IAM COMPACT Study 7

Dietary shift to lower animal protein consumption

September 4, 2023

BC3

Outline

Motivation and the Model

Motivation

Literature has analyzed how a transition to healthy diets can benefit health, biodiversity, land use, and climate (Lancet-EAT)

But...

 $\star$ it is unclear how this transition will occur

 $\star$ the system-wide effects that could derive from this transition

We'll study the Flexitarian Vegetarian or Vegan (**FVV**) diet.

Objective

1. Create a model to deal with the uncertainty of the scenario projections

2. Study the following effects:
   - ▷ GHG emissions
   - ▷ Water consumption
   - ▷ Premature deaths
   - ▷ Land use
   - ▷ Nutritional values

The model

Assumptions

1. Each person decides to become FVV independently but is influenced by 3 factors:
   ▷ Social pressure
   ▷ Percentage of the population following the FVV diet by 2100
   ▷ Peak year when the majority of the population will shift

2. Once a person decides to follow the FVV diet, will stick to this decision for the rest of the century

The model

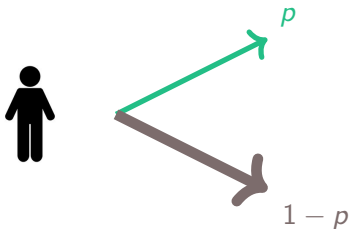Binomial distribution with probability *p*
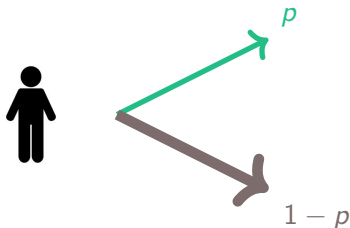
Where the probability *p* is influenced by

- ⋆ Social pressure
- ⋆ Percentage of the population following the FVV diet by 2100
- ⋆ Peak year when the majority of the population will shift

The model
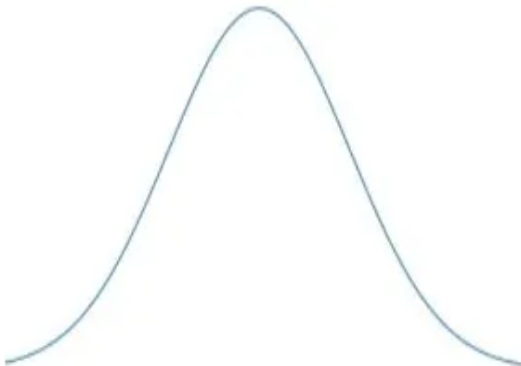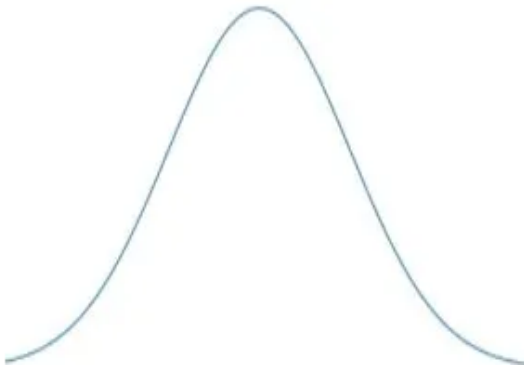
Binomial distribution with probability p

Where the probability p is influenced by

* ⋆ Social pressure   → Exogenous
* ⋆ Percentage of the population following the FVV diet by 2100
* ⋆ Peak year when the majority of the population will shift

Uncertainty considerations

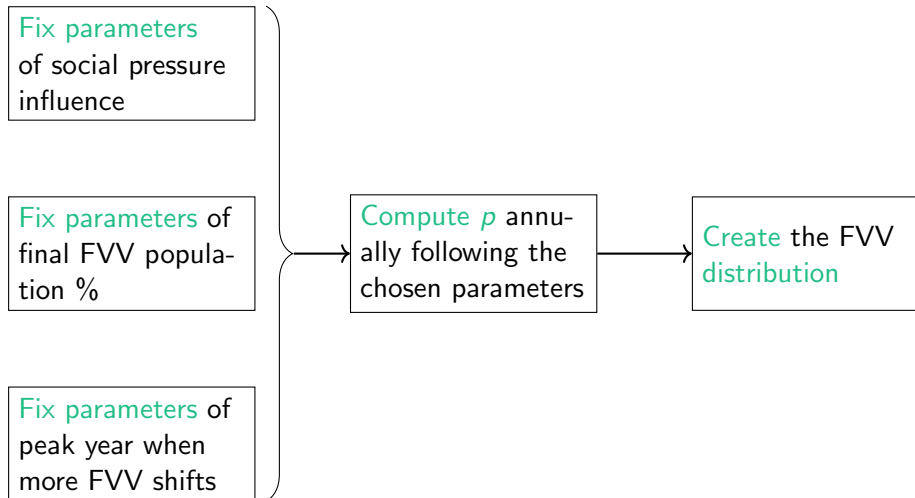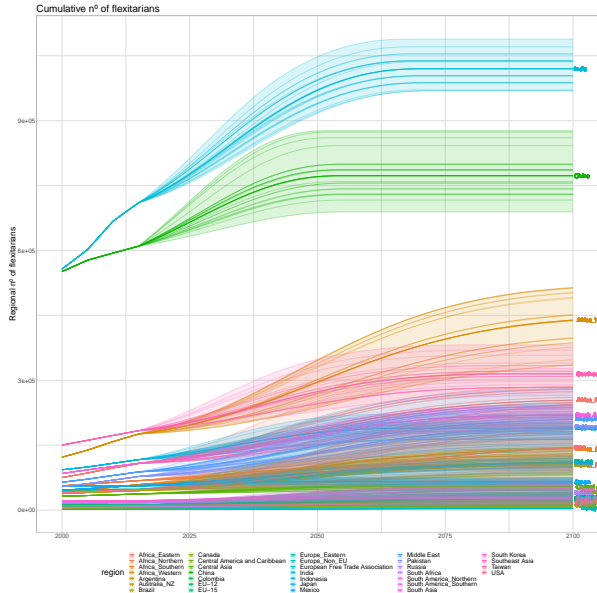Each factor value is randomly chosen from a Normal Distribution $N(\mu, \sigma)$

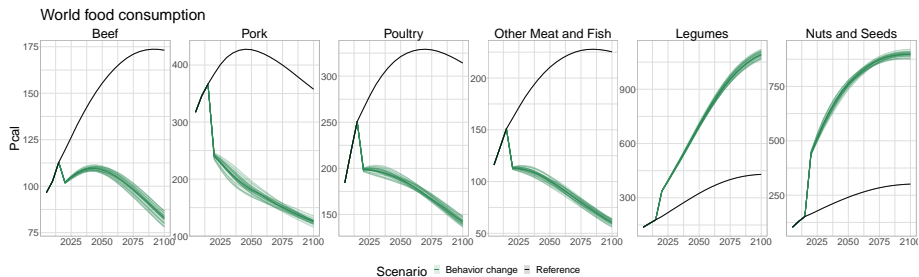Each factor value is randomly chosen from a Normal Distribution $N(\mu, \sigma)$

Recap

Fix parameters of social pressure influence

Fix parameters of final FVV population %

Fix parameters of peak year when more FVV shifts

Compute p annually following the chosen parameters

Create the FVV distribution

Example

Example

World food consumption

System-wide effects

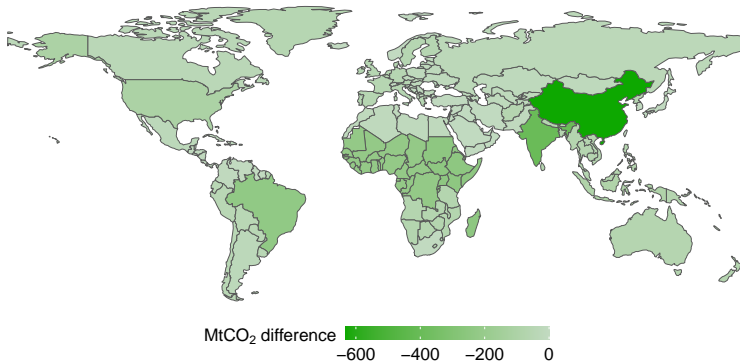# GHG emissions
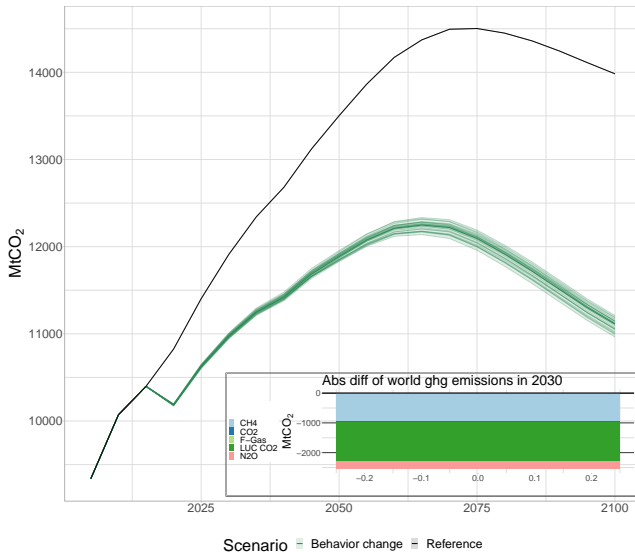
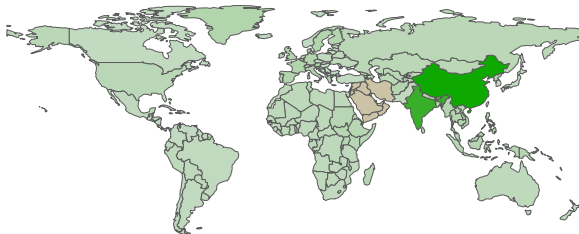Abs MTCO2 regional GHG avoided emissions in 2030
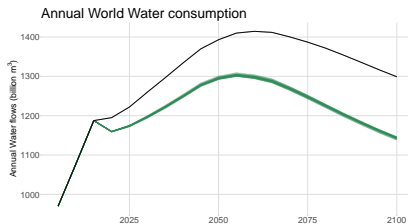
GHG emissions

Annual World CH$_4$ emissions prices

Water consumption

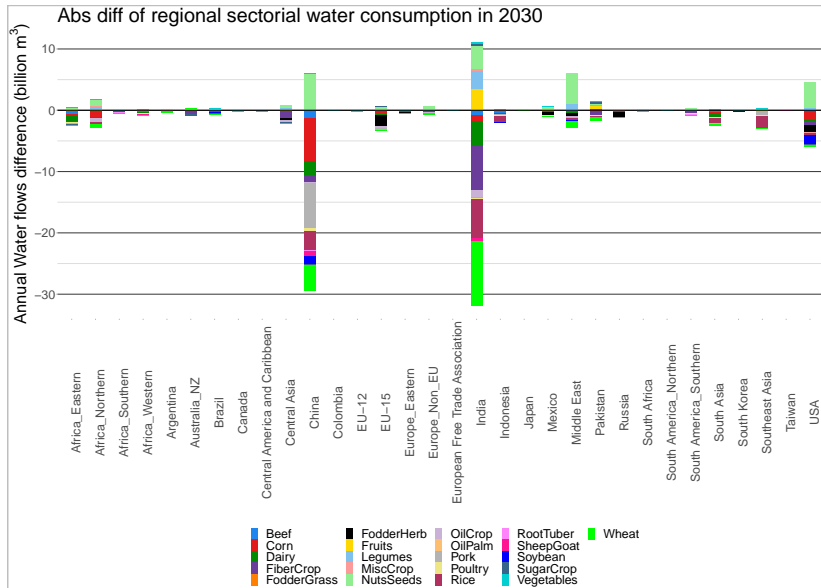Annual water consumption abs difference in 2030

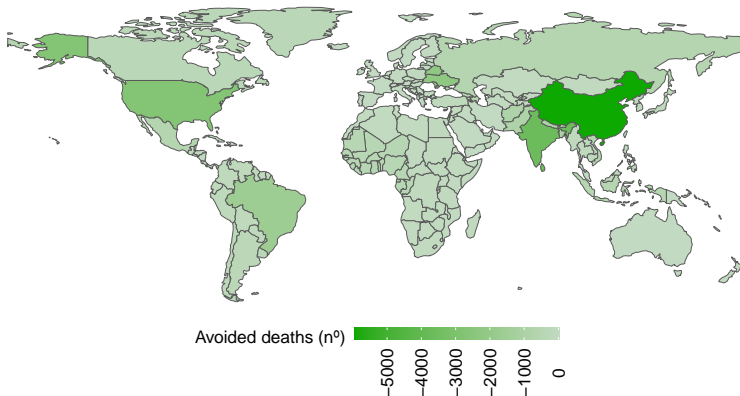Annual Water flows difference (billion m^3)

−20 −15 −10 −5 0

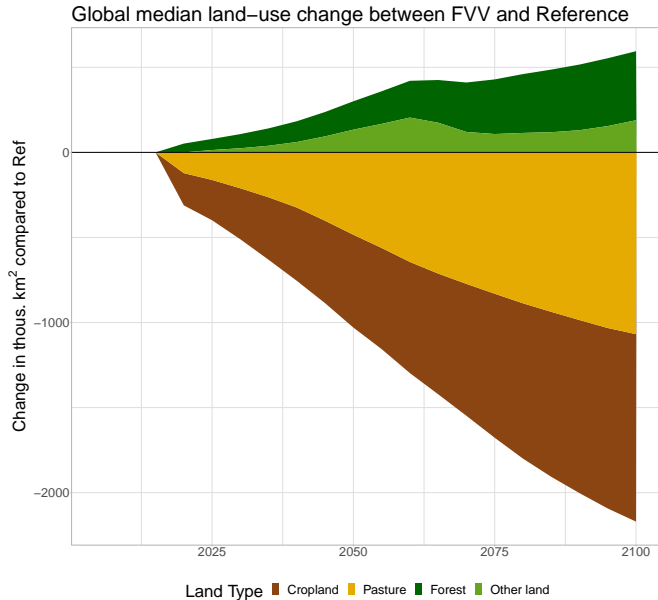Annual World Water consumption

Water consumption

Abs diff of regional sectorial water consumption in 2030

Avoided premature deaths

Annual avoided deaths in 2030

Avoided deaths (nº)

−5000 −4000 −3000 −2000 −1000 0

Land use

Global median land–use change between FVV and Reference

Future work

- ⋆ Study nutritional values
- ⋆ Create multiple scenarios to see which one has better system-wide effects. Maybe considering different regional levels of FVV?
- ⋆ Do a similar study for trade (with VWT) and transport. Maybe simplified?