

Supplementary Information

Chronicle of the Causes of Famine in the World during 1840–2019 and their Risks

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19 **Supplementary Table 1. Classification of contributing factors of famine**

Category	Factors	Keywords
Environmental	Drought	
	Flood	
	Other environmental factors	Insects, locusts, crop diseases, loss of cattle, shortage of seeds
Social	War / Conflict	
	Price rise / Economic crisis	Failure of food rationing system, Inflation
	Imperfect infrastructure	Fragmented market, imperfect transportation system
Domestic	Political regime	Colonization, socialism, communism, dictatorship, indifferent colonial government
	Poor government reaction	No food reserves, failure of relief distribution, failure of administering relief, land reform, continued collection of heavy taxes, resettlement, relocation, displacement
International	Insufficient or delayed aid, lack of non-food aid	Late request, insufficient shipment
	Embargo on food aid, blockade	Western hostility, indifference

Supplementary Table 2 Datasets

The datasets used in the logistic regression analysis are listed. Categories, names, available periods, and sources of each dataset are listed.

Aspect of the risk triangle	Dataset	Period	Source
Hazard	Soil water in cropland (kg/m ²)	1961–2014	H08 output
	Conflict	1961–2019	Uppsala Conflict Data Program [25] [24]
Vulnerability	Agricultural water input (kg/s)	1961–2014	H08 output
	Value of agricultural production (USD in 2004–2006)	1961–2016	FAOSTAT [26]
	Cereal import dependency (%)	2000–2014	FAOSTAT [27]
	GDP per capita (USD in 2019)	1961–2019	World Bank [28]
	Urban population rate (%)	1961–2019	World Bank [29]
	Gini coefficient	2002–2019	World Bank [30]

Supplementary Table 3 P-value of each value

The P-values of each variable are shown calculated under the null hypothesis that there is no significant difference between the variables of famine-experienced countries and those of other countries.

Data	P-value
Soil water	$2.12e^{-28}$
Conflict frequency	$2.15e^{-37}$
CAV	$1.85e^{-15}$
CID	$6.32e^{-3}$
GDP per capita	$1.92e^{-51}$
Urban population rate	$4.74e^{-43}$
Gini coefficient	$1.90e^{-3}$

Supplementary Table 4 P-value between all pairs of the coefficients

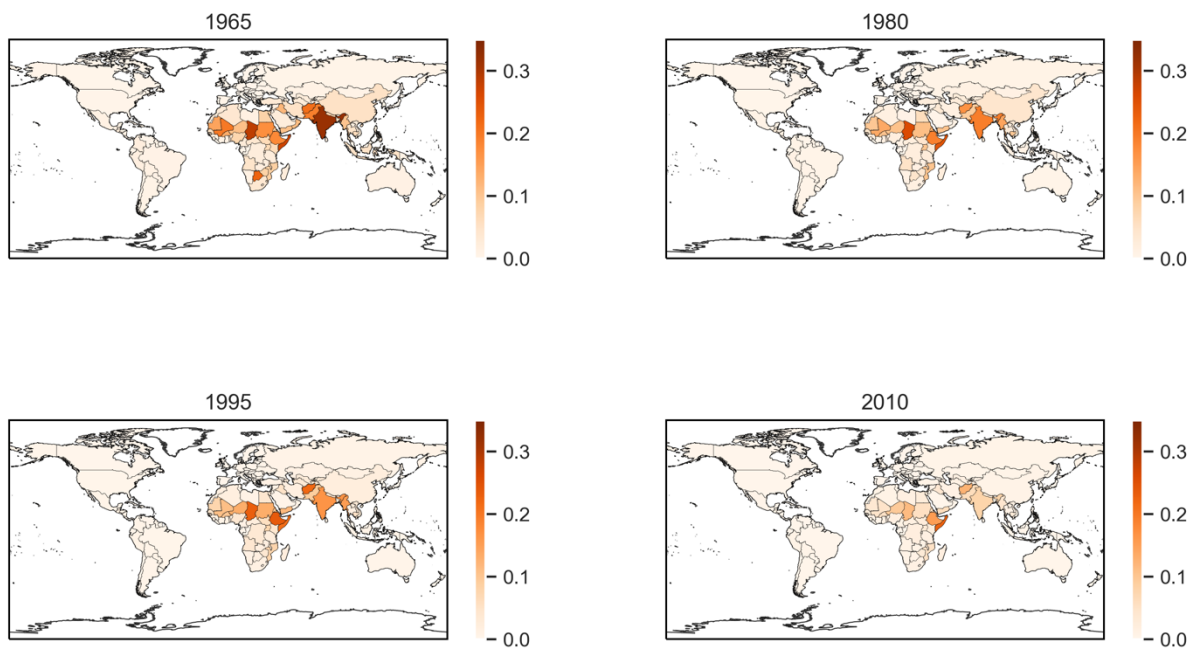
The P-values calculated for every pair of variables under the null hypothesis that there is no significant difference between them are shown.

	Conflict frequency	CAV	CID	GDP per cap.	UPR	Gini Coeff.
Soil water	$1.10e^{-123}$	$1.50e^{-119}$	$2.47e^{-108}$	$3.71e^{-8}$	$1.44e^{-65}$	$6.47e^{-108}$
Conflict frequency	—	$3.76e^{-29}$	$6.34e^{-94}$	$2.42e^{-108}$	$1.02e^{-78}$	$3.00e^{-93}$
CAV	—	—	$3.93e^{-97}$	$8.08e^{-104}$	$2.93e^{-73}$	$7.06e^{-77}$
CID	—	—	—	$5.43e^{-84}$	$4.12e^{-40}$	$3.28e^{-24}$
GDP per cap.	—	—	—	—	$4.20e^{-48}$	$2.07e^{-91}$
UPR	—	—	—	—	—	$5.51e^{-49}$

39 **Supplementary Table 5 Dataset used for future prediction**

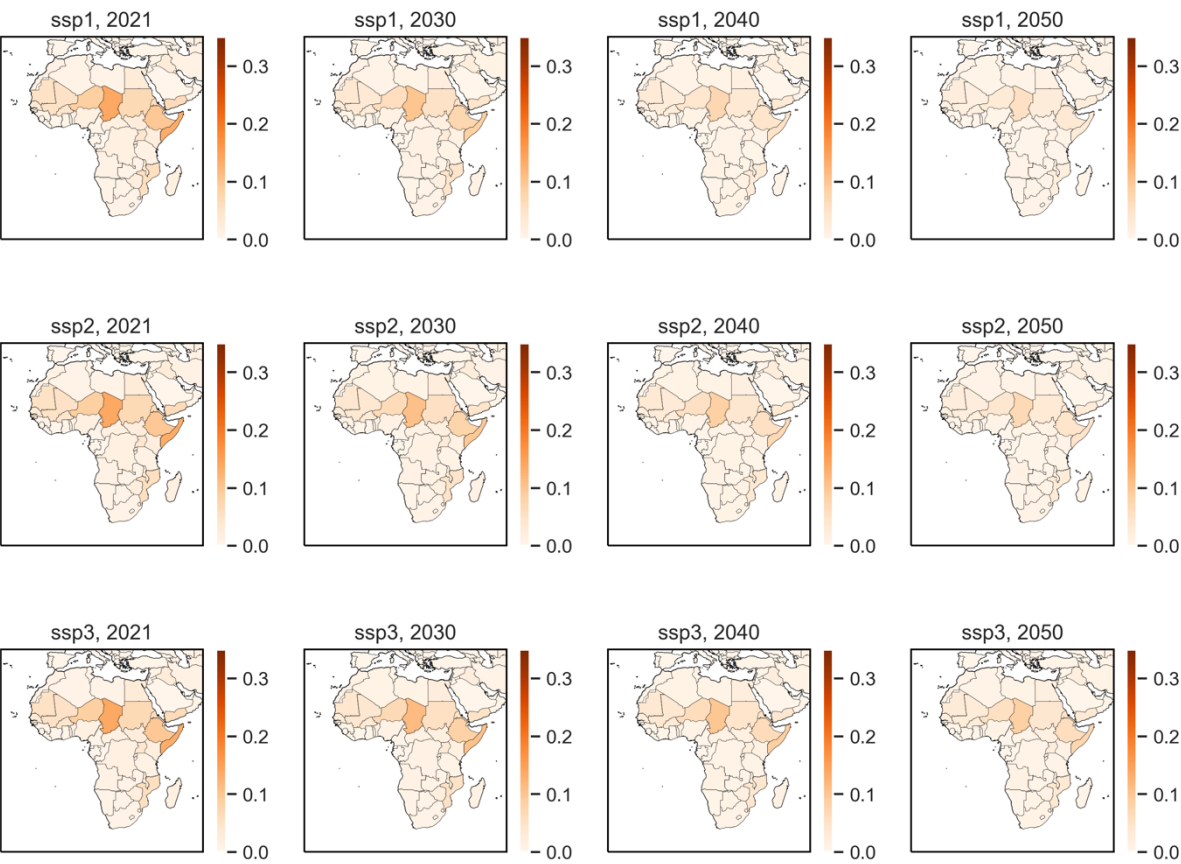
	Period	Source
GDP in SSP1, SSP2, and SSP3 (USD in 2005)	2020–2050	NIES [23]
Population in SSP1, SSP2, and SSP3	2020–2050	NIES [23]
Soil water in RCP2.6, RCP4.5, RCP6.0, and RCP8.5 (kg/m ²)	2020–2050	H08 output [22] ISIMIP2a Simulation Data [31]
Urban population rate (%)	2020–2050	United Nations [32]

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Supplementary Fig. 1 Probability of famine in each country (world map)

The results of the regression analysis are illustrated on the world maps. The estimated probabilities of famine in 1965, 1980, 1995, and 2010 are shown in each map.



50 **Supplementary Fig. 2 Probability of famine in the future**

51 The results of the future projection are shown on the maps for each SSP and year. Countries other than Africa are
52 omitted because most of their results are less than 0.01.

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