

Climate change as a direct risk and indirect multiplier of international crisis and conflict, and the role of Earth observation

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Focus on climate as a conflict accelerator
but:

- Consider also the direct climate threat to security assets

**Report on Effects of a Changing Climate to the
Department of Defense**



January 2019

Office of the Under Secretary of Defense
for Acquisition and Sustainment

As required by Section 335 of the National Defense Authorization Act for Fiscal Year 2018
(Public Law 115-91).

The estimated cost of this report or study for the Department of
Defense is approximately \$329,000 in Fiscal Years 2018 - 2019.
This includes \$58,000 in expenses and \$271,000 in DoD labor.

Generated on 2018Dec18 RefID: 9-D30BE5A

Summary Table of Current & Potential Effects to 79 Installations

The following tables provide a summary of current and future (20 years) vulnerabilities to military installations.

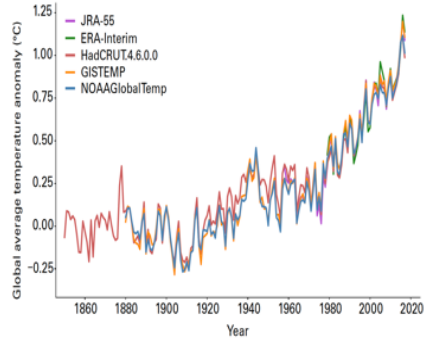
Service	# Installations	<i>Recurrent Flooding</i>		<i>Drought</i>		<i>Desertification</i>		<i>Wildfires</i>		<i>Thawing Permafrost</i>	
		Current	Potential	Current	Potential	Current	Potential	Current	Potential	Current	Potential
Air Force	35	20	25	20	22	4	4	32	32	-	-
Army	20	14	16	4	4	2	2	4	4	1	1
Navy	19	16	16	18	18	-	-	-	7	-	-
DLA	2	2	2	-	2	-	-	-	-	-	-
DFAS	1	-	-	-	1	-	-	-	-	-	-
NGA	1	1	1	1	1	-	-	-	-	-	-
WHS	1	-	-	-	-	-	-	-	-	-	-
Totals	79	53	60	43	48	6	6	36	43	1	1

Key risks to assets perceived by DoD are:

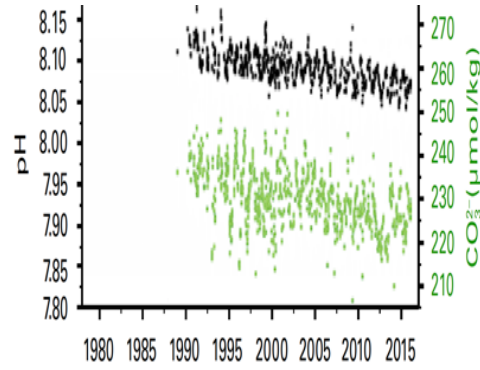
- Recurrent flooding
- Droughts
- Desertification
- Wildfires
- Thawing permafrost

Effect of climate changed also considered in relation to:
Operations and to **specific DOD missions**.

Mean Temperature Ocean Acidity

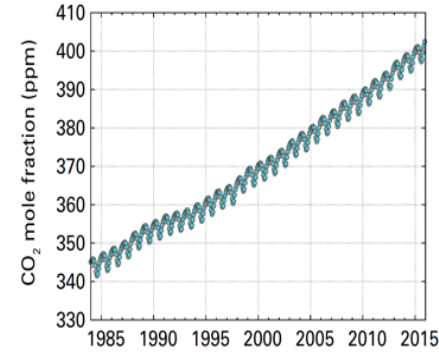


Global mean temperature anomalies, with respect to the 1850–1900 baseline, for the five global datasets (Source: UK Met Office Hadley Centre)

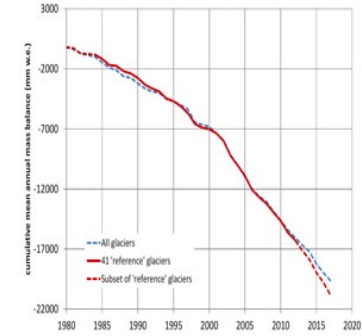


Trends in surface (< 50 m) ocean carbonate chemistry calculated from observations obtained at the Hawaii Ocean Timeseries (HOT) Program in the North Pacific over 1988–2015. Seawater pH (black points, primary y-axis) and carbonate ion concentration (green points, secondary y-axis). Ocean chemistry data were obtained from the Hawaii Ocean Timeseries Data Organization & Graphical System (HOT-DOGS). (Source: US National Oceanic and Atmospheric Administration (NOAA), Jewett and Romanou, 2017)

Atmospheric CO₂ Glacier Mass Balance

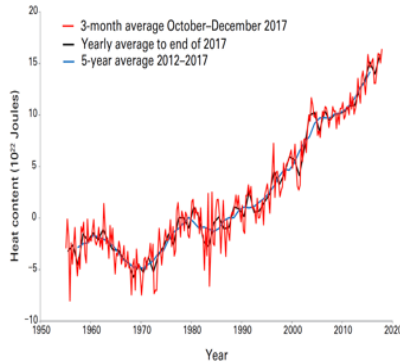


Globally averaged mole fraction (measure of concentration), from 1984 to 2016, of CO₂ in parts per million (left), CH₄ in parts per billion (middle) and N₂O in parts per billion (right). The red line is the monthly mean mole fraction with the seasonal variations removed; the blue dots and line depict the monthly averages. (Source: WMO Global Atmosphere Watch)

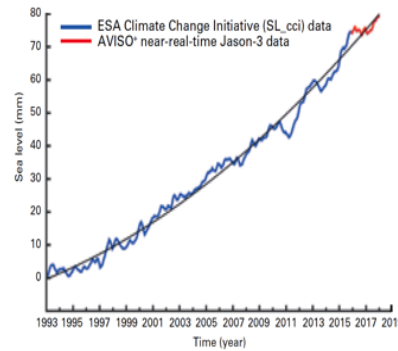


Mean cumulative mass balance of all reported glaciers (blue line) and the reference glaciers (red line). SOURCE: **world glacier monitoring service** <http://wgms.ch/>

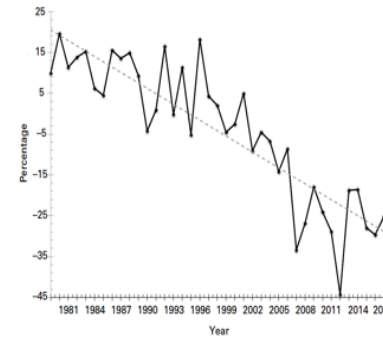
Ocean Heat Content



Sea Level Change



Sea Ice Extent

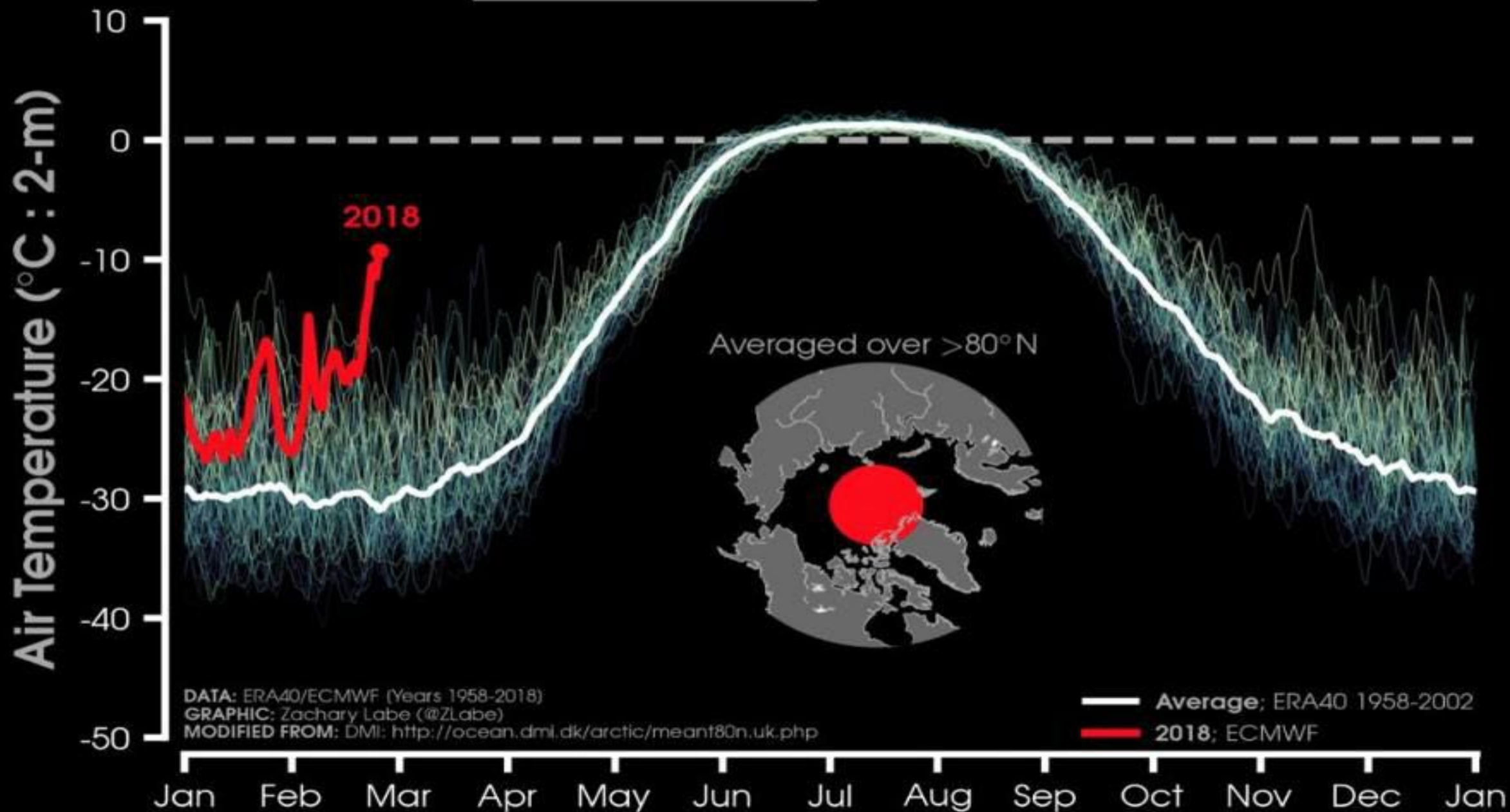


Antarctic



September sea-ice extent for the Arctic, and (right) September sea-ice extent for the Antarctic. Percentage of long-term average of the reference period 1981–2010 (Source: prepared by WMO using data from the US National Snow and Ice Data Center)

DAILY ARCTIC TEMPERATURE





CONSERVATIVE PROJECTIONS INDICATE THAT AT LEAST 33% OF TIBET'S REMAINING 46,000 GLACIERS WILL DISAPPEAR OVER THE NEXT 75 YEARS

17 "Why We Must Preserve Tibet-the Water Tower of Asia," speech by President of Central Tibetan Administration, His Excellency Dr. Lobsang Sangay at the 5th Rabindranath Barthakur memorial lecture at the Balipara Foundation.



18/06/2017 09:17

NATO and the security implications of climate change

Virtual speech by NATO Secretary General Jens Stoltenberg

28 Sep. 2020 - | Last updated: 29 Sep. 2020 08:22

(As delivered)



NORTH ATLANTIC TREATY ORGANIZATION





HM Government

Global Britain in a competitive age

The Integrated Review of Security,
Defence, Development and Foreign Policy



CP 403

UK-MOD CLIMATE CHANGE DOC.

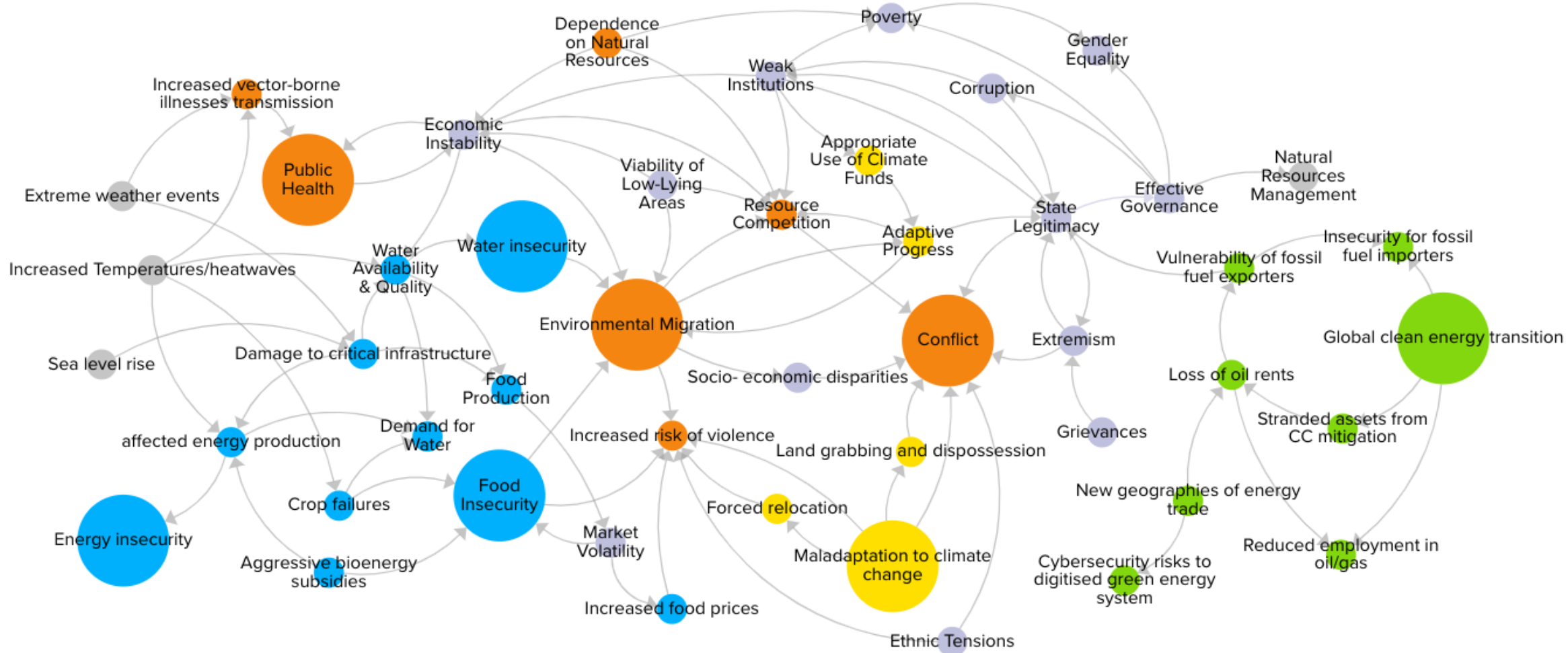


Ministry of Defence Climate Change and Sustainability Strategic Approach



Security approach to climate issues

- Climate has consequences for human, national and global security
- UK keen to make this point at CoP26 and in Integrated Review above
- Some resistance from those who see an attempt to “securitise” climate as an issue
- Agree that it should not be seen as a security issue alone, but military should as a minimum take climate issues into account and form part of an integrated government response
- Security apparatus has important assets and experience in practice of intelligence, logistics, engineering, early warning, data management, risk prioritisation, initiative, resilience, task organisation etc etc. which can be relevant
- International politics and hence security issues are still essentially spatial and territorial – hence geospatial data including satellite-based data are invaluable.
- Proposals have been made for securitisation of climate more effectively – less as an emergency response and more as a strategic approach taking into account military experience in addressing such topics.



Legend

- Physical risk to resources and infrastructure
- Climate change adaptation risk
- Climate change mitigation risk
- Risks to livelihoods and social cohesion



MINISTRY OF DEFENCE

A Multiplier for Instability

A Force for Good

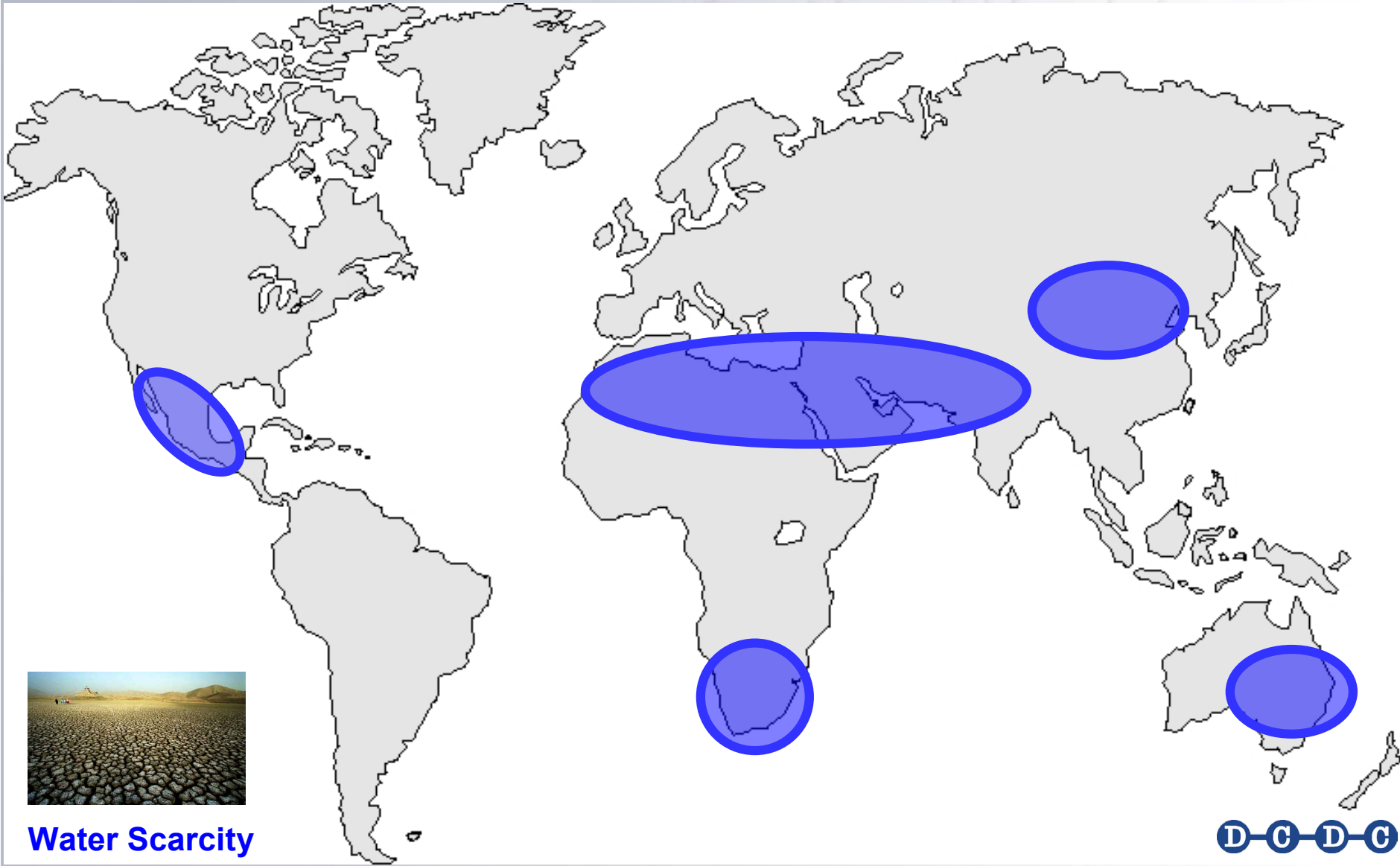




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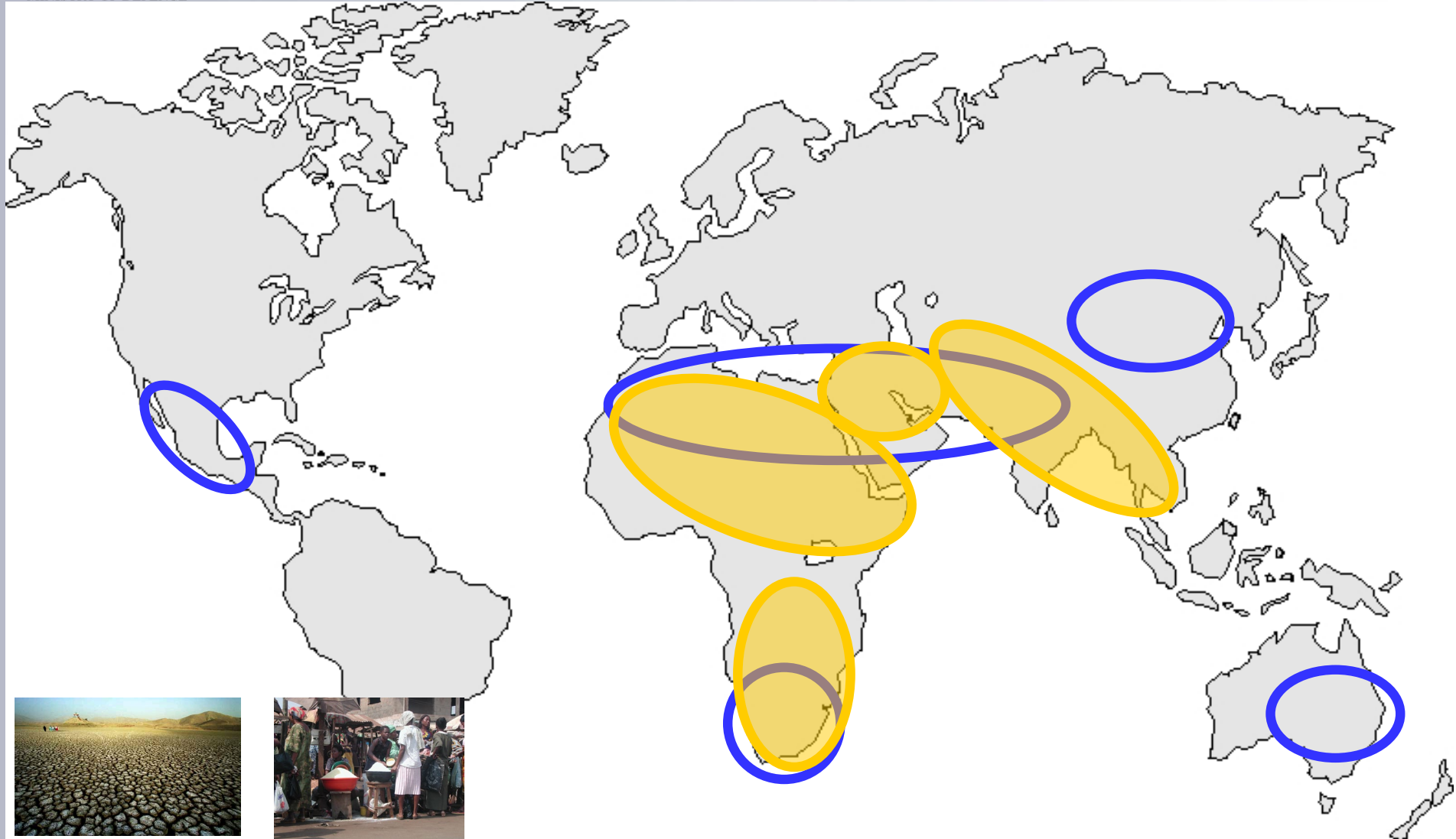
Water Scarcity



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Water scarcity



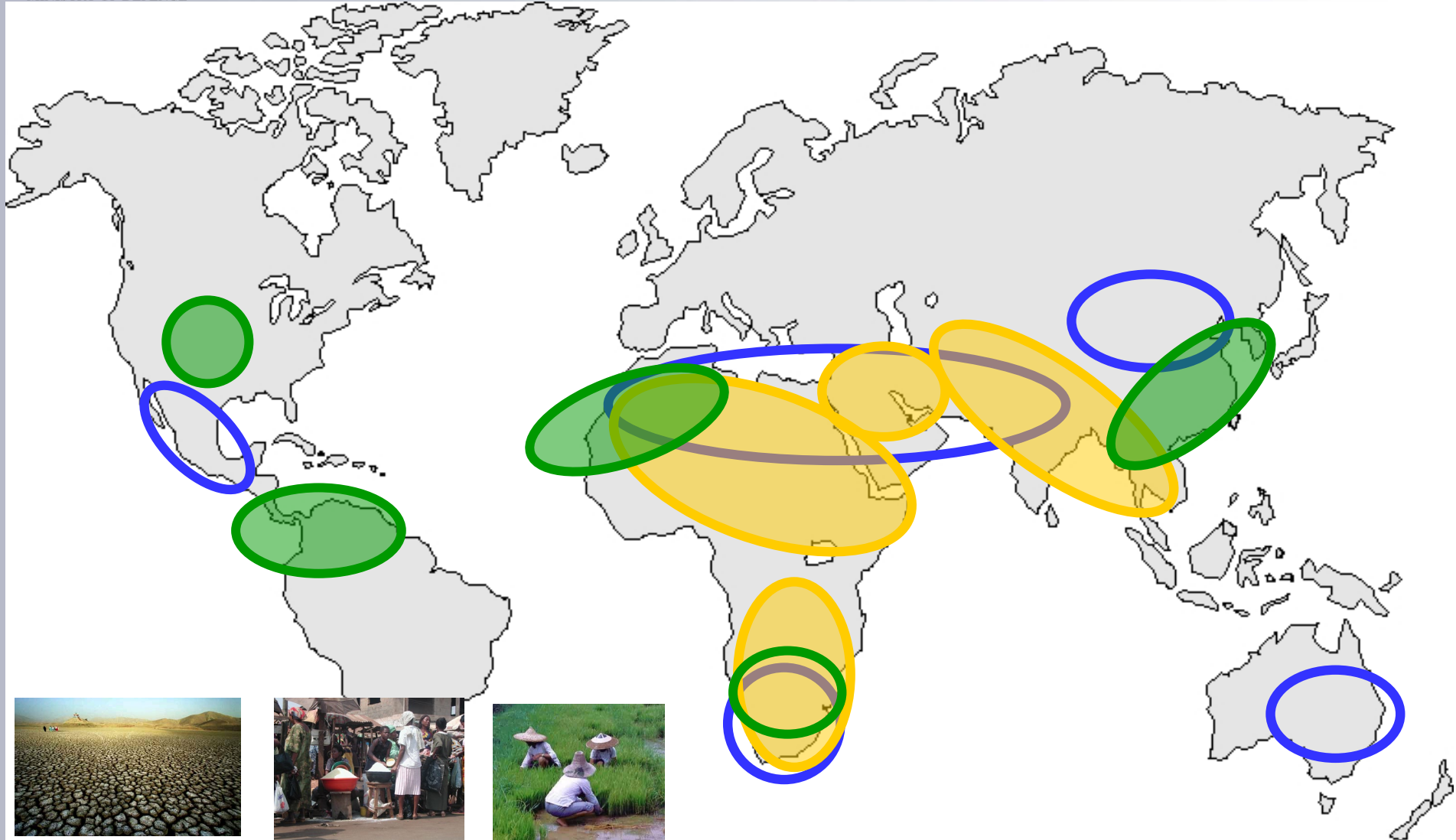
Demography



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Water scarcity **Demography** **Crop decline**



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Water scarcity



Demography



Crop decline



Hunger



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Water scarcity



Demography



Crop decline



Hunger



Coastal risk

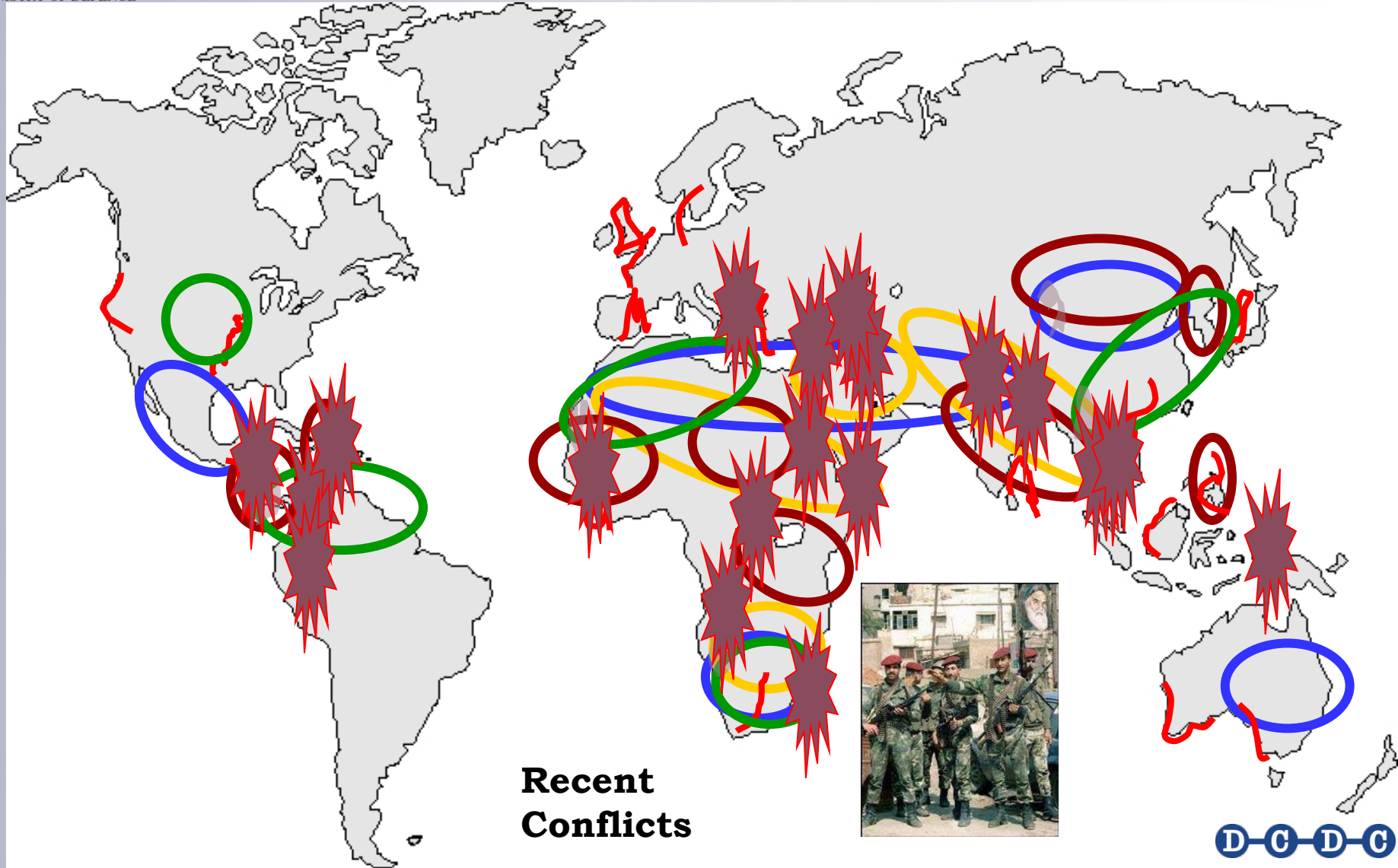




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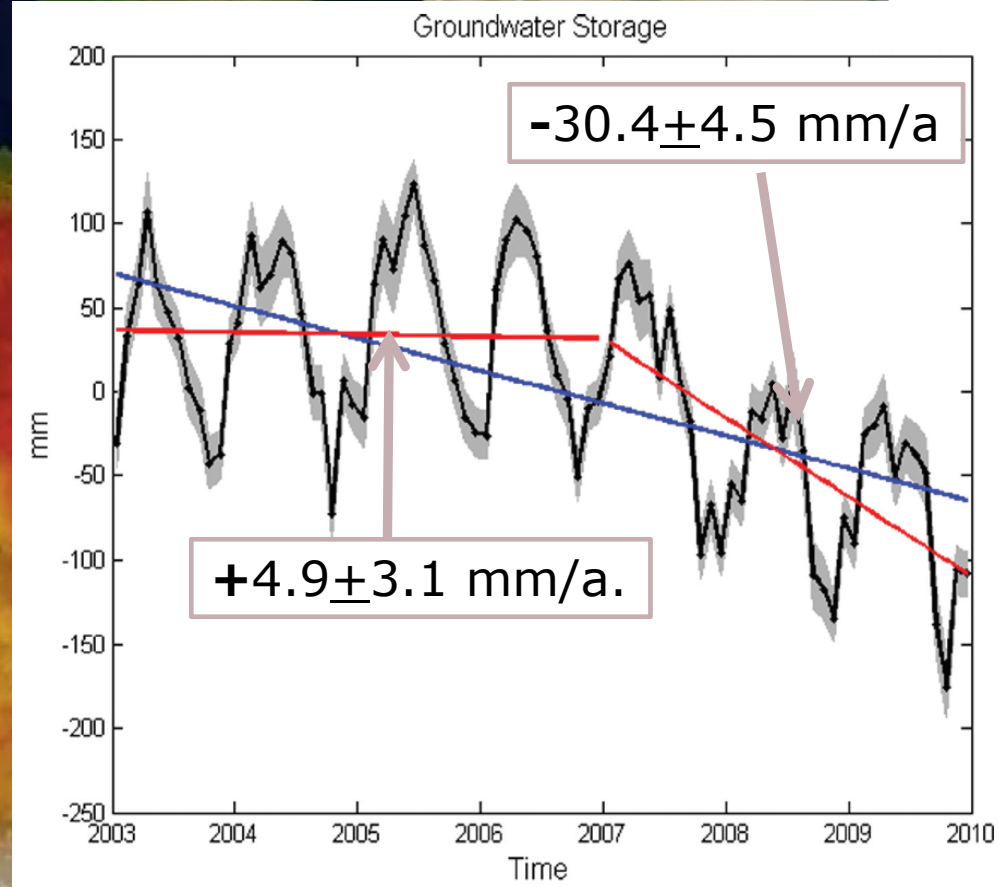
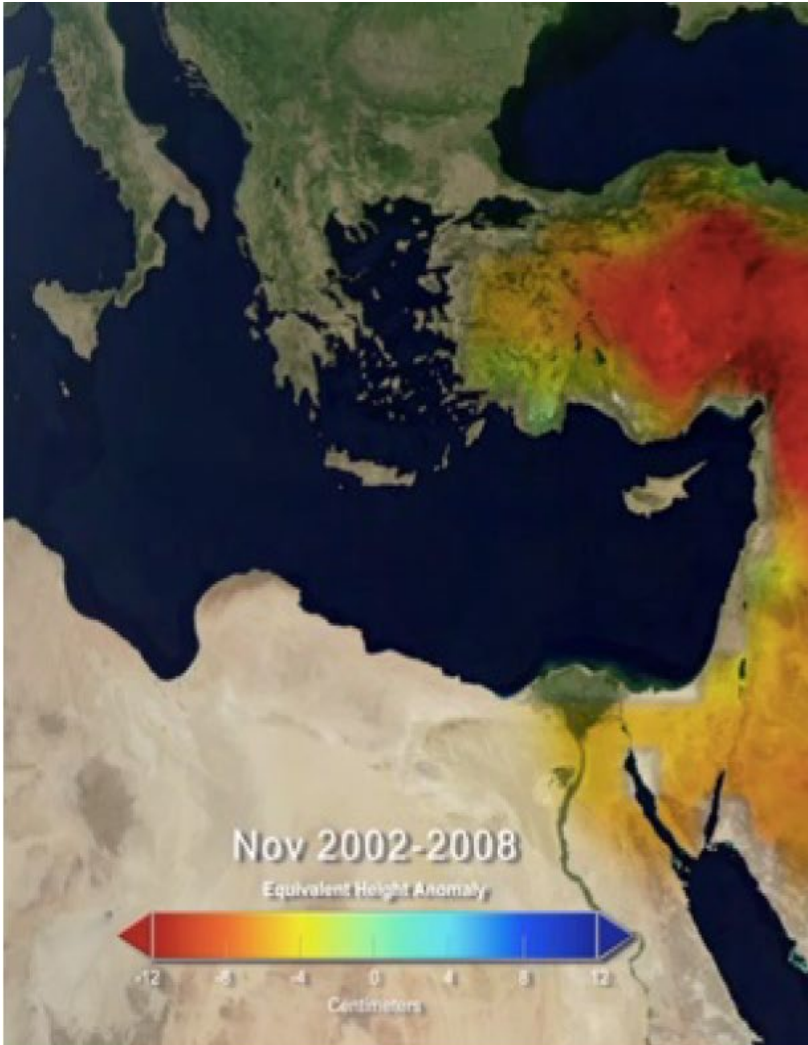
A Multiplier for Instability

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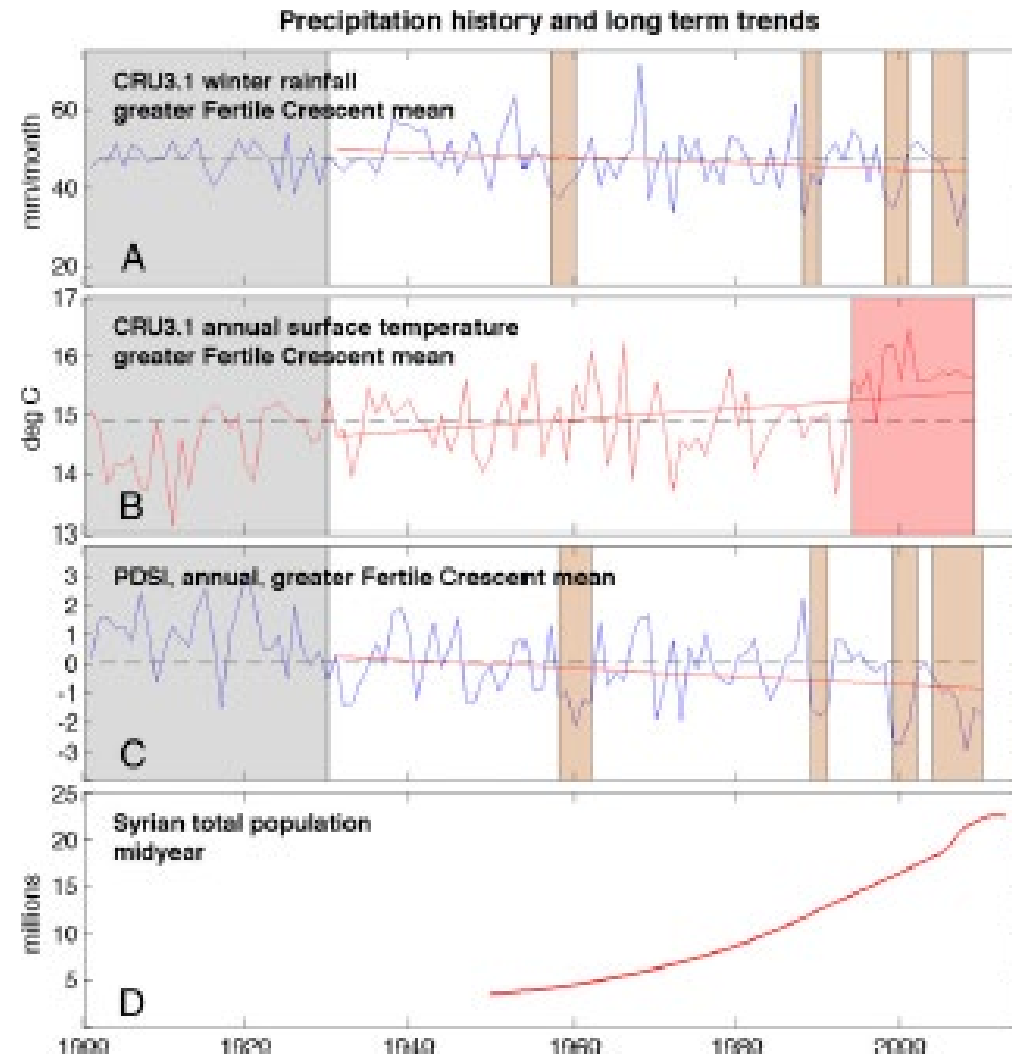
Recent Conflicts

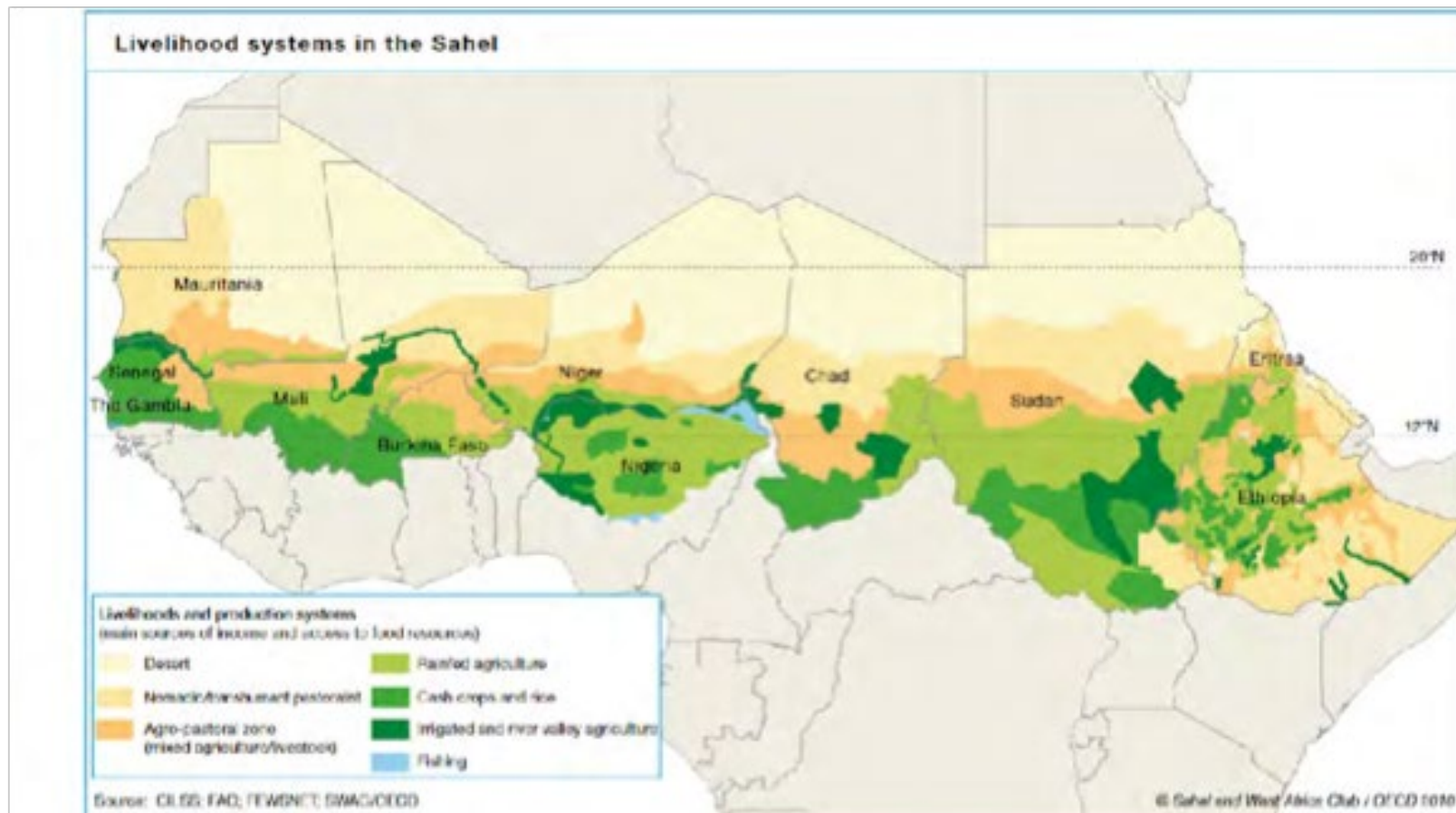
From Gravity Measurements to Water Shortage as Trigger of Violent Conflicts



Gravity anomaly measured with GRACE and improved with GOCE geoid translated into ground water depletion

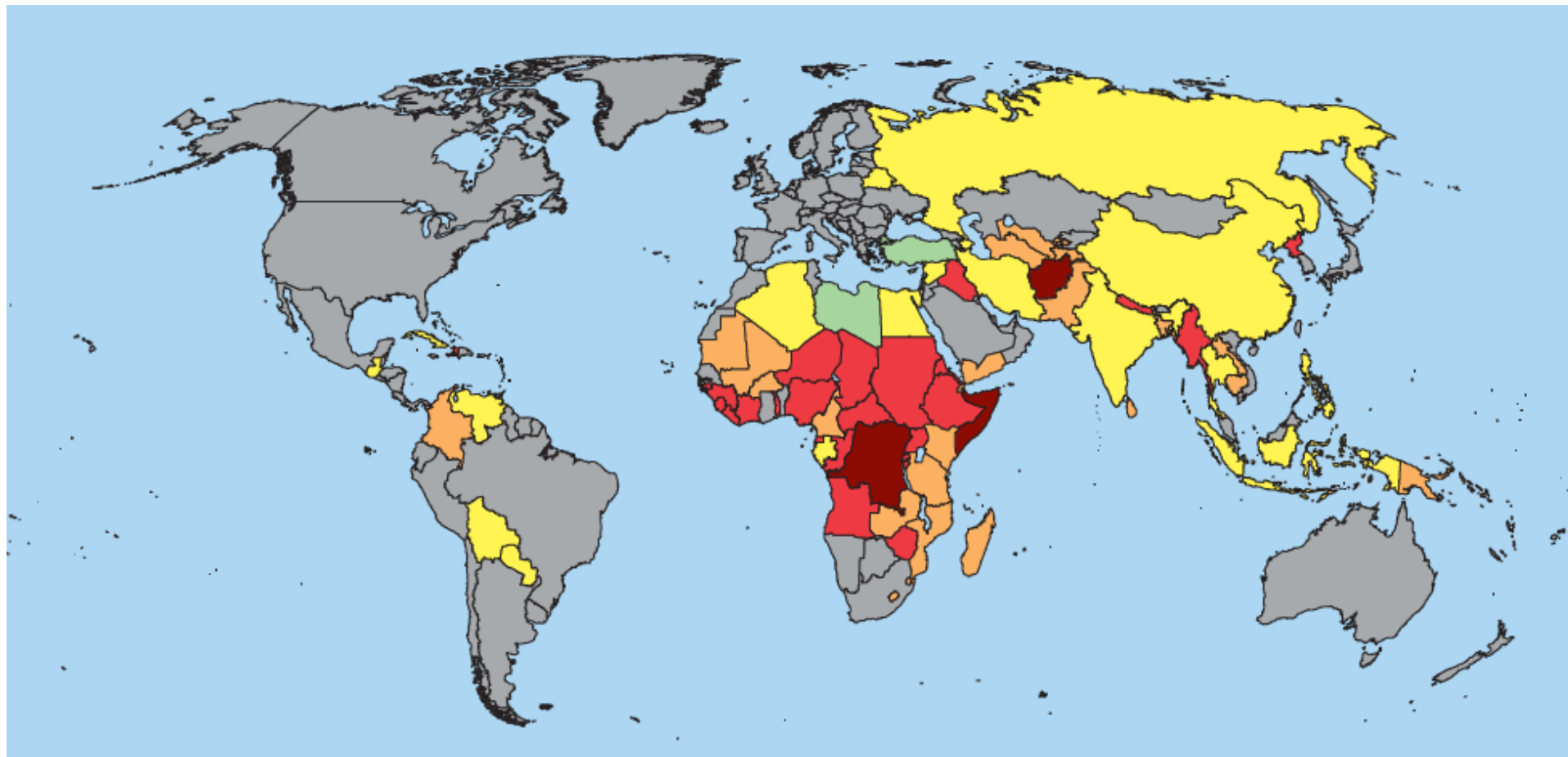
Rainfall and drought in Syria (Kelley et al., PNAS)



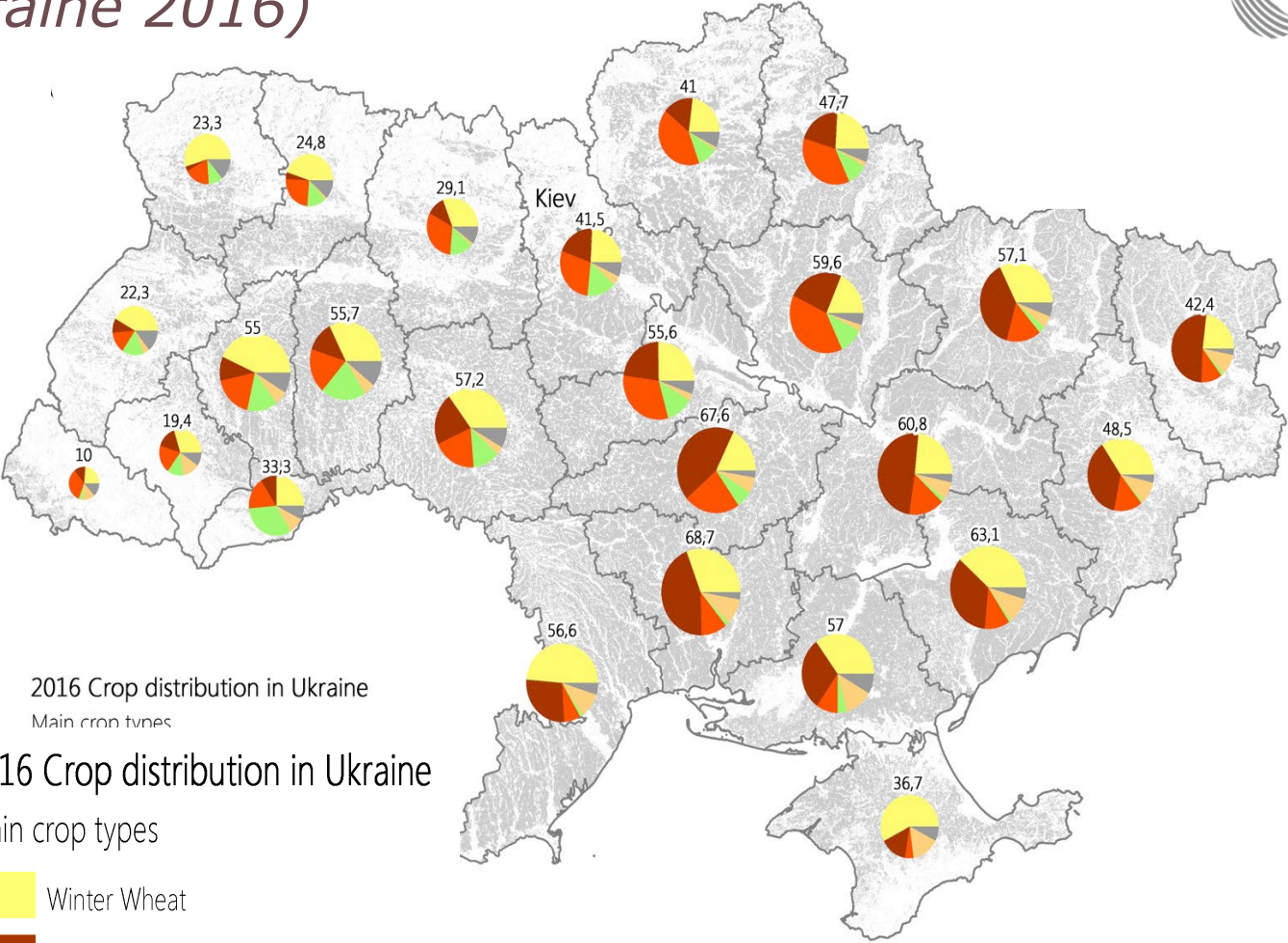


Security Implications of Climate Change in the Sahel Region: Policy considerations, Philipp Heinrigs, OECD, 2012, Sahel and West Africa Club, p. 20.

Weakest states (Brookings Institution)



National crop statistics by administrative units (Ukraine 2016)



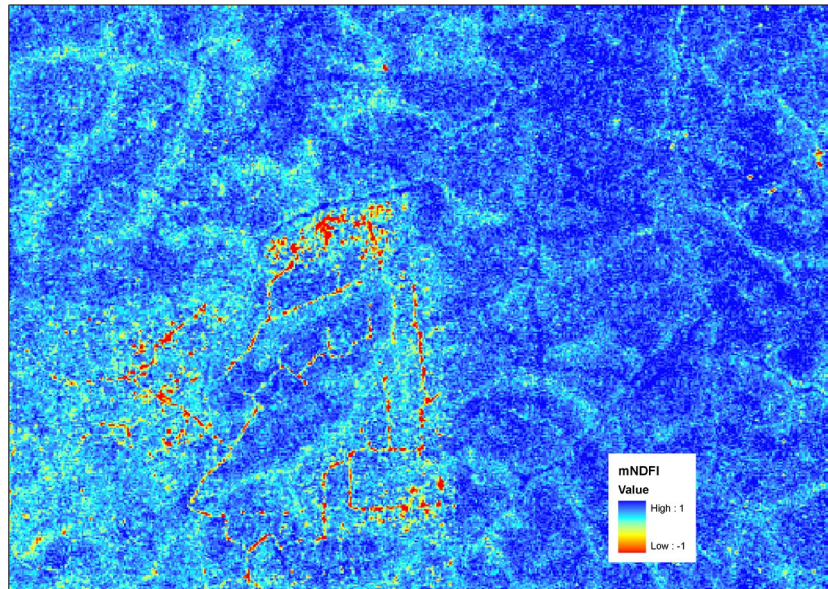
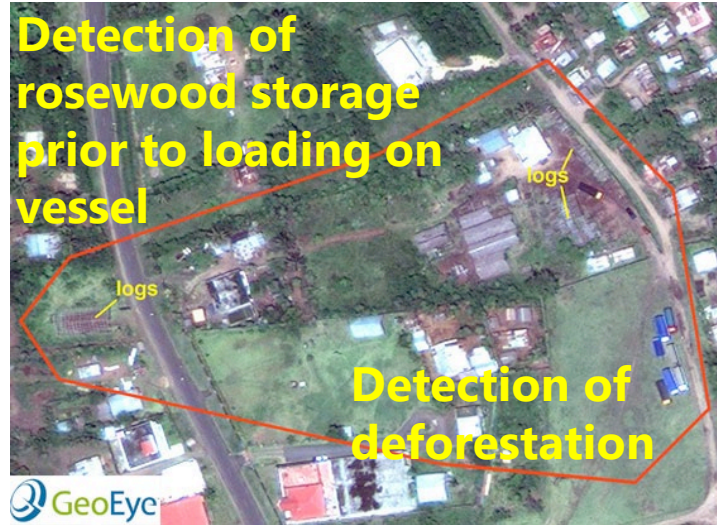
2016 Crop distribution in Ukraine
Main crop types

- Winter Wheat
- Sunflower
- Maize
- Soybeans
- Spring Barley
- Other Crops



Illicit logging and trafficking

- Detection of unlicensed deforestation
- Detection of storage sites for illegally felled timber
- Detection of anomalous activities at ports
- Tracking suspect vessels along transit route



Monitoring ports for presence/absence of vessels

