Transparent framework to assess the revision of national climate pledges

- Supplementary Information –

Kushal Tibrewal[1,*], Katsumasa Tanaka[1,2,*,✉], Philippe Ciais[1], Olivier Boucher[3]

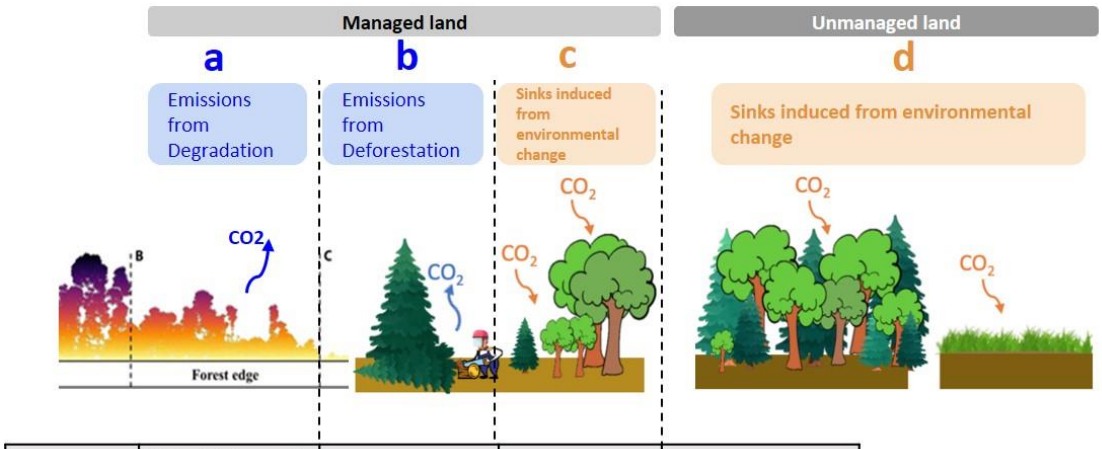
[1] Laboratoire des Sciences du Climat et de l'Environnement (LSCE), IPSL, CEA/CNRS/UVSQ, Université Paris-Saclay, Gif-sur-Yvette, France

[2] Earth System Division, National Institute for Environmental Studies (NIES), Tsukuba, Japan

[3] Institut Pierre-Simon Laplace (IPSL), Sorbonne Université / CNRS, Paris, France

* These authors contributed equally to this work.

✉ Corresponding author: katsumasa.tanaka@lsce.ipsl.fr



1750-2020	1/3rd of deforestation emissions	OSCAR	DGVMs	Our study
2020-2100	Fixed at avg. of 2005-2010	NDC or Fyson or Fixed at 2020 levels		
2000-2015	Not included	NGHGI		Meinshausen 2022
2015-2100	Not included	NDC or fixed at 2015 levels		

c + d are already included in land-uptake through the carbon-cycle module within the simple climate models (ACC2 / MAGICC)
So "c" part has to be removed when inputting emissions into the model for temperature calculations (dotted lines below)

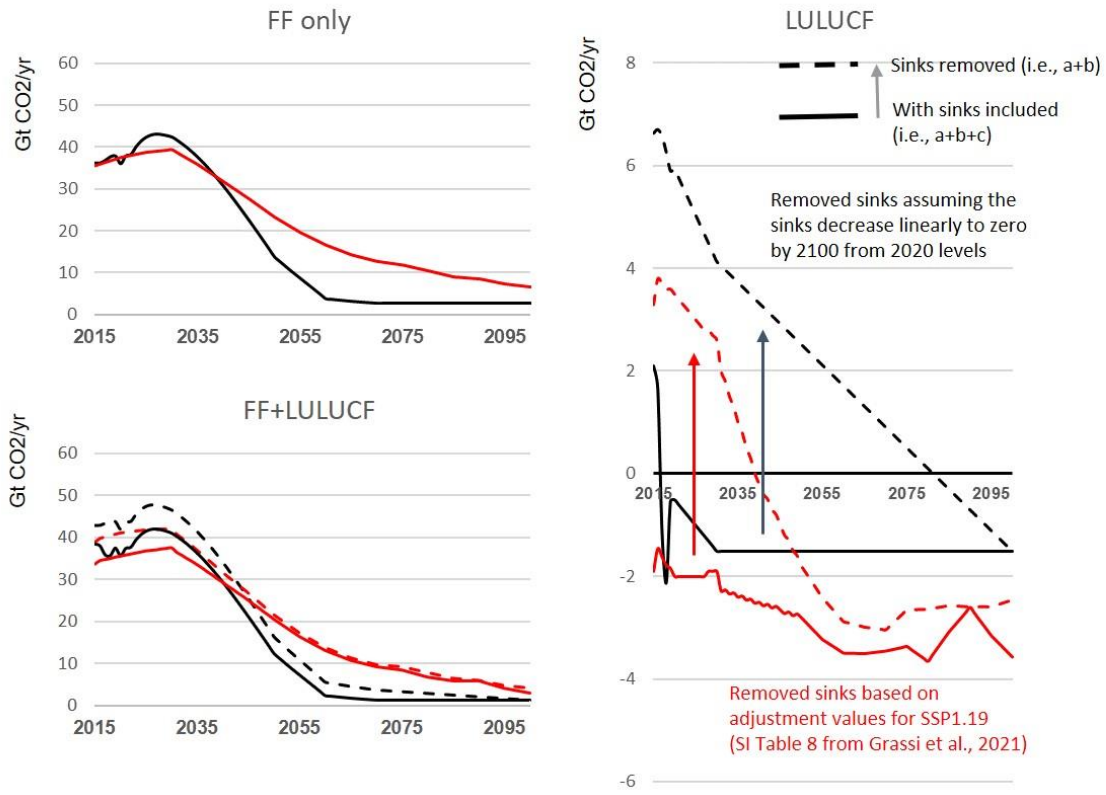


Fig. S1 | Graphical representation of accounting the LULUCF sector. LULUCF fluxes reported in NDCs or national inventories submitted to UNFCCC contain sinks over managed land. Sinks over managed land must be removed from the emission input to reduced-complexity climate model ACC2, IRF, and TCRE), as they are already included as part of their processes or parameterizations. This graphical representation explains the various components involved in the LULUCF fluxes and how they are accounted for in this

study (black line) and Meinshausen et al., 2022[8] (red line). "FF" means CO_2 emissions excluding the LULUCF sector, i.e., energy and industrial emissions. The adjustment to LULUCF flux is shown in the right panel. Total CO_2 emissions after and before adjusting for sinks are shown on the bottom left panel. The dotted lines in the bottom left panel are input to the respective temperature calculation. For the LULUCF sector, emissions (avg 2015-2020) from net deforestation corresponds to 4 $GtCO_2$/yr and from forest degradation is 2.4 $GtCO_2$/yr (based on 2.1 Gt CO_2/yr during 2005-2010 from ref.[78]).

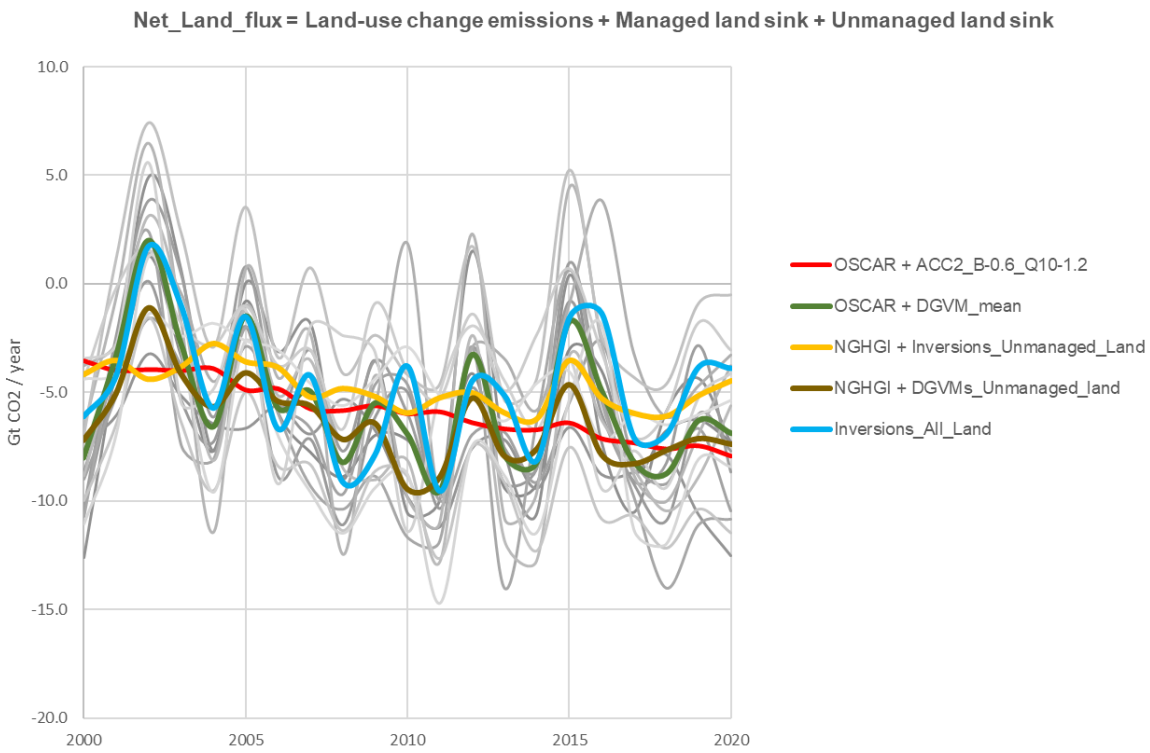


Fig. S2 | Net-land flux from the LULUCF sector using different combinations for data sources. "Net-land flux" shown here, includes emissions from deforestation and sinks induced from environmental changes over both managed and unmanaged land. "OSCAR" represents emissions from deforestation as reported by the OSCAR bookkeeping model to the Global Carbon Budget 2022. "DGVM_mean" represents the average of total sinks (managed + unmanaged land) from the 16 Dynamic Global Vegetation Models part of the Global Carbon Budget 2022. Shaded grey line represents the sum of OSCAR deforestation emissions and sink from each DGVM. "NGHGI" represents the net-flux over managed land as reported in the national greenhouse gas inventories of countries, submitted to UNFCCC as part of their NIR/BUR/National communications. Inversions represent land fluxes as computed from atmospheric inversions for Global Carbon Budget 2022.

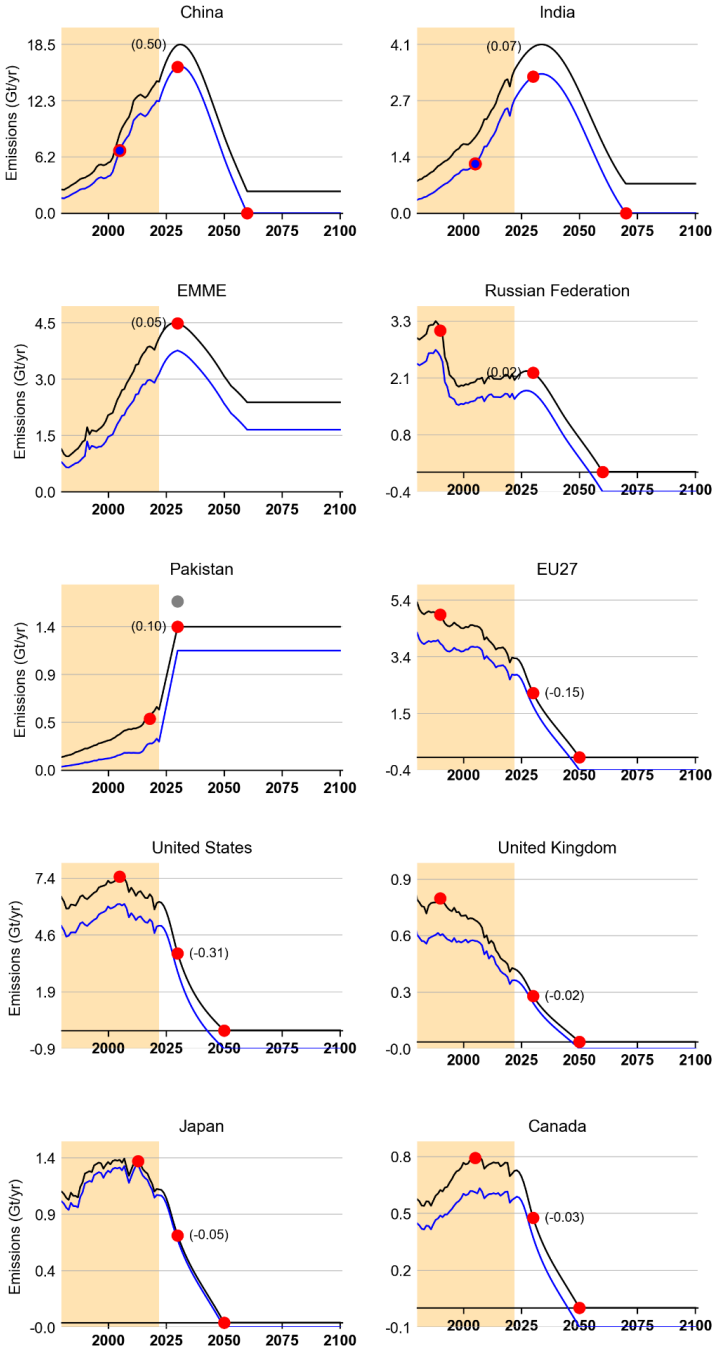


Fig. S3a | Country-level emissions trajectories for major emitters from Fig. 1. Emissions trajectories (excluding LULUCF) from 1980-2100 are shown for selected major emitters for CO_2eq (black line) and CO_2 (blue line). Dots represent emissions in the base year, BAU 2030, 2030 after reduction, and net-zero (if any), respectively. Generally red dots represent values taken directly from NDC or after applying reductions based on NDC. If the base year is not present in NDC, it is taken from PRIMAP and shown with red-edge black circle (CO_2eq) or red-edge blue circle (CO_2). BAU 2030 taken from NDC is shown in grey. If BAU 2030 is adjusted based on emissions in the base year, it is shown as grey-edge circle. The value in the bracket denotes the trend in emissions (Gt/yr^2) from 2022 to 2030.

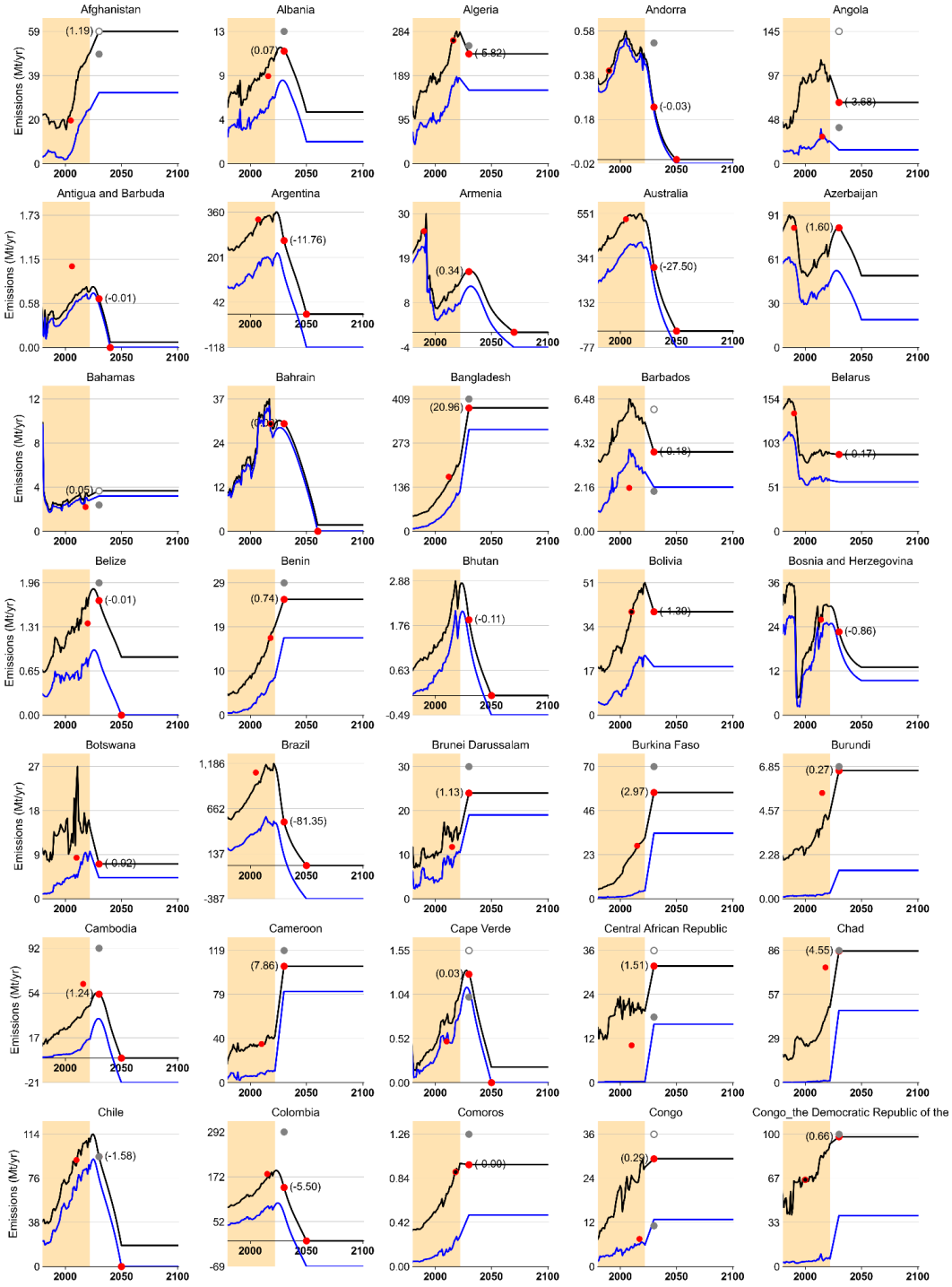


Fig. S3b | Country-level emissions trajectories. Same as Fig. S3a but for other countries by alphabetical order.

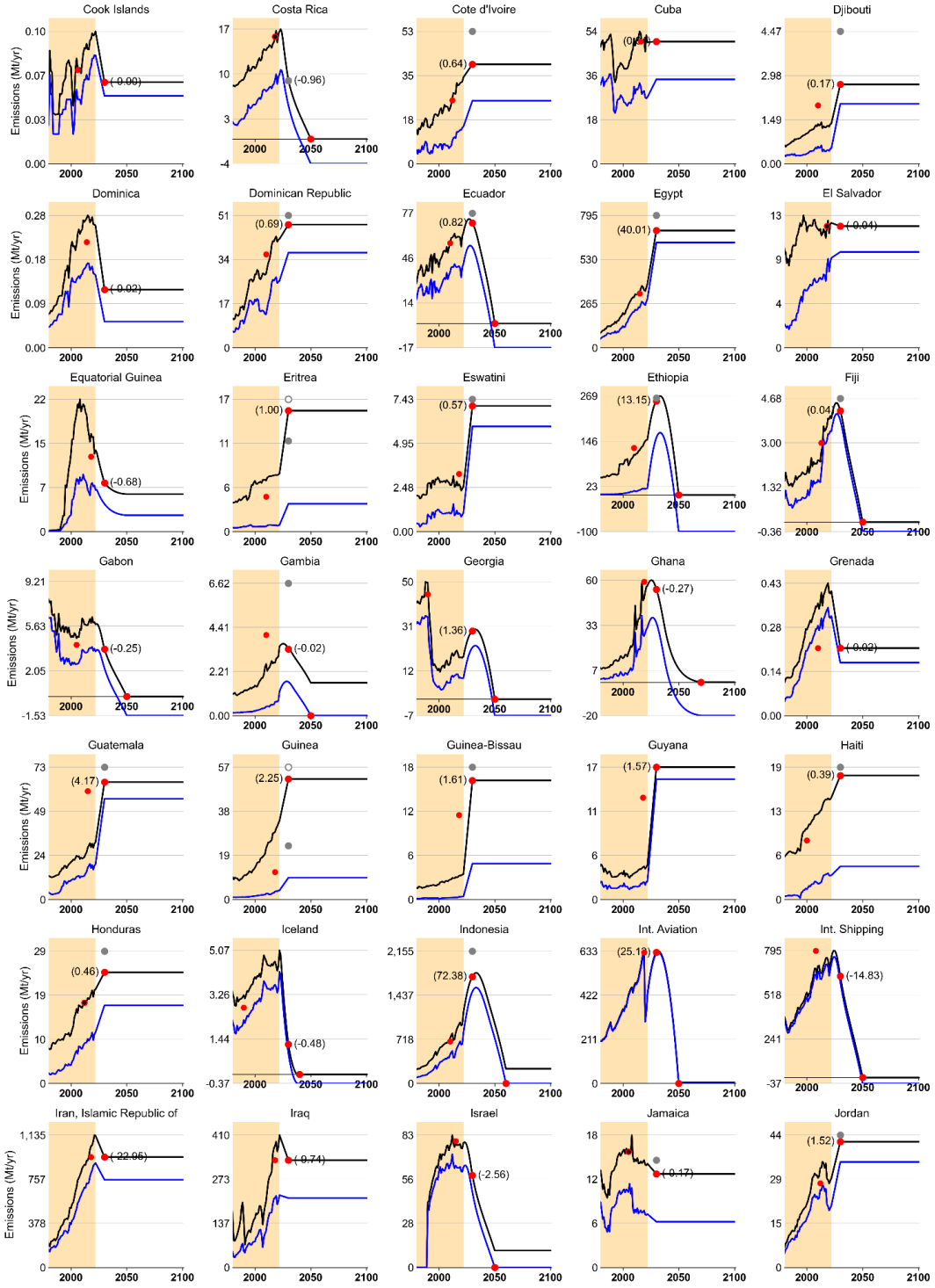


Fig. S3c | Country-level emissions trajectories. Same as Fig. S3a but for other countries by alphabetical order.

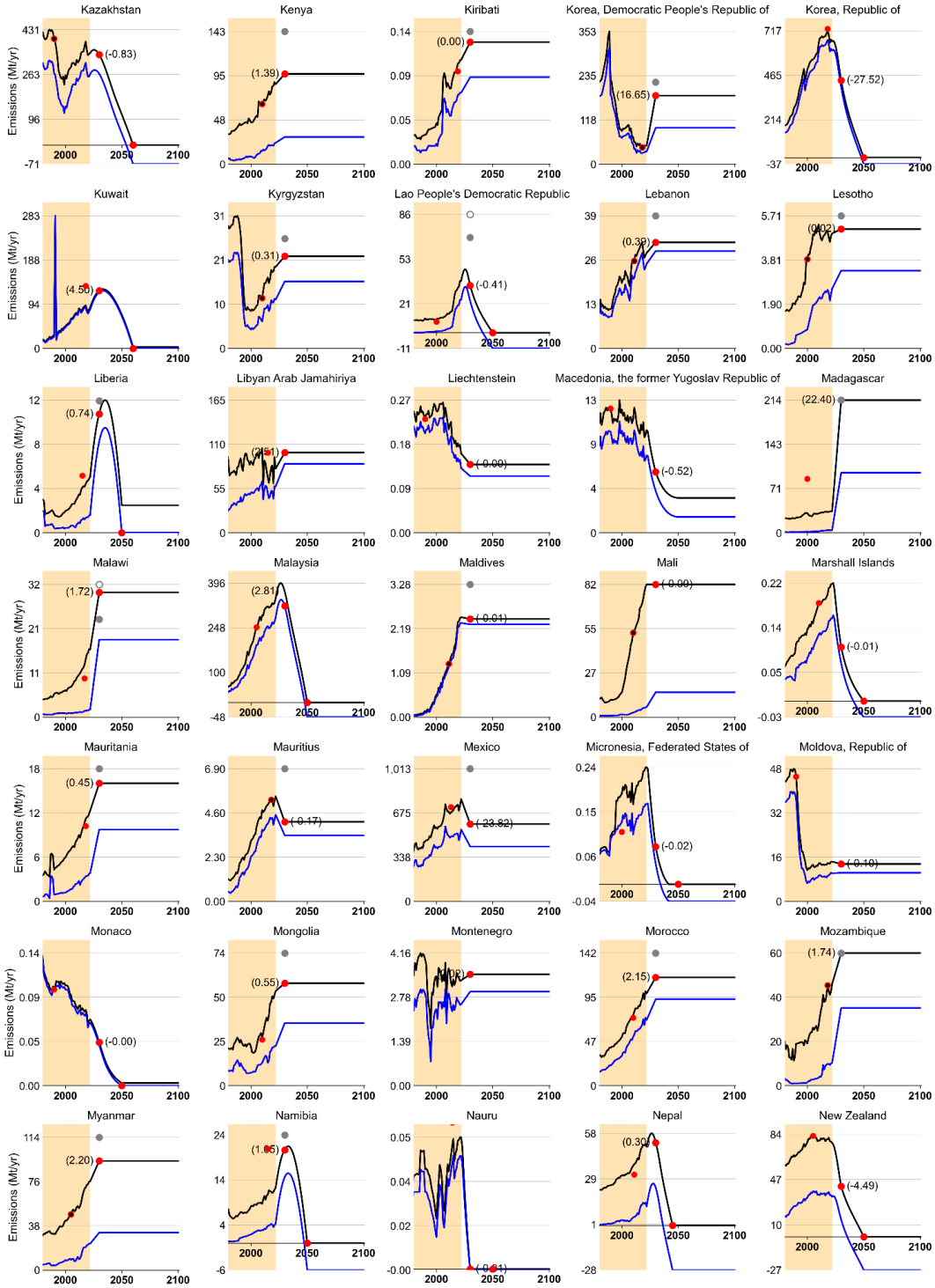


Fig. S3d | Country-level emissions trajectories. Same as Fig. S3a but for other countries by alphabetical order.

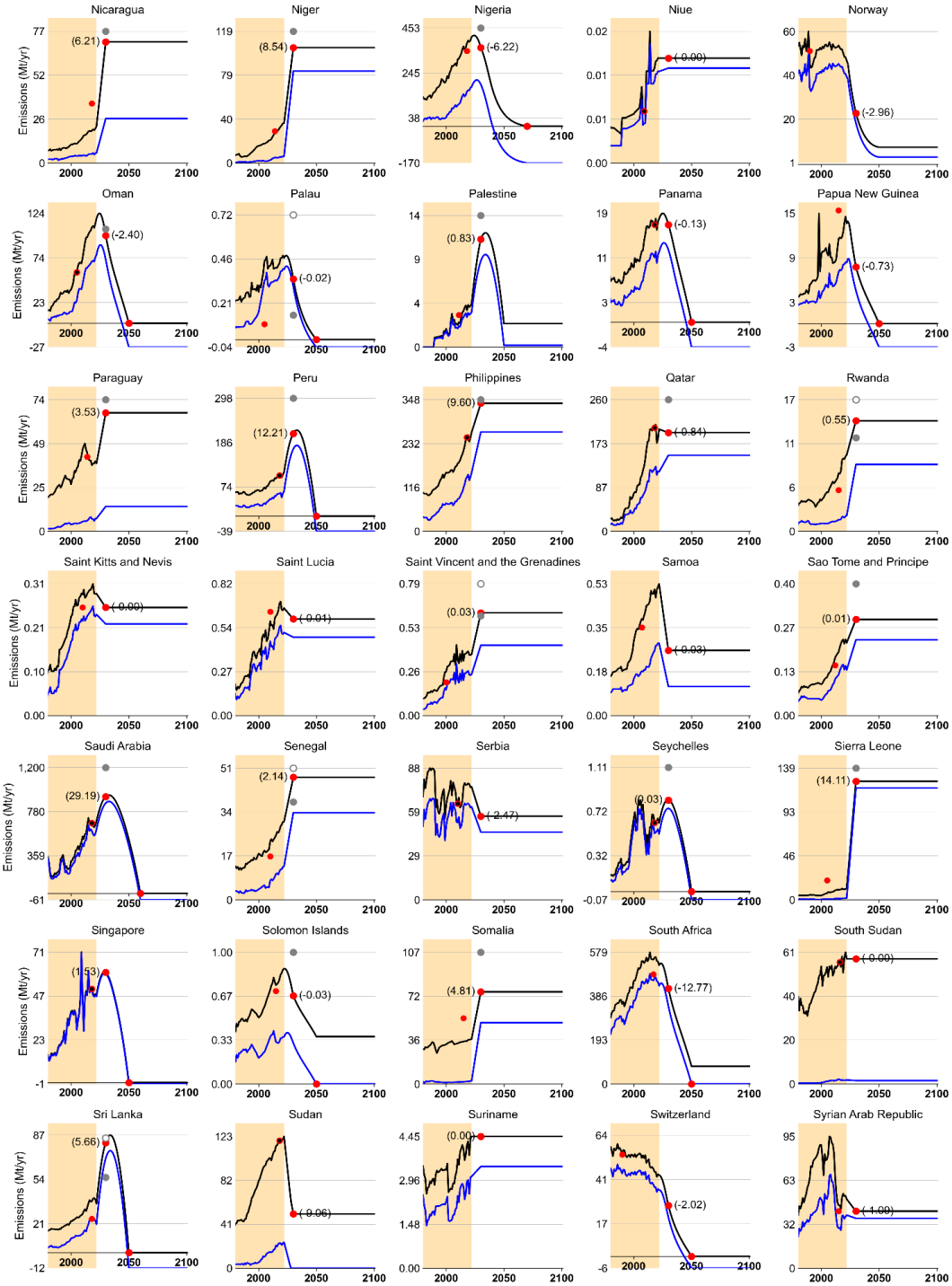


Fig. S3e | Country-level emissions trajectories. Same as Fig. S3a but for other countries by alphabetical order.

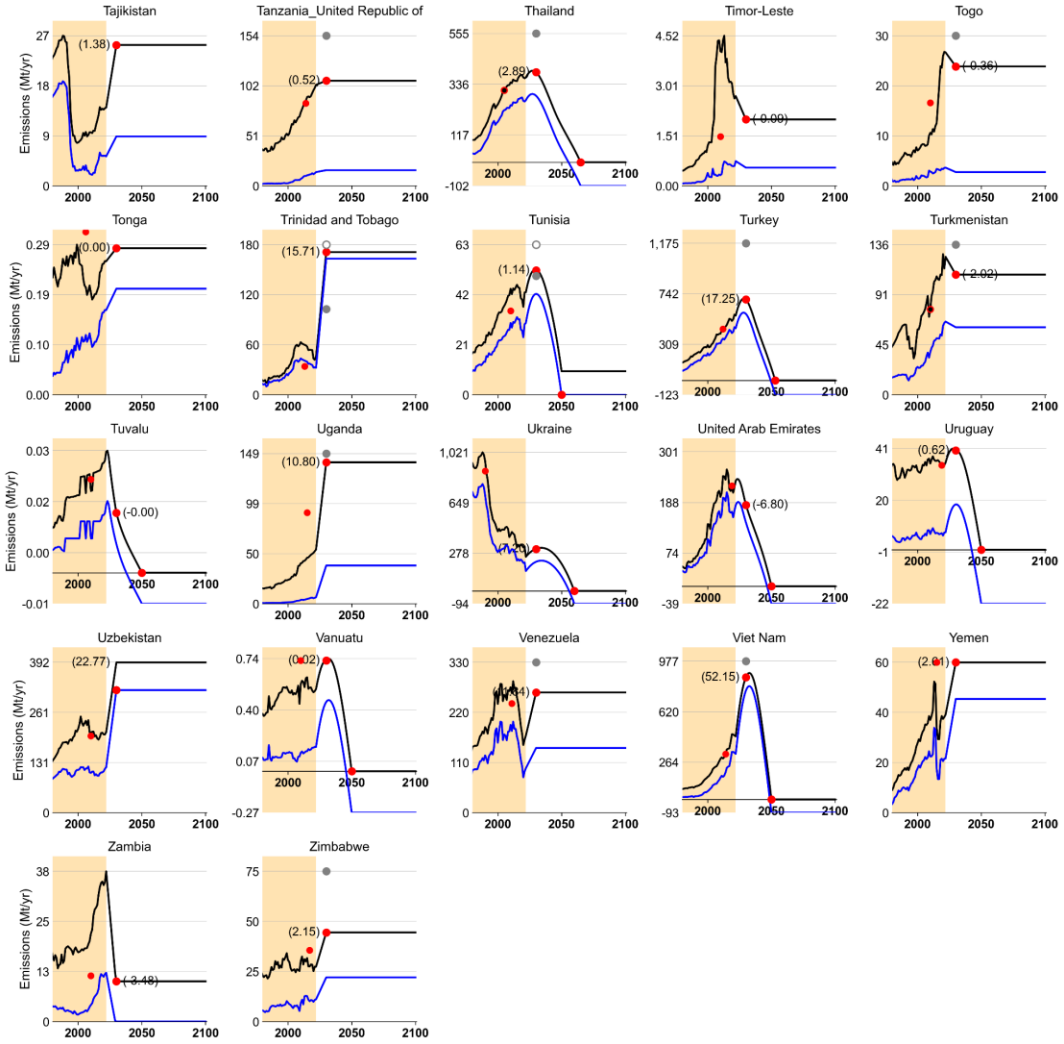


Fig. S3f | Country-level emissions trajectories. Same as Fig. S3a but for other countries

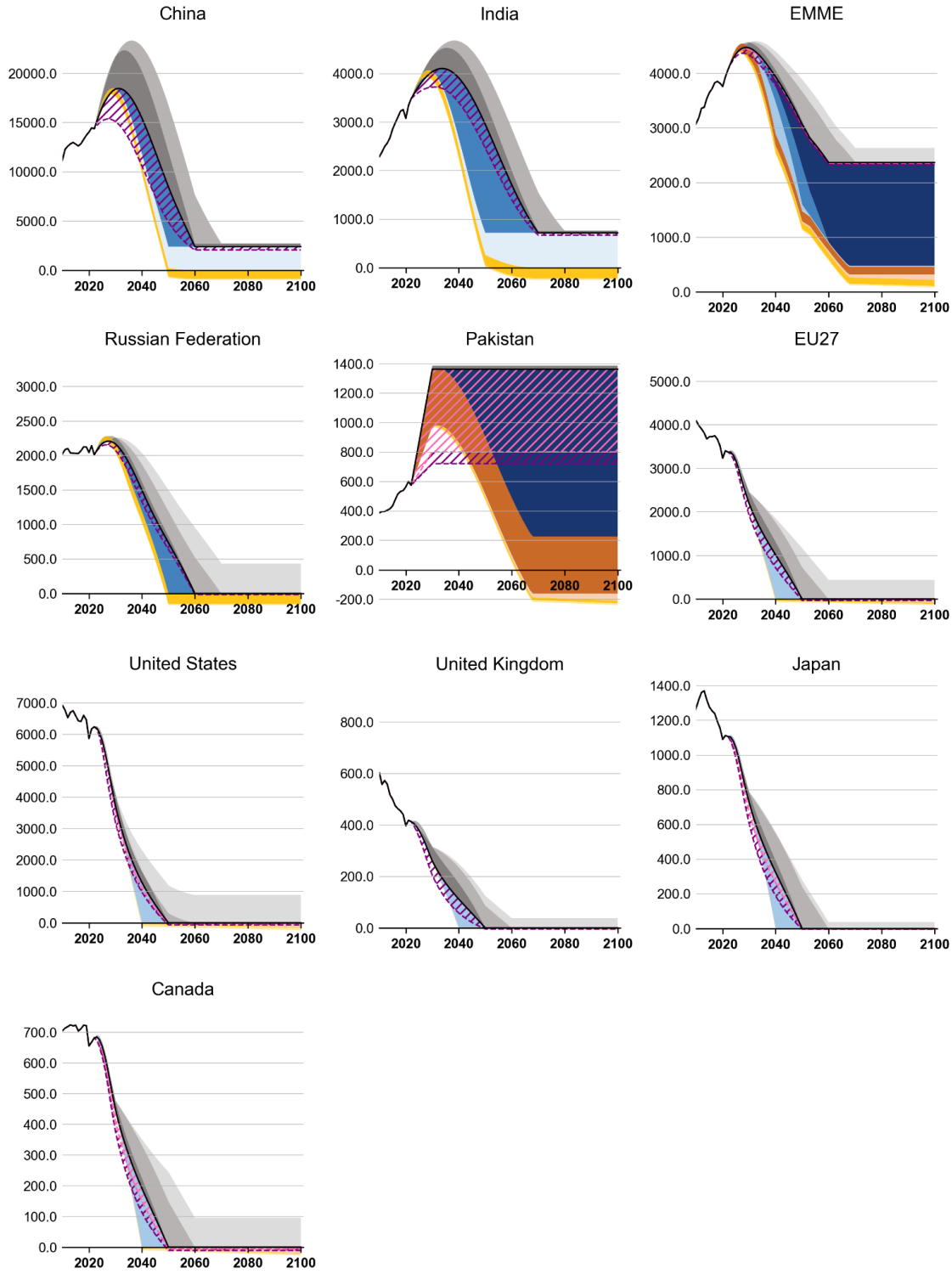


Fig. S4a | Emissions responses to enhanced or delayed national climate pledges. CO_2eq emissions (Gt/yr) excluding the LULUCF sector are shown for major emitters from Fig. 1. Responses from LUF pledges are not shown as they are estimated only at the global level. CON and NDC01 pledges (hatched) are shown in a separate layer from other pledges (shaded) due to their potential inter-dependency.

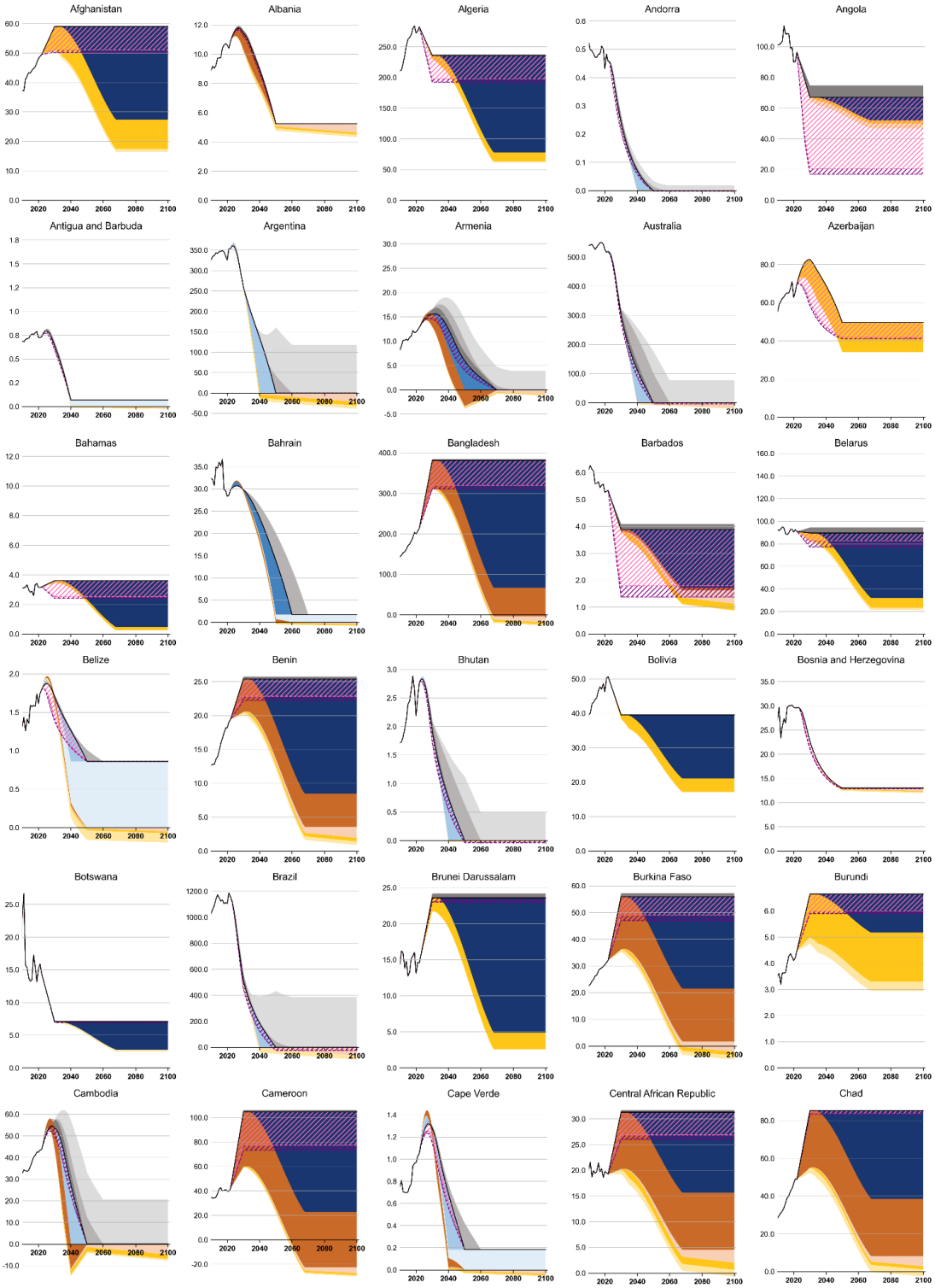


Fig. S4b | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

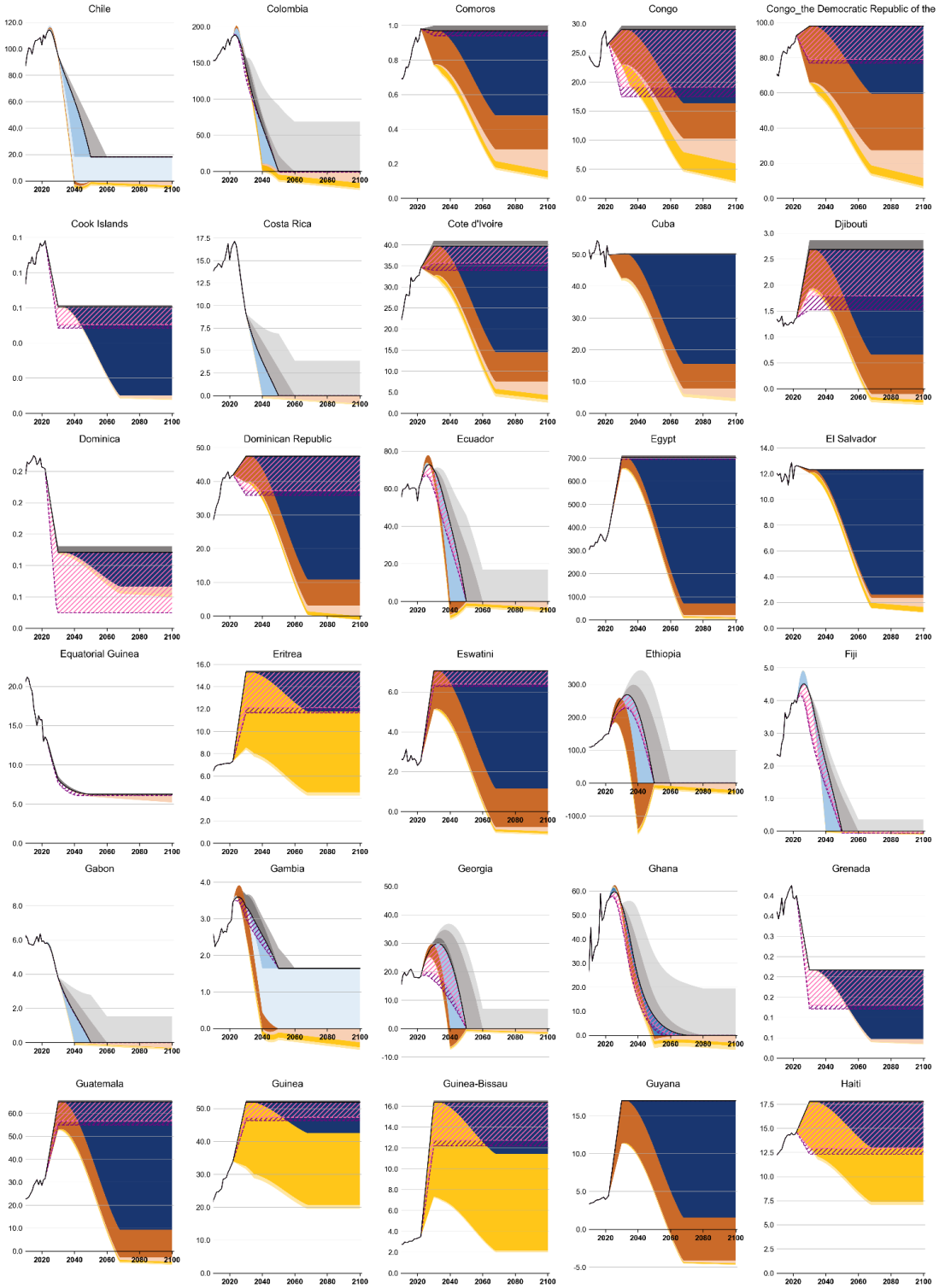


Fig. S4c | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

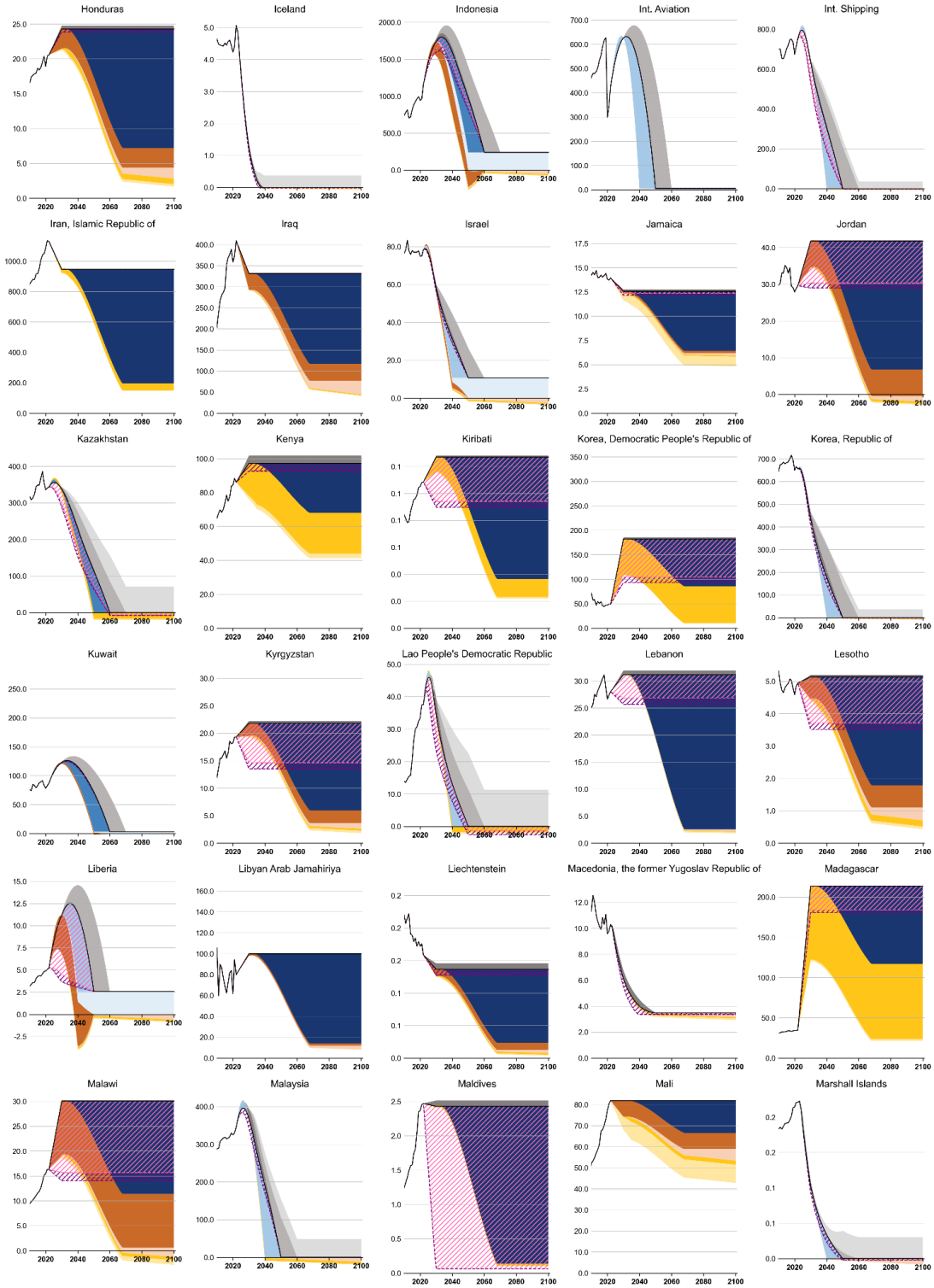


Fig. S4d | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

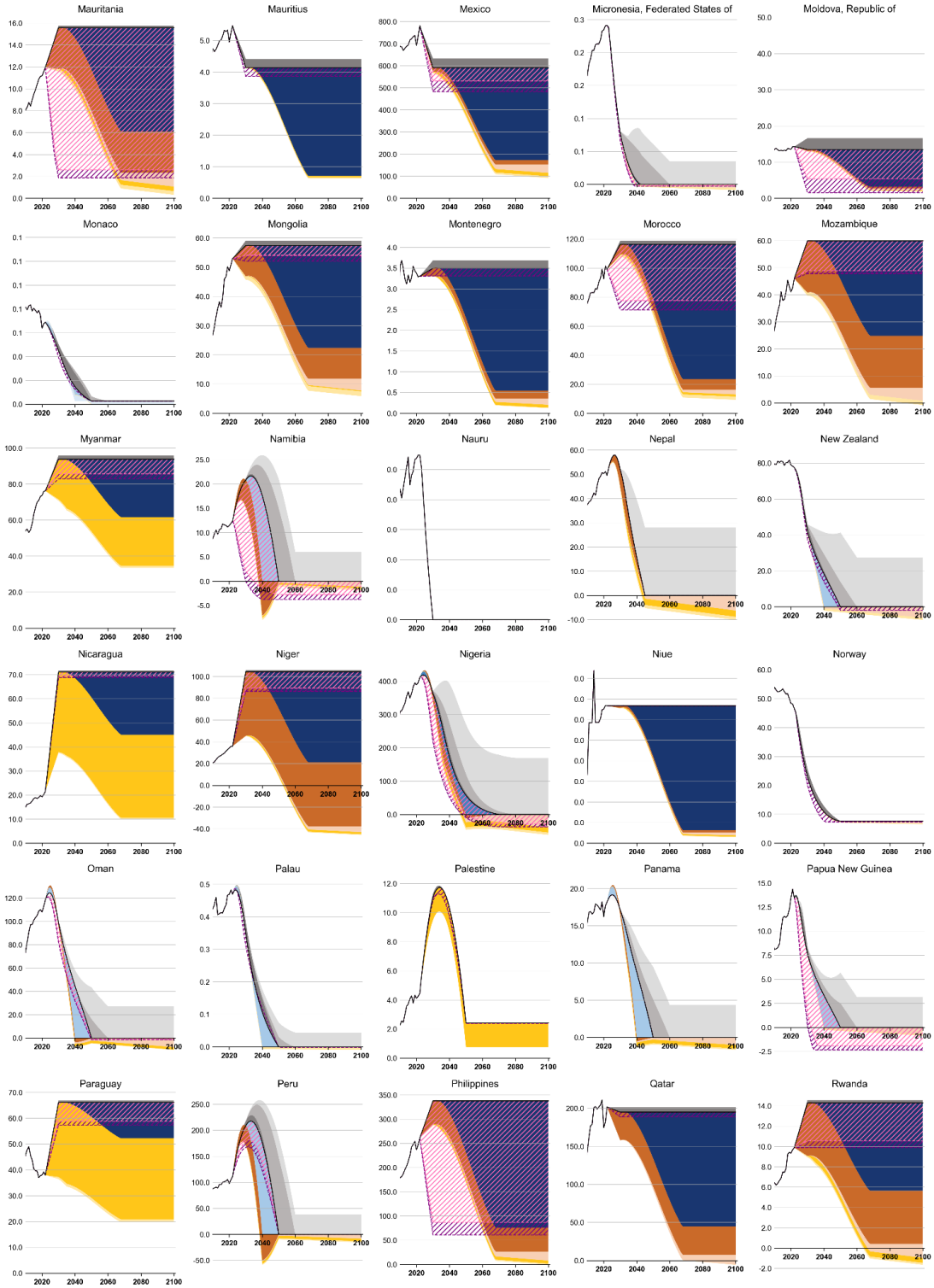


Fig. S4e | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

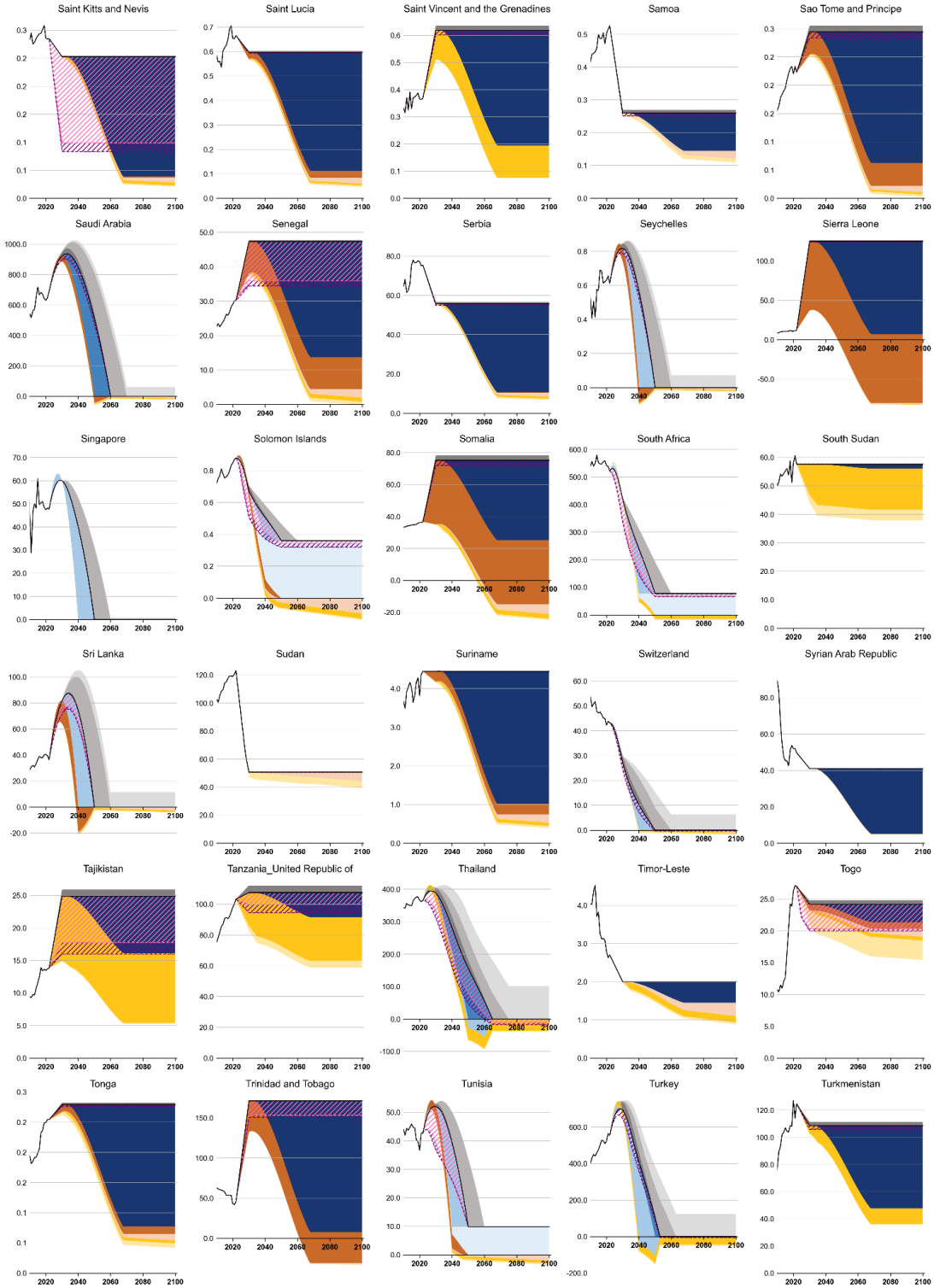


Fig. S4f | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

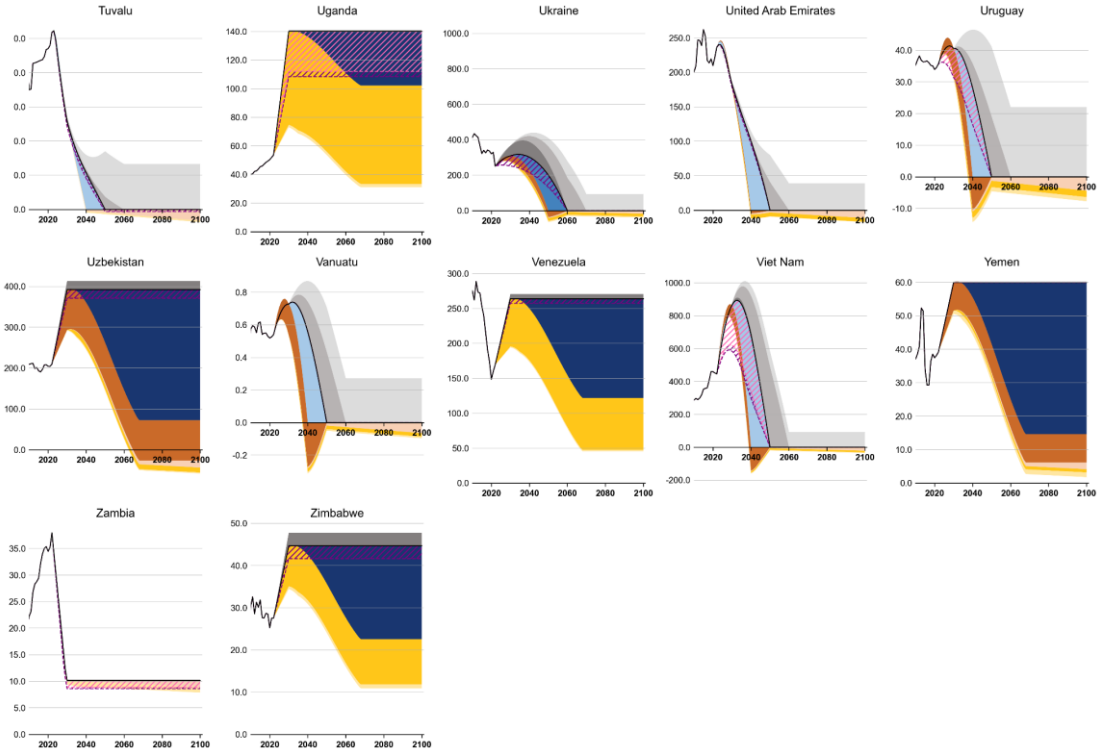


Fig. S4g | Country-level emissions responses to enhanced or delayed national climate pledges. Same as Fig. S4a but for other countries and emissions are in Mt/yr.

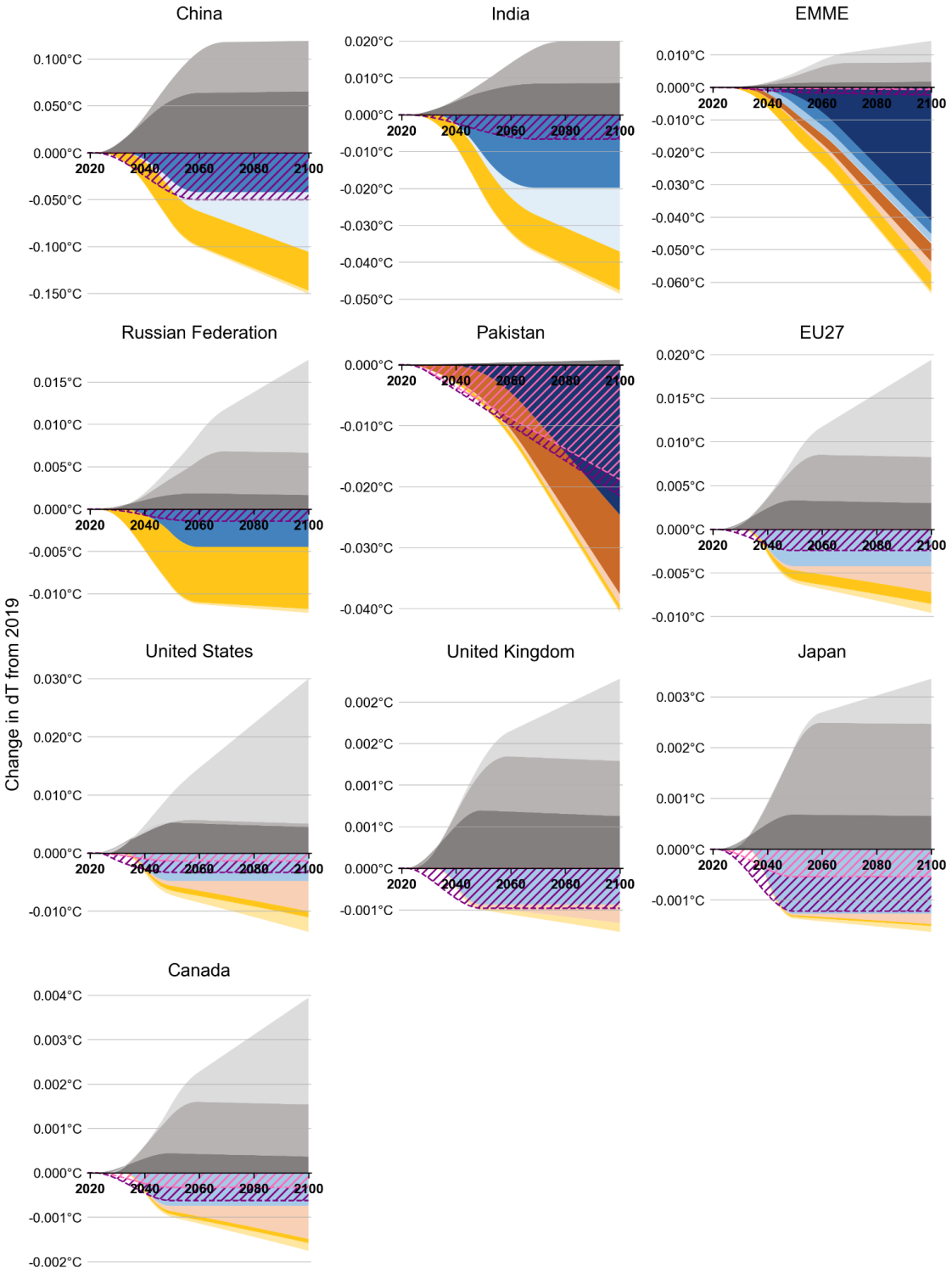


Fig. S5a | Temperature responses to enhanced or delayed national climate pledges for major emitters. The figure shows the change in temperatures from 2019 (excluding LULUCF) for each enhanced/delayed pledge compared to temperatures from 2019 for the base case (current pledges with unconditional target). Only for NDC02 (purple shade), the change is with respect to a different base (current pledges with conditional near-term target). Countries are the major emitters from Fig. 1. Responses from LUF pledges are not shown as they are estimated only at the global level. CON and NDC01 pledges (hatched) are shown in a separate layer from other pledges (shaded) due to their potential inter-dependency.

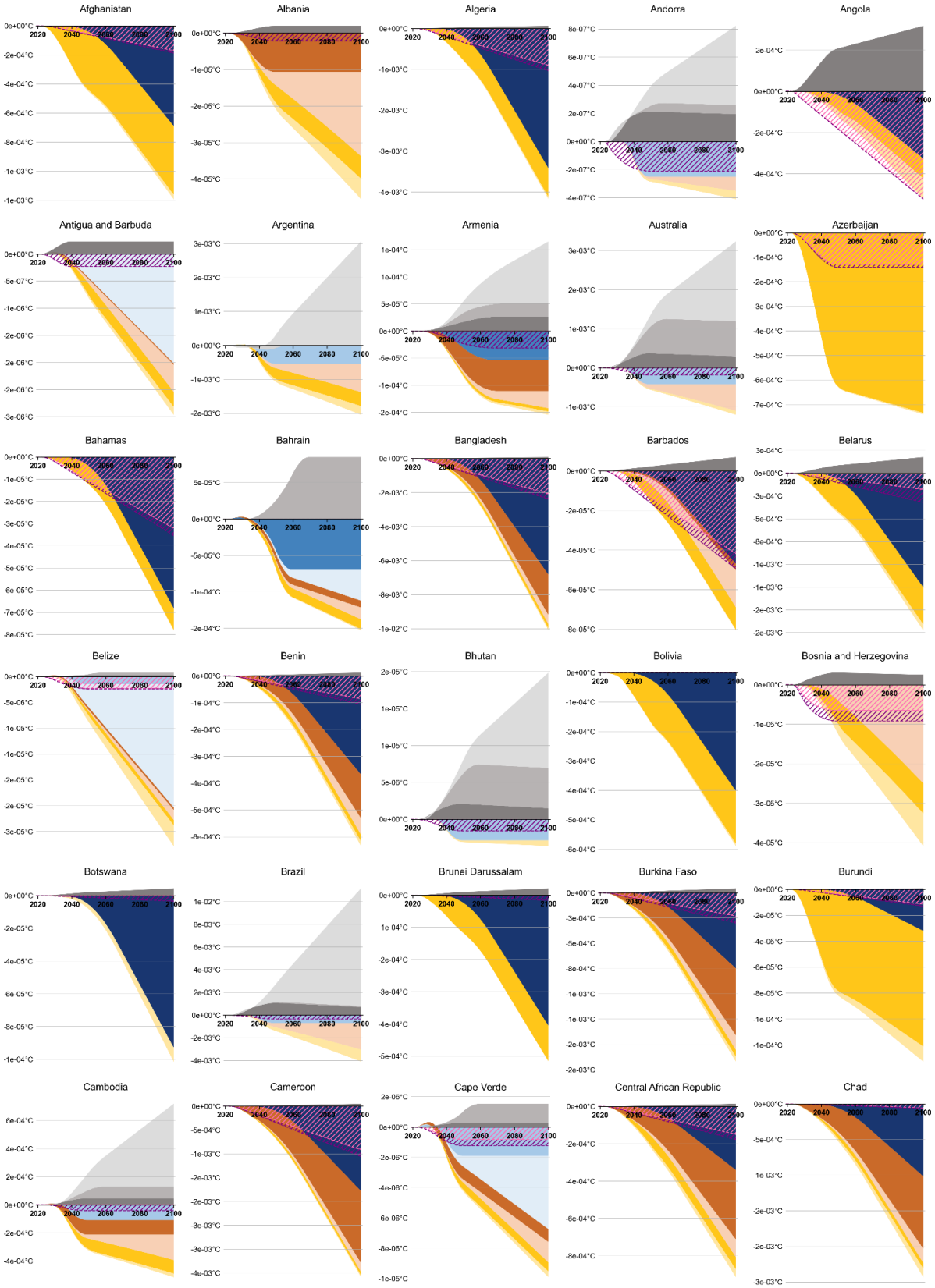


Fig. S5b | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.

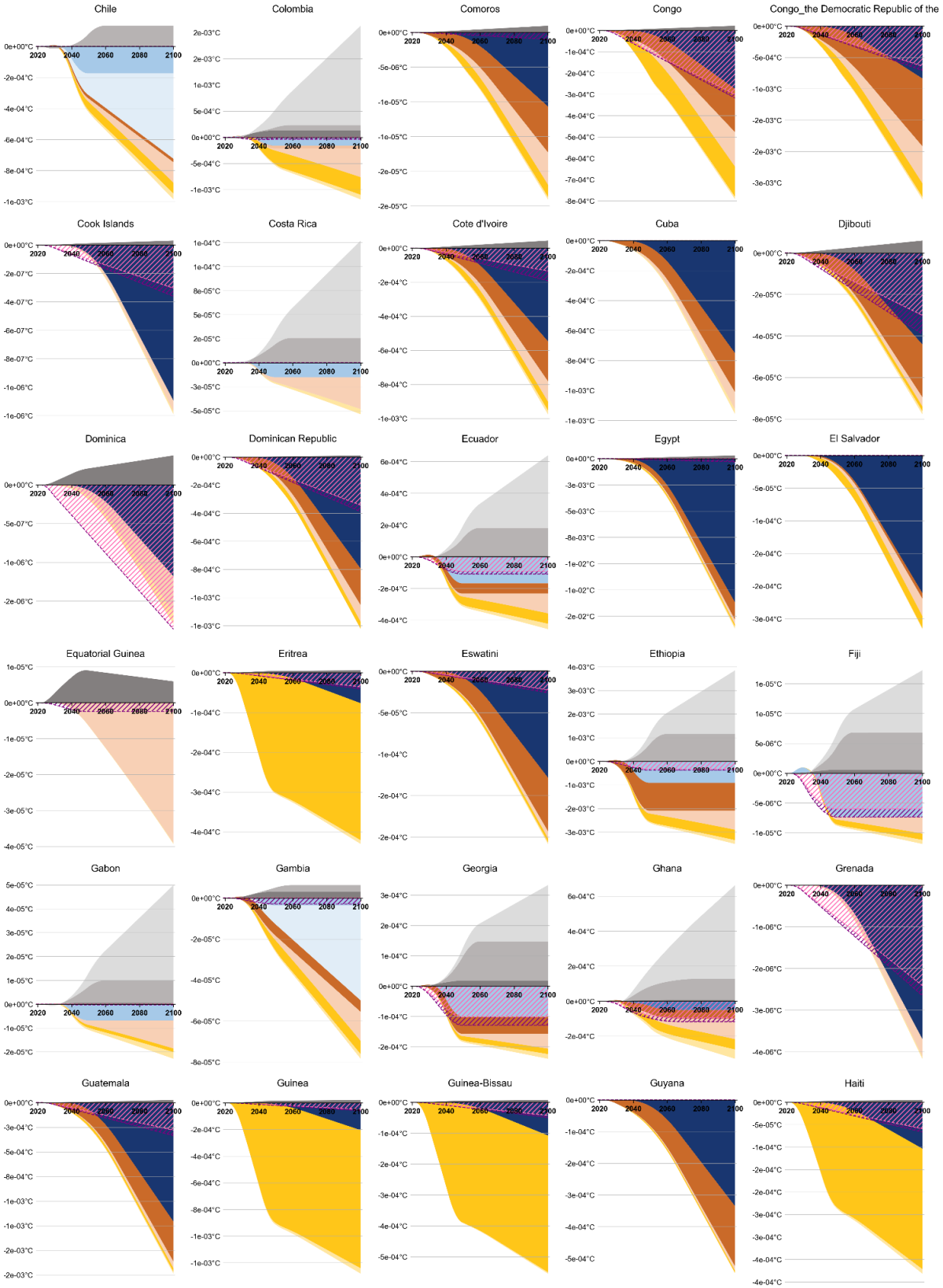


Fig. S5c | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.

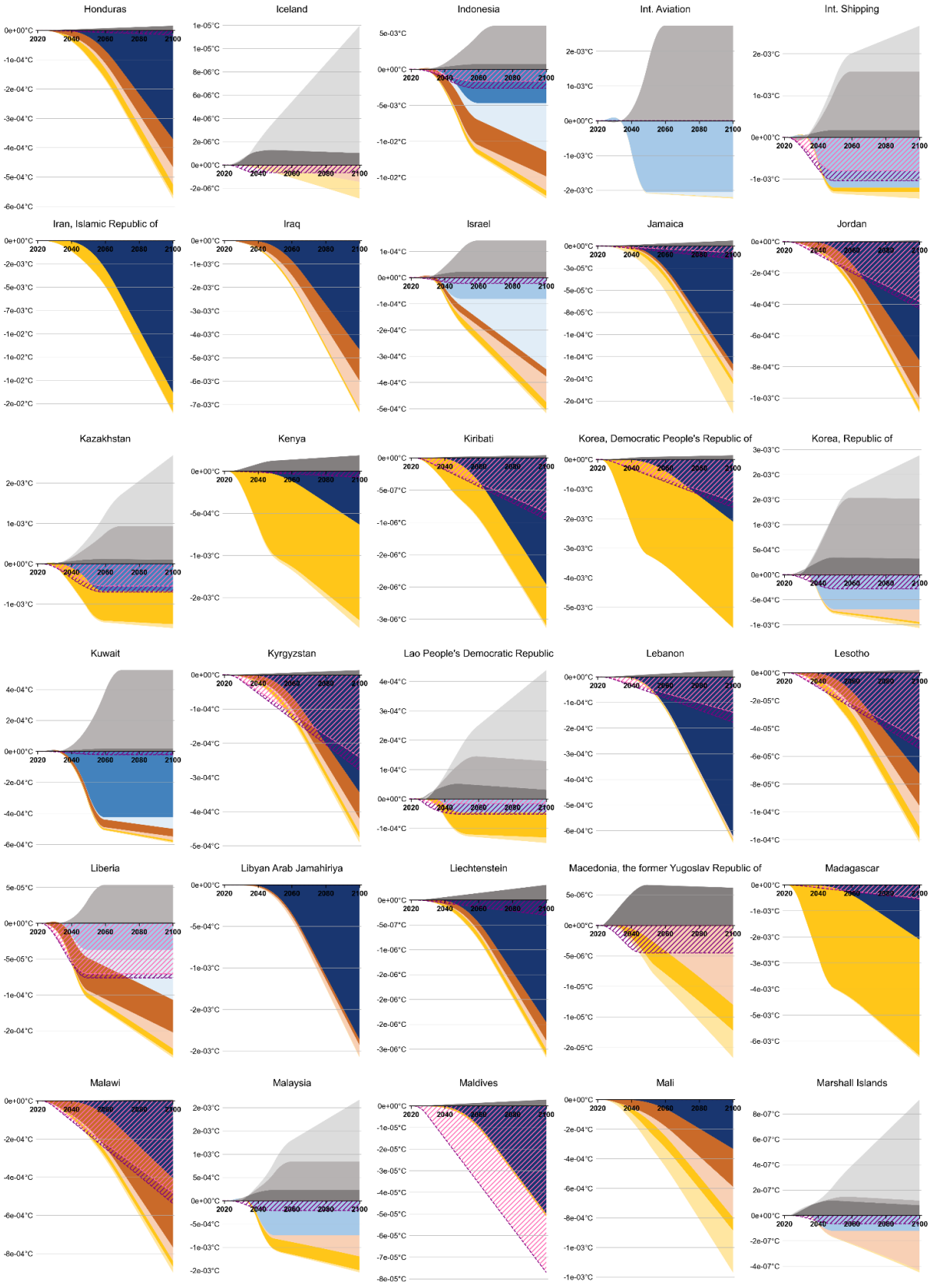


Fig. S5d | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.

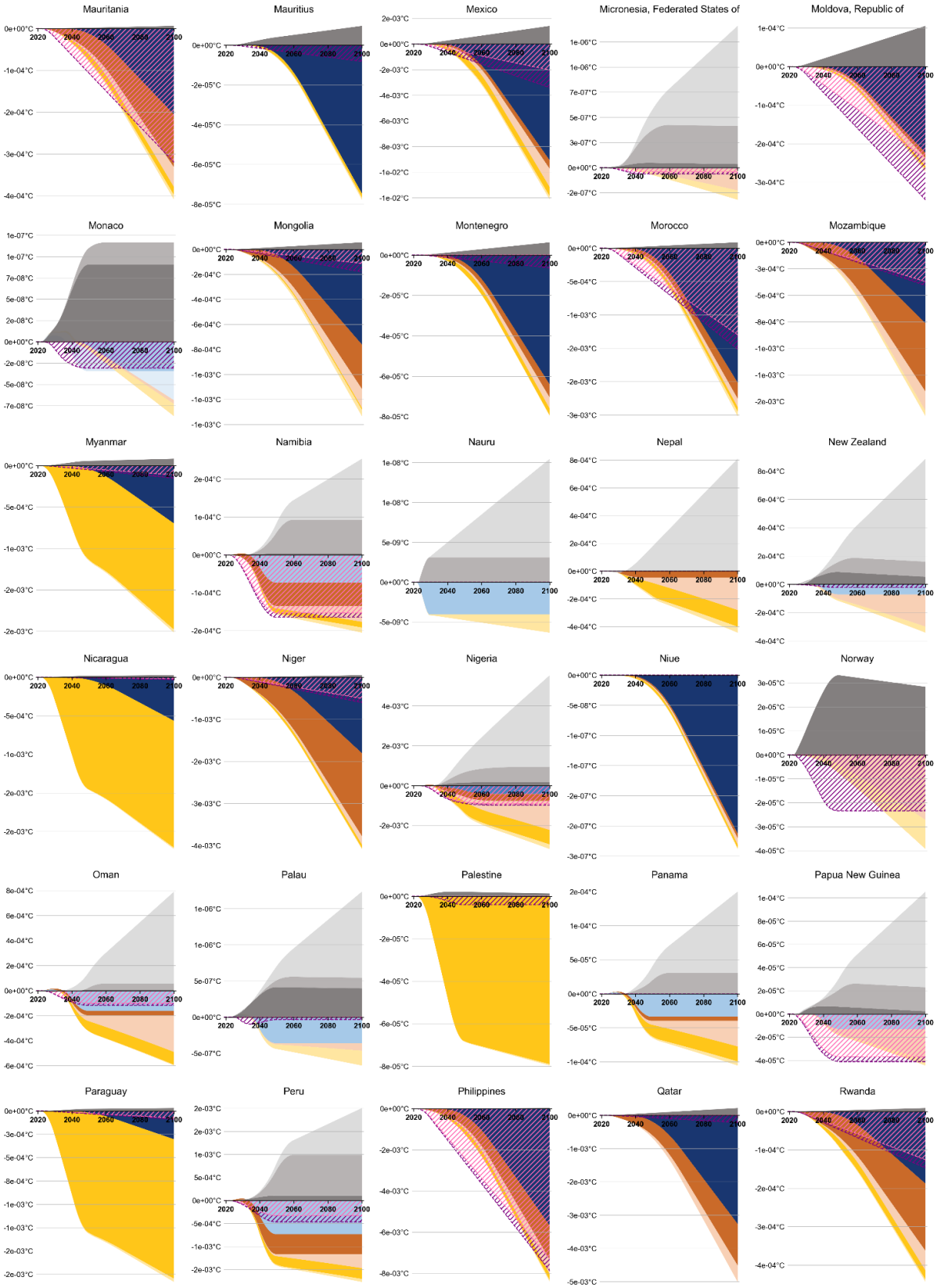


Fig. S5e | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.

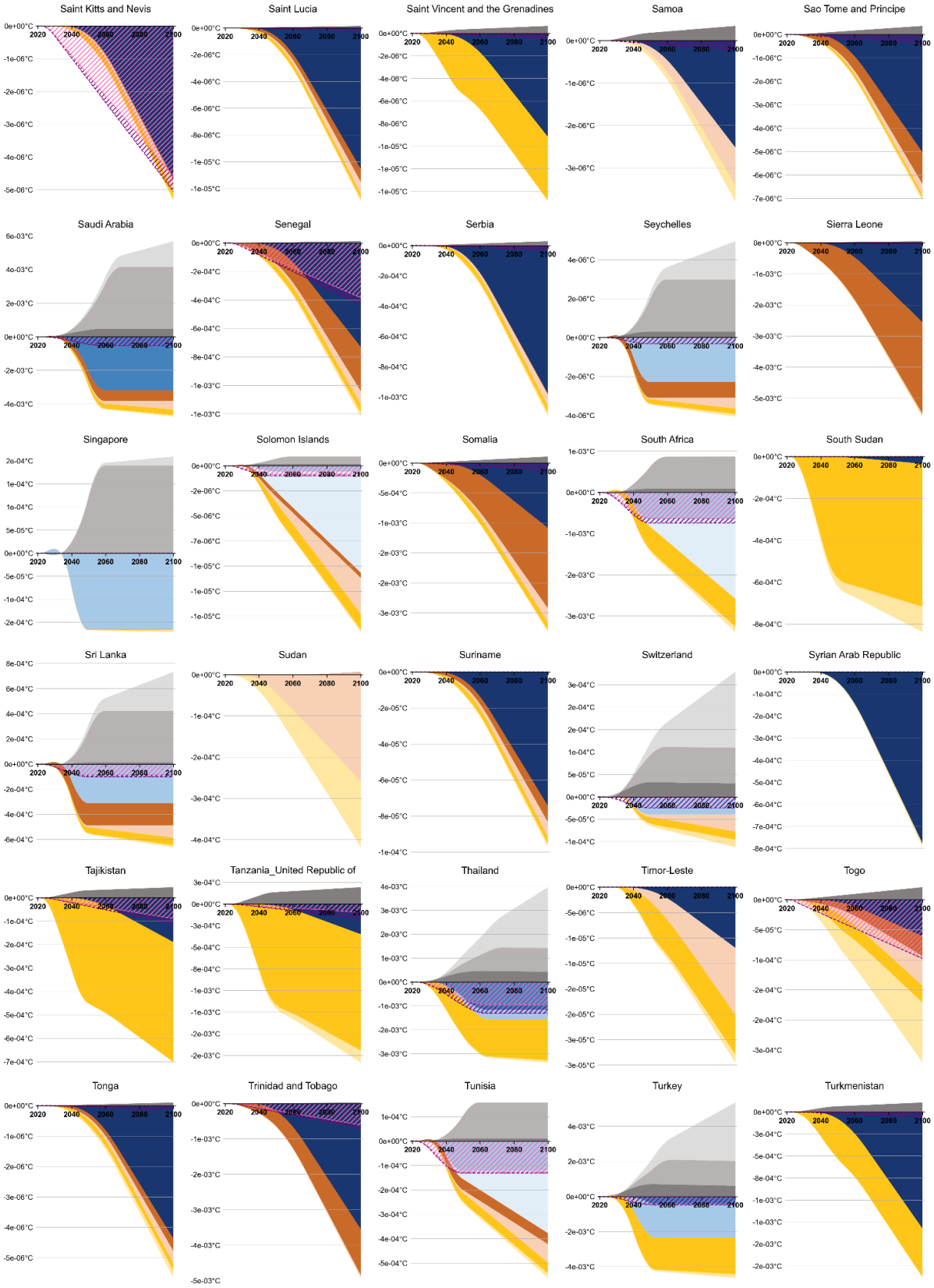


Fig. S5f | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.

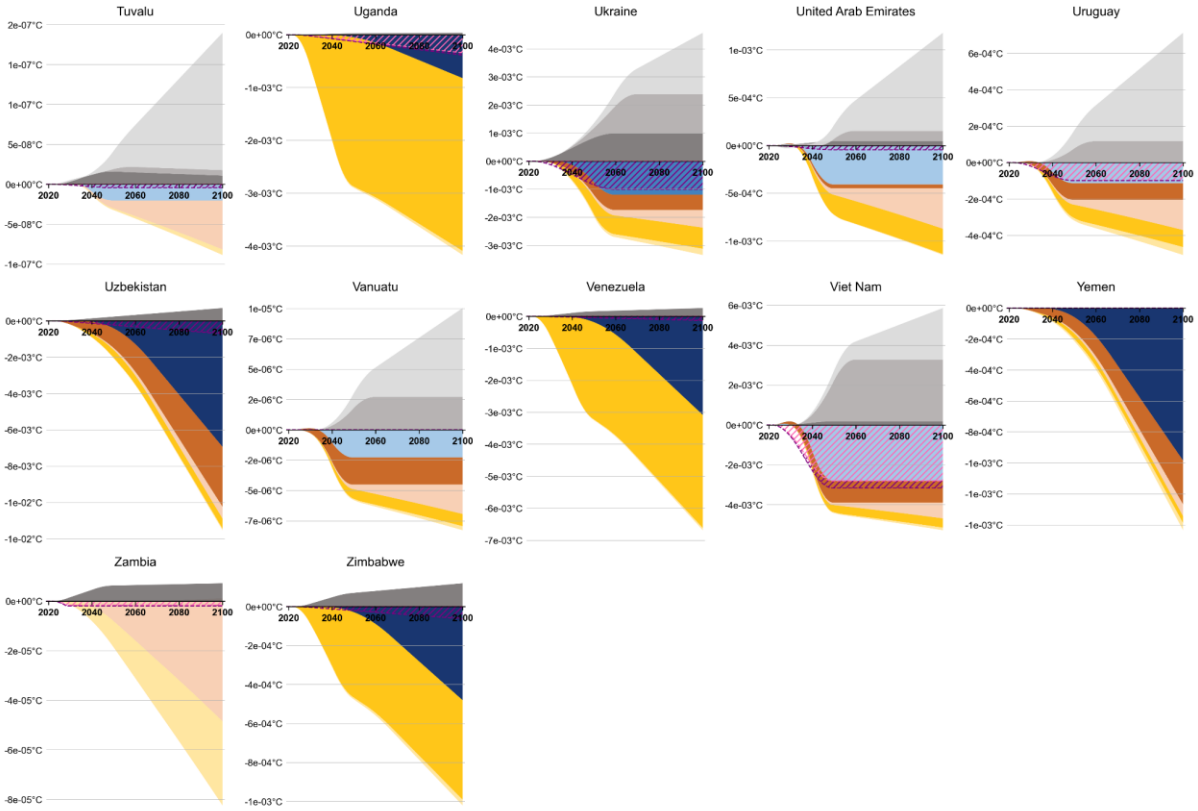


Fig. S5g | Country-level temperature responses to enhanced or delayed national climate pledges. Same as Fig. S5a but for other countries in alphabetical order.