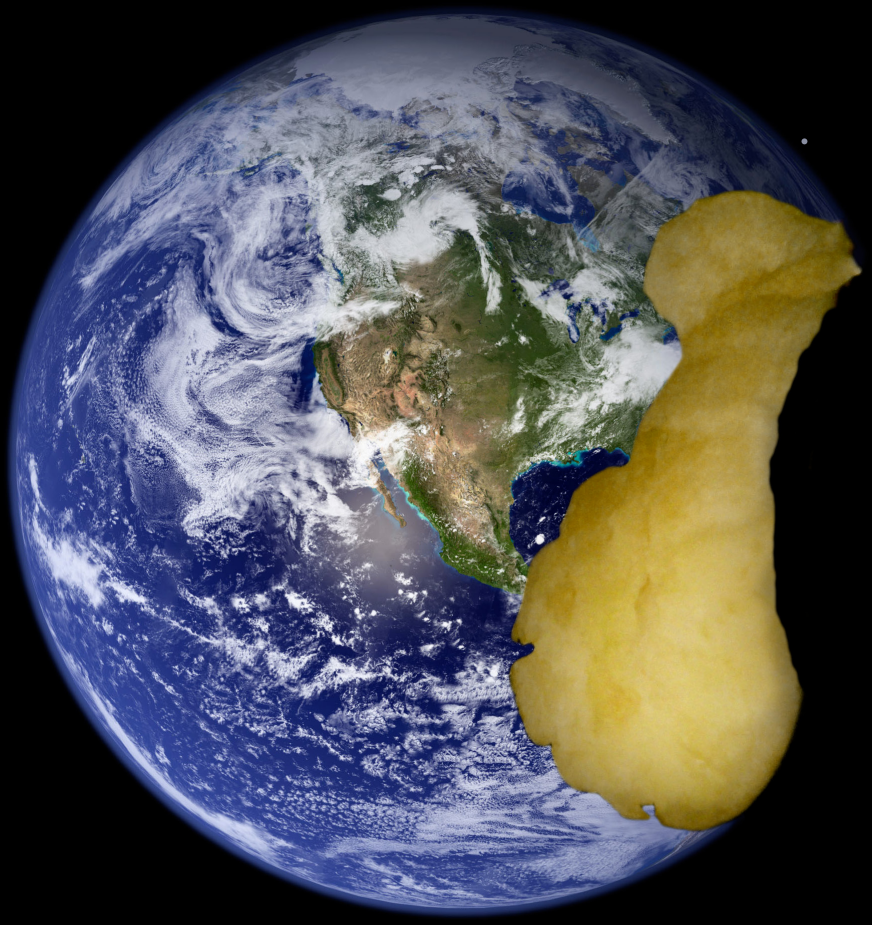
UNEP

ERISC PHASE II:
HOW FOOD PRICES LINK ENVIRONMENTAL CONSTRAINTS TO SOVEREIGN CREDIT RISK



ERISC: Environmental Risk Integration in Sovereign Credit Analysis

UNEP FINANCE INITIATIVE

Global Footprint Network®
Advancing the Science of Sustainability

United Nations Environment Programme

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This report contributes to implementation of:

Natural Capital Declaration
Financial sector leadership on natural capital

Secretariat:
UNEP FINANCE INITIATIVE
GCP GLOBAL CANOPY PROGRAMME

KEY MESSAGES

Higher and more volatile food prices are key transmission mechanisms through which environmental risks and constraints such as climate change, ecosystem degradation and water scarcity will impact national economies. If these impacts are significant enough, they may affect a country's credit rating and the risk exposure of sovereign bondholders.

The global food system is vulnerable to changing environmental conditions. Climate change along with land and water scarcity will increasingly affect food production on the supply side. At the same time, demand for food will increase as a result of global population and income growth. The growing imbalance between rising demand for food and the capacity to supply it, will lead to greater variability in food production, higher and more volatile food commodity prices, and a higher likelihood of price shocks.

These food commodity price shocks will affect every country differently. To assess which countries would face the largest economic risks, we have modelled the impact of a rapid doubling in global food commodity prices on three macro-economic indicators for 110 countries: Gross Domestic Product (GDP); Current account balance; and Consumer Price Index (CPI).

KEY FINDINGS

- The risk exposure of individual countries is largely determined by their net food trade and the share of average household spending on food commodities. Countries such as **Egypt, Morocco**, and the **Philippines** that combine high food commodity imports and high household spending on these commodities see the worst effects in terms of reduction in absolute GDP, worsening of current account balances, and higher inflation. A number of large emerging market countries, including **China, Indonesia, and Turkey,** are also strongly impacted as they have high household spending levels on food commodities and moderate net imports of these commodities.
- Nine countries experience an increase in GDP, including South American cash crop exporters such as **Paraguay and Uruguay** and agricultural powerhouses such as **Brazil, Australia, Canada, and the United States**.
- Globally, negative effects massively outweigh positive effects in absolute terms. In the stress test, **China** experiences an absolute reduction in GDP of USD 161 billion, the highest negative value of any country. The highest positive effect on GDP, seen in the **US**, is 50 times smaller, at USD 3 billion.
- In 23 countries, a doubling in food commodity prices leads to an absolute increase in the consumer price index of more than 10 percentage points. These include many of the countries that experienced social unrest during the food price crisis of 2007-08, including **Morocco**, **Bangladesh**, **Egypt,** and **Indonesia**.
- Overall, countries with higher credit ratings tend to be less exposed to economic risks resulting from a food commodity price spike. Nonetheless, there is considerable variety in the economic risks highlighted by the stress test for each credit rating grade, and countries in each of these grades face potentially significant effects.
- Wealthy countries tend to contribute most to the environmental constraints that make food prices higher and more volatile as they consume the most natural resources and environmental services on a per capita basis. The resulting economic risk, however, is largely borne by poorer countries.
- A simulated integration of the results in a country risk assessment carried out by a participating financial institution in the ERISC project found that 58 out of 78 countries experience a downgrade in the quantitative rating module of at least one notch (in a 19-notch rating scale). Sixteen countries, including **India**, would be downgraded by three notches or more.

Ranking of Countries Most Affected by Food Price Shocks According to GDP Impact

RANK	COUNTRY/ REGION	GDP effect* (%)	Current account effect** (% of GDP)	CPI effect*** (%)	Net Food Commodity Imports, including embedded (% of GDP)	GNI, PPP (2014)	Gen. Gvt. Debt/ GDP (2014)	S&P rating (foreign currency LT) ****
1	Benin	-8.6	-11.9	18.8	10.4%	2,020	34.0	-
2	Nigeria	-7.2	-1.4	47.8	1.0%	5,710	10.5	B+
3	Côte d'Ivoire	-7.0	-7.1	21.7	7.1%	3,130	36.6	-
4	Senegal	-6.6	-7.5	17.4	7.1%	2,300	53.1	B+
5	Ghana	-6.5	-1.0	35.7	2.2%	3,900	69.0	B-
6	Mozambique	-6.1	-1.5	29.0	4.1%	1,120	57.5	B-
7	Rwanda	-5.5	0.9	46.5	1.3%	1,630	30.2	B+
8	Malawi	-5.4	0.7	35.3	1.6%	790	--	-
9	Ethiopia	-5.4	-1.4	32.4	2.2%	1,500	22.3	B
10	Tanzania	-5.2	-0.1	30.0	1.2%	2,510	35.2	-
11	Burkina Faso	-5.1	-2.3	23.0	2.5%	1,600	28.5	B-
12	Cameroon	-4.9	-2.7	23.6	3.2%	2,950	25.4	B
13	Guinea	-4.6	-4.8	14.6	5.4%	1,130	41.1	-
14	Morocco	-4.5	-1.7	19.4	2.1%	7,290	63.4	BBB-
15	Kenya	-4.4	-0.6	28.4	1.8%	2,940	52.6	B+
16	Lao PDR	-4.1	-0.1	24.9	0.4%	5,060	62.5	-
17	Tunisia	-3.9	-1.9	15.7	2.2%	11,020	50.0	-
18	Bangladesh	-3.5	-1.3	19.0	1.3%	3,330	33.9	BB-
19	Egypt	-3.3	-2.2	13.2	2.4%	10,260	90.5	B-
20	Georgia	-3.2	-1.3	13.8	1.9%	7,510	34.8	BB-
21	Nepal	-3.2	-1.3	17.5	1.3%	2,410	27.7	-
22	Nicaragua	-3.2	-2.3	12.8	2.8%	4,790	29.5	-
23	Uganda	-3.2	0.0	19.1	0.9%	1,720	31.4	B
24	Togo	-3.1	-0.5	23.9	1.6%	1,290	58.7	-
25	Madagascar	-3.1	-1.9	14.9	2.6%	1,400	34.7	-
26	Jordan	-2.9	-3.7	4.8	3.3%	11,910	89.0	BB-
27	Kyrgyzstan	-2.8	-2.6	8.3	2.8%	3,220	53.0	-
28	Sri Lanka	-2.7	-0.3	13.7	0.6%	10,370	75.5	B+
29	Zambia	-2.6	0.8	15.0	-1.0%	3,690	35.2	B
30	Indonesia	-2.5	-0.6	11.0	0.7%	10,190	25.0	BB+
31	Honduras	-2.5	-2.8	4.8	2.6%	4,570	45.7	B+
32	India	-2.4	0.7	13.8	-0.6%	5,630	66.1	BBB-
33	Albania	-2.4	-1.4	8.6	1.7%	10,180	72.5	B+
34	Armenia	-2.3	-0.9	11.4	1.6%	8,450	41.3	-
35	Bolivia	-2.3	-0.4	11.1	0.3%	6,290	33.0	BB
36	Belarus	-2.2	0.0	10.7	0.2%	17,610	40.5	B-
37	Jamaica	-2.1	-2.4	4.0	2.3%	8,640	135.7	B
38	Mauritius	-2.1	-1.9	5.4	1.9%	18,150	56.2	-
39	Guatemala	-2.0	-1.1	11.1	1.3%	7,250	24.3	BB
40	Philippines	-1.9	-1.2	7.1	1.2%	8,450	36.4	BBB
41	Peru	-1.6	-0.8	5.9	0.8%	11,440	20.7	BBB+
42	Costa Rica	-1.6	-1.3	4.4	1.3%	14,420	39.7	BB-
43	China	-1.6	-0.5	7.4	0.5%	13,170	41.1	AA-
44	Dominican Republic	-1.5	-1.1	5.0	1.1%	12,600	35.0	BB-
45	Croatia	-1.5	0.0	7.5	0.0%	20,500	85.1	BB
46	Ecuador	-1.5	-0.6	5.8	0.6%	11,190	31.3	B
47	Botswana	-1.3	-1.2	3.9	1.1%	16,030	14.5	A-
48	El Salvador	-1.3	-0.7	10.3	1.0%	8,000	56.8	B+
49	Panama	-1.3	-1.2	3.4	1.2%	19,930	45.6	BBB
50	Namibia	-1.2	-0.6	4.3	0.7%	9,810	24.7	-
51	Romania	-1.2	0.6	8.9	-0.4%	19,020	40.6	BBB-
52	Colombia	-1.2	-0.5	4.4	0.6%	12,910	44.3	BBB
53	Turkey	-1.1	0.1	6.4	0.1%	18,980	33.6	BB+
54	Mongolia	-1.1	-1.0	3.3	0.9%	11,120	-	B
55	Venezuela	-1.1	-0.5	4.1	0.5%	17,700*	51.8	CCC
56	Kazakhstan	-1.0	0.7	6.3	-0.7%	21,710	14.9	BBB-
57	Malaysia	-1.0	-0.8	3.1	0.9%	24,770	55.2	A-

58	Saudi Arabia	**-1.0**	**-0.9**	**4.3**	1.0%	51,320*	1.6	A-
59	Israel	**-1.0**	**-0.6**	**3.5**	0.6%	32,830	67.1	A+
60	Cambodia	**-0.9**	**1.0**	**12.0**	-0.7%	3,080	33.9	-
61	Korea, Rep. of	**-0.8**	**-0.4**	**3.0**	0.4%	34,620	36.0	AA-
62	Mexico	**-0.8**	**-0.5**	**2.7**	0.5%	16,640	49.8	BBB+
63	Cyprus	**-0.8**	**-1.1**	**1.2**	1.0%	29,800	107.5	BB-
64	Portugal	**-0.8**	**-0.7**	**1.8**	0.7%	28,010	130.2	BB+
65	Russian Federation	**-0.7**	**0.1**	**3.6**	-0.2%	24,710	17.8	BB+
66	South Africa	**-0.7**	**-0.2**	**2.5**	0.2%	12,700	46.0	BBB-
67	Slovenia	**-0.6**	**-0.4**	**2.0**	0.4%	29,920	80.8	A-
68	Oman	**-0.6**	**-0.7**	**1.9**	0.8%	33,690*	5.1	BBB-
69	Bahrain	**-0.6**	**-0.7**	**1.5**	0.8%	37,680*	43.8	BB
70	Greece	**-0.5**	**-0.1**	**2.3**	0.2%	25,660*	177.1	B-
71	Spain	**-0.5**	**-0.3**	**1.5**	0.3%	33,080	97.7	BBB+
72	Kuwait	**-0.5**	**-0.4**	**2.0**	0.6%	79,850	6.9	AA
73	Hong Kong, China SAR	**-0.5**	**-0.4**	**1.1**	0.4%	56,570	0.1	AAA
74	New Zealand	**-0.4**	**0.1**	**2.2**	-0.1%	34,970	30.4	AA
75	Czech Republic	**-0.4**	**0.2**	**2.3**	-0.2%	28,020	42.6	AA-
76	Japan	**-0.4**	**-0.2**	**1.5**	0.2%	37,920	246.2	A+
77	Slovakia	**-0.4**	**0.1**	**2.1**	-0.1%	26,820	53.6	A+
78	Estonia	**-0.4**	**0.1**	**2.0**	-0.1%	26,330	10.4	AA-
79	Luxembourg	**-0.4**	**-0.2**	**1.7**	0.2%	65,040	22.1	AAA
80	Poland	**-0.3**	**0.1**	**1.9**	-0.1%	23,930	50.1	BBB+
81	Netherlands	**-0.3**	**-0.2**	**1.1**	0.2%	48,260	67.9	AAA
82	Chile	**-0.3**	**-0.2**	**0.9**	0.2%	21,580	15.1	AA-
83	Finland	**-0.3**	**0.0**	**1.2**	0.0%	39,940	59.0	AA+
84	Belgium	**-0.3**	**0.0**	**1.3**	0.0%	43,220	106.6	AA
85	Norway	**-0.3**	**-0.2**	**0.9**	0.2%	66,330	28.1	AAA
86	United Kingdom	**-0.2**	**-0.1**	**1.0**	0.1%	39,040	89.4	AAA
87	Austria	**-0.2**	**0.0**	**1.1**	0.0%	45,930	84.4	AA+
88	Italy	**-0.2**	**0.0**	**1.2**	0.0%	34,700	132.1	BBB-
89	Germany	**-0.2**	**0.0**	**1.2**	0.0%	46,850	74.6	AAA
90	Sweden	**-0.2**	**0.0**	**1.0**	0.0%	46,750	43.8	AAA
91	Qatar	**-0.2**	**-0.2**	**1.5**	0.3%	134,420	31.7	AA
92	Lithuania	**-0.2**	**0.9**	**3.3**	-0.9%	25,490	40.9	A-
93	Denmark	**-0.2**	**0.1**	**0.9**	-0.1%	46,210	45.2	AAA
94	Ireland	**-0.2**	**0.2**	**1.1**	-0.2%	42,270	107.6	A+
95	Switzerland	**-0.2**	**-0.1**	**0.5**	0.1%	57,960*	46.3	AAA
96	Singapore	**-0.1**	**0.1**	**0.7**	-0.1%	80,270	98.6	AAA
97	Thailand	**-0.1**	**2.6**	**6.5**	-2.8%	14,870	43.5	BBB+
98	France	**-0.1**	**0.3**	**1.1**	-0.3%	39,610	95.6	AA
99	Ukraine	**-0.1**	**3.1**	**8.9**	-2.9%	8,560	71.2	B-
100	Latvia	**0.0**	**0.7**	**1.9**	-0.7%	22,690	37.8	A-
101	Pakistan	**0.0**	**2.0**	**11.5**	-2.1%	5,090	64.9	B-
102	Viet Nam	**0.0**	**3.6**	**11.4**	-3.9%	5,350	57.2	BB-
103	Hungary	**0.0**	**1.1**	**2.3**	-1.1%	23,630	77.0	BB+
104	United States of America	**0.0**	**0.3**	**0.7**	-0.3%	55,860	104.8	AA+
105	Canada	**0.0**	**0.5**	**0.9**	-0.5%	43,360	87.9	AAA
106	Brazil	**0.1**	**0.7**	**1.6**	-0.7%	15,590	65.2	BB
107	Australia	**0.1**	**0.5**	**0.7**	-0.5%	42,760	33.9	AAA
108	Bulgaria	**0.6**	**1.8**	**2.1**	-1.9%	16,260	26.9	BB+
109	Uruguay	**2.5**	**5.0**	**2.2**	-5.0%	20,220	61.3	BBB
110	Paraguay	**5.7**	**9.9**	**4.2**	-10.7%	8,470	19.0	BB

The five highest and lowest effects for each variable are highlighted in orange and in green respectively.

* GDP effect refers to the change in a country's real GDP, expressed as a percentage of the total, as a result of a rapid doubling in food commodity prices.

** Current account effect refers to the change in a country's current account balance, expressed in percentage of the country's GDP, as a result of a rapid doubling in food commodity prices.

*** CPI effect refers to the increase in a country's consumer price index, expressed as a percentage of the total, as a result of a rapid doubling in food commodity prices.

****Ratings by S&P Global Ratings are as of April 5, 2016. Mozambique's rating is as of April 15, 2016.

FOREWORD

The increasing global competition for the planet's finite resources is becoming an ever more significant factor of economic performance. The 2016 Global Risk Report by the World Economic Forum, for instance, found that the risks related to ecosystem degradation, water scarcity and climate change are among the most severe the world faces in terms of their likelihood and their potential impact on our global economy. While the report underscores a growing understanding about the materiality of such environmental risks, their effects on national economies is largely absent from credit risk analysis in bond markets. Indeed, in the debate over the impacts of climate change and resource scarcity, the sovereign bond market has been a long overlooked portion of the financial system. However, with more than US$ 40 trillion in outstanding debt, government bonds are one of the most important asset classes held by investors worldwide.

The Environmental Risk Integration in Sovereign Credit (ERISC) project, a joint collaboration of UNEP Finance Initiative (UNEP FI) and Global Footprint Network, assesses how environmental phenomena such as deforestation, climate change and resource scarcity affect a country's economy and therefore, potentially, its sovereign credit worthiness and country risk ratings. The first phase of the project was completed in 2012 with an introductory report showing that environmental risks are material, unevenly distributed between countries and not adequately reflected in sovereign credit risk analysis.

We are pleased to hereby release this report summarizing the second phase of ERISC, which looks specifically at how environmental risks affect food production and food prices and how this in turn can have material macroeconomic impacts. It was developed in collaboration with S&P Global Ratings, HSBC, Caisse des Dépôts, First State Investments, KfW, Kempen Capital Management, and Cambridge Econometrics.

Disruptions to our food system are an increasingly important risk to national economies, as climate change, changing diets, population pressure and competition for land push food prices higher and create more volatility. In this report, we examine the linkages between the resulting food price shocks and sovereign credit risk by submitting 110 countries to a stress test simulating a food commodity price shock. The results can inform bond investors and credit rating agencies, but also governments looking for ways to reduce economic impacts from environmental risks.

We invite both the financial industry and governments to collaborate with us to scale up this work.

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Head UNEP Finance Initiative (a.i.)

Susan Burns
Director, Finance Initiative
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INTRODUCTION: ERISC AND FOOD PRICES

The Environmental Risk Integration in Sovereign Credit Analysis (ERISC) project is a pioneering exploration by UNEP FI and Global Footprint Network (GFN) in collaboration with financial institutions to uncover and quantify the economic risks at country-level resulting from environmental degradation. Poor environmental management by countries puts pressure on their ability to maintain and grow economies. Indeed, environmental risks such as water scarcity, climate change, and overuse of renewable natural resources can affect a country's economy in multiple ways, ultimately impacting its ability to manage its public debt.

In the first phase of ERISC we showed that environmental risks can be material, but are not systematically incorporated into credit analysis. The consequences of environmental degradation have attracted more attention from the finance industry since the publication of the first report, with credit rating agencies and policy makers looking more closely at the effect of climate change in particular.[1–3] Research on the broader economic effects of long-term environmental degradation is, however, still rare. This phase of ERISC contributes to bridging this gap by analyzing one of the most direct and impactful channels linking environmental risk to economic effects: food price shocks. Further phases of ERISC will, with the continued support of the finance sector and others, build and expand the research in order to improve financial sector understanding of environmental risk and provide economic evidence for better environmental management by countries.

ENVIRONMENTAL RISK AND THE LINK TO FOOD PRICE SHOCKS

Food prices are one of the most important channels by which environmental risks affect national economies.