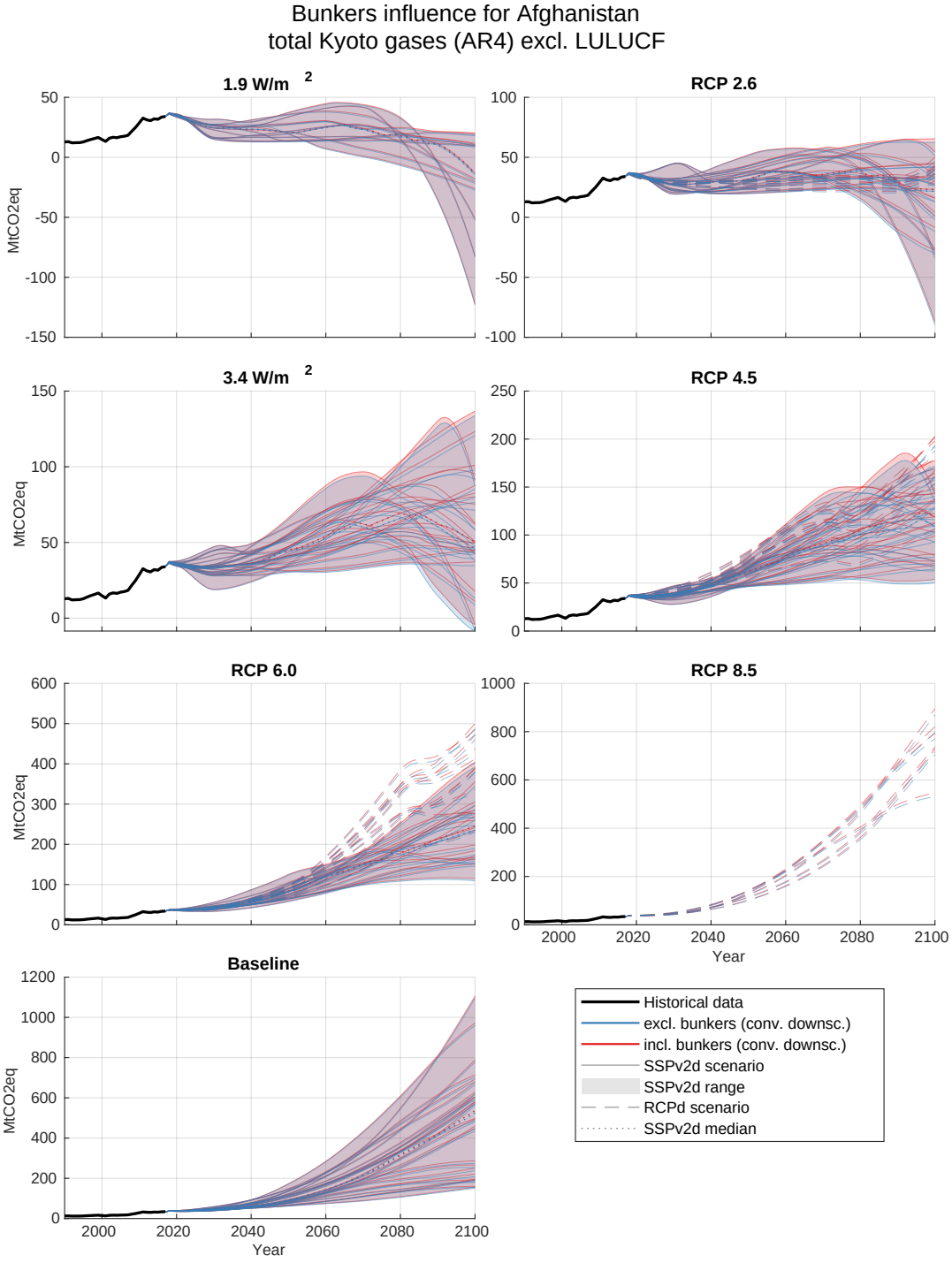

Figure S100. Influence of bunkers emissions on results for Afghanistan. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

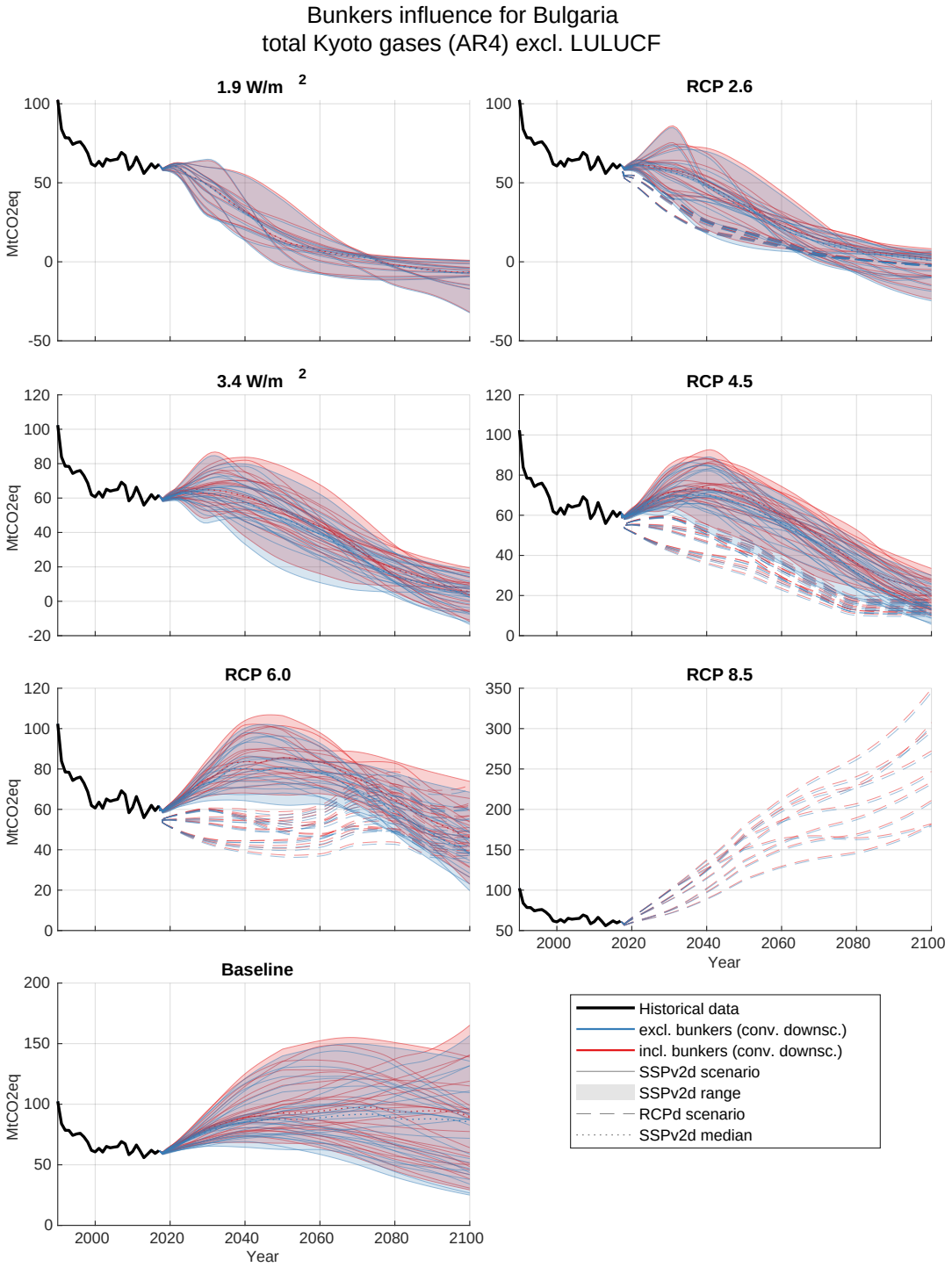

Figure S101. Influence of bunkers emissions on results for Bulgaria. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

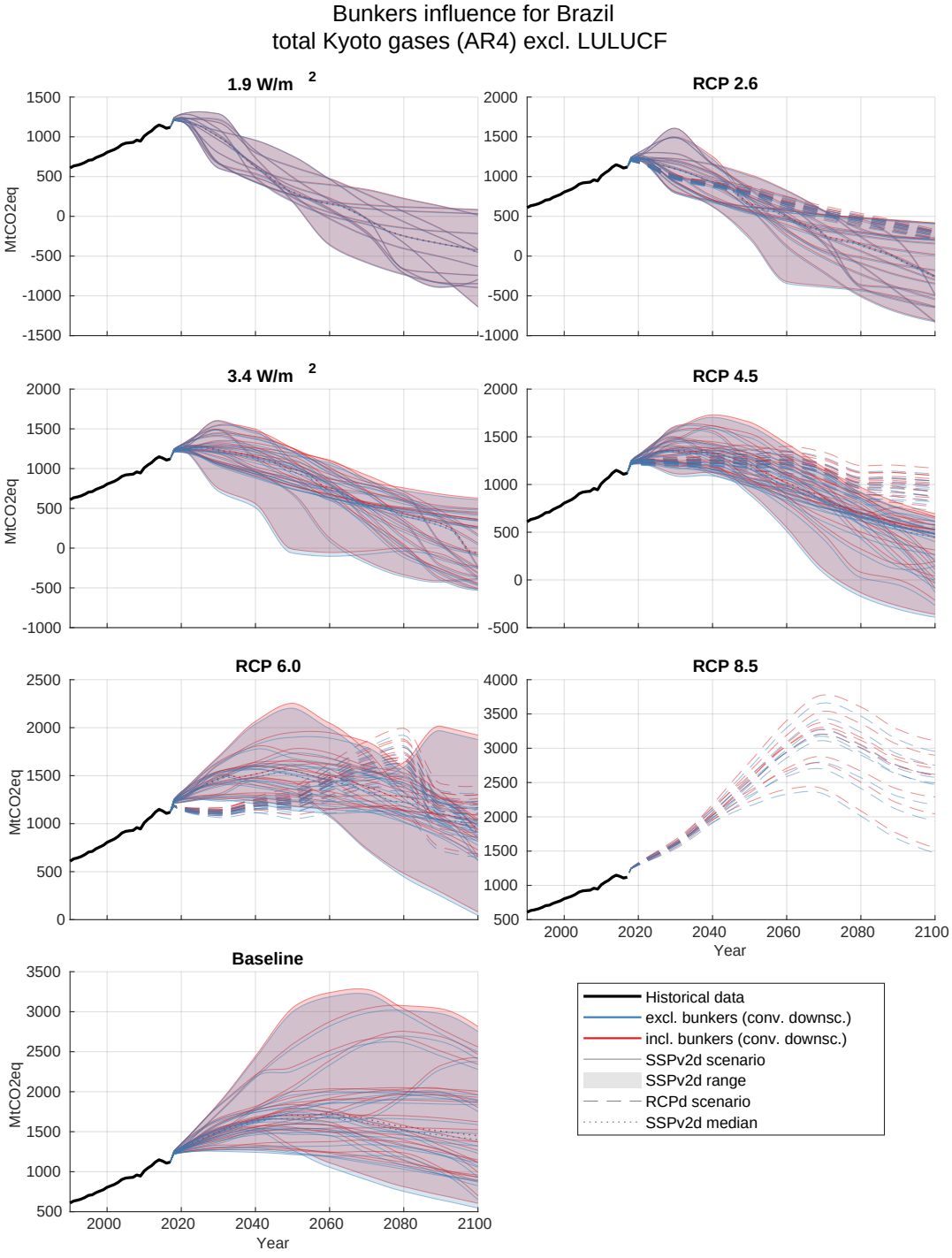

Figure S102. Influence of bunkers emissions on results for Brazil. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

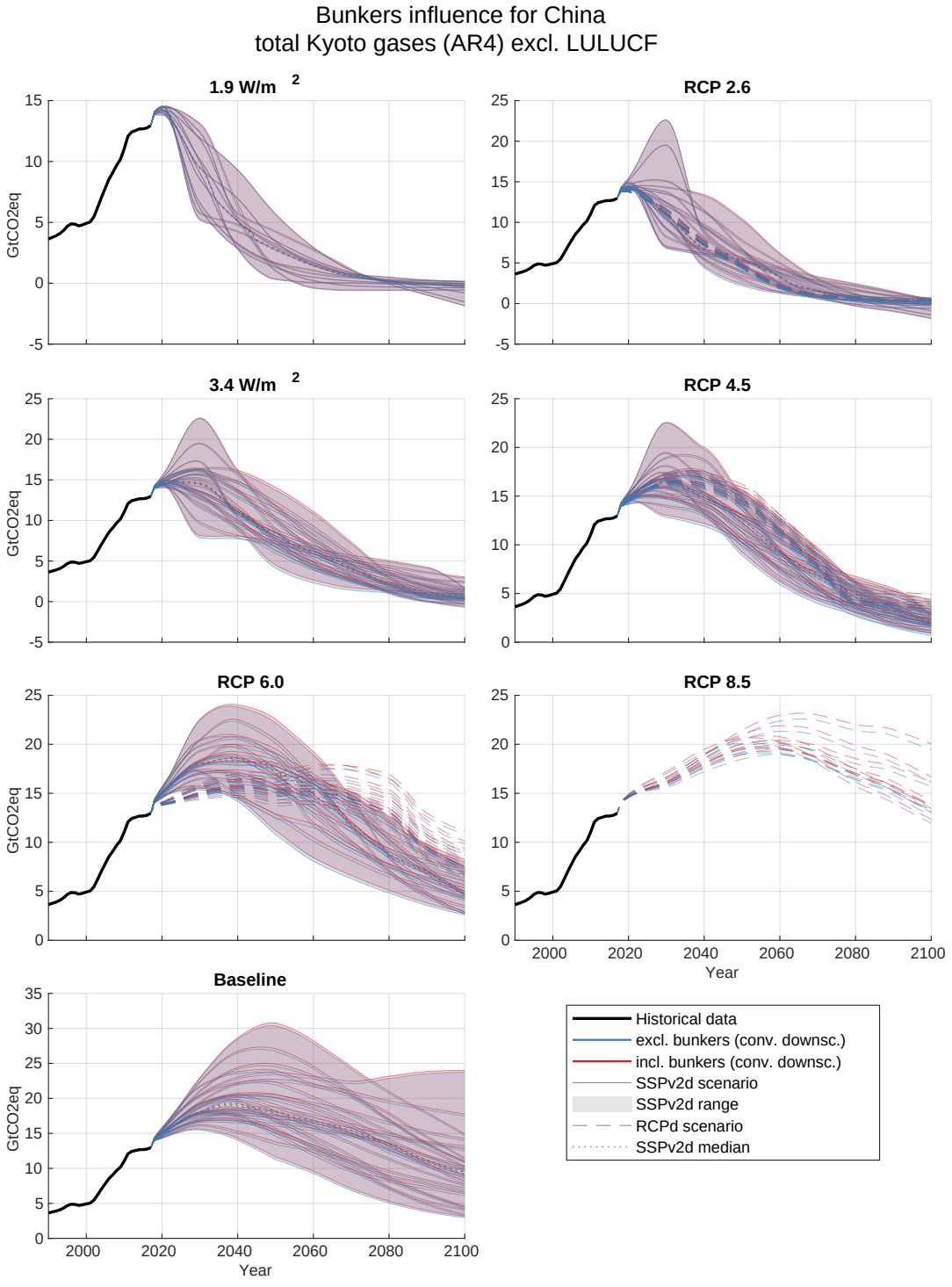

Figure S103. Influence of bunkers emissions on results for China. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

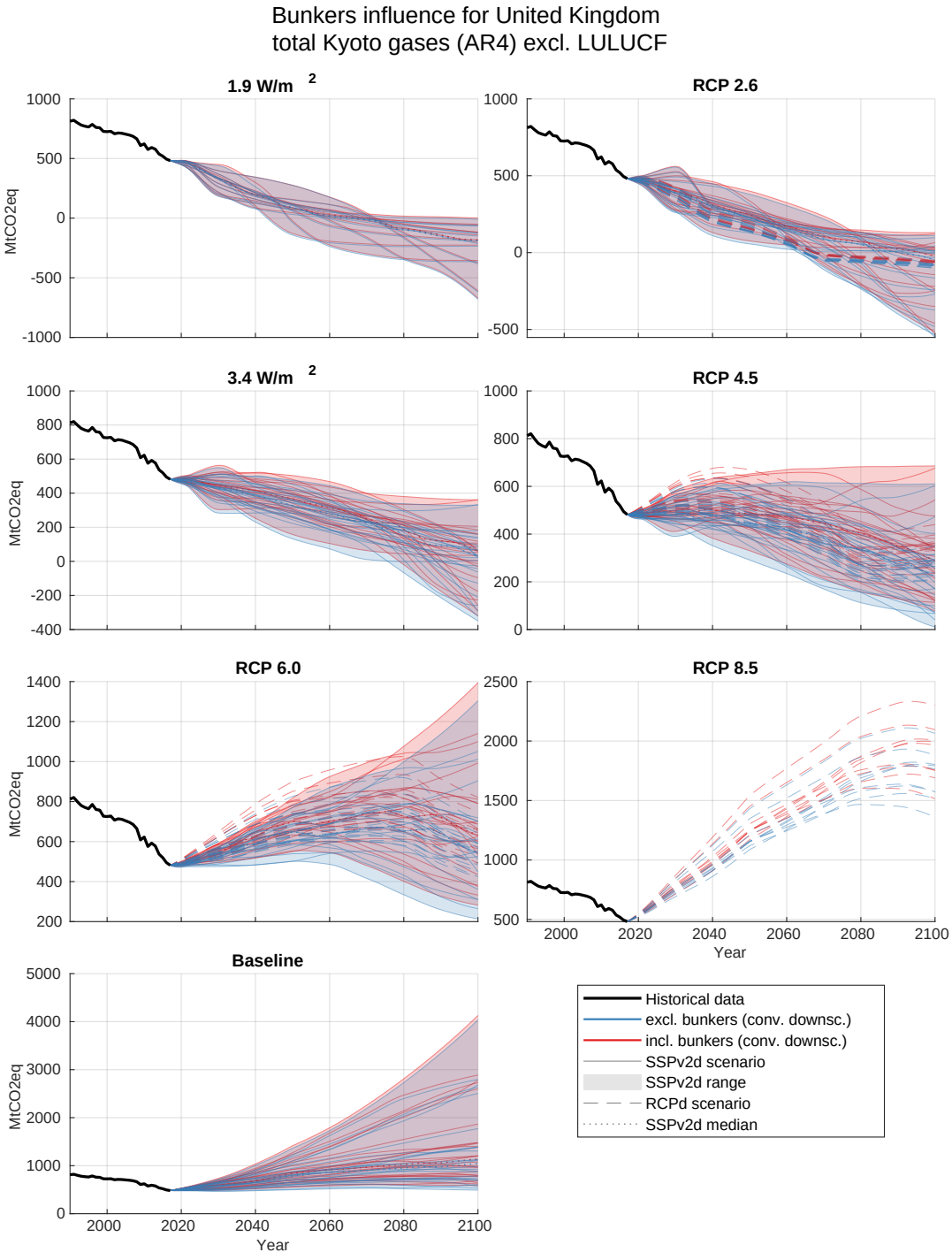

Figure S104. Influence of bunkers emissions on results for Great Britain. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

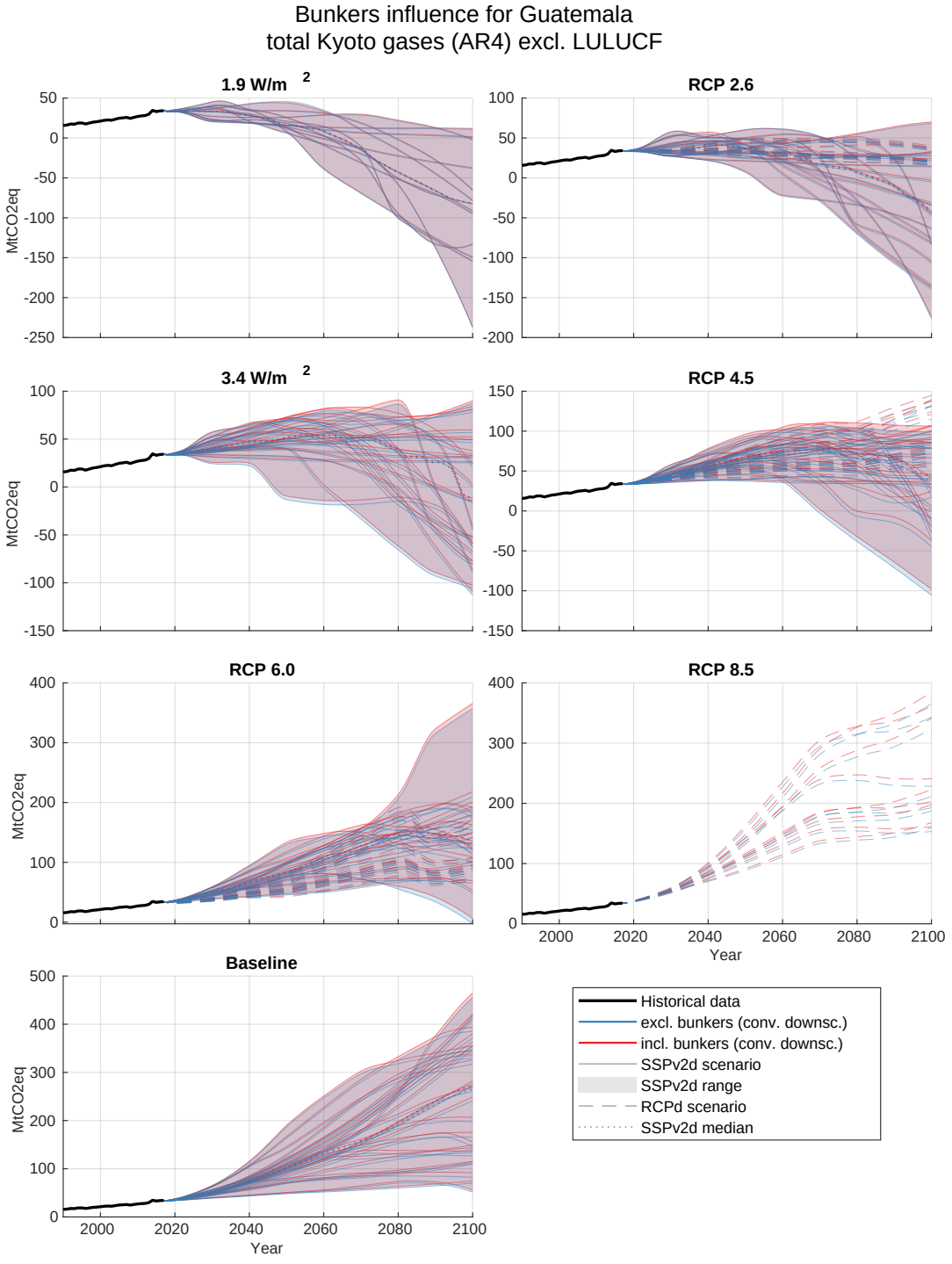

Figure S105. Influence of bunkers emissions on results for Guatemala. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

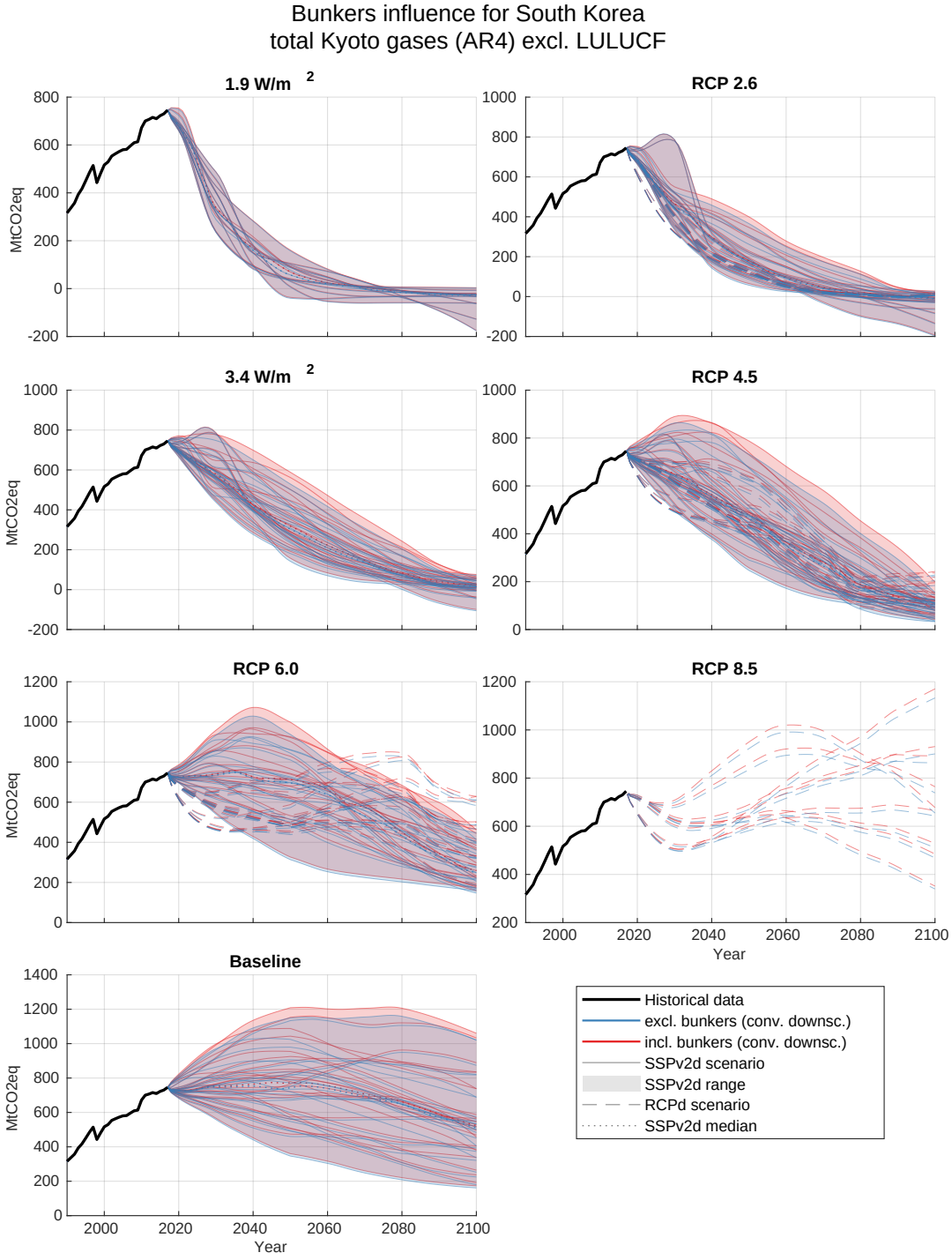

Figure S106. Influence of bunkers emissions on results for Korea. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

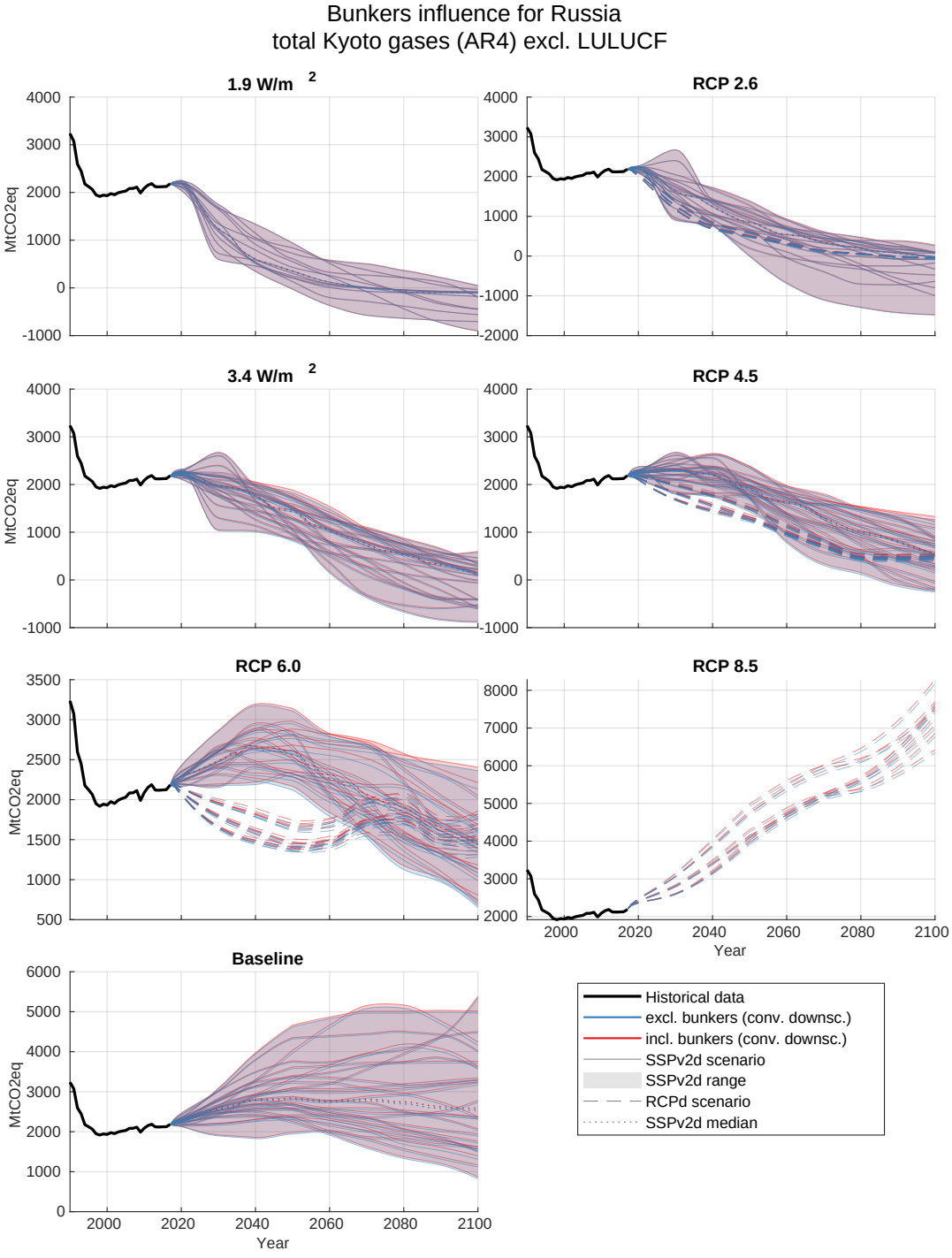

Figure S107. Influence of bunkers emissions on results for Russia. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

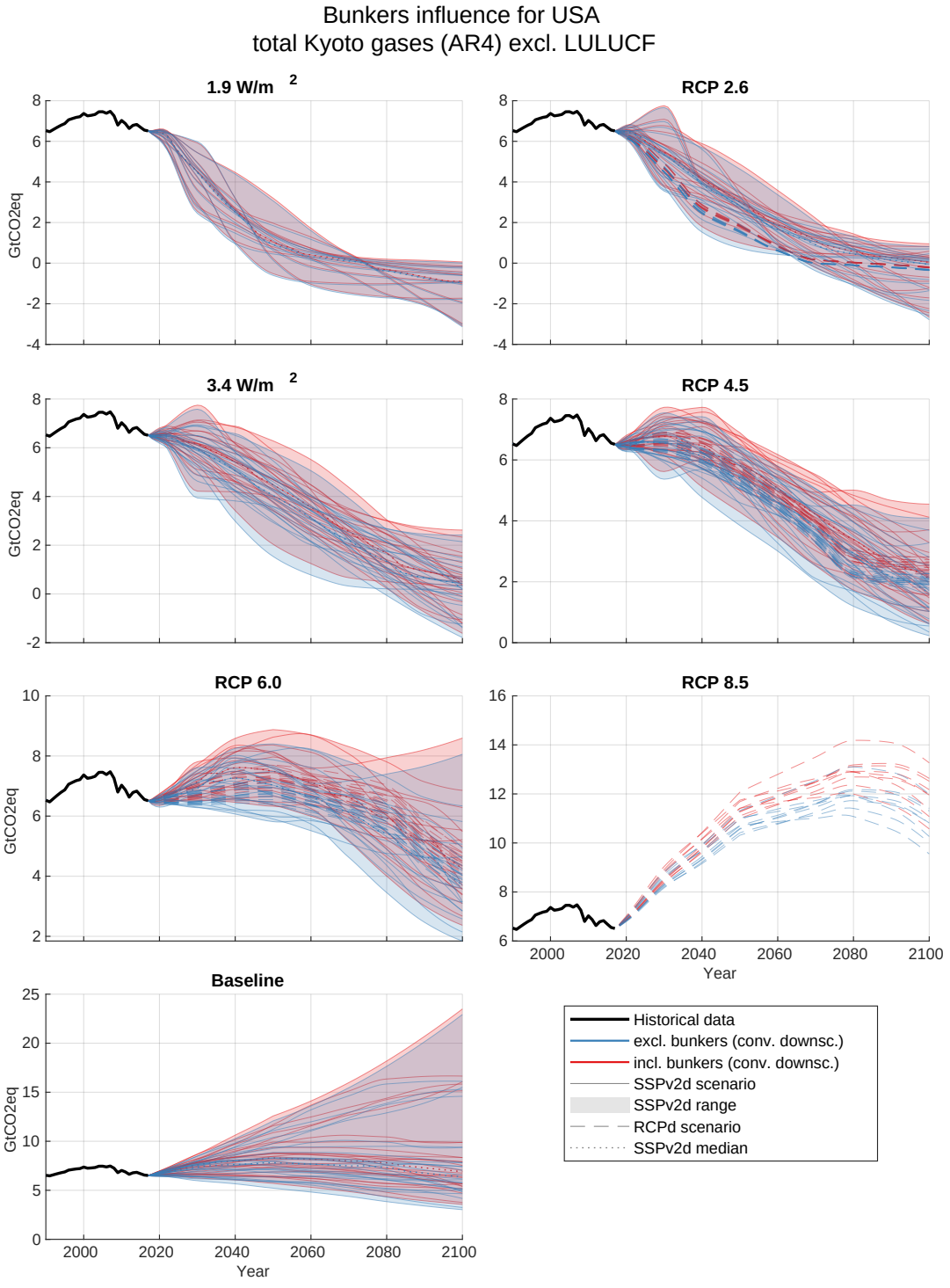

Figure S108. Influence of bunkers emissions on results for the USA. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

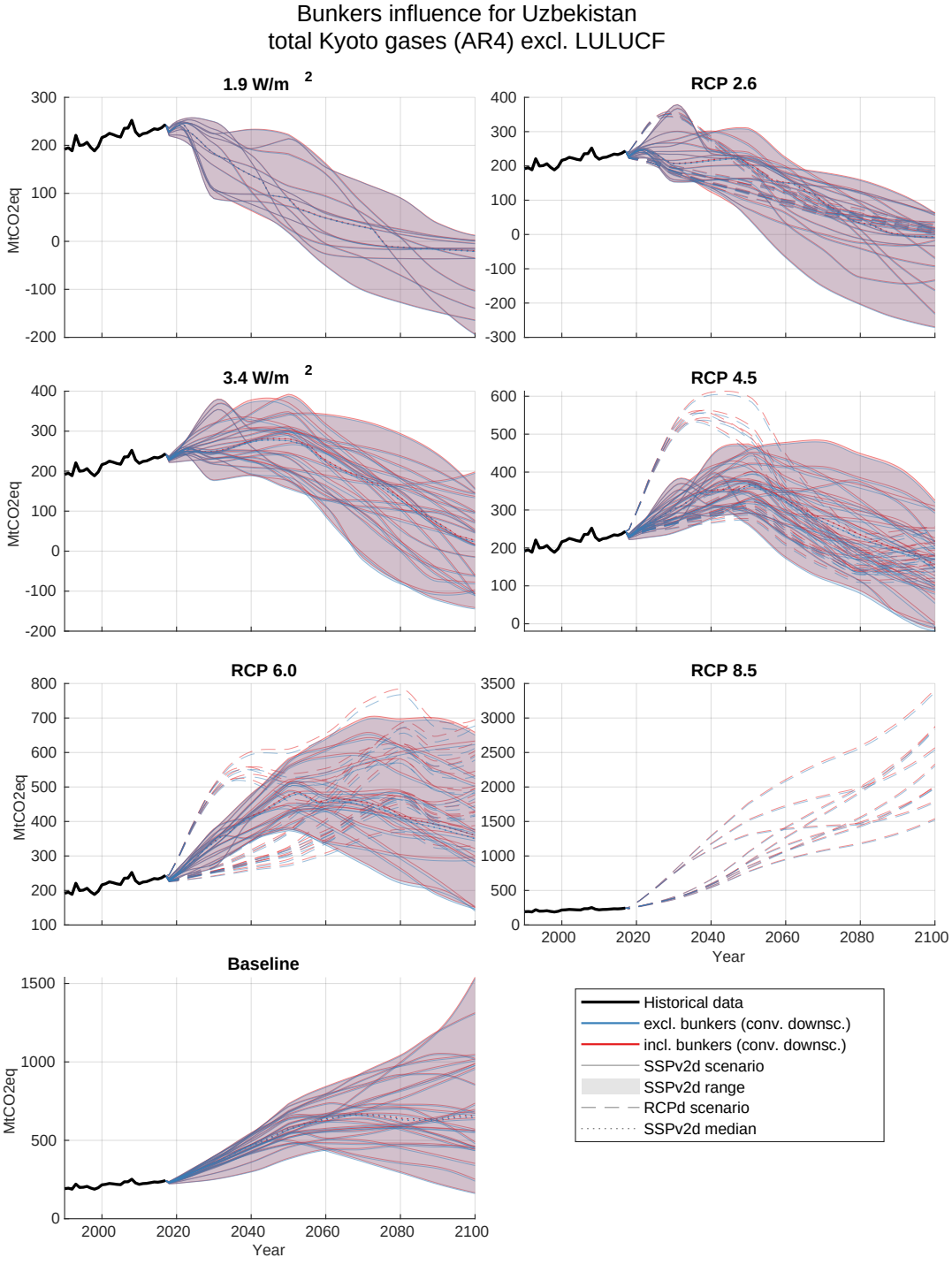

Figure S109. Influence of bunkers emissions on results for Uzbekistan. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

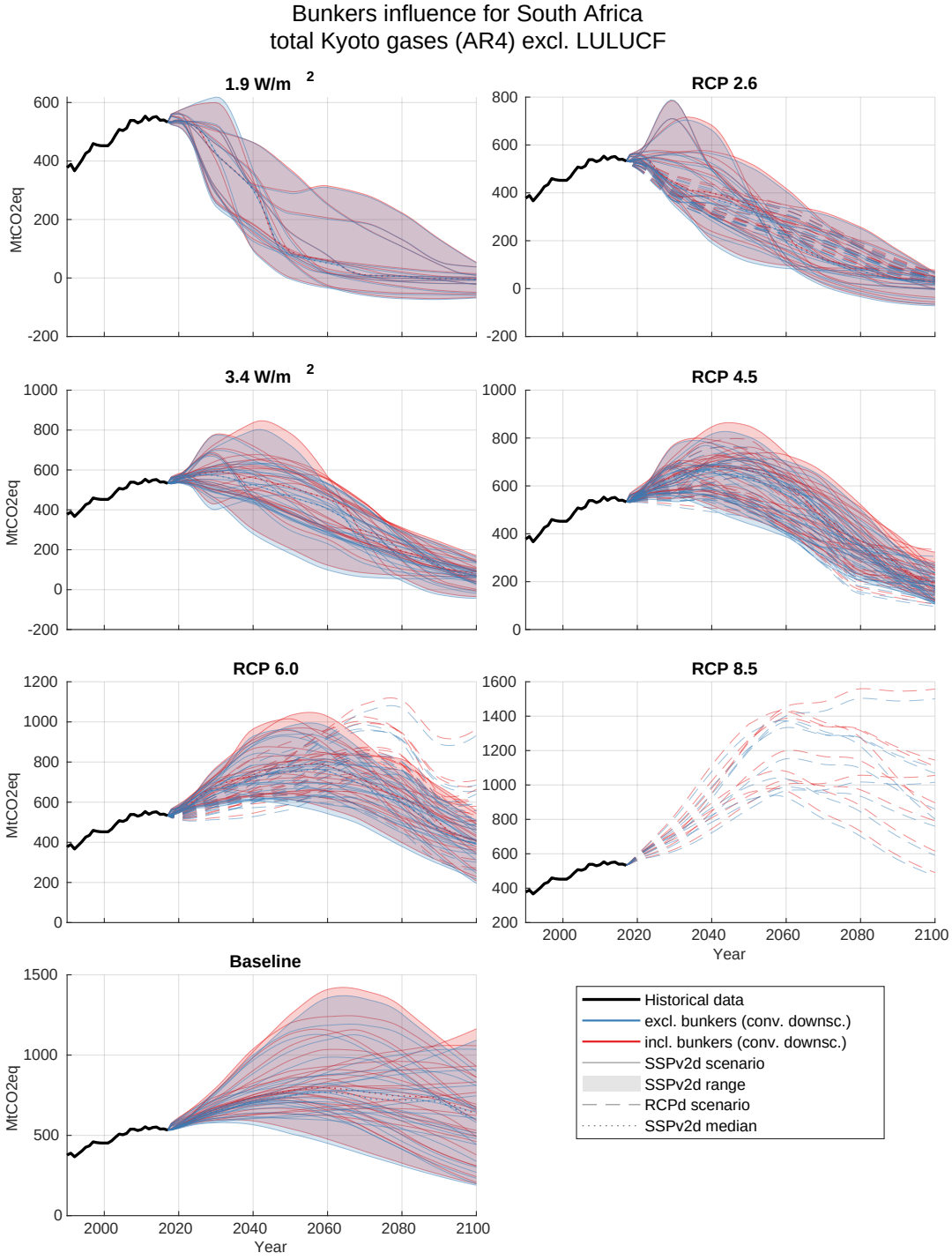

Figure S110. Influence of bunkers emissions on results for South Africa. Ranges and median are calculated over all SSPs and all SSPv2d scenarios for each RCP. RCPd scenarios are shown as individual lines only (dashed).

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