EMERGING CLIMATE-RELATED FOOD SAFETY RISKS AND HOW TO EVALUATE THEM

Louise Manning, Professor of Sustainable Agri-food Systems

Lincoln Institute for Agri-food Technology

University of Lincoln

Consumers expect the food and drink they purchase to be high quality and to be safe.

RASFF Notifications (examples)

Date	Tea notifications (examples)	Countries involved/where identified
16.06.2023	Mouse droppings in red clover tea	3 countries (Company own check)
08.06.2023	Unauthorised residues (Dinotefuran, Permethrin)	2 countries (Border control)
06.06.2023	Pirolizidine alkaloids in Chamomile tea	3 countries (Official market controls)
02.06.2023	Nickle leakage from teapot	6 countries (Official market controls)
08.05.2023	Anthraquinone in Jasmine Tea	5 countries (Official market controls)
03.05.2023	Chlorpyrifos in green tea	10 countries (Official market controls)
23.12.2022	Unauthorised substances sildenafil and sibutramine in tea	2 countries (Border control)

Assuring food security means there must be sufficient, affordable, safe food that is accessible for all

Emerging questions

How will climate change trends and incidents affect food safety risk?

What strategies will the food sector need to adopt now, and in the future,

Does supply chain mapping and risk assessment have a role?

Sustainable food production: the answer is complex.. and many of the risks we may not even understand ..as yet.

Setting the scene

Forest fires can be a potential source of airborne dioxins and polyaromatic hydrocarbons (PAH), leading to soil and groundwater contamination.

Predicted temperature change resulting in droughts, landslides, and floods will impact on plants, fish, shellfish and other animals.

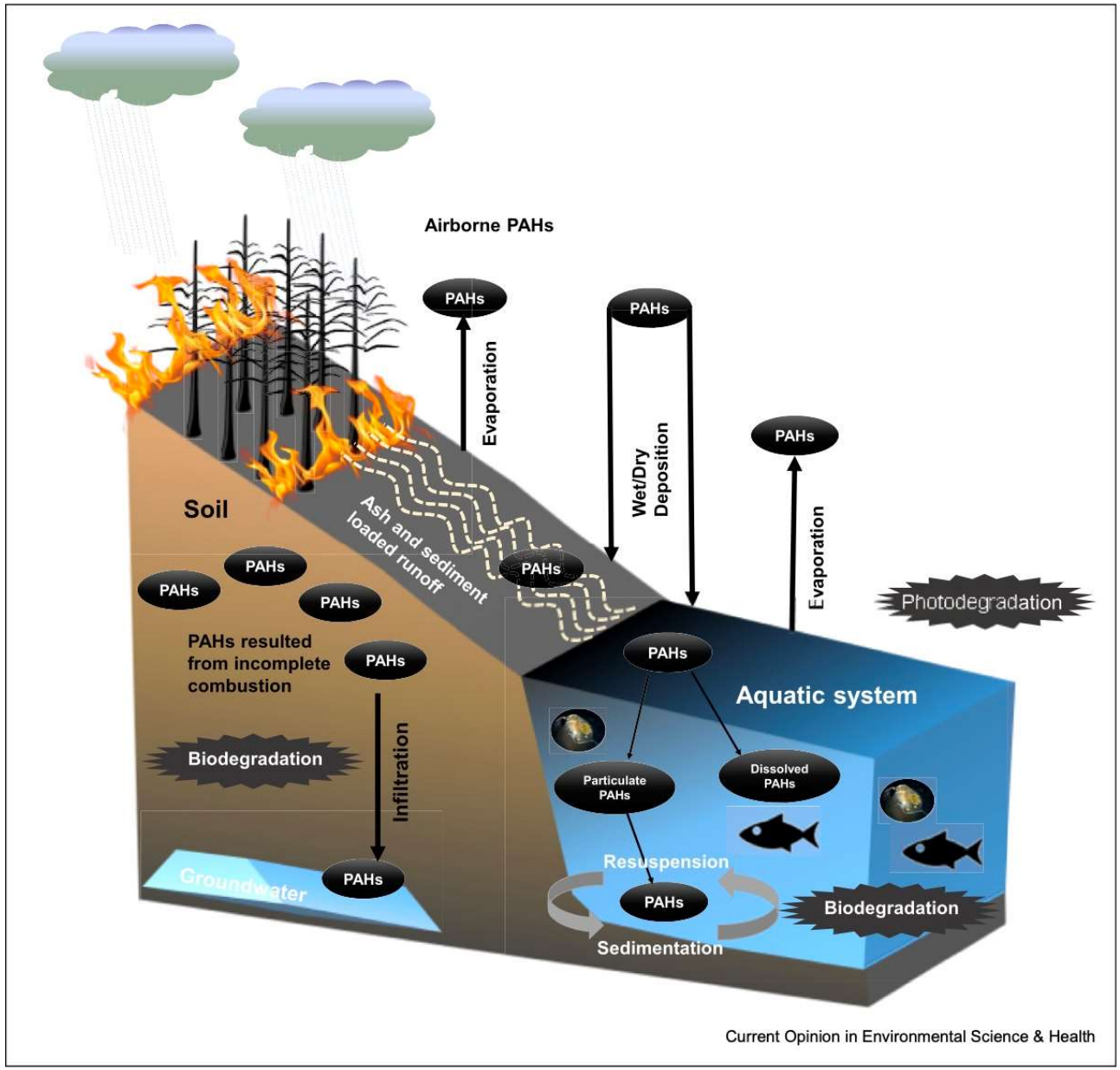
Adverse weather conditions lead to increased stress on livestock & plants, pest infestation, mould/bacterial growth in crops.

More humid conditions increase risk of mould/fungal contamination of cereal and grains, e.g. *Fusarium, Aspergillus, and Penicillium* and the associated toxins that are produced.

US example – impact of forest fires

Approximately 80 percent of the freshwater resources in the U.S. originate on forested land, and more than 3,400 public drinking-water systems are located in watersheds containing national forest lands

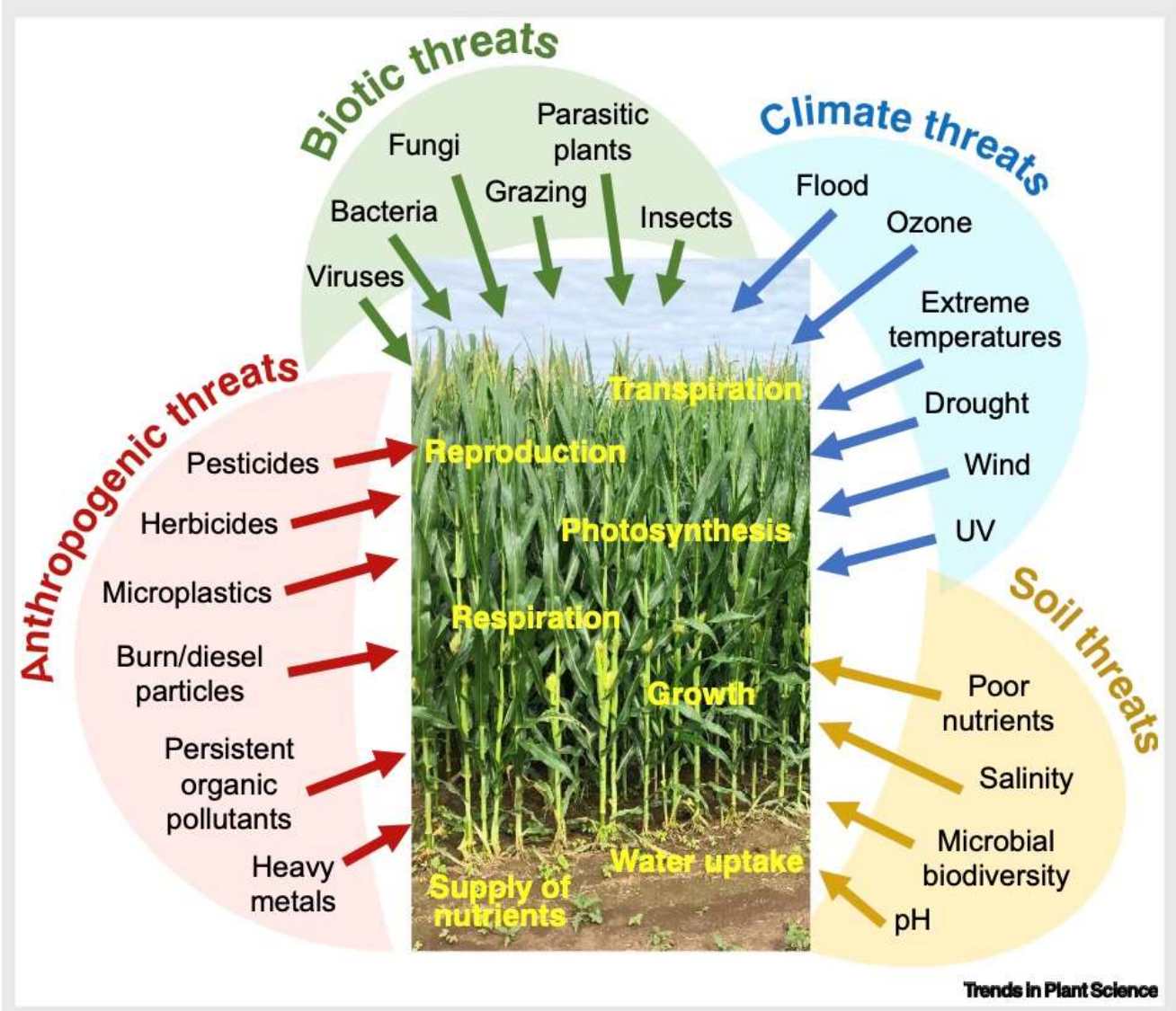
Source https://ca.water.usgs.gov/wildfires/wildfires-water-quality.html



Polycyclic Aromatic Hydrocarbons and Forest Fires

Campos, I., & Abrantes, N. (2021). Forest fires as drivers of contamination of polycyclic aromatic hydrocarbons to the terrestrial and aquatic ecosystems. *Current Opinion in Environmental Science & Health*, *24*, 100293.

Multifactorial stress: combination of stress factors



Zandalinas, S. I., Fritschi, F. B., & Mittler, R. (2021). Global warming, climate change, and environmental pollution: recipe for a multifactorial stress combination disaster. *Trends in Plant Science*, *26*(6), 588-599.

Sustainable food production: How do we increase plant stress tolerance, to a variety of factors, in a relatively short time frame?

Cyanotoxin accumulation in foods

- Fish, shellfish, bivalves and crabs,
- Irrigated crops – lettuce, carrots, rice, tomatoes
- Algal based supplements

Mutoti, M., Gumbo, J., & Jideani, A. I. O. (2022). Occurrence of cyanobacteria in water used for food production: A review. *Physics and Chemistry of the Earth, Parts A/B/C*, *125*, 103101.

Aflatoxins

- Academic modelling work is being undertaken to consider the change in risk of aflatoxin levels in food from direct consumption e.g. nuts, wheat flour through to supply chain transfer e.g. Aflatoxin M1 in milk via silage fed to cows.
- Risk with in-country production and food imports different.
- 100 notifications in RASFF between 22nd March and 16th June 2023.
- Already an issue in a broad range of materials.

Emerging questions

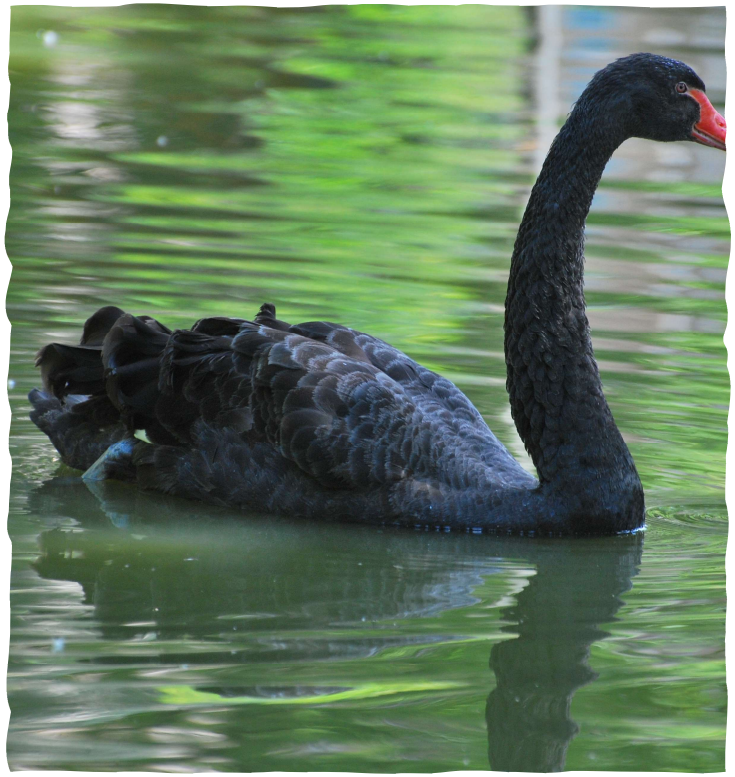
How will climate change trends and incidents affect food safety risk?

What strategies will the food sector need to adopt now, and in the future?

Does supply chain mapping and risk assessment have a role?

Upstream thinking

Upstream thinking



Upstream thinking means taking wise collective action to ensure better outcomes rather than simply responding to, and being overwhelmed by, crises we could have foreseen.

Black swan theory – see Taleb's work built upon by others

Black swan	unforeseeable risk
Grey swan	foreseeable risk
White swan	actual risk

Source: https://solutions.thischangeseverything.org/module/upstream-thinking

Or in the supply chain context….

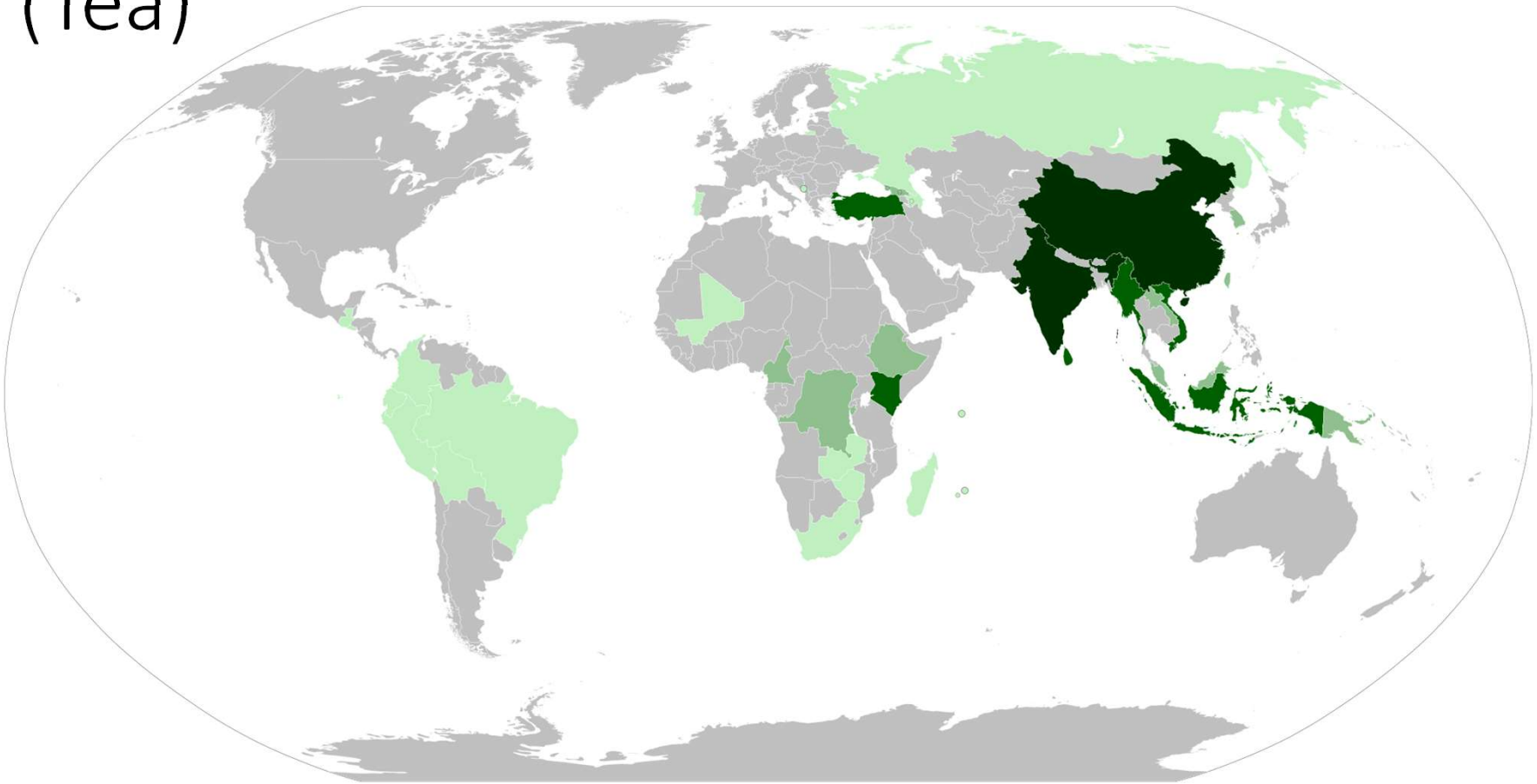
Upstream thinking - considering your supply base, their ability to provide safe, legal food of the quality desired now and in the future.

Downstream thinking – shaping your relationships with customers and ultimately the consumer.

The role of laboratories in the prevention and detection of emerging food safety hazards is essential including the validation of test methods and laboratory competencies to undertake testing programmes is essential.

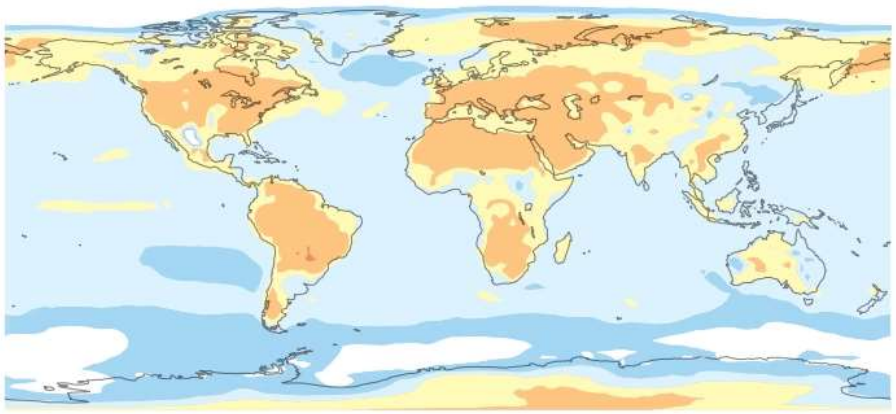
The role of laboratories in the **prevention** and **detection** of emerging food safety hazards is essential including the **validation** of test methods and **laboratory competencies** to undertake testing programmes is essential.

Supply chain mapping and risk assessment (Tea)

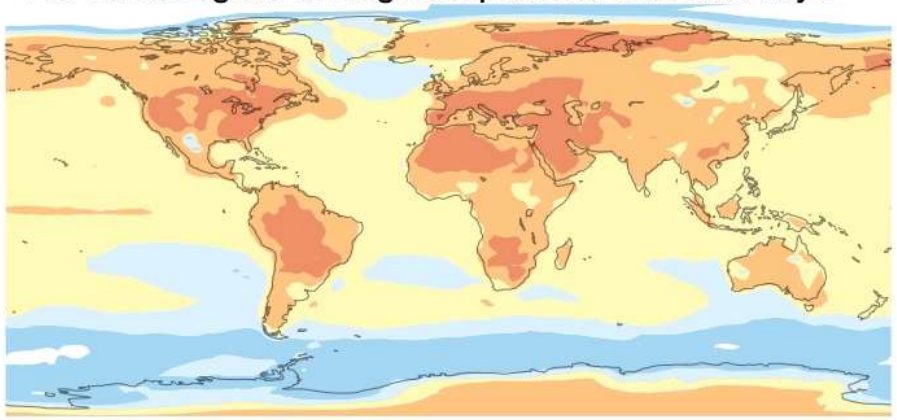


https://commons.wikimedia.org/wiki/File:World_Map_Tea_Production.svg

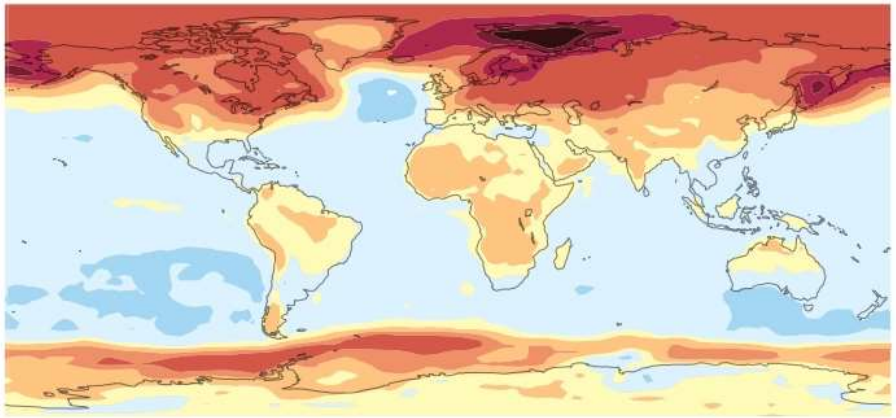
+ 1.5°C: Change in average temperature of hottest days



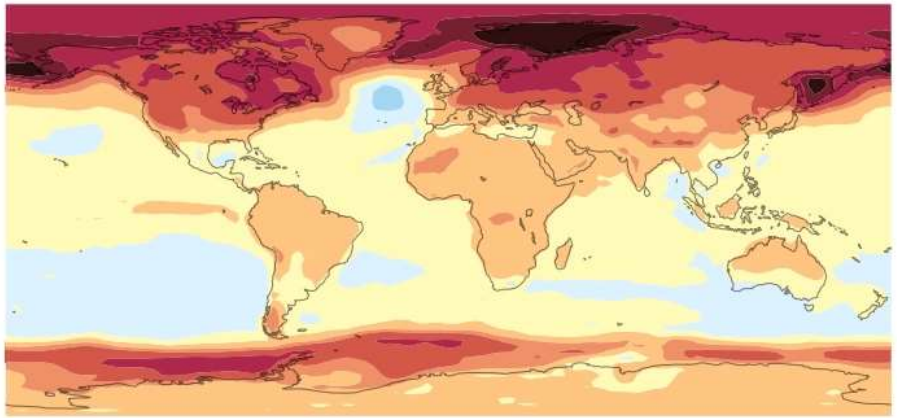
+ 2.0°C: Change in average temperature of hottest days



+ 1.5°C: Change in average temperature of coldest nights



+ 2.0°C: Change in average temperature of coldest nights

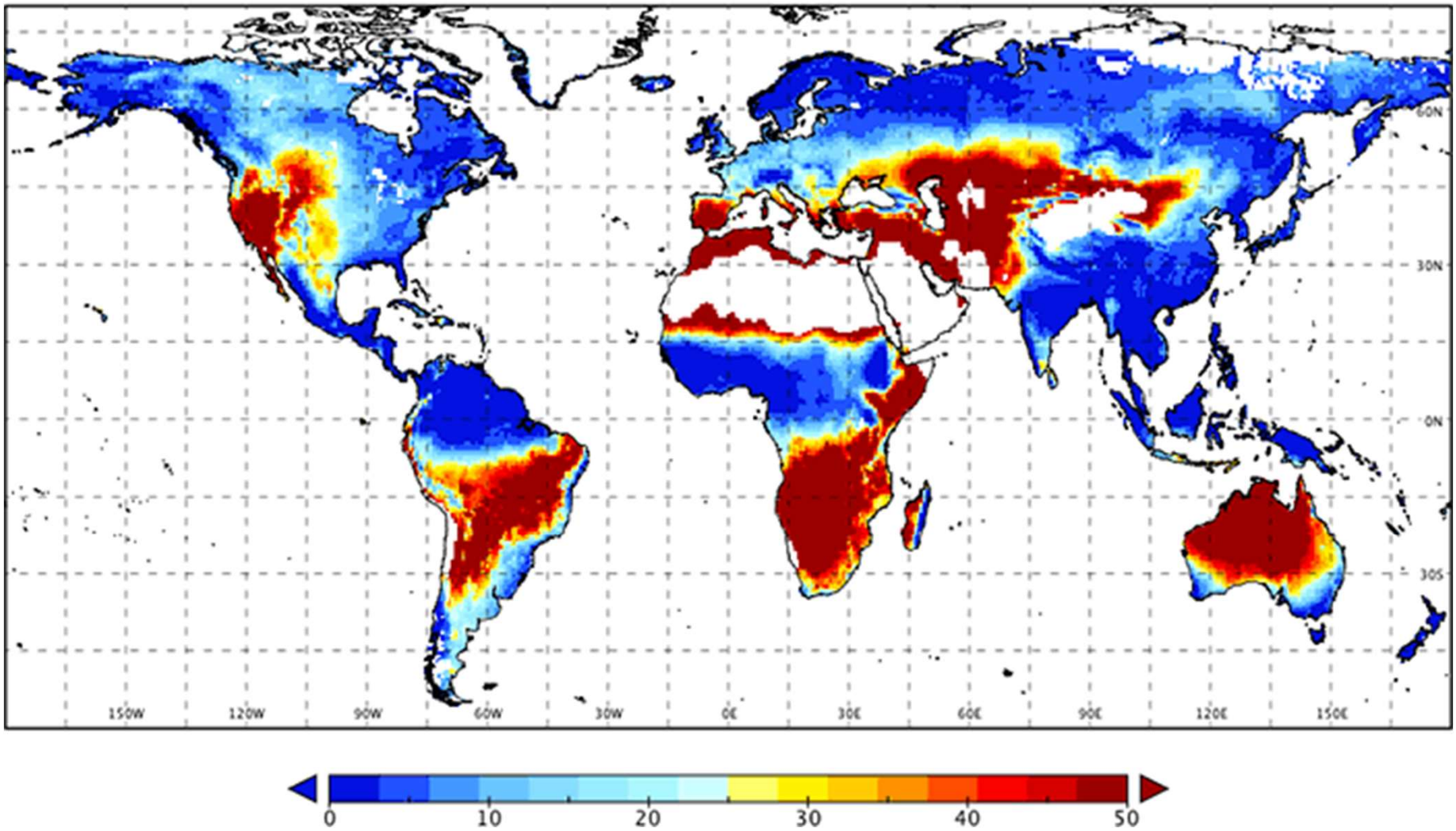


°C

0.0 0.5 1.0 1.5 2.0 3.0 4.0 6.0 8.0 10.0

https://climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/

Mean July Fire Weather Index, 1980–2012



https://data.giss.nasa.gov/impacts/gfwed/

Emerging climate-related food safety risks and how to evaluate them

Final thoughts