Supplementary Information of: Climate damage projections beyond annual temperature

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Appendix A - Additional information on climatic projections from CMIP6 models

	GCM	Scenario	Ensemble	+0.38°C	+0.84°C	+1°C	+1.5°C	+2°C	+3°C	+4°C
1	ACCESS-CM2	ssp126	r1i1p1f1	1973-2013	1990-2030	2006-2025	2018-2037	2033-2052		
2	ACCESS-CM2	ssp370	r1i1p1f1	1973-2013	1990-2030	2006-2025	2018-2037	2030-2049	2053-2072	2073-2092
3	ACCESS-ESM1-5	ssp126	r1i1p1f1	1972-2012	1988-2028	2004-2023	2021-2040	2064-2083		
4	ACCESS-ESM1-5	ssp370	r1i1p1f1	1972-2012	1989-2029	2004-2023	2024-2043	2039-2058	2060-2079	
5	BCC-CSM2-MR	ssp126	r1i1p1f1	1971-2011	1992-2032	2009-2028	2032-2051			
6	BCC-CSM2-MR	ssp370	r1i1p1f1	1971-2011	1992-2032	2008-2027	2023-2042	2037-2056	2065-2084	
7	CanESM5	ssp119	r1i1p1f1	1950-1990	1973-2013	1990-2009	2003-2022	2015-2034		
8	CanESM5	ssp126	r1i1p1f1	1950-1990	1973-2013	1990-2009	2004-2023	2017-2036		
9	CanESM5	ssp370	r1i1p1f1	1950-1990	1973-2013	1990-2009	2004-2023	2014-2033	2034-2053	2050-2069
10	CESM2	ssp126	r1i1p1f1	1965-2005	1984-2024	2000-2019	2016-2035	2032-2051		
11	CESM2	ssp370	r1i1p1f1	1965-2005	1985-2025	2000-2019	2016-2035	2032-2051	2057-2076	2075-2094
12	CESM2-WACCM	ssp370	r1i1p1f1	1962-2002	1983-2023	1997-2016	2019-2038	2032-2051	2054-2073	2076-2095
13	CMCC-CM2-SR5	ssp126	r1i1p1f1	1945-1985	1974-2014	1993-2012	2014-2033	2029-2048		
14	CMCC-CM2-SR5	ssp370	r1i1p1f1	1945-1985	1974-2014	1993-2012	2016-2035	2030-2049	2054-2073	2078-2097
15	CNRM-CM6-1	ssp126	r1i1p1f2	1961-2001	1984-2024	2003-2022	2018-2037	2050-2069		
16	CNRM-CM6-1	ssp370	r1i1p1f2	1961-2001	1985-2025	2004-2023	2023-2042	2036-2055	2057-2076	2074-2093
17	CNRM-CM6-1-HR	ssp126	r1i1p1f2	1917-1957	1974-2014	1994-2013	2008-2027	2021-2040		
18	CNRM-ESM2-1	ssp119	r1i1p1f2	1971-2011	1991-2031	2007-2026	2058-2077			
19	CNRM-ESM2-1	ssp126	r1i1p1f2	1971-2011	1991-2031	2006-2025	2038-2057			
20	CNRM-ESM2-1	ssp370	r1i1p1f2	1971-2011	1992-2032	2009-2028	2027-2046	2043-2062	2063-2082	2080-2099
21	EC-Earth3	ssp119	r4i1p1f1	1909-1949	1966-2006	1985-2004	2008-2027	2035-2054		
22	EC-Earth3	ssp126	r1i1p1f1	1972-2012	1985-2025	1999-2018	2013-2032	2034-2053		
23	EC-Earth3	ssp370	r1i1p1f1	1972-2012	1985-2025	1999-2018	2013-2032	2029-2048	2054-2073	2075-2094
24	EC-Earth3-AerChem	ssp370	r1i1p1f1	1980-2020	1993-2033	2009-2028	2023-2042	2038-2057	2057-2076	2074-2093
25	EC-Earth3-Veg	ssp119	r1i1p1f1	1909-1949	1965-2005	1984-2003	2002-2021	2020-2039		
26	EC-Earth3-Veg	ssp126	r1i1p1f1	1909-1949	1965-2005	1984-2003	2003-2022	2020-2039		
27	EC-Earth3-Veg	ssp370	r1i1p1f1	1909-1949	1965-2005	1984-2003	2002-2021	2023-2042	2048-2067	2067-2086
28	EC-Earth3-Veg-LR	ssp119	r1i1p1f1	1951-1991	1981-2021	1997-2016	2020-2039			
29	EC-Earth3-Veg-LR	ssp126	r1i1p1f1	1951-1991	1981-2021	1998-2017	2021-2040			
30	EC-Earth3-Veg-LR	ssp370	r1i1p1f1	1951-1991	1981-2021	1998-2017	2019-2038	2036-2055	2057-2076	2078-2097
31	FGOALS-g3	ssp119	r1i1p1f1	1956-1996	1982-2022	1997-2016				
32	FGOALS-g3	ssp126	r1i1p1f1	1956-1996	1982-2022	1996-2015				
33	FGOALS-g3	ssp370	r1i1p1f1	1956-1996	1982-2022	1997-2016	2018-2037	2037-2056	2075-2094	
34	GFDL-ESM4	ssp119	r1i1p1f1	1973-2013	1994-2034	2011-2030				
35	GFDL-ESM4	ssp126	r1i1p1f1	1973-2013	1994-2034	2011-2030				
36	GFDL-ESM4	ssp370	r1i1p1f1	1973-2013	1995-2035	2012-2031	2032-2051	2048-2067	2074-2093	
37	HadGEM3-GC31-LL	ssp126	r1i1p1f3	1974-2014	1987-2027	2000-2019	2012-2031	2028-2047		
38	HadGEM3-GC31-MM	ssp126	r1i1p1f3	1973-2013	1991-2031	2006-2025	2019-2038	2031-2050		
39	INM-CM4-8	ssp126	r1i1p1f1	1955-1995	1986-2026	2005-2024	2041-2060			
40	INM-CM4-8	ssp370	r1i1p1f1	1955-1995	1987-2027	2007-2026	2026-2045	2043-2062	2074-2093	
41	INM-CM5-0	ssp126	r1i1p1f1	1961-2001	1988-2028	2007-2026	2027-2046			
42	INM-CM5-0	ssp370	r1i1p1f1	1961-2001	1988-2028	2006-2025	2023-2042	2041-2060	2075-2094	
43	IPSL-CM6A-LR	ssp119	r1i1p1f1	1931-1971	1975-2015	1993-2012	2009-2028	2028-2047		
44	IPSL-CM6A-LR	ssp126	r1i1p1f1	1931-1971	1975-2015	1993-2012	2010-2029	2029-2048		
45	IPSL-CM6A-LR	ssp370	r1i1p1f1	1931-1971	1975-2015	1993-2012	2010-2029	2025-2044	2046-2065	2067-2086
46	KACE-1-0-G	ssp126	r1i1p1f1	1934-1974	1974-2014	1991-2010	2005-2024	2015-2034		
47	KACE-1-0-G	ssp370	r1i1p1f1	1934-1974	1974-2014	1991-2010	2005-2024	2015-2034	2037-2056	2063-2082
48	KIOST-ESM	ssp126	r1i1p1f1	1946-1986	1973-2013	1993-2012	2011-2030			
49	MIROC-ES2L	ssp119	r1i1p1f2	1972-2012	1994-2034	2012-2031				
50	MIROC-ES2L	ssp126	r1i1p1f2	1972-2012	1994-2034	2010-2029	2032-2051			
51	MIROC-ES2L	ssp370	r1i1p1f2	1972-2012	1994-2034	2010-2029	2030-2049	2046-2065	2075-2094	
52	MIROC6	ssp119	r1i1p1f1	1972-2012	1997-2037	2016-2035				
53	MIROC6	ssp126	r1i1p1f1	1972-2012	1997-2037	2016-2035	2054-2073			
54	MIROC6	ssp370	r1i1p1f1	1972-2012	1997-2037	2017-2036	2034-2053	2050-2069		
55	MPI-ESM1-2-HR	ssp126	r1i1p1f1	1950-1990	1984-2024	2002-2021	2032-2051			
56	MPI-ESM1-2-HR	ssp370	r1i1p1f1	1950-1990	1985-2025	2001-2020	2025-2044	2041-2060	2072-2091	
57	MPI-ESM1-2-LR	ssp126	r1i1p1f1	1957-1997	1983-2023	2002-2021	2033-2052			
58	MPI-ESM1-2-LR	ssp370	r1i1p1f1	1957-1997	1984-2024	2004-2023	2026-2045	2043-2062	2069-2088	
59	MRI-ESM2-0	ssp119	r1i1p1f1	1969-2009	1989-2029	2005-2024	2021-2040			
60	MRI-ESM2-0	ssp126	r1i1p1f1	1969-2009	1989-2029	2005-2024	2020-2039			
61	MRI-ESM2-0	ssp370	r1i1p1f1	1969-2009	1989-2029	2005-2024	2022-2041	2036-2055	2064-2083	
62	NESM3	ssp126	r1i1p1f1	1969-2009	1985-2025	2000-2019	2012-2031	2040-2059		
63	NorESM2-LM	ssp126	r1i1p1f1	1977-2017	1998-2038	2018-2037				
64	NorESM2-LM	ssp370	r1i1p1f1	1977-2017	2000-2040	2023-2042	2042-2061	2060-2079		
65	NorESM2-MM	ssp126	r1i1p1f1	1978-2018	2000-2040	2013-2032				
66	NorESM2-MM	ssp370	r1i1p1f1	1978-2018	2002-2042	2022-2041	2037-2056	2053-2072	2081-2100	
67	TaiESM1	ssp126	r1i1p1f1	1981-2021	1993-2033	2008-2027	2018-2037	2031-2050		
68	TaiESM1	ssp370	r1i1p1f1	1981-2021	1996-2036	2010-2029	2024-2043	2034-2053	2052-2071	2072-2091
69	UKESM1-0-LL	ssp119	r1i1p1f2	1977-2017	1988-2028	2004-2023	2015-2034	2030-2049		
70	UKESM1-0-LL	ssp126	r1i1p1f2	1977-2017	1988-2028	2003-2022	2014-2033	2027-2046		
71	UKESM1-0-LL	ssp370	r1i1p1f2	1977-2017	1988-2028	2004-2023	2013-2032	2022-2041	2041-2060	2060-2079

Table S1. Models, scenarios and ensembles used for climatic projections with the respective global warming level windows

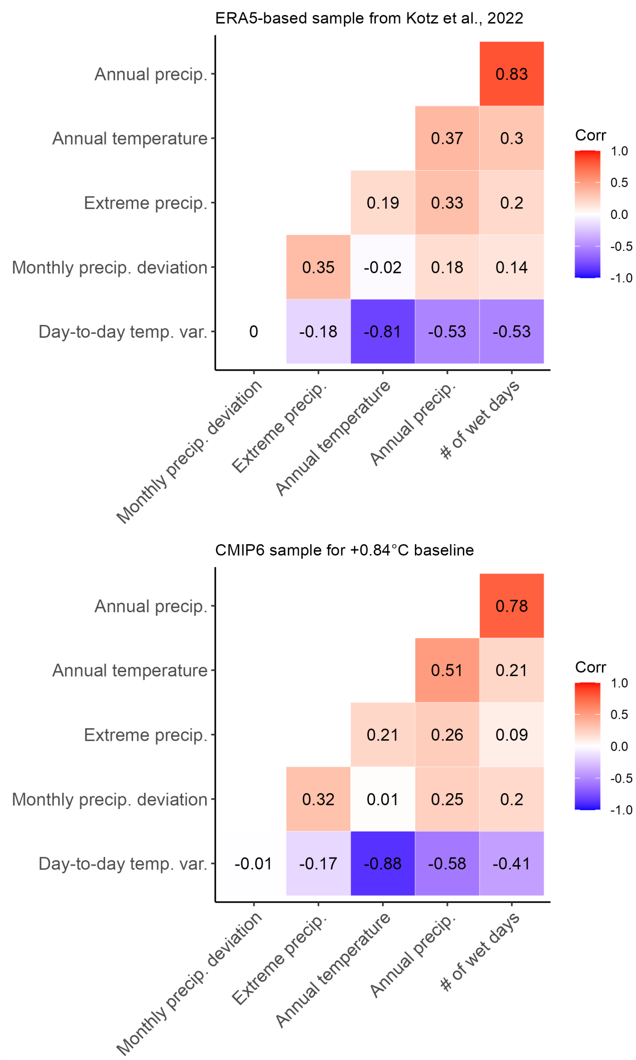


Figure S1. Correlation of climate indicators in the Kotz et al., 2022 sample (ERA5-based) and the corresponding baseline period for +0.84°C using CMIP6 models

Appendix B - Additional results and information on GDP impact projections

Omitted non-sovereign ADM0-level countries

All country-level results displayed in this paper do not include the following non-sovereign ADM0-level countries that are featured in the GADM database (v3.6): Akrotiri and Dhekelia, Åland, American Samoa, Aruba, Bermuda, Bonaire, Sint Eustatius and Saba, British Virgin Islands, Cayman Islands, Faroe Islands, French Guiana, French Polynesia, French Southern Territories, Greenland, Guadeloupe, Guam, Guernsey, Hong Kong, Isle of Man, Jersey, Kosovo, Macao, Martinique, Mayotte, Montserrat, New Caledonia, Northern Cyprus, Northern Mariana Islands, Palestina, Puerto Rico, Reunion, Saint Helena, Saint Pierre and Miquelon, Svalbard and Jan Mayen, Tokelau, Turks and Caicos Islands, United States Minor Outlying Islands, Virgin Islands, U.S., Wallis and Futuna, Western Sahara.

	Impact channel	+1°C	+1.5°C	+2°C	+3°C	+4°C
1	All indicators	-0.59% (-1.71 to 0.44%)	-2.4% (-4.11 to -0.92%)	-4.3% (-6.66 to -2.11%)	-7.89% (-11.76 to -4.14%)	-11.56% (-16.87 to -6.29%)
2	Annual temperature	-0.65% (-1.8 to 0.39%)	-2.55% (-4.19 to -1.13%)	-4.47% (-6.75 to -2.36%)	-8.11% (-11.85 to -4.48%)	-11.63% (-16.75 to -6.54%)
3	Annual precip.	0.02% (-0.2 to 0.25%)	0.08% (-0.14 to 0.34%)	0.15% (-0.08 to 0.45%)	0.24% (-0.01 to 0.58%)	0.34% (0.02 to 0.74%)
4	Day-to-day temp var.	0.03% (-0.24 to 0.31%)	0.09% (-0.2 to 0.38%)	0.12% (-0.14 to 0.4%)	0.18% (-0.11 to 0.48%)	0.2% (-0.14 to 0.55%)
5	Monthly precip. deviation	0.03% (-0.26 to 0.29%)	0.03% (-0.28 to 0.32%)	0.03% (-0.32 to 0.36%)	-0.05% (-0.48 to 0.35%)	-0.23% (-0.89 to 0.32%)
6	# of wet days	0.02% (-0.38 to 0.42%)	0.02% (-0.41 to 0.47%)	0.02% (-0.43 to 0.5%)	0.1% (-0.35 to 0.6%)	0.16% (-0.39 to 0.74%)
7	Extreme precip.	-0.02% (-0.17 to 0.1%)	-0.07% (-0.23 to 0.05%)	-0.13% (-0.3 to 0.01%)	-0.23% (-0.45 to -0.05%)	-0.38% (-0.69 to -0.12%)

Table S2. Global mean GDP impacts by warming level and climate indicator (upper and lower decile in parentheses)

	Country	Year	Annual GDP growth
1	Syria	2012	-26.3%
2	Greece	2011	-10.15%
3	World	2009	-1.34%
4	World	2020	-3.11%

Table S3. Examples for historic year-to-year contractions in real GDP (in 2015 USD) from the World Bank's World Development Indicators database used in Figure **2**

Median CMIP6 model for variance decomposition

Figure S2 below shows the mean GDP impact by CMIP6 model at +3°C of global warming for impacts from all climate indicators, as well as for separate impacts from each climate indicator. Since the model that produces overall median damages, MPI-ESM1-2-HR, is very atypical with respect to variability & extremes, we choose ACCESS-CM2 for our main variance decomposition as it produces near-median outcomes for both the total damages as well as the variability & extremes indicators overall (despite relatively high damages for extreme precipitation). Figure S3 shows the resulting variance decomposition for ACCESS-CM2, but unlike in Figure 2 in the main manuscript, negative interaction terms are left at the raw values (for details, see **Methods**). To explore sensitivities, we also use the median models for total damages and annual temperature damages, MPI-ESM1-2-HR and EC-Earth3, respectively (see Figures S4 and S5). For EC-Earth3, dose-response function uncertainty is substantially higher for monthly precipitation deviation and, to a lesser extent, for extreme precipitation. However, the stark difference in uncertainty decompositions between annual temperature impacts and other impacts is robust across the different median models.

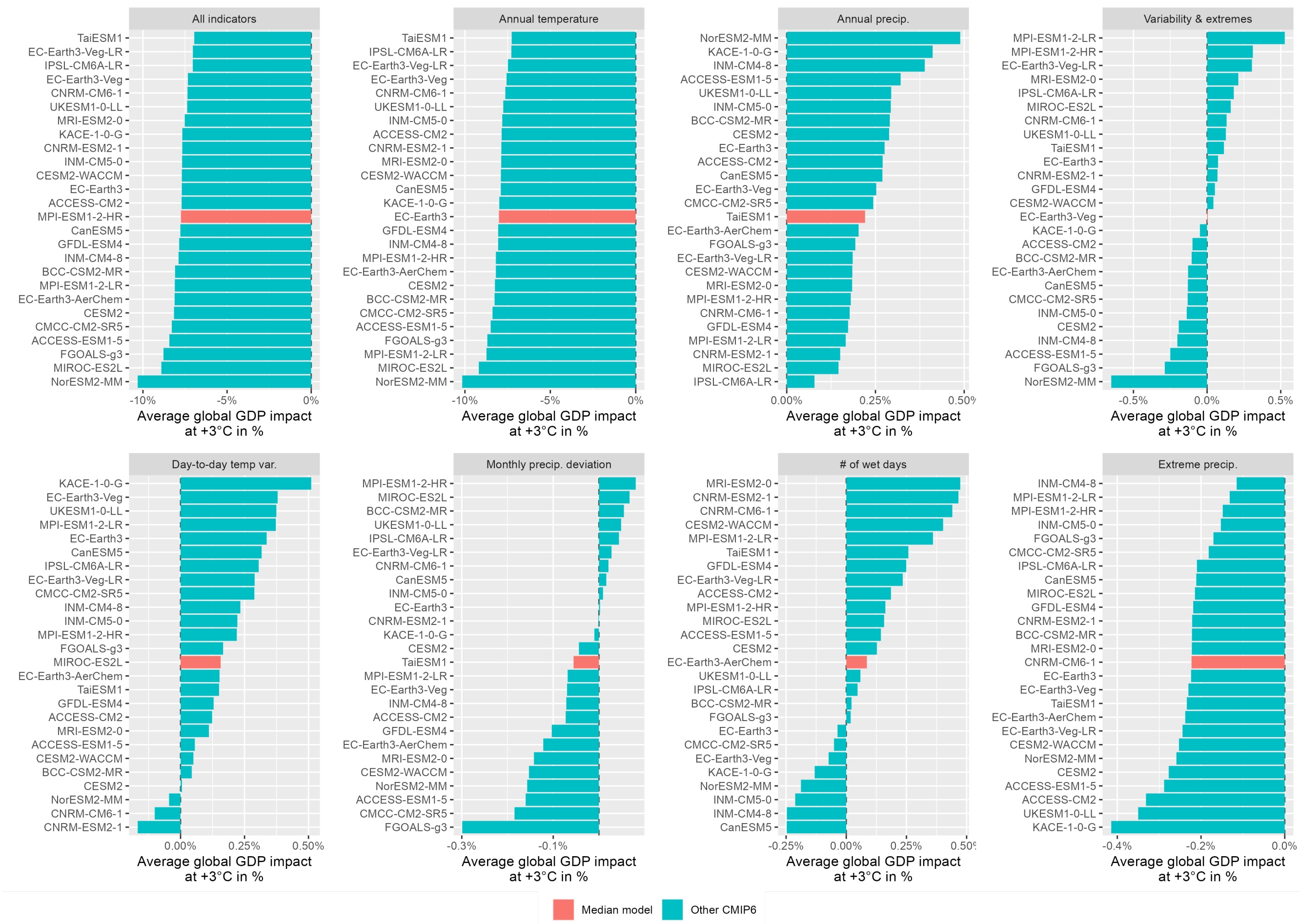


Figure S2. Average GDP impact by CMIP6 model for different climate indicators and global warming levels

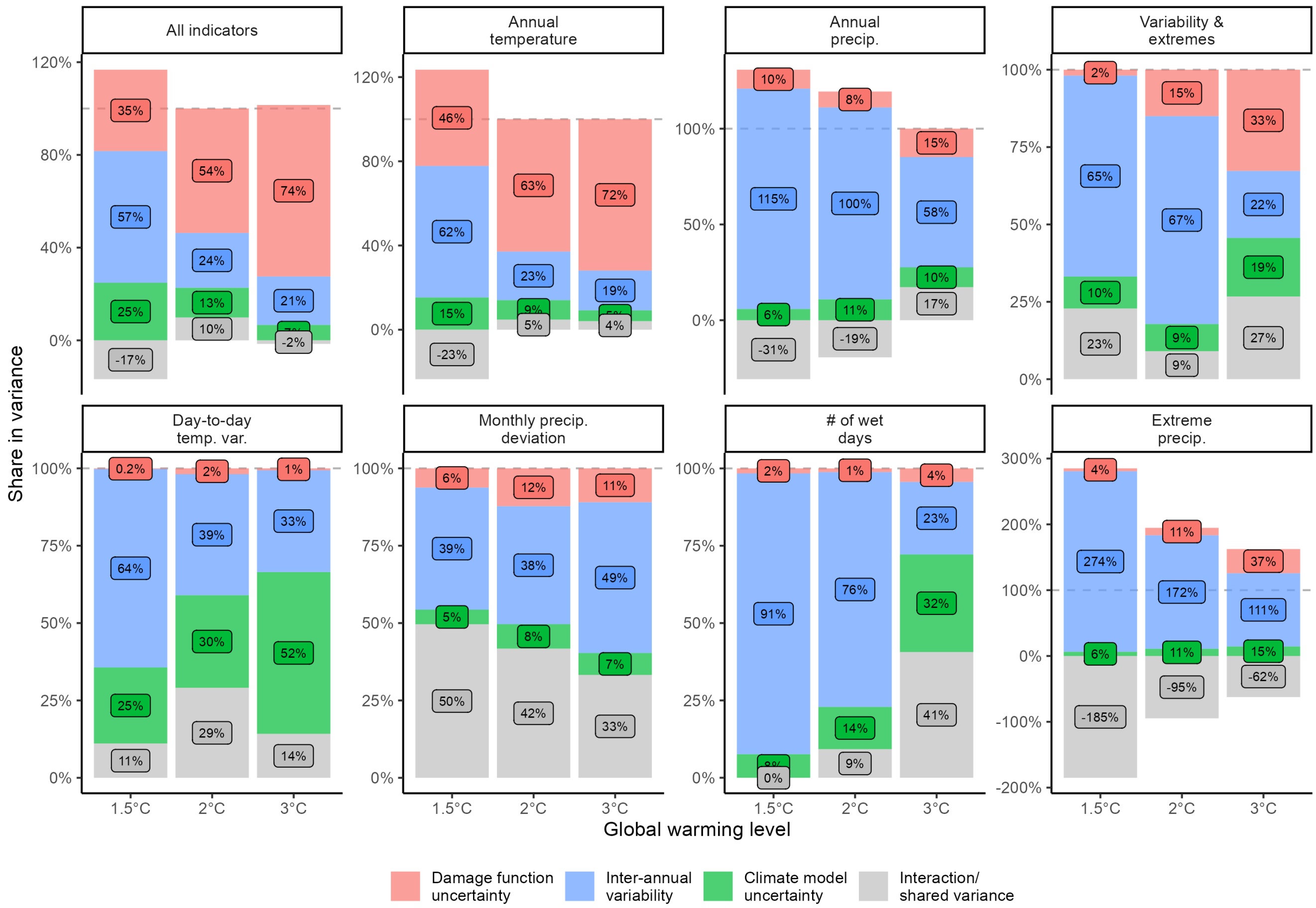


Figure S3. Variance decomposition of GDP impacts as displayed in Figure 2 but for raw negative interaction terms (for details, see **Methods** in the main manuscript).

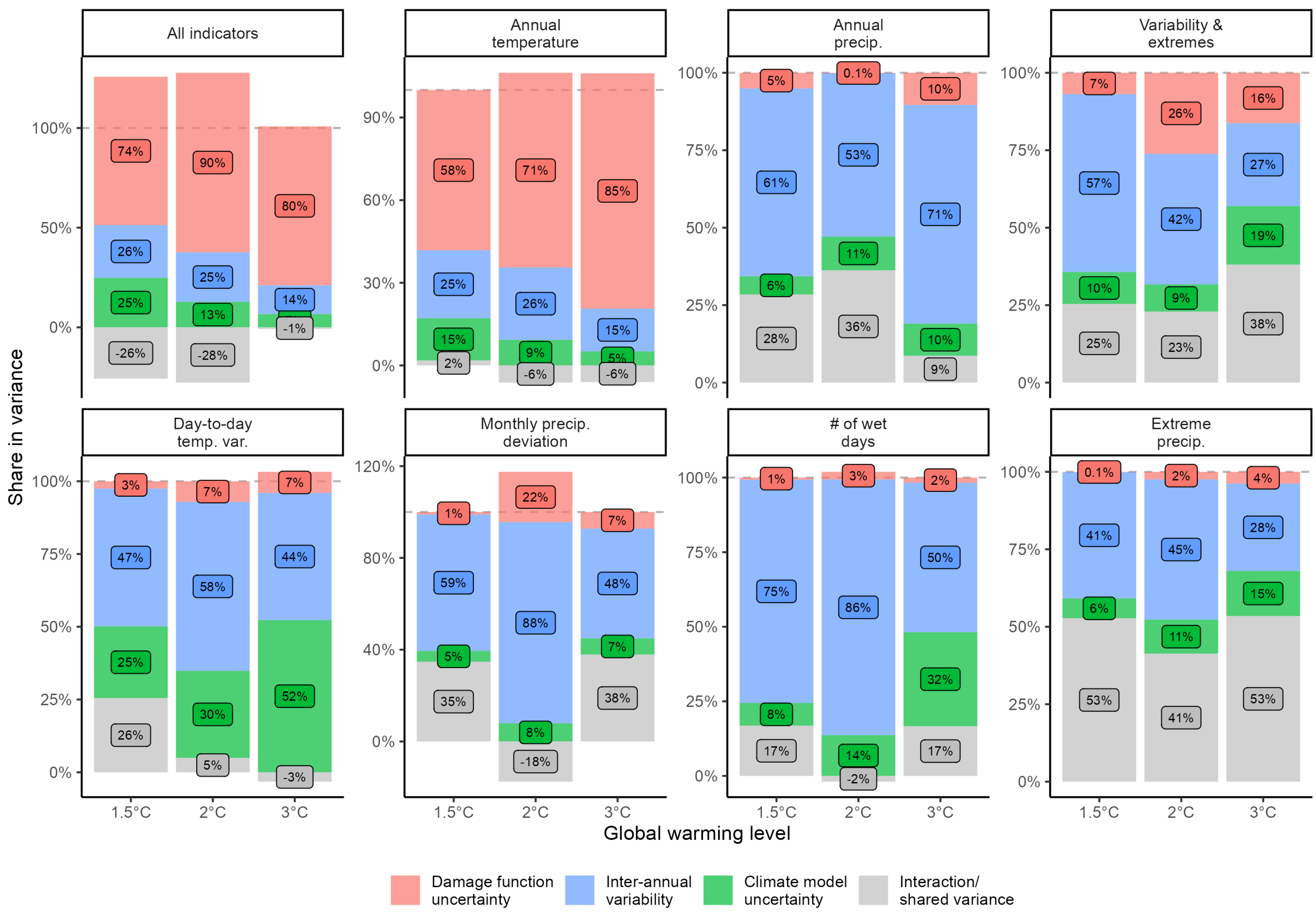


Figure S4. Variance decomposition of GDP impacts as displayed in Figure 2 but for raw negative interaction terms and for using MPI-ESM1-2-HR as median model (for details, see **Methods** in the main manuscript).

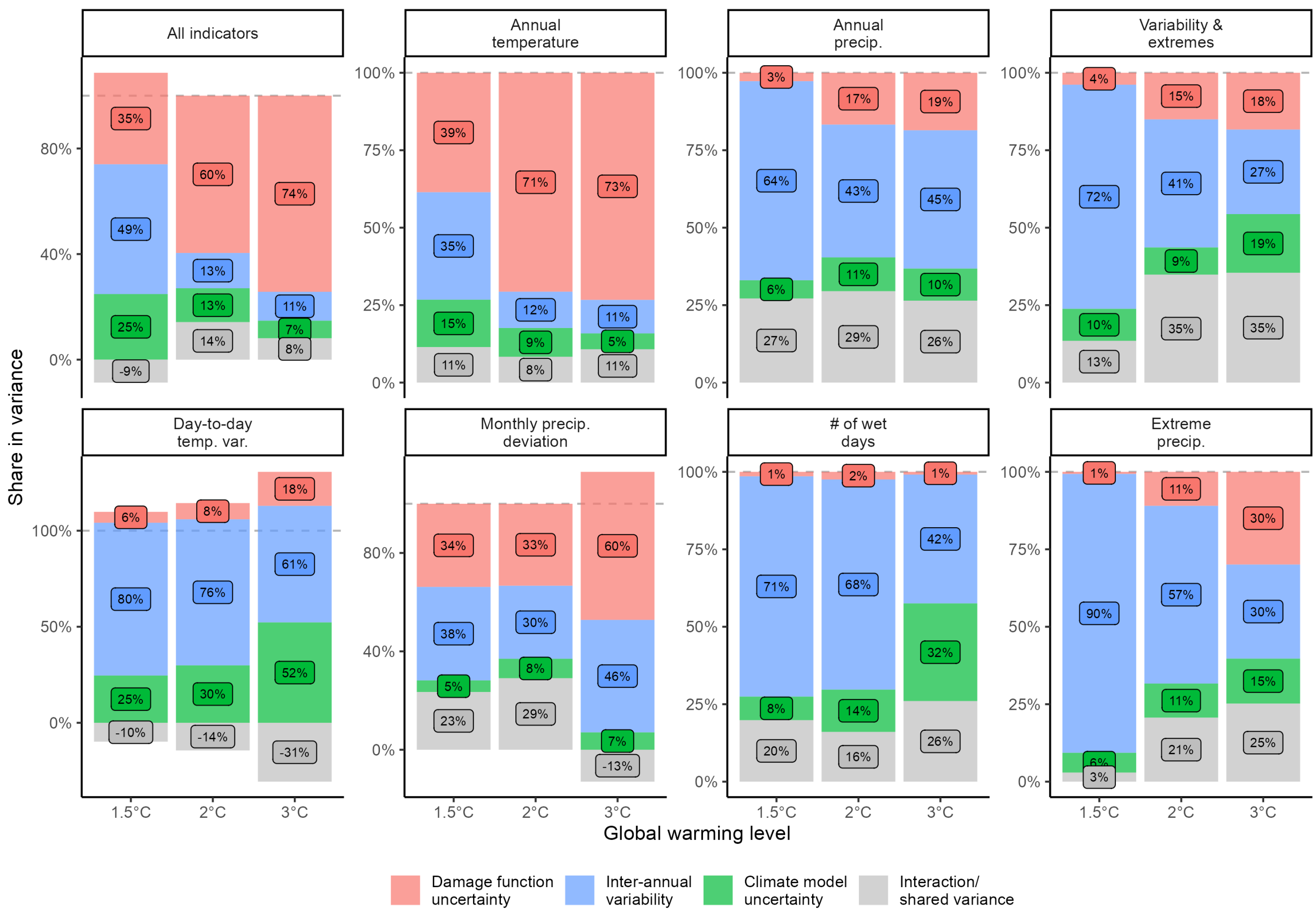


Figure S5. Variance decomposition of GDP impacts as displayed in Figure 2 but for raw negative interaction terms and for using EC-Earth3 as median model (for details, see **Methods** in the main manuscript).

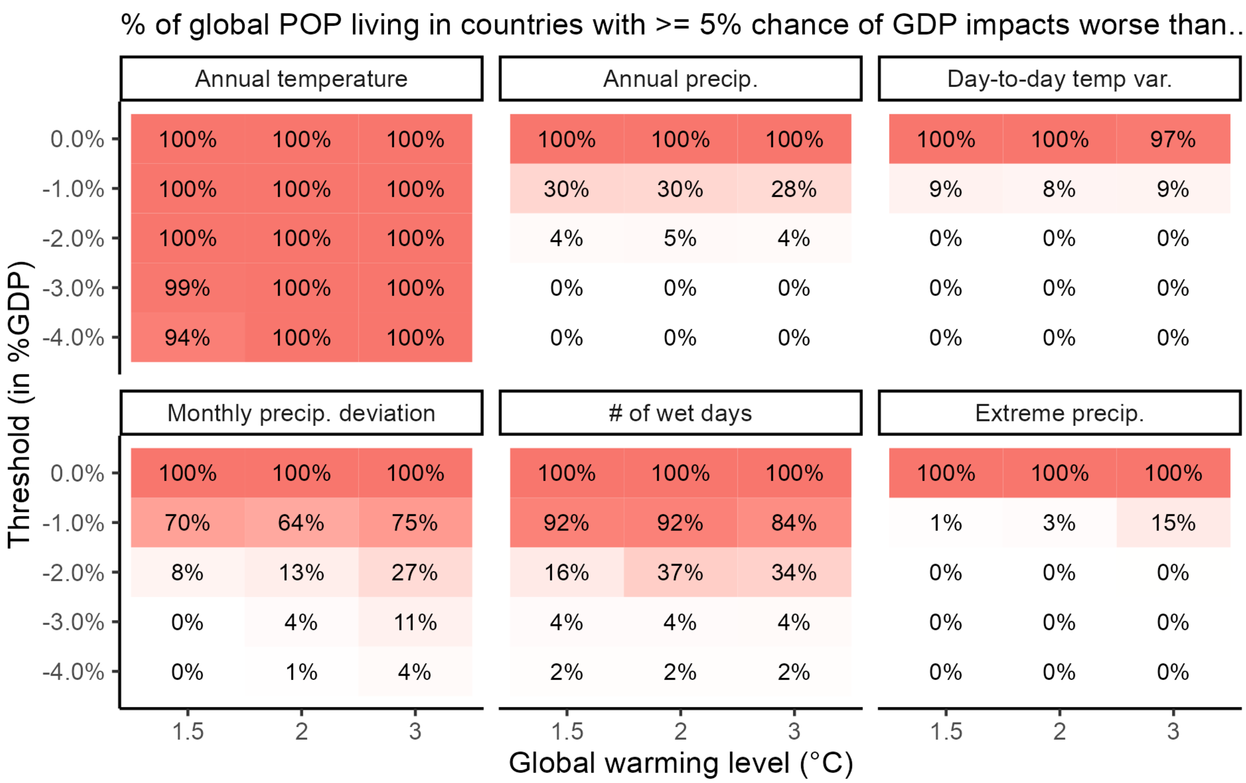


Figure S6. Exposure of global population to tail GDP impacts (95th percentile). Share of the current global population that lives in countries whose projected GDP impacts for the respective climate indicator (panel) and warming level (x-axis) exceed the given threshold (y-axis) for at least 5% of the GDP impact distribution.

Appendix C - Additional results and information on dose-response function estimation

Regressions underlying the dose-response functions

Dose-response functions used for our damage projections are derived using the sample and main specification by ref.[1], which is displayed in column (5) of Table S4. To compare with a status quo approach where the temperature dose-response function is estimated solely by controlling for annual precipitation, we remove all other climate indicators from the specification and re-estimate the model using the same sample (see column (1) in Table S4). Note that we display columns (3) and (4) for the sake of completeness, but we do not use these specifications for any of our results and we use the results from column (2) only for Figure 4b in the main manuscript.

Marginal effects of annual mean temperature on income.

We calculate the marginal effect of a +1°C increase in annual mean temperature on income growth (in log-scale) following ref.[2] as follows:

$$\beta_1^T + \beta_2^T + T_0(\beta_3^T + \beta_4^T) \tag{S1}$$

where the notation for the regression coefficients is taken from Equation 7 in the **Methods** section and T_0 denotes a given territory's initial temperature prior to the +1°C increase. The marginal effects in Figure 4b are based on the regression models in Table S4, columns (1), (2) and (5). To convert marginal effects from log-scale to % of GDP, we exponentiate and subtract one.

Inflation adjustment in the dependent variable

Recently, a new study reviewing estimates for climate change damages[3] has criticized ref.[2] due to the lack of inflation adjustment in the dependent variable (nominal GDP per capita growth). Notably, ref.[2] has used the same sample as ref.[1], our source of dose-response functions. In contrast, ref.[4] uses the same sample but adjusts for inflation using GDP deflator data for the US (as all subnational income values in the underlying sample are expressed in nominal USD). Therefore, we convert the nominal per capita income values in the sample by ref.[1] into real terms based on World Bank data for the GDP deflator in the US, and then re-calculate the dependent variable by taking first differences of the log-transformed real per capita income. When re-estimating the model for the main specification by ref.[1], results are virtually identical (see Table S5). This is because all income per capita values are already expressed in USD such that all values from the same year are multiplied by the same inflation adjustment factor, which in log-scale is absorbed by the year fixed effect. Therefore, we conclude that inflation adjustment following ref.[4] would not alter the findings presented here.

Table S4. Regression models to estimate-dose-response functions

	Dependent variable:				
	Growth in subnational income per capita				
	(1)	(2)	(3)	(4)	(5)
	"status quo"				Kotz et al., 2022
D.MeanTemp	6e-03***	1.8e-03	1.6e-03	1.3e-03	9.6e-04
	(4.7e-03)	(4.8e-03)	(4.8e-03)	(4.8e-03)	(4.8e-03)
L.D.MeanTemp	-4.3e-04	-2.4e-03	-2.2e-03	-2.1e-03	-2.3e-03
	(5.8e-03)	(6e-03)	(6e-03)	(5.9e-03)	(5.9e-03)
D.MeanTemp:MeanTemp	-1e-03***	-1e-03*	-1.1e-03**	-1.1e-03**	-1.1e-03**
	(4.9e-04)	(5.2e-04)	(4.9e-04)	(5e-04)	(5.1e-04)
L.D.MeanTemp:L.MeanTemp	-6e-04***	-5.5e-04	-6.7e-04	-6.6e-04	-6.5e-04
	(5.2e-04)	(5.3e-04)	(5.2e-04)	(5.2e-04)	(5.2e-04)
Annual precip.	1.5e-05	1e-05	6.3e-05**	4.3e-05*	5.8e-05**
	(2.3e-05)	(2.3e-05)	(2.7e-05)	(2.6e-05)	(2.7e-05)
Annual precip. sq.	-4e-10	1e-10	-3.9e-09**	-2.8e-09*	-3.8e-09**
	(1.9e-09)	(1.9e-09)	(1.8e-09)	(1.6e-09)	(1.7e-09)
Day-to-day temp. var.		-5.3e-02***	-5.8e-02***	-5.7e-02***	-5.8e-02***
		(0.017)	(0.017)	(0.016)	(0.016)
No. of wet days			-9.9e-04**	-1.3e-03**	-1.3e-03**
			(4.7e-04)	(5.2e-04)	(5.3e-04)
No. of wet days sq.			7.3e-07	1.2e-06	1.1e-06
			(1.2e-06)	(1.2e-06)	(1.2e-06)
Monthly precip. deviation				0.014	0.017*
				(0.01)	(0.01)
Monthly precip. deviation sq.				-2.9e-02***	-2.8e-02***
				(9.8e-03)	(9.9e-03)
Extreme precip.					-3.7e-04***
					(8.7e-05)
Extreme precip.:MeanTemp					1.3e-05***
					(3.7e-06)
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	30121	30121	30121	30121	30121
R^2	2.9e-03	8.2e-03	0.011	0.013	0.014
Adjusted R^2	-5.3e-02	-4.7e-02	-4.5e-02	-4.3e-02	-4.1e-02

Note: All standard errors clustered at country level $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table S5. Kotz et al., 2022 main specification with and without inflation adjustment via US GDP deflator

	Dependent variable:	
	Growth in subnational income per capita	
	(1)	(2)
	Kotz et al., 2022	Inflation-adjusted
D.MeanTemp	9.6e-04	9.6e-04
	(4.8e-03)	(4.8e-03)
L.D.MeanTemp	-2.3e-03	-2.3e-03
	(5.9e-03)	(5.9e-03)
D.MeanTemp:MeanTemp	-1.1e-03**	-1.1e-03**
	(5.1e-04)	(5.1e-04)
L.D.MeanTemp:L.MeanTemp	-6.5e-04	-6.5e-04
	(5.2e-04)	(5.2e-04)
Annual precip.	5.8e-05**	5.8e-05**
	(2.7e-05)	(2.7e-05)
Annual precip. sq.	-3.8e-09**	-3.8e-09**
	(1.7e-09)	(1.7e-09)
Day-to-day temp. var.	-5.8e-02***	-5.8e-02***
	(0.016)	(0.016)
Monthly precip. deviation	0.017*	0.017*
	(0.01)	(0.01)
Monthly precip. deviation sq.	-2.8e-02***	-2.8e-02***
	(9.9e-03)	(9.9e-03)
No. of wet days	-1.3e-03**	-1.3e-03**
	(5.3e-04)	(5.3e-04)
No. of wet days sq.	1.1e-06	1.1e-06
	(1.2e-06)	(1.2e-06)
Extreme precip.	-3.7e-04***	-3.7e-04***
	(8.7e-05)	(8.7e-05)
Extreme precip.:MeanTemp	1.3e-05***	1.3e-05***
	(3.7e-06)	(3.7e-06)
Region fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	30121	30121
R^2	0.014	0.014
Adjusted R^2	-4.1e-02	-4.1e-02
Note: All standard errors clustered at the country level	$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$	

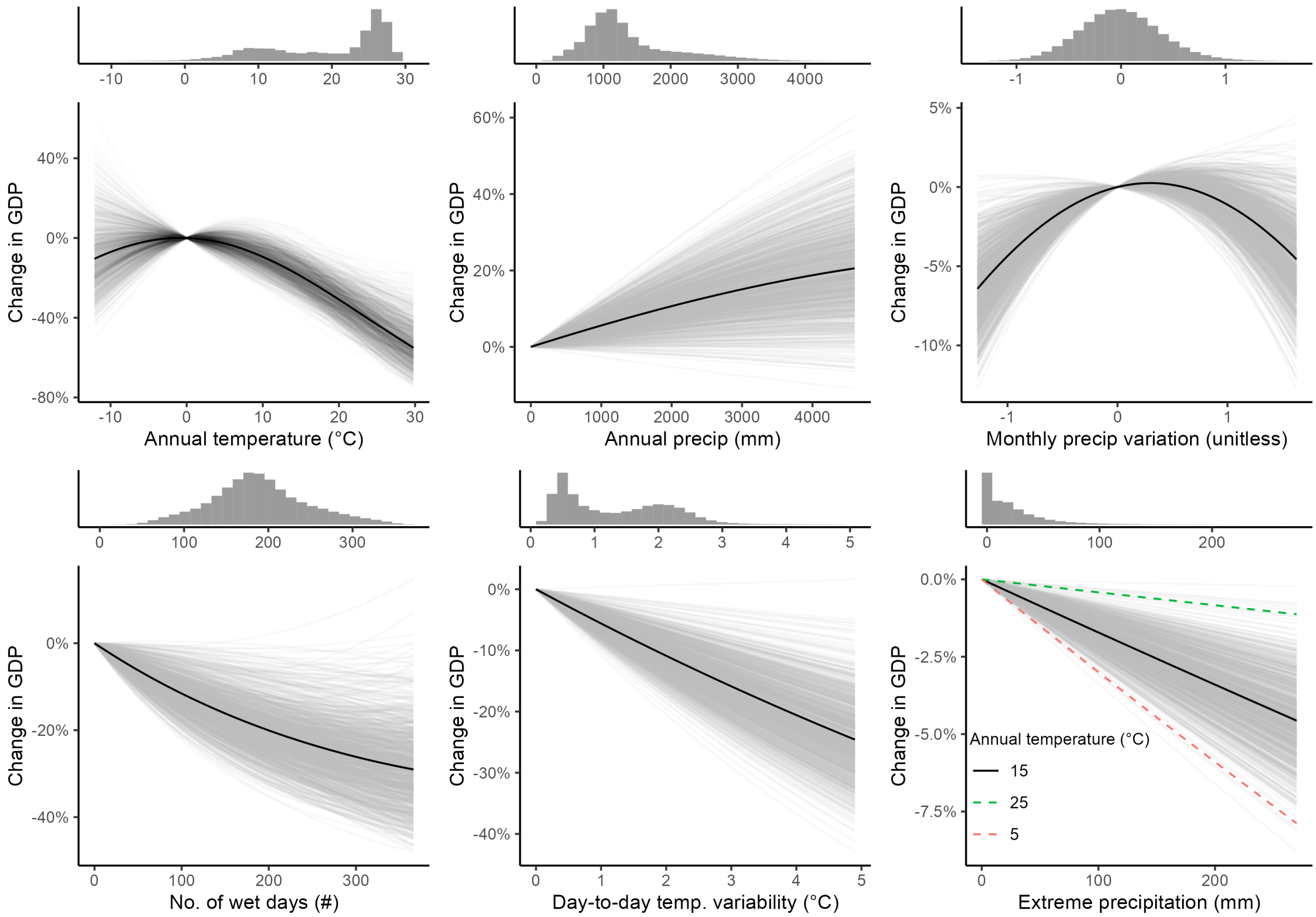


Figure S7. Dose-response functions for all six climate indicators used for damage projections, with ADM1-level distributions during the baseline period for all CMIP6 models. The black line indicates the dose-response function based on point estimates by ref.[1], while grey lines denote $N = 1,000$ draws from the multivariate Gaussian distribution based on standard errors clustered at the country level. Marginal histograms display the distribution of ADM1 regions for the respective climate indicator across all CMIP6 models during the +0.84°C baseline period. Change in GDP is expressed in % of GDP, not in log-scale, such that functions that are linear in log-scale (day-to-day temperature variability and extreme precipitation) appear slightly non-linear. Since the dose-response function for extreme precipitation interacts with the annual mean temperature, we show parameter draws and the black line for an example value of 15°C and illustrate how the black line would shift for different temperature levels via the dashed lines. As the dose-response function for annual mean temperature that underlies our analysis is trajectory-dependent (see **Methods**), the function displayed here is derived by simply integrating the formula for the marginal effect of annual mean temperature given in Equation S1 and serves illustrative purposes. Value ranges displayed for each climate indicator range from the 0.1th to the 99.9th percentile in the baseline period across all CMIP6 models, omitting extreme outliers for visual purposes.

Appendix D - Main results for bias-corrected CMIP6 data

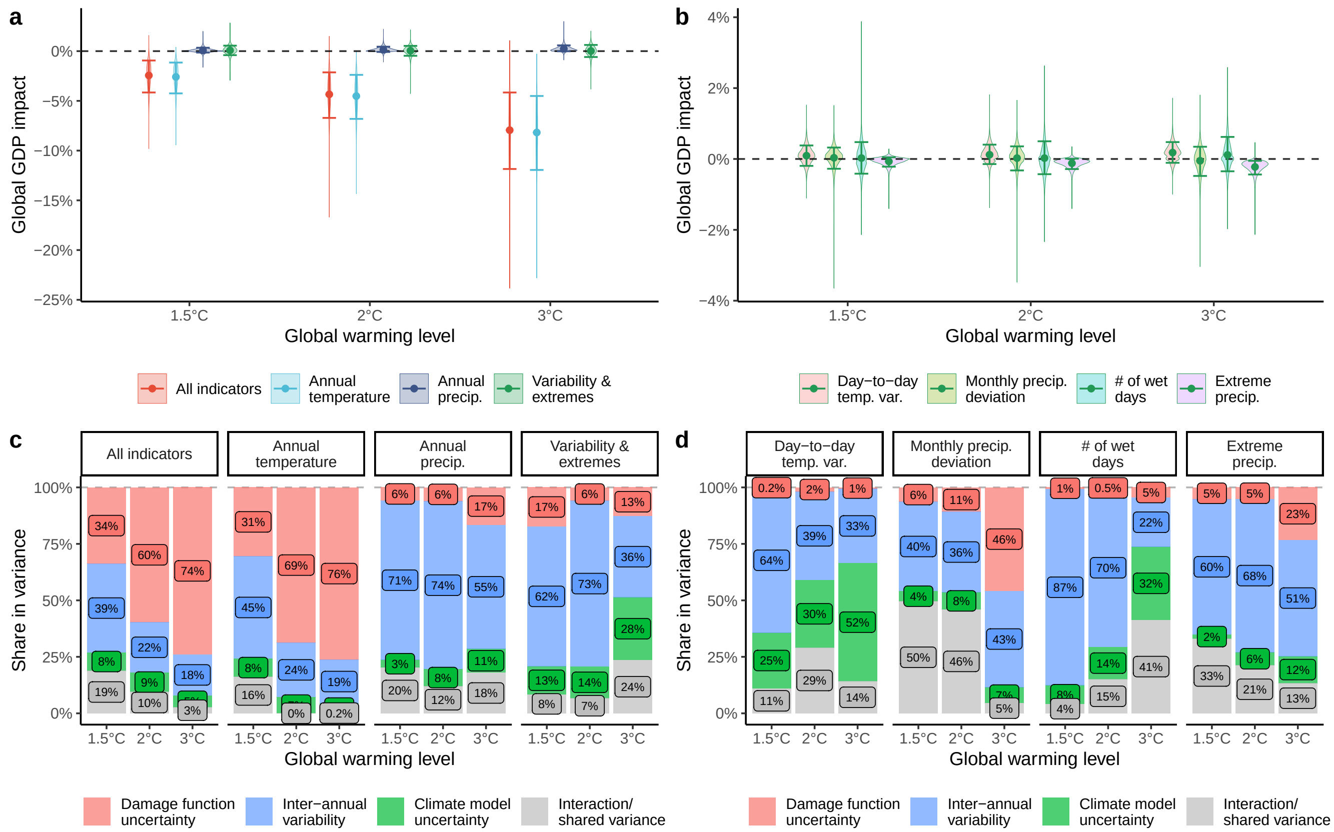


Figure S8. Distribution and variance decomposition of global GDP impacts under different global warming levels using bias-corrected CMIP6 data. For further descriptions, see the caption of Figure 2 in the main manuscript.

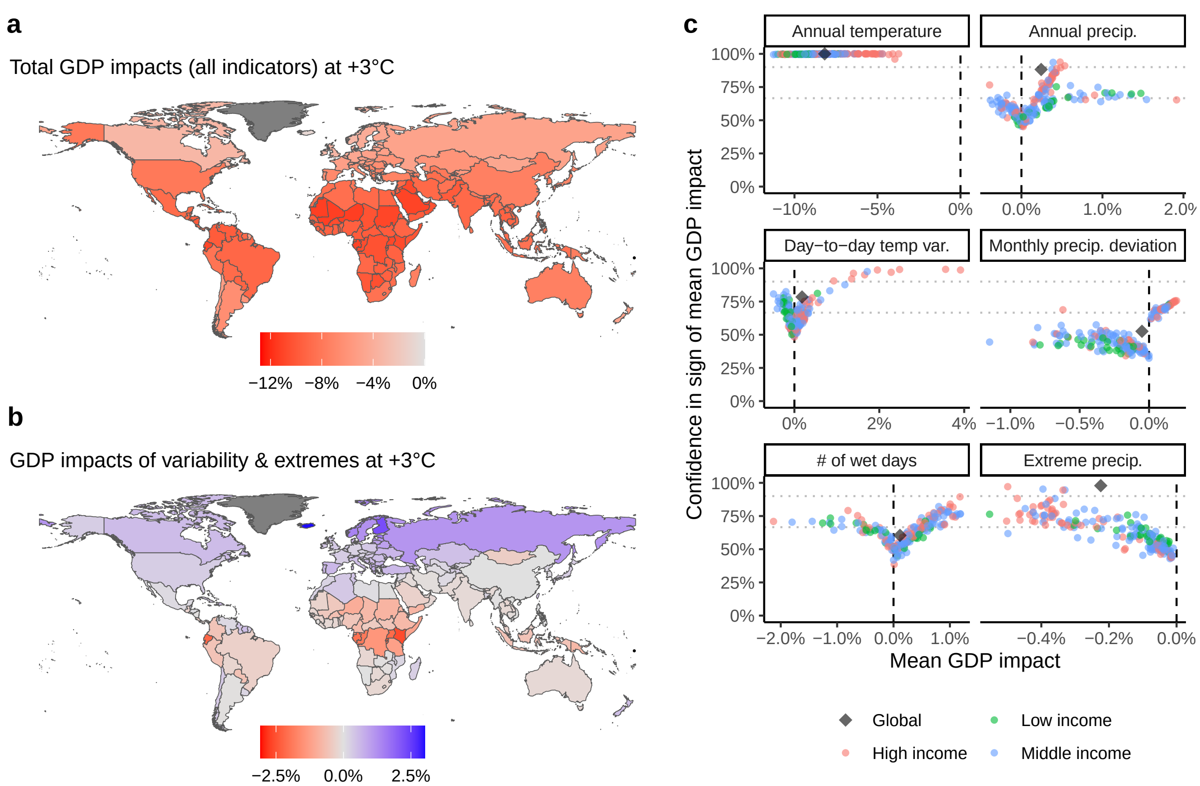


Figure S9. Country-level GDP impacts and uncertainty under +3°C of global warming using bias-corrected CMIP6 data. For further descriptions, see the caption of Figure 3 in the main manuscript.

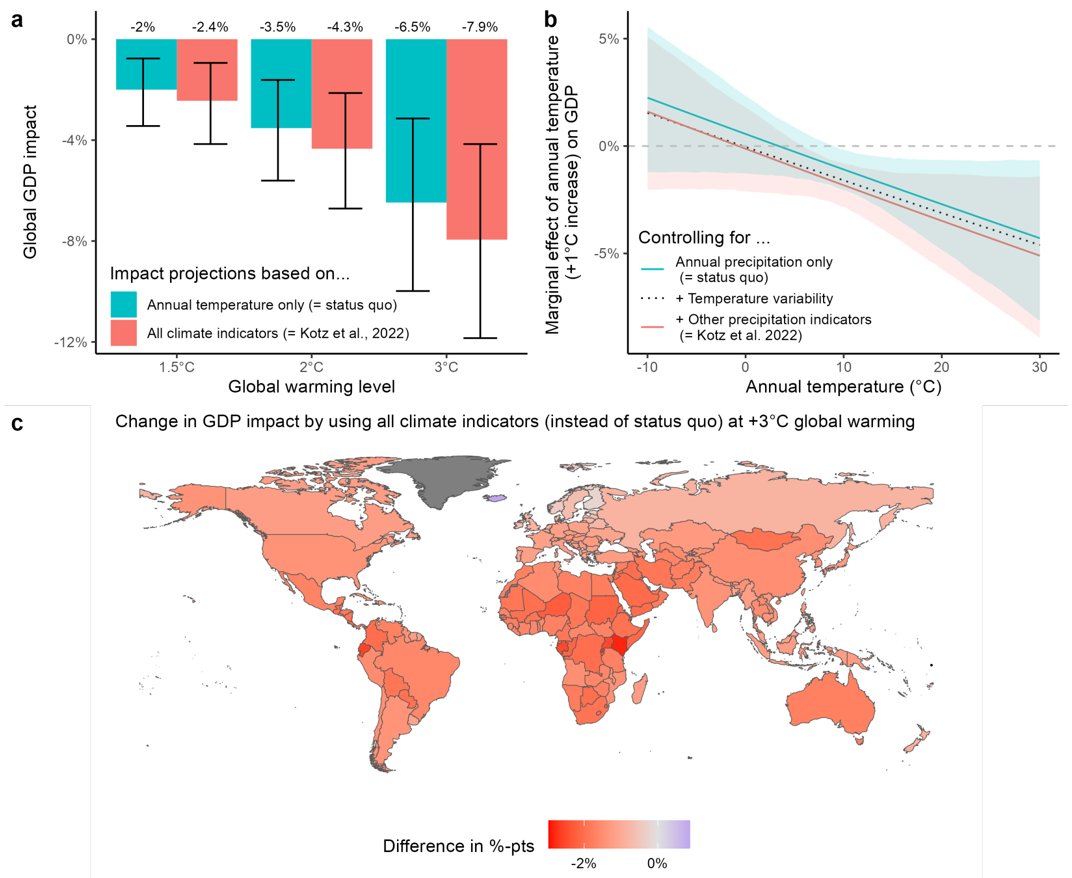
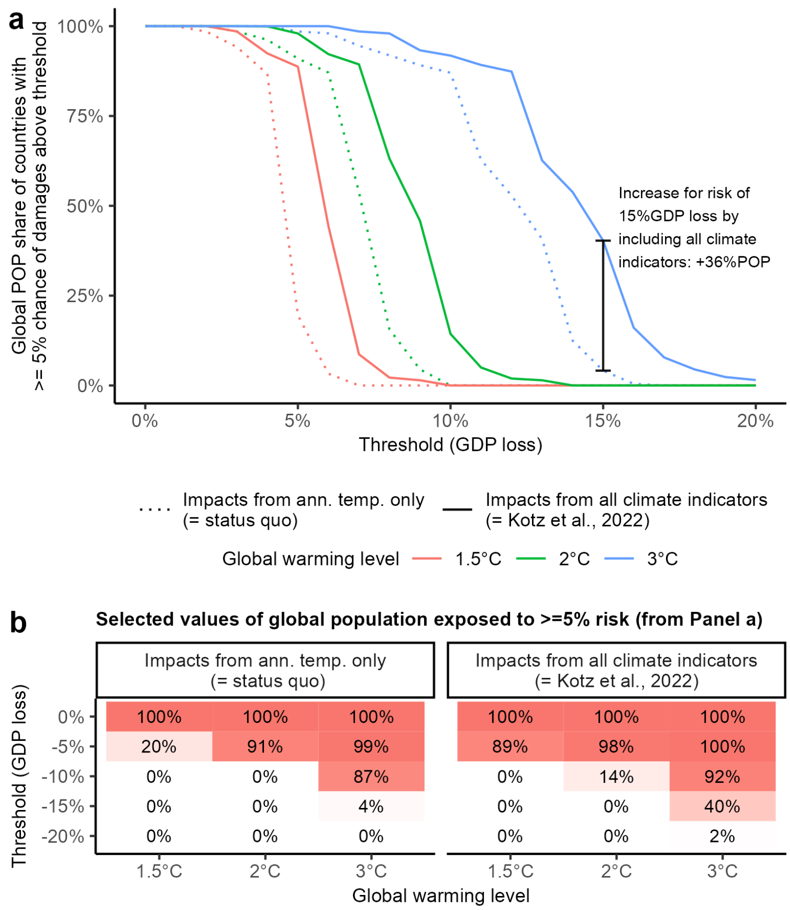


Figure S10. Comparison with impact projections based on considering annual temperature only (= status quo) using bias-corrected CMIP6 data. For further descriptions, see the caption of Figure 4 in the main manuscript.



Threshold (GDP loss)	Impacts from ann. temp. only (= status quo) 1.5°C	2°C	3°C	Impacts from all climate indicators (= Kotz et al., 2022) 1.5°C	2°C	3°C
0%	100%	100%	100%	100%	100%	100%
-5%	20%	91%	99%	89%	98%	100%
-10%	0%	0%	87%	0%	14%	92%
-15%	0%	0%	4%	0%	0%	40%
-20%	0%	0%	0%	0%	0%	2%

Figure S11. Exposure of global population to tail risks (5th percentile) of GDP losses using bias-corrected CMIP6 data. For further descriptions, see the caption of Figure 5 in the main manuscript.

	Impact channel	+1°C	+1.5°C	+2°C	+3°C	+4°C
1	All indicators	-0.6% (-1.75 to 0.45%)	-2.44% (-4.16 to -0.94%)	-4.34% (-6.71 to -2.13%)	-7.95% (-11.85 to -4.16%)	-11.66% (-17.02 to -6.32%)
2	Annual temperature	-0.66% (-1.84 to 0.4%)	-2.59% (-4.25 to -1.15%)	-4.52% (-6.81 to -2.38%)	-8.18% (-11.95 to -4.51%)	-11.75% (-16.92 to -6.58%)
3	Annual precip.	0.02% (-0.19 to 0.25%)	0.08% (-0.14 to 0.34%)	0.15% (-0.08 to 0.44%)	0.24% (-0.01 to 0.58%)	0.34% (0.01 to 0.75%)
4	Day-to-day temp var.	0.03% (-0.24 to 0.31%)	0.09% (-0.2 to 0.38%)	0.12% (-0.14 to 0.4%)	0.18% (-0.11 to 0.48%)	0.2% (-0.14 to 0.55%)
5	Monthly precip. deviation	0.03% (-0.26 to 0.29%)	0.03% (-0.28 to 0.32%)	0.02% (-0.32 to 0.36%)	-0.05% (-0.48 to 0.35%)	-0.23% (-0.89 to 0.32%)
6	# of wet days	0.02% (-0.39 to 0.43%)	0.03% (-0.42 to 0.48%)	0.02% (-0.43 to 0.5%)	0.11% (-0.35 to 0.62%)	0.18% (-0.37 to 0.77%)
7	Extreme precip.	-0.02% (-0.16 to 0.09%)	-0.07% (-0.22 to 0.05%)	-0.12% (-0.28 to 0.01%)	-0.22% (-0.44 to -0.05%)	-0.37% (-0.67 to -0.12%)

Table S6. Global mean GDP impacts by warming level and climate indicator (upper and lower decile in parentheses) using bias-corrected CMIP6 data

References

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