Modeling food shocks in a global economic model

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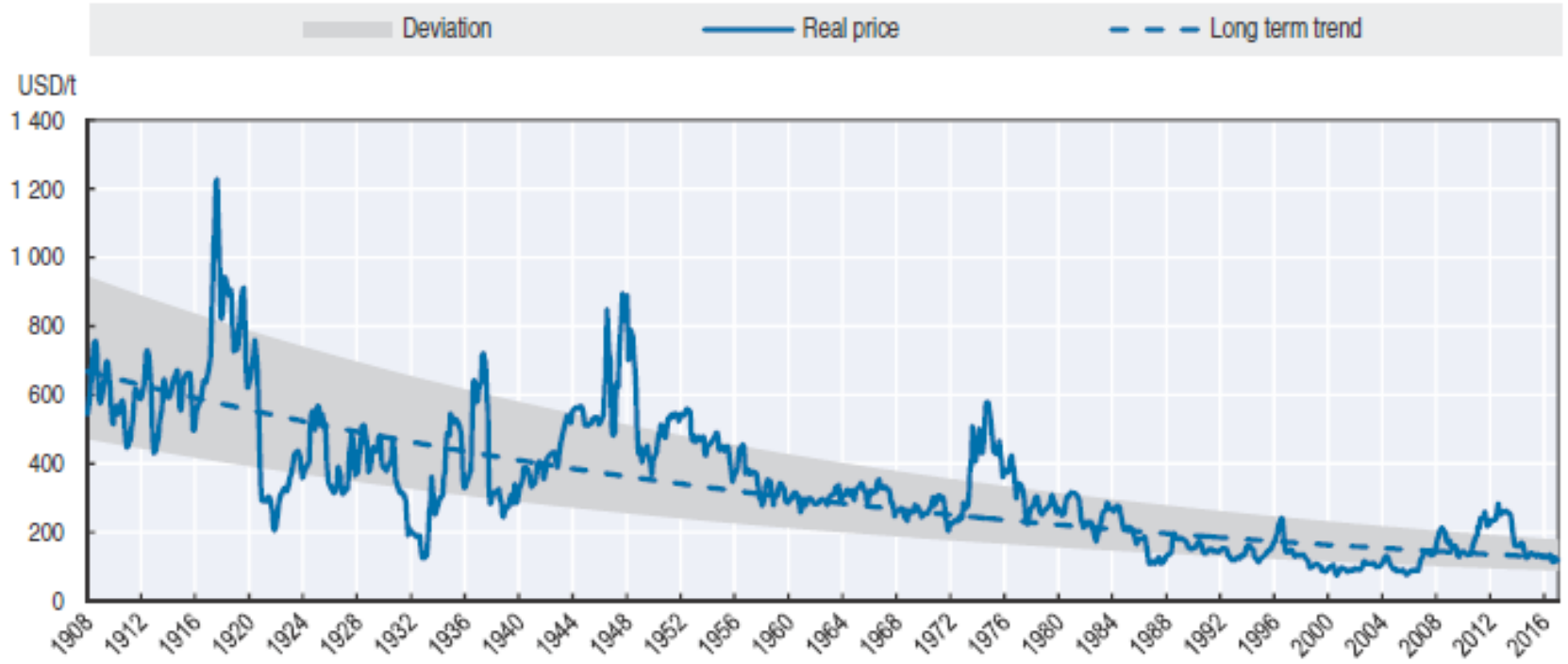
What kind of food shock?

Figure 1.32. **Long-term price of maize in real terms**

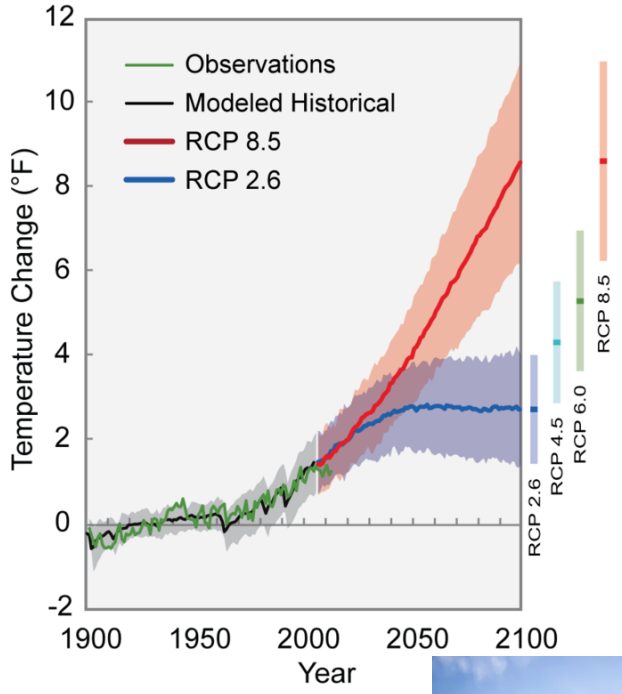


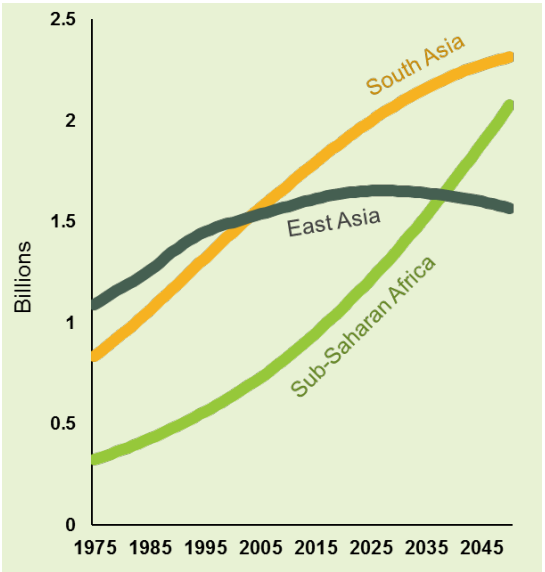
Note: Deviation refers to one standard deviation above and below the trend line.
Source: Monthly "Corn price received" from USDA Quickstats, deflated using monthly CPI data from *www.bls.gov/data*.

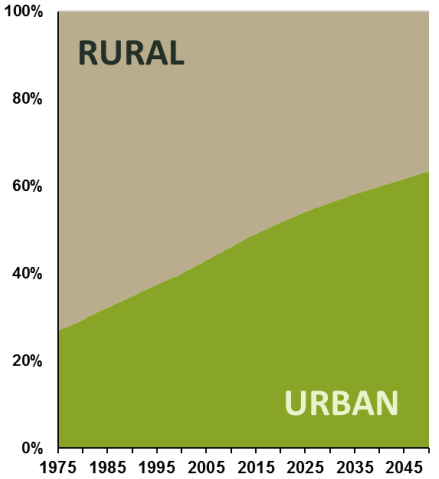
StatLink http://dx.doi.org/10.1787/888933521503

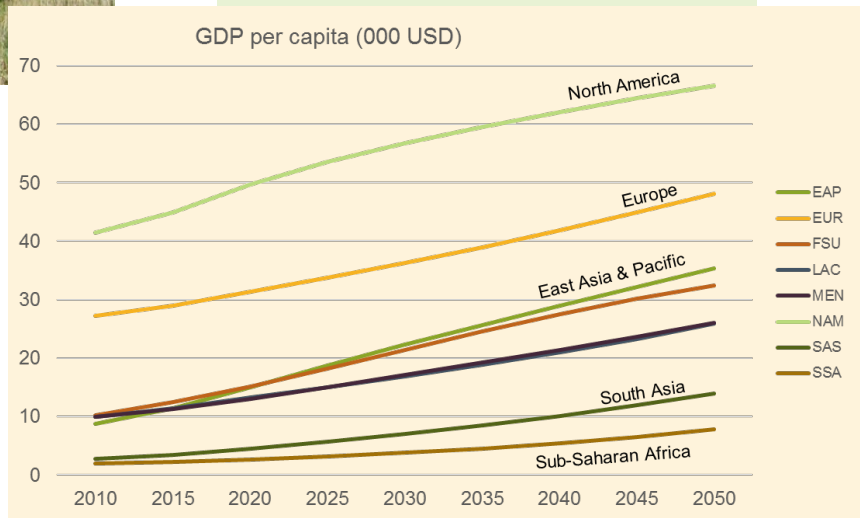
Source: OECD-FAO Agricultural Outlook 2017-2026

Balancing multiple drivers and constraints



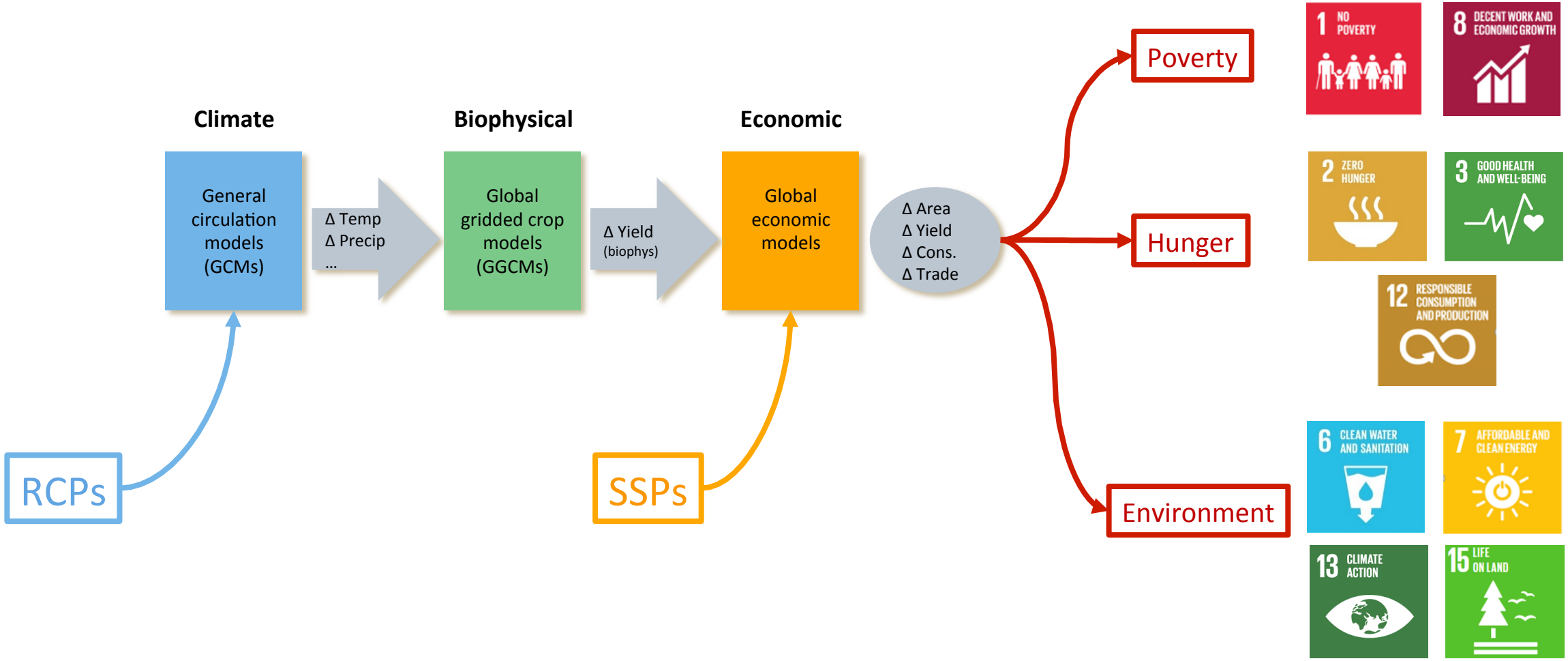






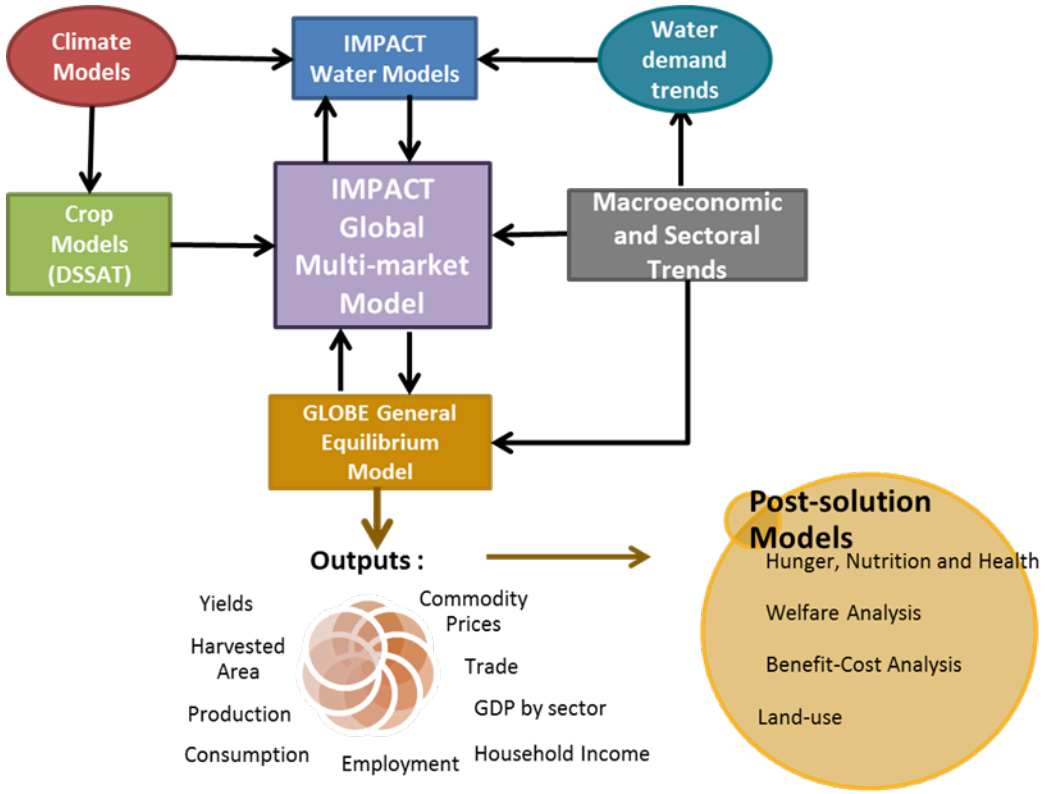
Modeling alternative futures for agriculture

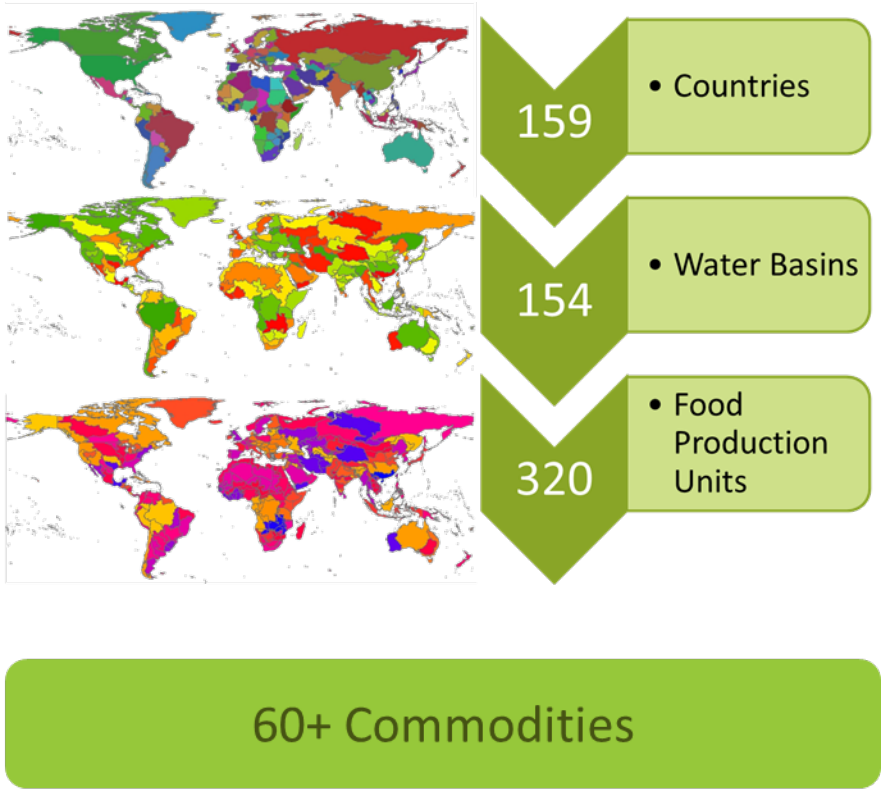
biophysical and socioeconomic drivers and effects



Adapted from Nelson et al., *Proceedings of the National Academy of Sciences* (2014)

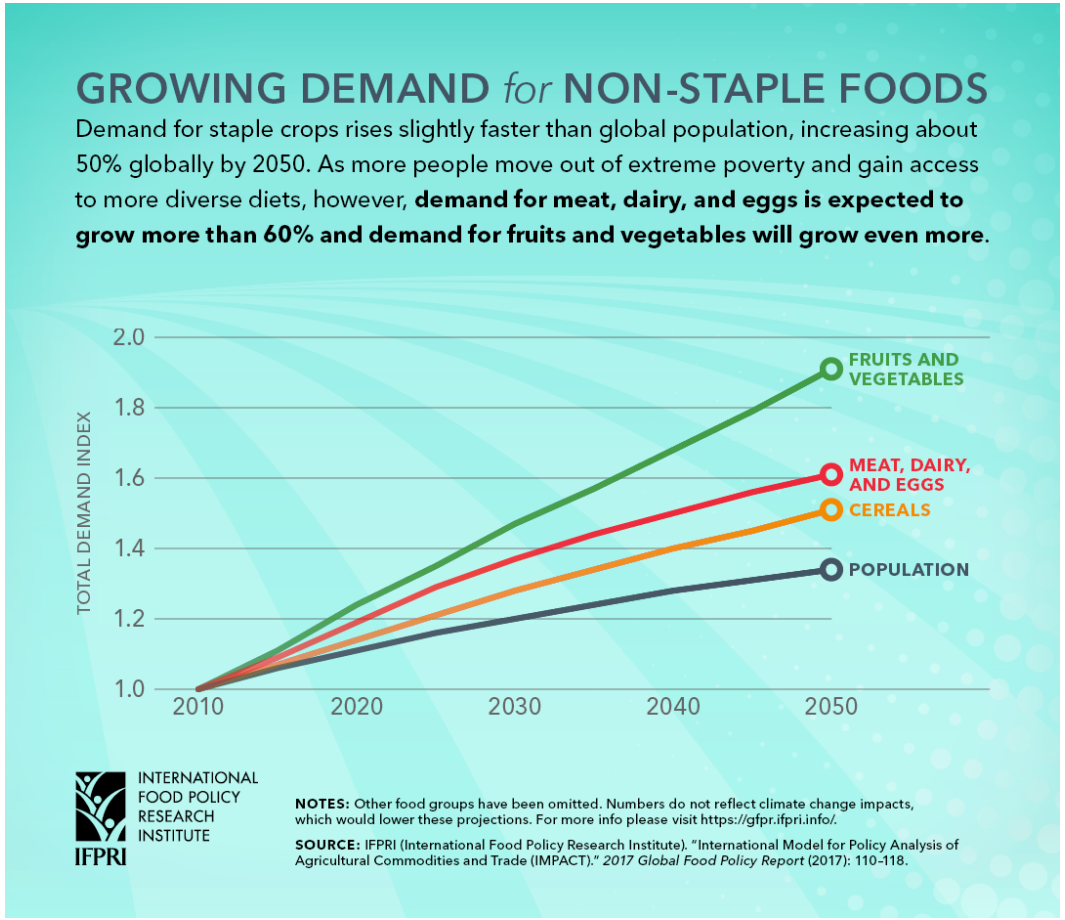
The IMPACT-GLOBE system of models

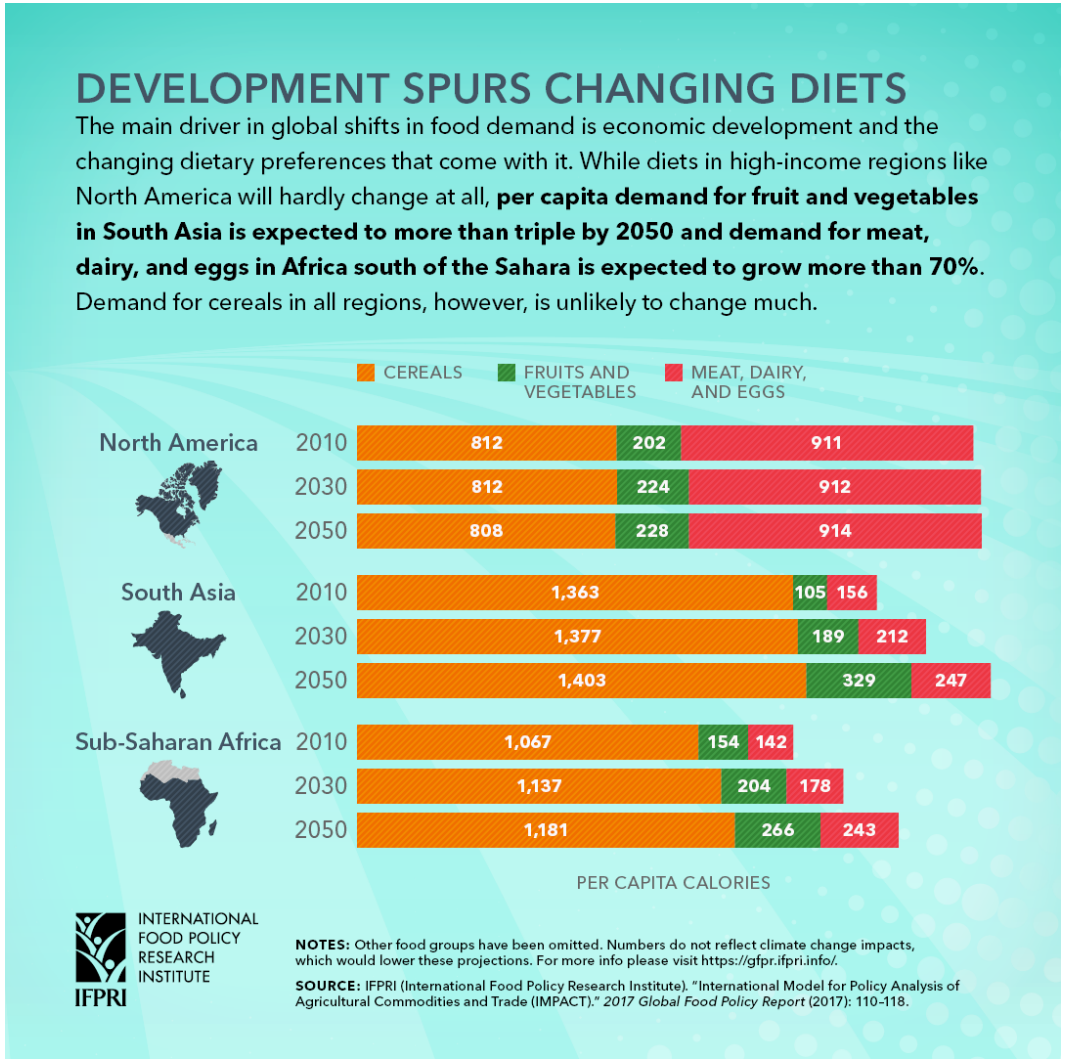




Source: Robinson et al. (IFPRI, 2015).

Changing patterns of demand



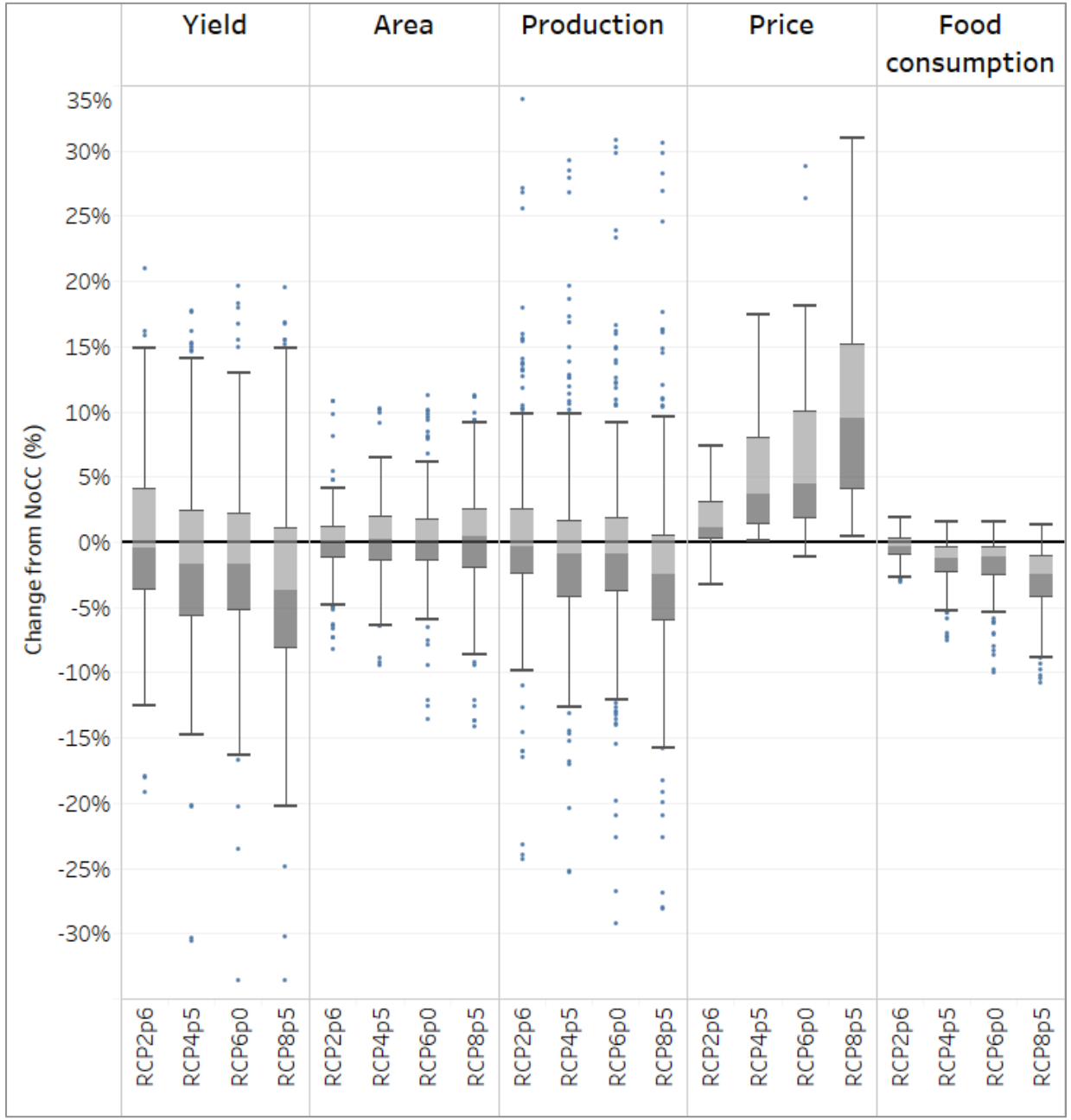


Source: IFPRI (2017)

Climate change impacts vary

by crop, region and scenario

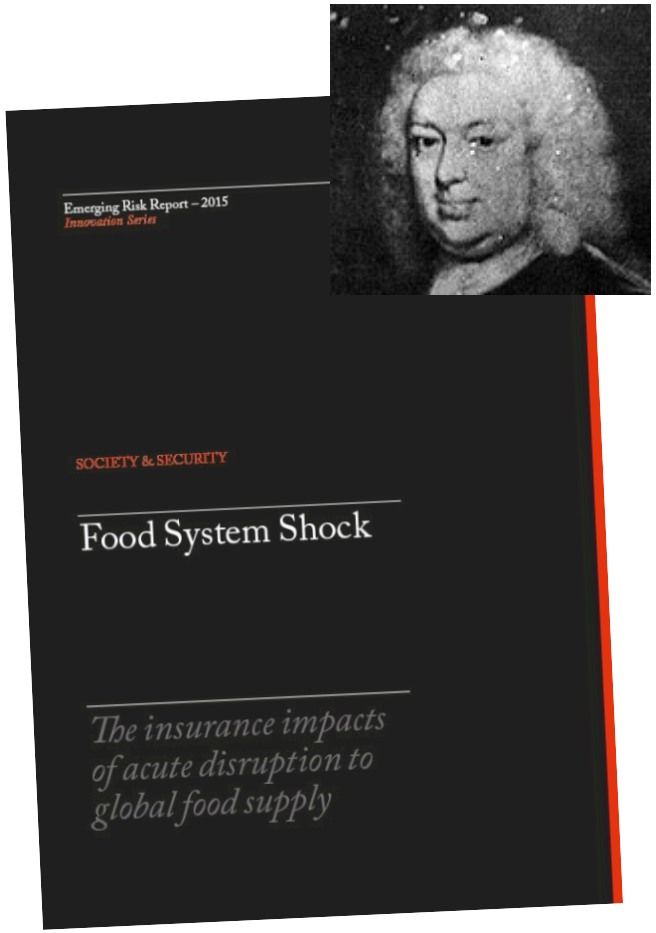
Percent change in selected indicators under climate change, relative to the NoCC reference scenario in 2050.

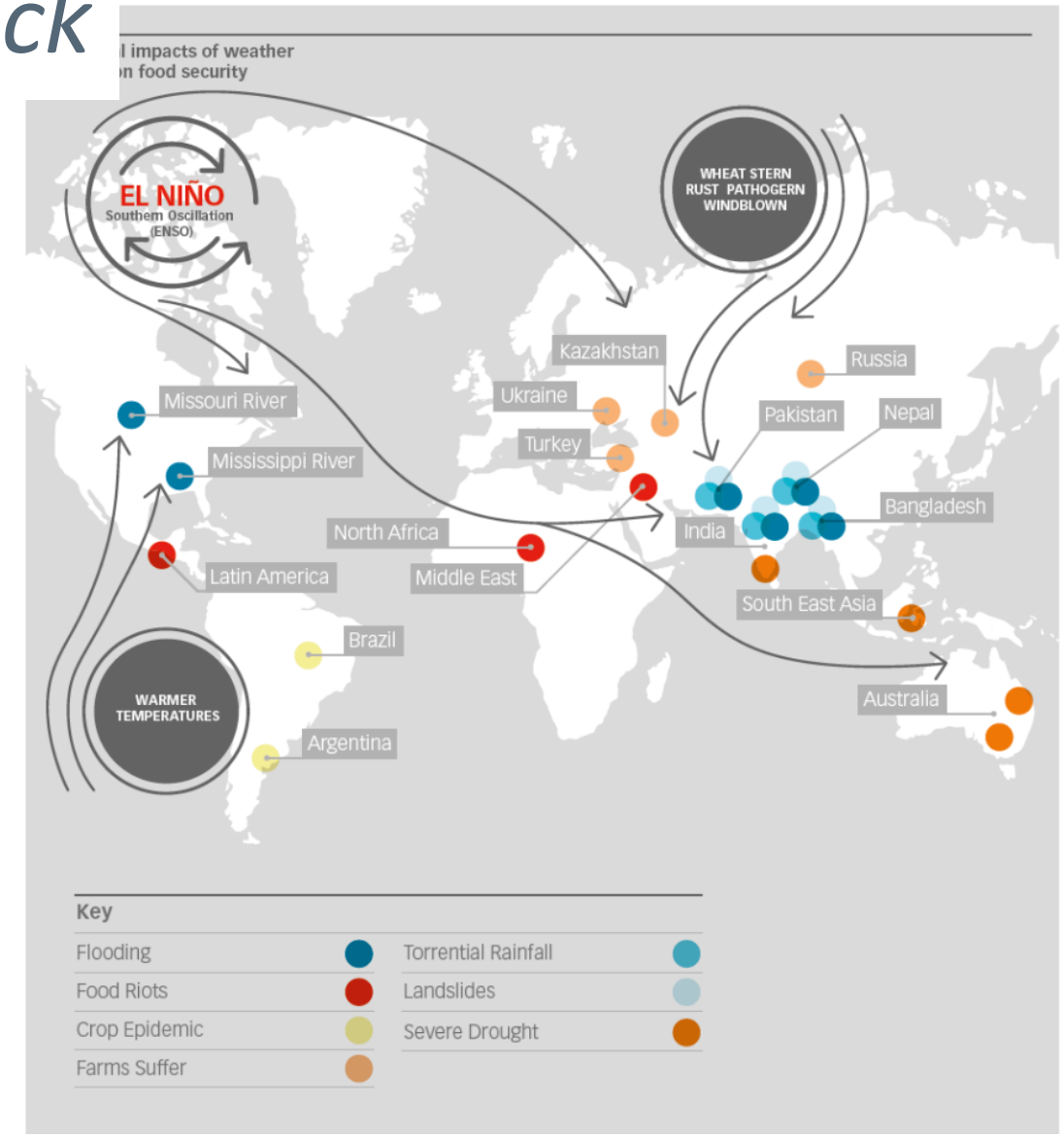


Note: Each observation represents a result for one crop group (cereals, roots and tubers, pulses, oil-crops, and fruit & vegetables), one region, one RCP, and one GCM. All estimates assume middle-of-the-road growth in population and income (SSP2).

Source: Mason-D'Croz, Cenacchi, Dunston, Sulser, Wiebe et al. (draft) based on results from IMPACT v3.3.

Lloyds *Food System Shock*





Global impacts of African swine fever in China

ANIMAL HEALTH

African swine fever marches across much of Asia

Rampant in China, the virus invades neighboring countries, threatening food security

By **Dennis Normile**, *in Shanghai, China*

The spread of African swine fever (ASF) in Asia is taking a worrisome turn. First reported in northeastern China in August 2018, the highly contagious, often fatal pig disease quickly swept through the country, causing the death or culling of more than 1 million pigs. In recent weeks, it has jumped borders to Vietnam, Cambodia, Mongolia, Hong Kong, and possibly North Korea. Animal health experts agree that the disease will inevitably spread farther. And many of the newly hit countries are even less prepared to deal with ASF than China, they say, which has so far failed to end its outbreaks.

Vietnam and Cambodia "probably do not have the technical abilities to be able to control ASF," says François Roger, an animal epidemiologist at the French Agricultural Research Center for International Development in Montpellier. He believes the virus will soon surface in Myanmar and Laos, which have "weak veterinary infrastructure and at bay is fiendishly difficult given how

"This is probably the most serious animal health disease [the world has] had for a long time, if not ever."

Dirk Pfeiffer, City University of Hong Kong

miologist at City University of Hong Kong.

ASF is harmless for humans but spreads rapidly among domestic pigs and wild boars through direct contact or exposure to contaminated feed and water. Farm workers can unwittingly carry the virus on shoes, clothing, vehicles, and machinery. It can survive in fresh and processed pork products; it is even resistant to some disinfectants.

Endemic in most of Africa, the ASF virus jumped to the nation of Georgia in 2007 and has since spread through Russia. It probably entered China in imported pork products last summer. Infected animals suffer high fever, internal bleeding, and, most often, death, and there is no treatment.

"There are promising vaccines under development," says Yolanda Revilla of the Severo Ochoa Center for Molecular Biology in Madrid, who co-authored a recent review on ASF vaccines—but they're still at least 3 or 4 years away from the market. Until then, reducing transmission is the only option.

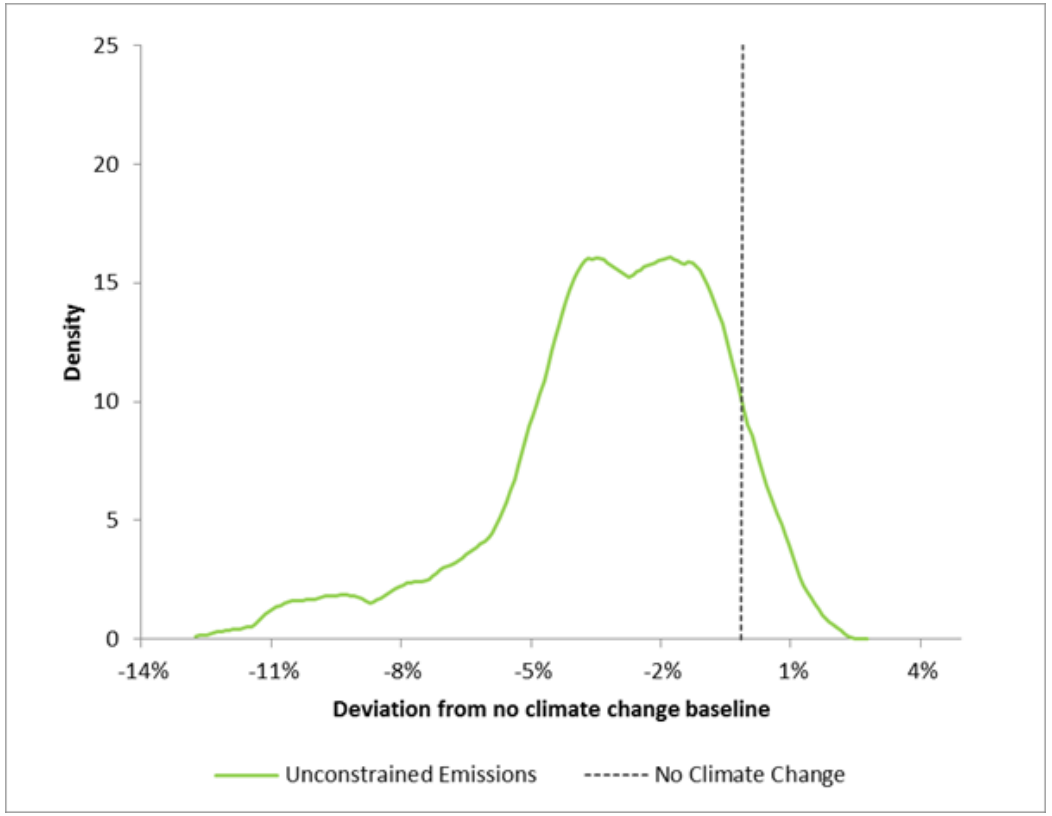
But keeping the virus

- Work in progress with Oxford and CSIRO, using IMPACT and GLOBE
- Scenarios of 20 – 80% reductions in pig numbers in China
- Simulating impacts on pork production, prices, demand, trade
- Also spillover effects on other commodities and regions

Impacts of climate uncertainty in Southern Africa

- The Joint Program for the Science and Policy of Global Change at MIT produces a distribution of 6800 possible climates for Southern Africa.
- Arndt et al. (2019) selected about 400 future climates and ran those through country and regional bio-physical and economic models to generate a distribution of outcomes.
- Extension of this work globally is now possible at reasonable computational cost. IFPRI is looking to do more to capture uncertainty and low-probability-but-high-impact events.

Estimated distribution of GDP for Mozambique in 2050



Source: Arndt et al., *Climatic Change* (2019)

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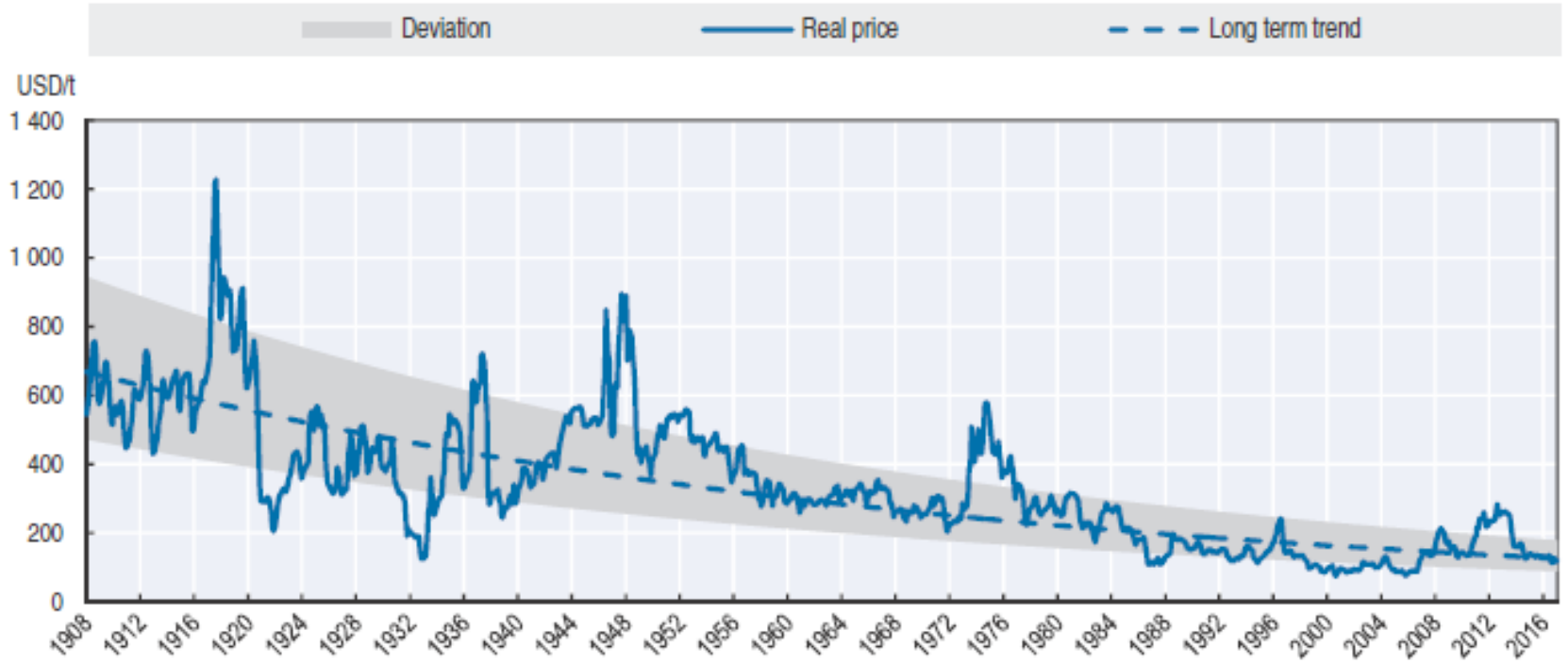

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- Routine to model impacts of long-term, slow-onset "shocks"
- Routine to model different scenarios
- Fairly routine to model impacts of one-off shocks
- Beginning to model uncertainty in outcomes
- Important to consider what kind of shock, for whom, for what, what scale, what tools, etc…

Thank you