



# Investigating global diet change dynamics by linking models of human behavior to IAMs

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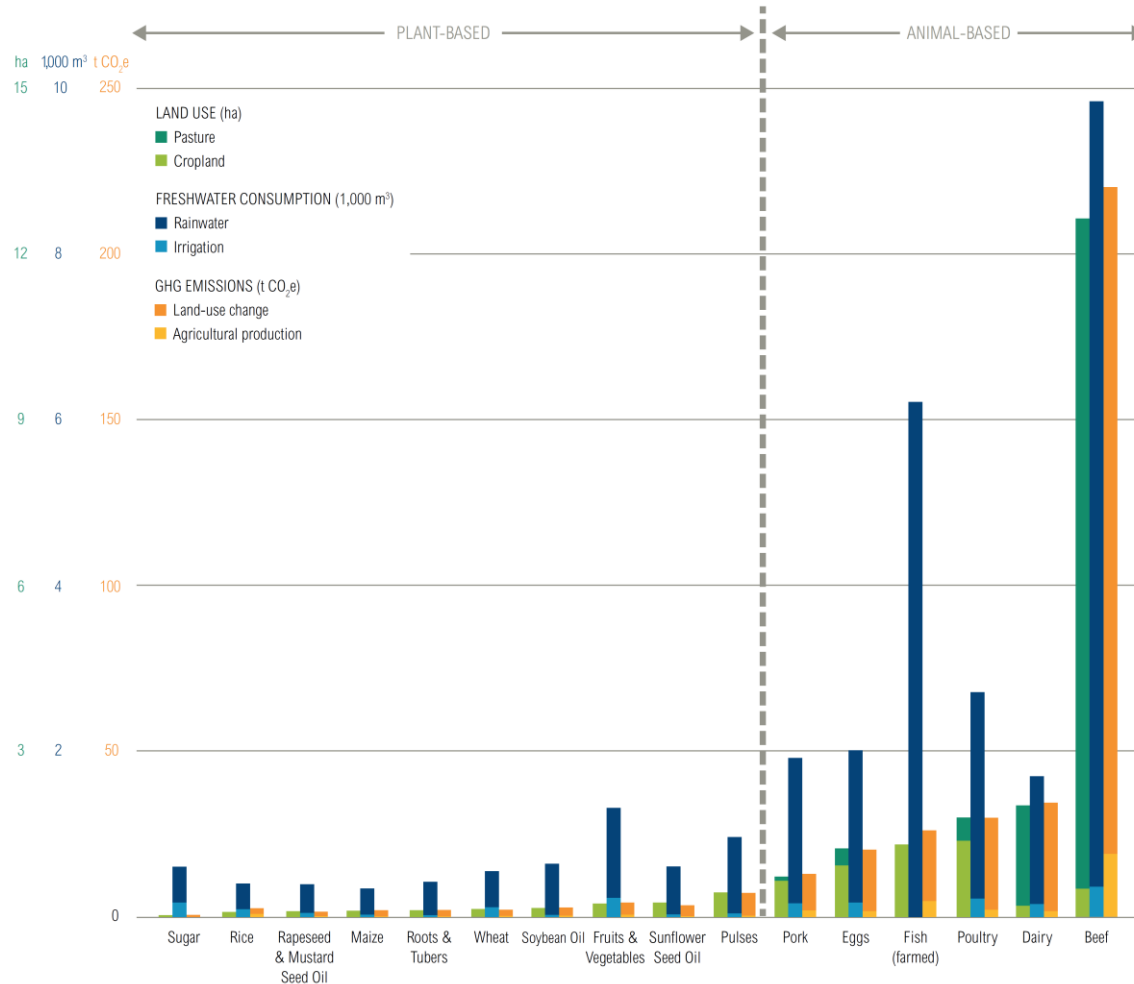
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# Diet change



# Diet Change

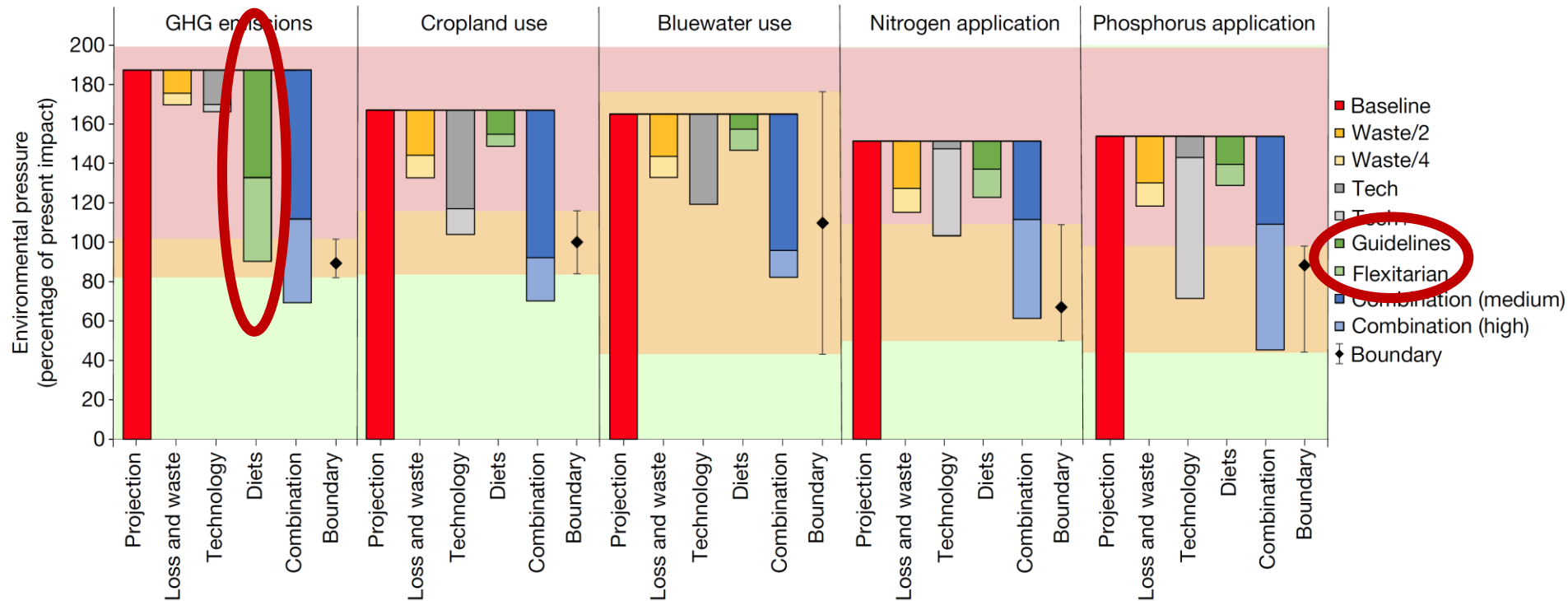
## PER MILLION KILOCALORIES CONSUMED



Source: World Resources Institute [1]

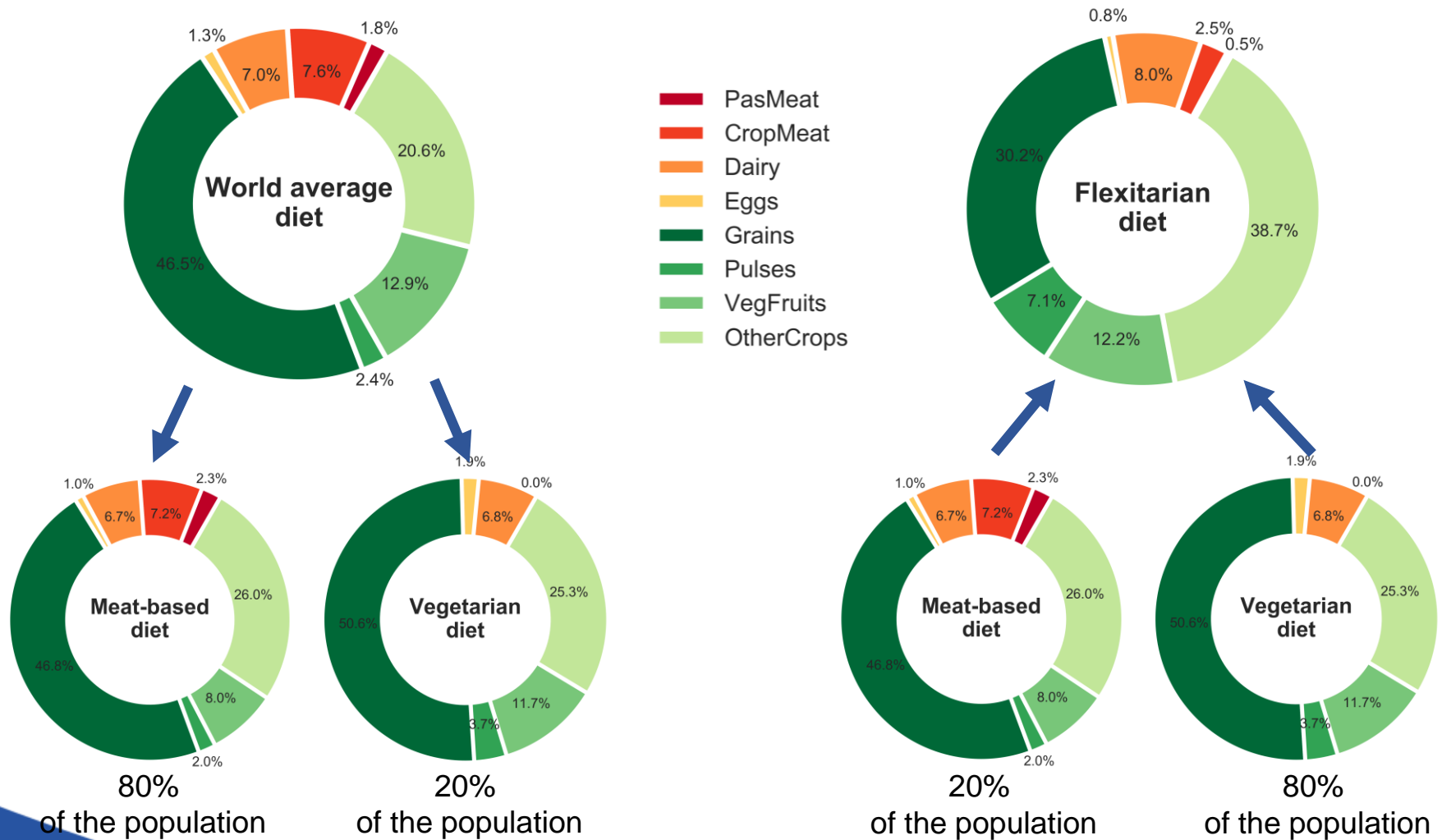
# Diet Change Dynamics

Impacts of reductions in food loss and waste, technological change, and dietary changes on global environmental pressures in 2050

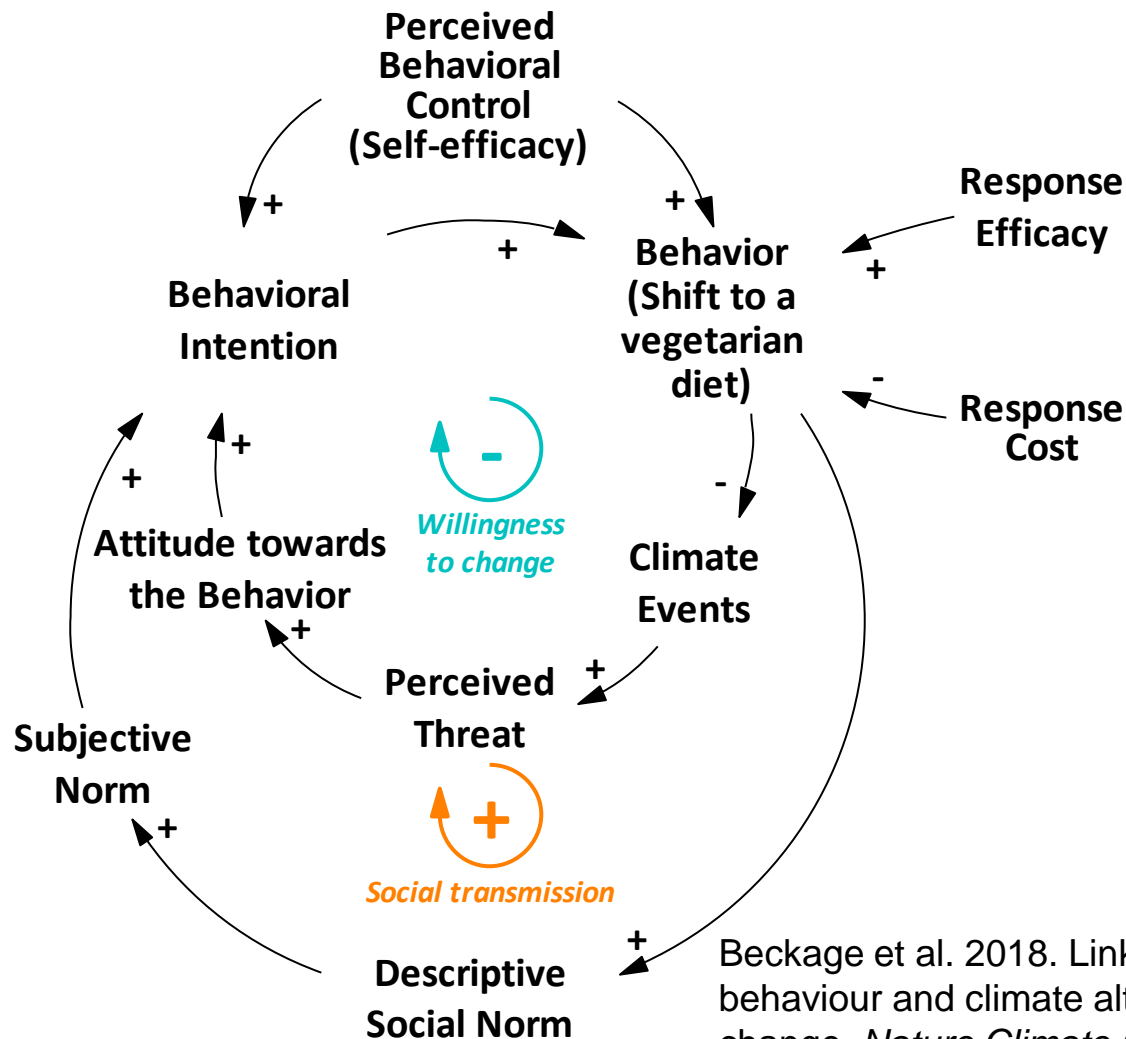


Source: Springmann et al. (2018) [2]

# How many people does it take...?

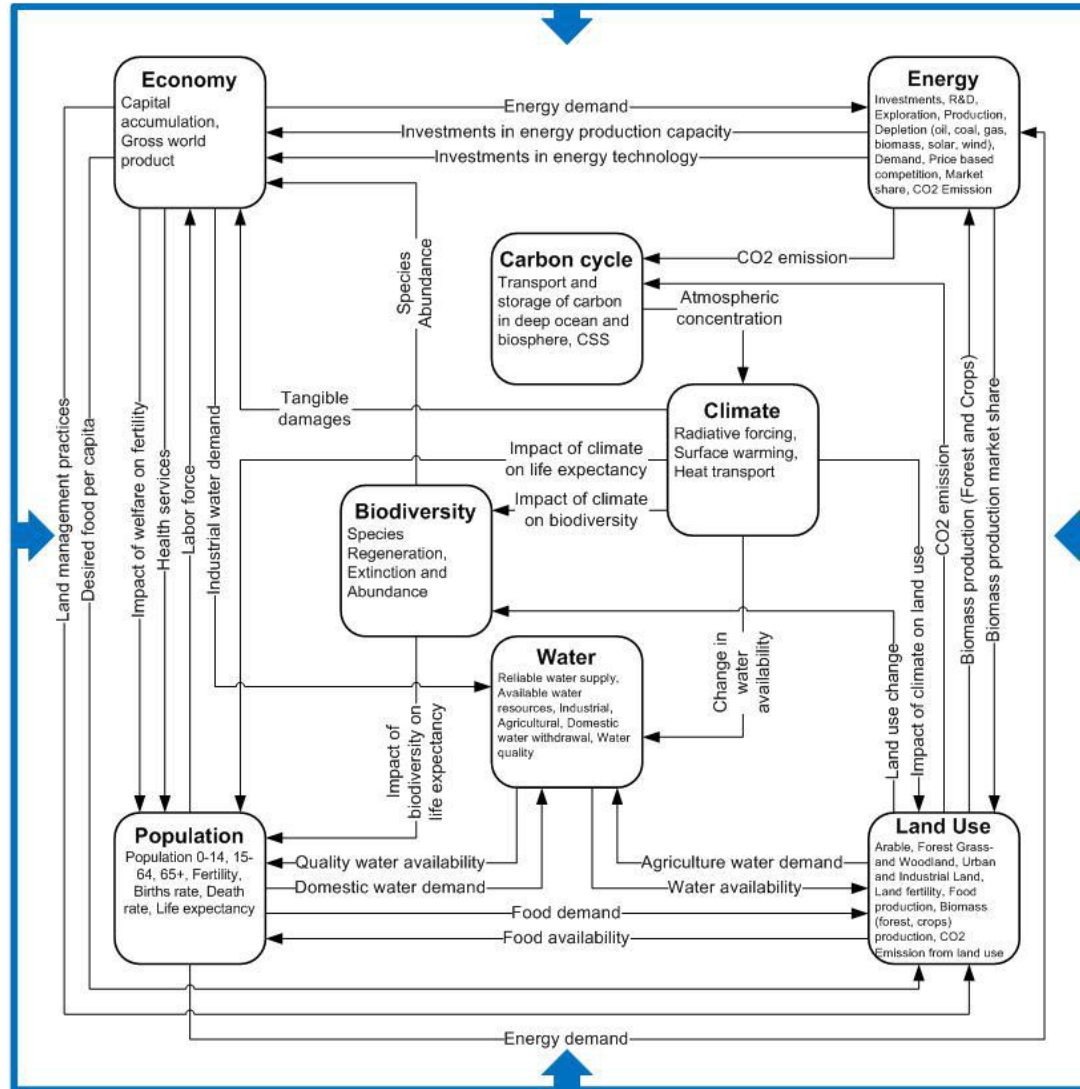


# Framework of Diet Change

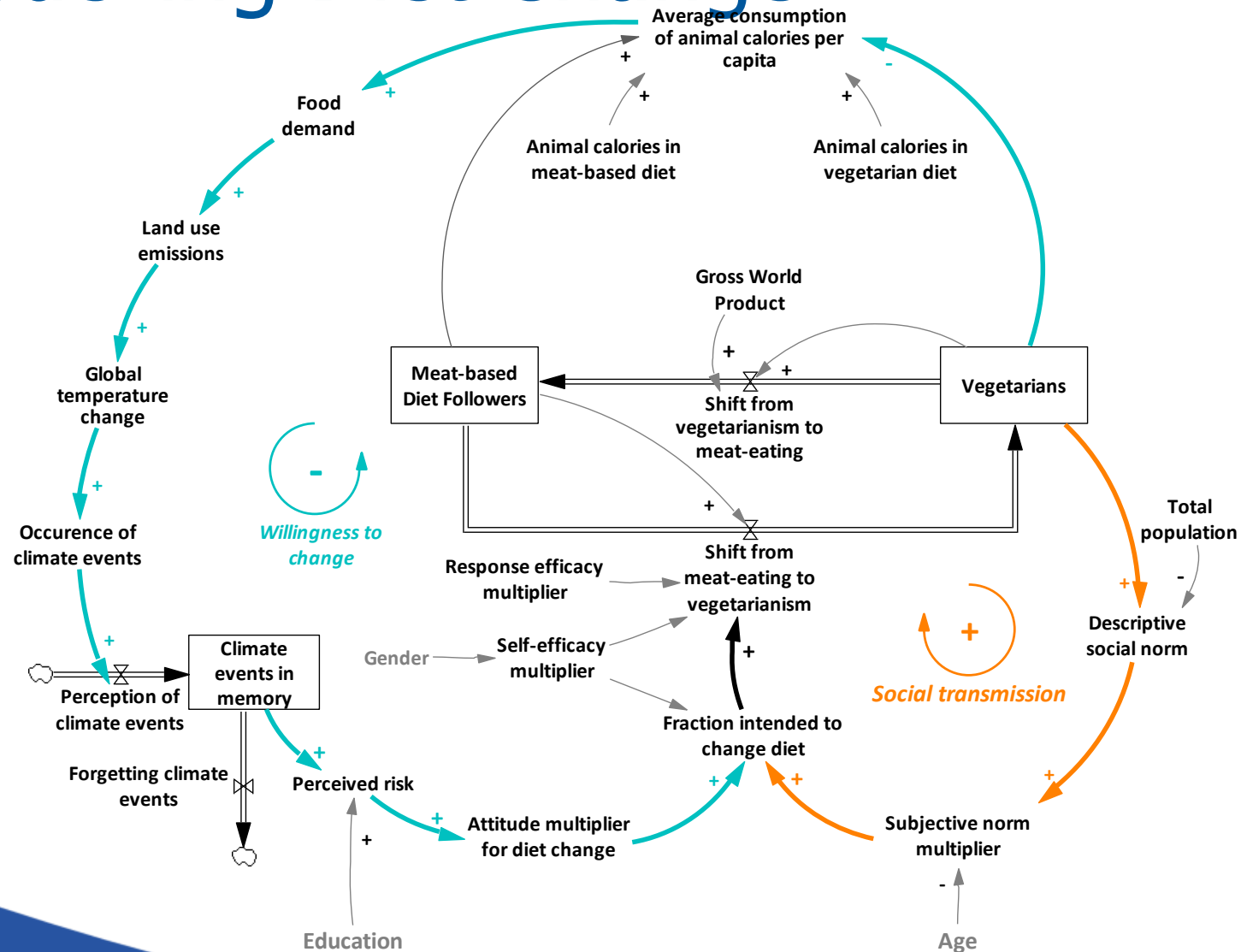


Beckage et al. 2018. Linking models of human behaviour and climate alters projected climate change. *Nature Climate Change*.

# Felix Model



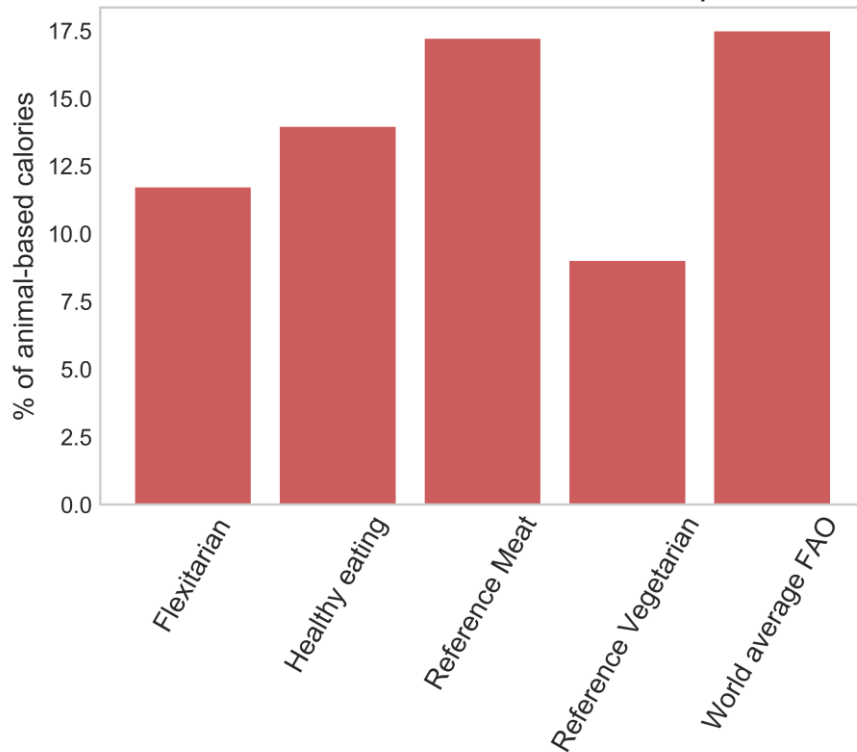
# Modelling Diet Change





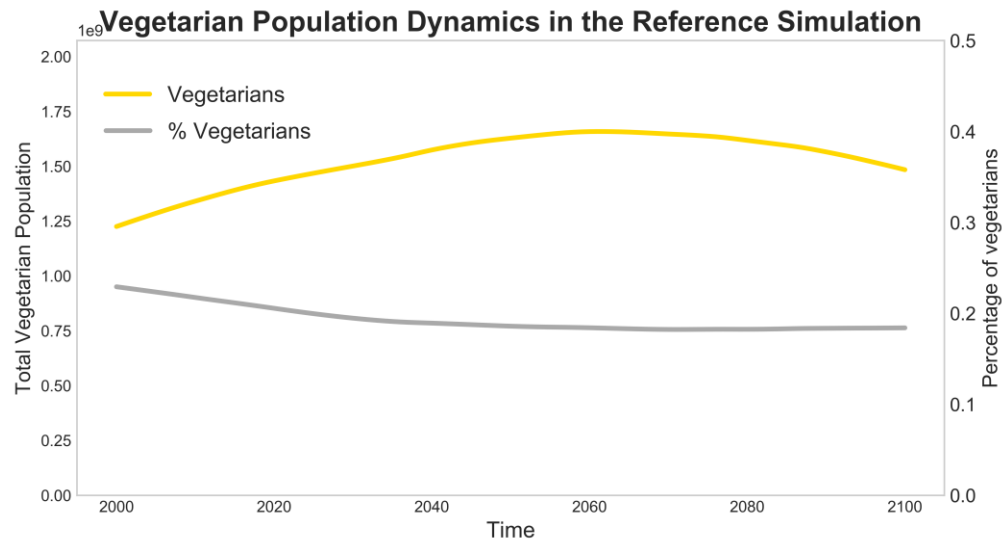
# Who eats what?

Animal calories in different diet compositions



Scenario	Meat-eater's diet	Vegetarians' diet
<i>Sc0_Reference</i>	Reference meat-based diet	Reference Lactoovo vegetarian diet
<i>Sc1_Flexitarian</i>	Flexitarian by 2050	
<i>Sc2_Healthy+Ref</i>	Healthy eating guidelines by 2050	Reference Lactoovo vegetarian diet
<i>Sc3_Healthy+Vegan</i>	Healthy eating guidelines by 2050	Vegan diet by 2050
<i>Sc4_Flexitarian+Vegan</i>	Flexitarian by 2050	Vegan diet by 2050

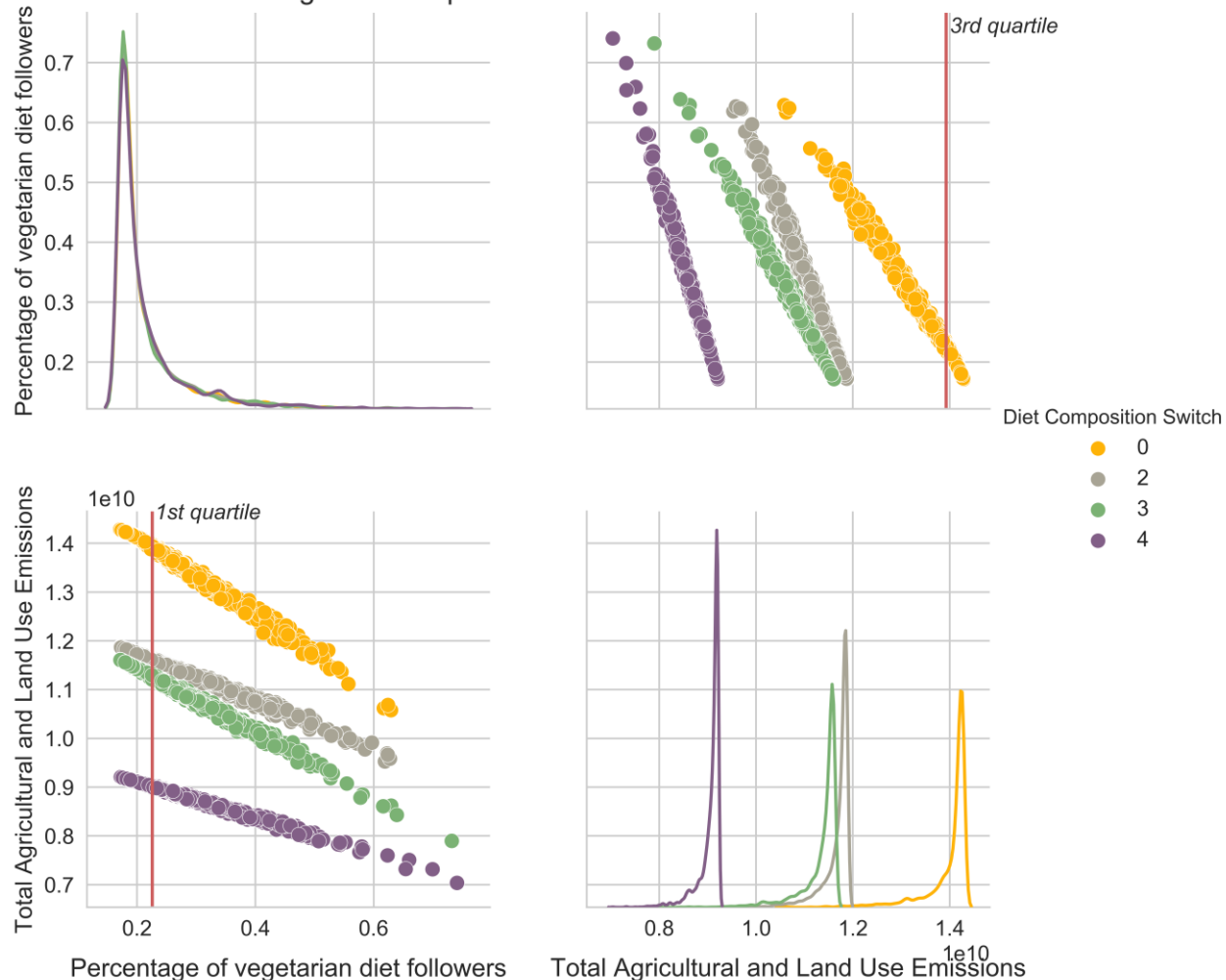
# Diet Change Dynamics





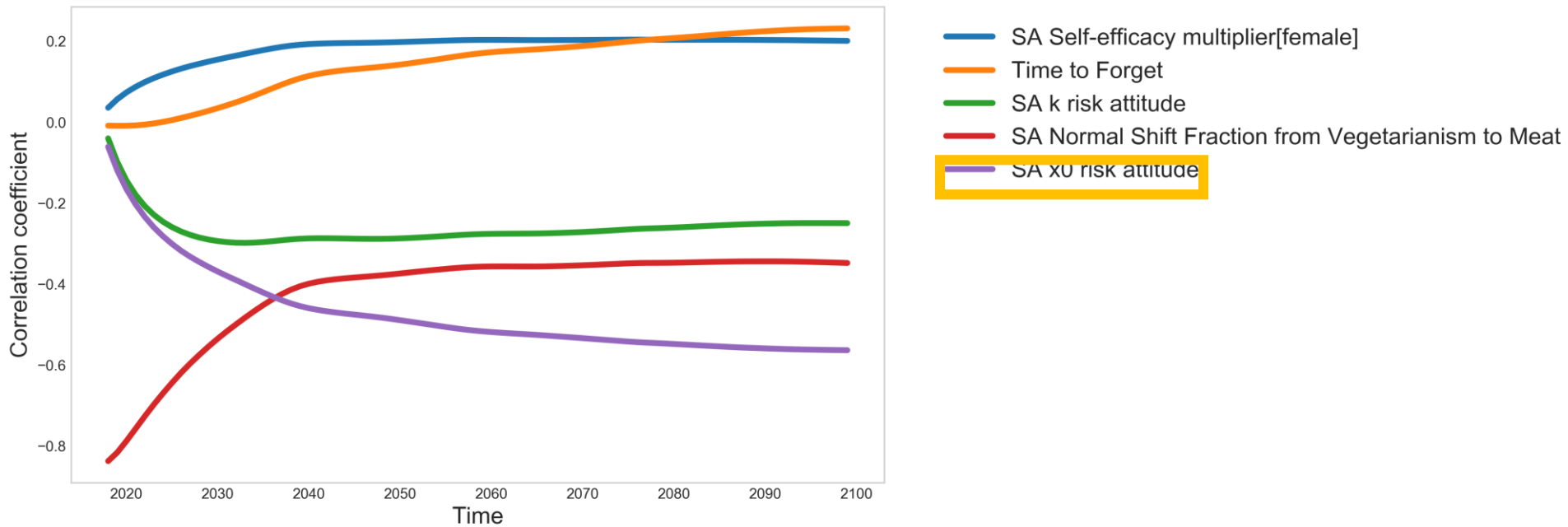
# Diet Change Dynamics - Uncertainty

Vegetarian Population vs. AFOLU Emissions in 2050



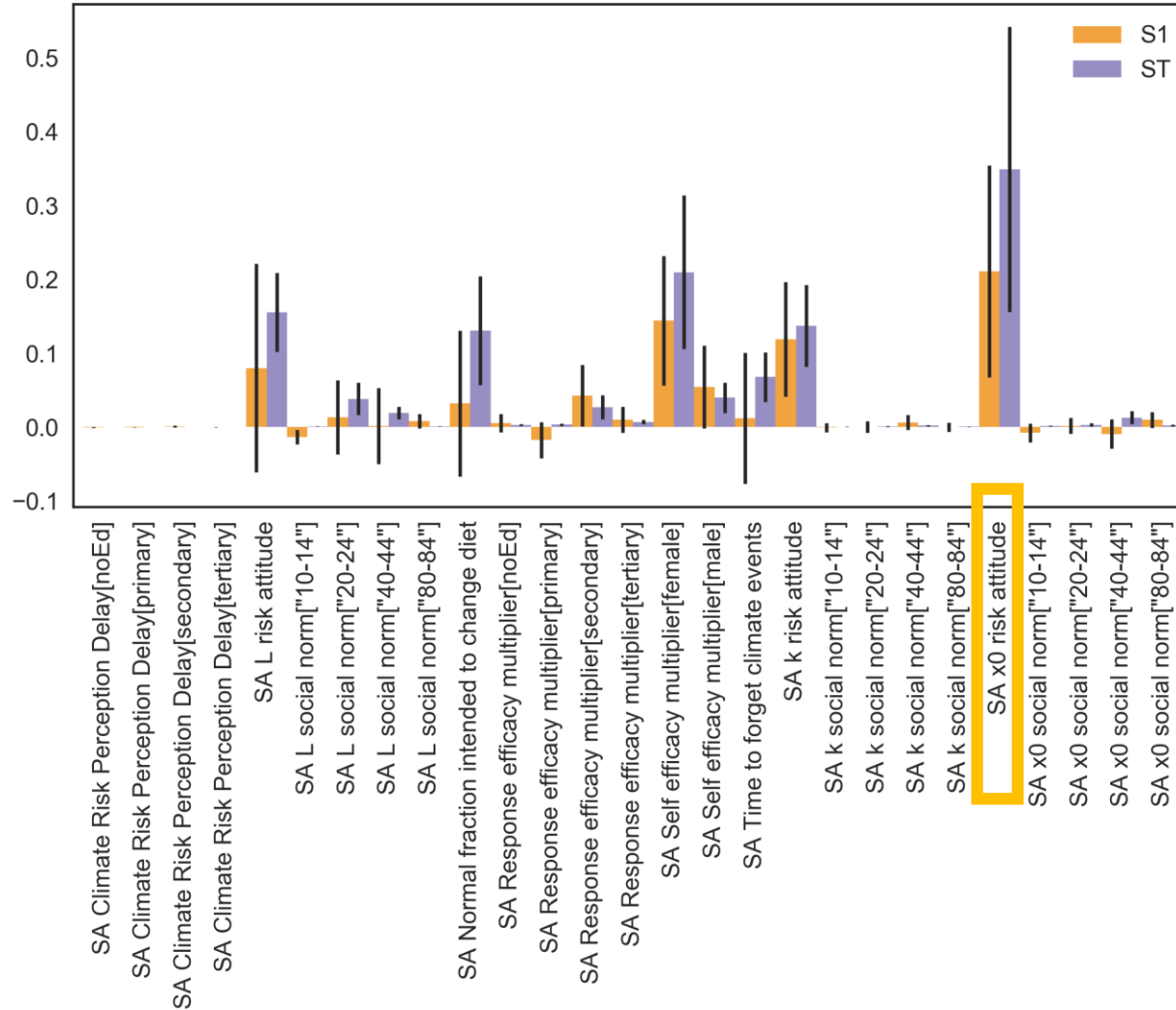
# Factor prioritization (Statistical screening)

Correlation coefficients over time for Total Vegetarians



# Factor prioritization (GSA)

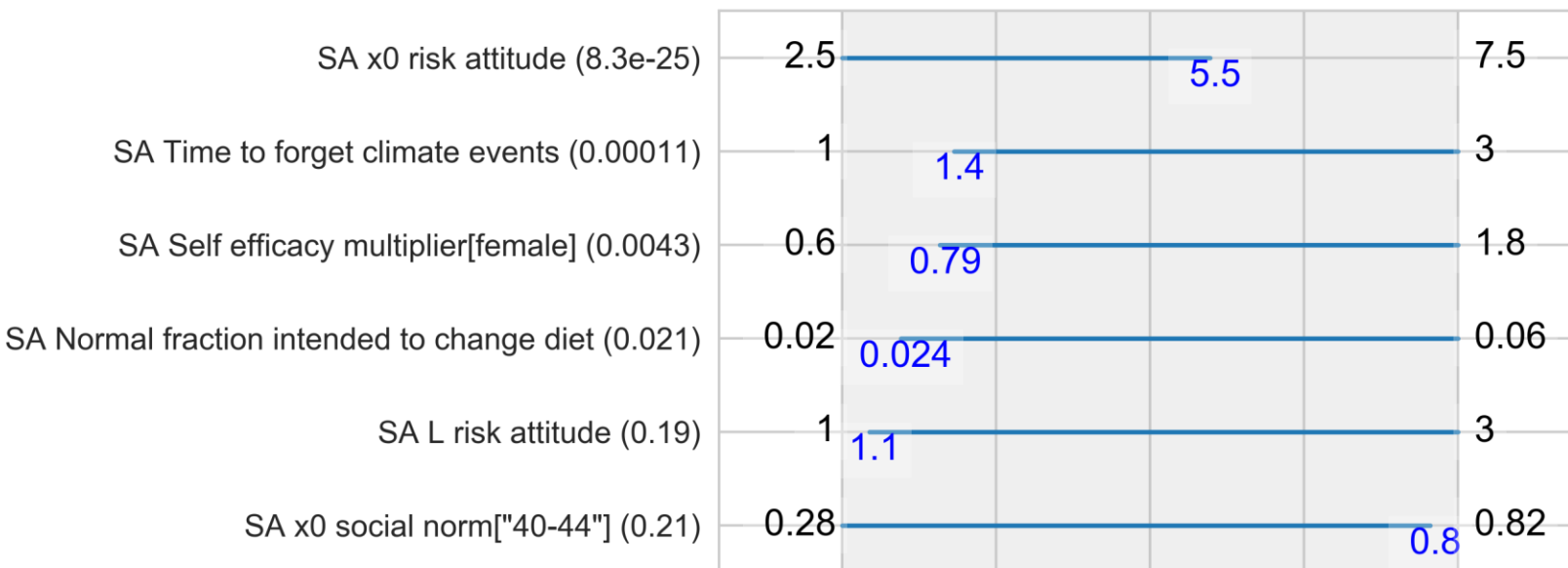
Sobol indices for Percentage of vegetarian diet followers



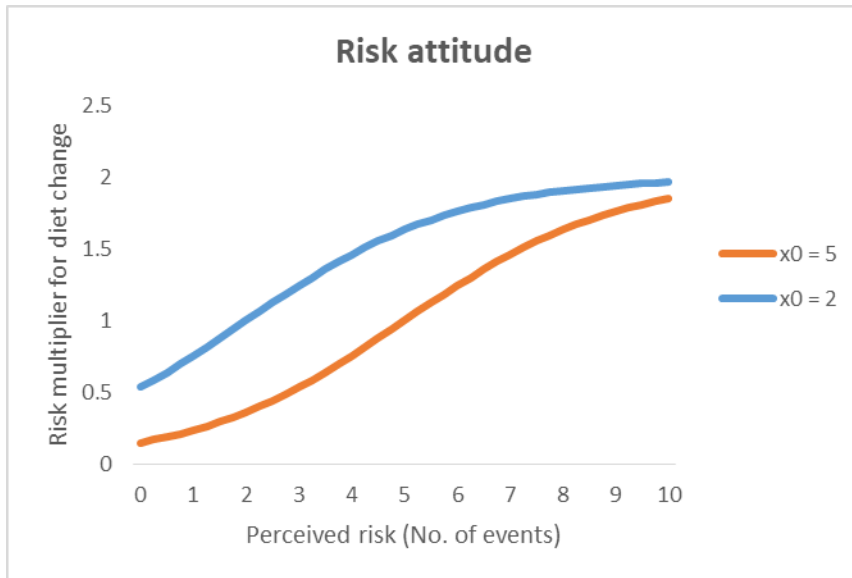
# Factor prioritization (PRIM)

**Which factors are distinguishing the scenarios with a high vegetarian fraction?  
(Reference diet composition, 2050)**

coverage	0.718
density	0.53



# Risk attitude



**The inflection point of the risk attitude function ( $x_0$ ):**

**The smaller it is, the more rapid diet change action is.**



# Conclusions

For an extensive diet change, even a low number of climate events should steer rapid action towards diet change.

A long time to forget climate events, e.g. by repeated media coverage, is required, too.

The model structure is transferable to other problems.

# References

- [1] Ranganathan, J., Vennard, D., Waite, R., Dumas, P., Lipinski, B., Searchinger, T., 2016. Shifting diets for a sustainable food future. World Resources Institute: Washington, DC, USA.
- [2] Springmann, Marco, et al. 2018. Options for keeping the food system within environmental limits." *Nature*.
- [3] Beckage, B., Gross, L.J., Lacasse, K., Carr, E., Metcalf, S.S., Winter, J.M., Howe, P.D., Fefferman, N., Franck, T., Zia, A., 2018. Linking models of human behaviour and climate alters projected climate change. *Nature Climate Change*

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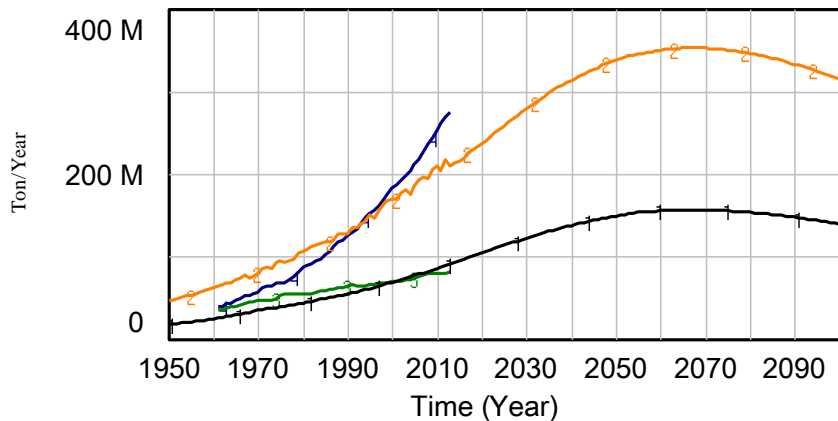
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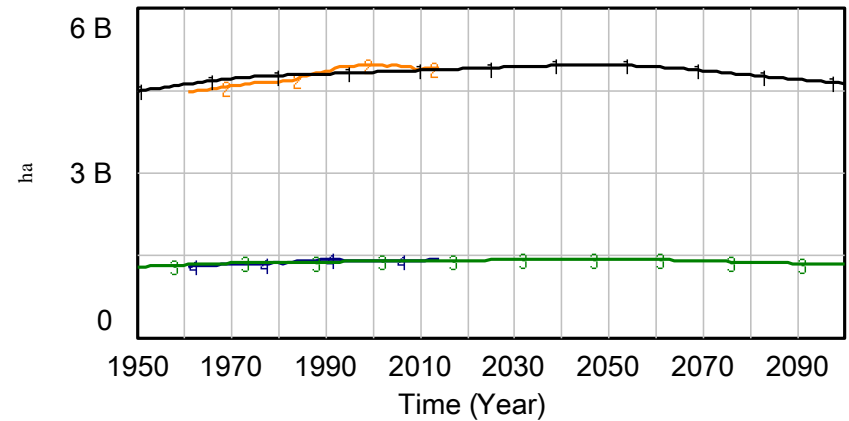
# Historical Data Comparison

Food production rate



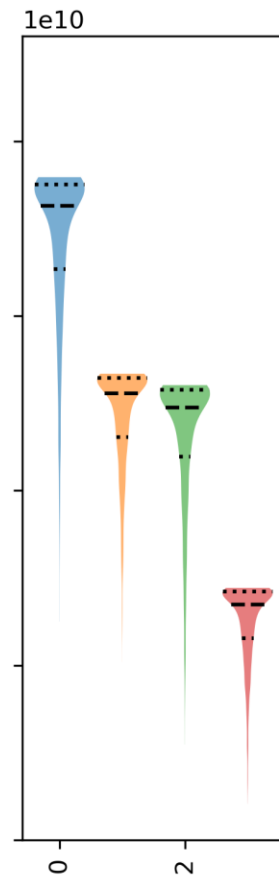
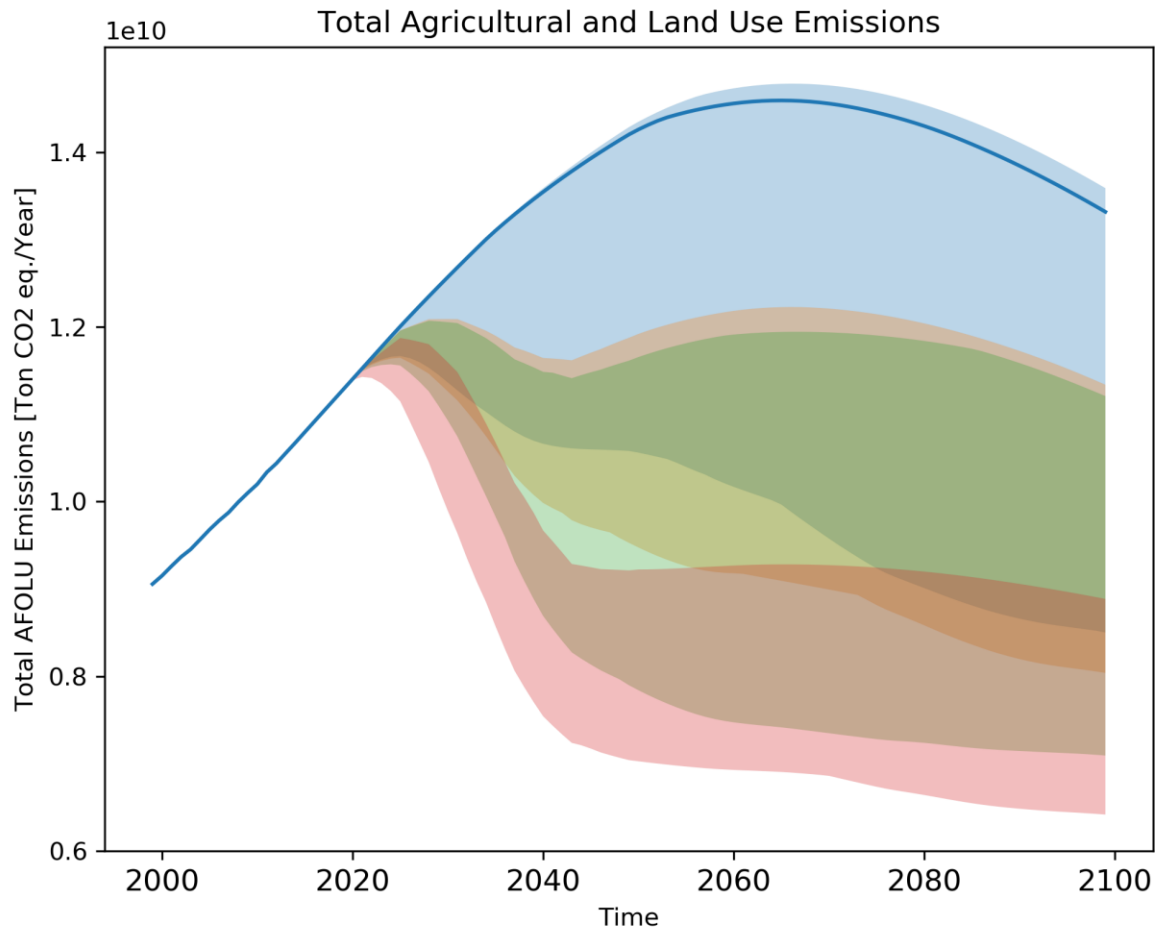
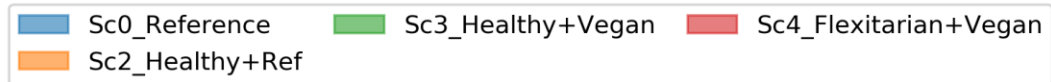
Food production rate[PasMeat] : Sc0\_Reference  
 Food production rate[CropMeat] : Sc0\_Reference  
 Food production rate[PasMeat] : HistoricalData  
 Food production rate[CropMeat] : Sc0\_Reference

Agricultural and Arable Land



Agricultural Land : Sc0\_Reference  
 Agricultural Land : HistoricalData  
 Arable Land : Sc0\_Reference  
 Arable Land : HistoricalData

# Diet Change Dynamics - Uncertainty



# Cropland Use

Vegetarian Population vs. Cropland Use

