Meat or vegetarian?

A model-based analysis of the global diet change dynamics

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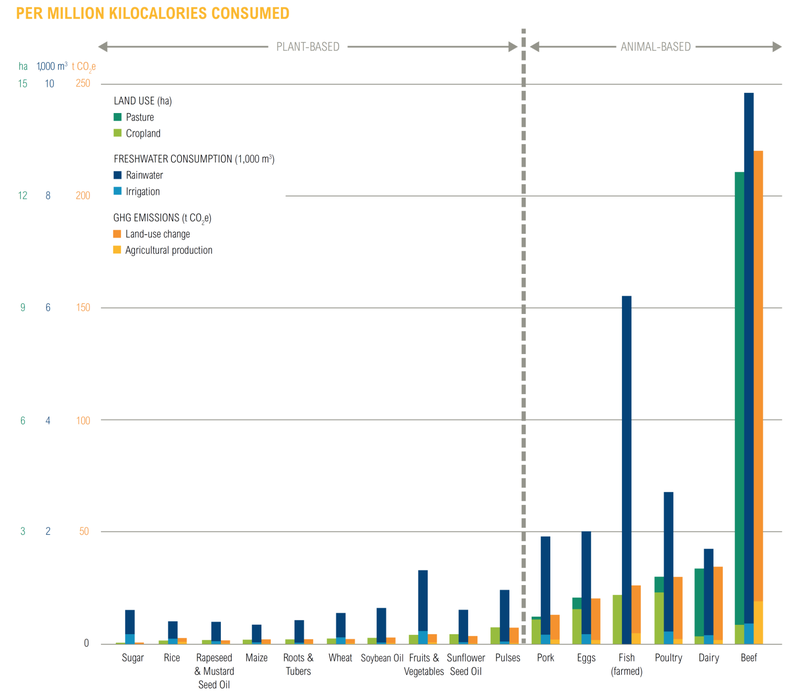
Environmental impact of dietary choices

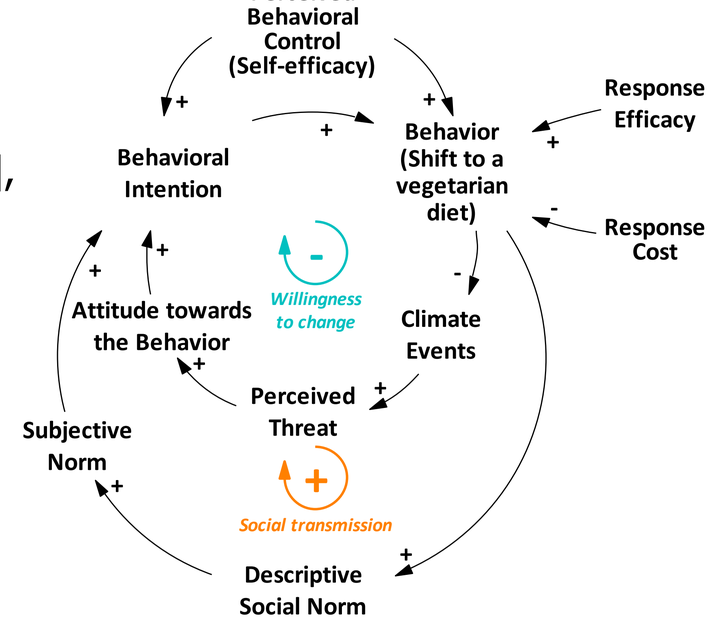
- Reducing global meat consumption can significantly help to alleviate agricultural land use change and greenhouse gas emissions [1,2,3,4].
- Most modelling studies rely on an average value of meat consumption per capita, or on stylized diet types. They do not consider behavioral dynamics behind diet change.
- Recent studies show the importance of linking human behavior feedback to climate models [5].
- Therefore, exploring the implications of diet change requires considering the feedback loops between dietary actions and environmental impacts.



Source: World Resources Institute [6]

In this study…

- We extend an existing integrated assessment model, the Felix Model [7,8], to capture the social and behavioral mechanisms behind diet change.
- We explore the dynamics of global vegetarian and meat-eating population.
- We use the statistical screening method [9] to identify the most important uncertainties.



Behavioral framework

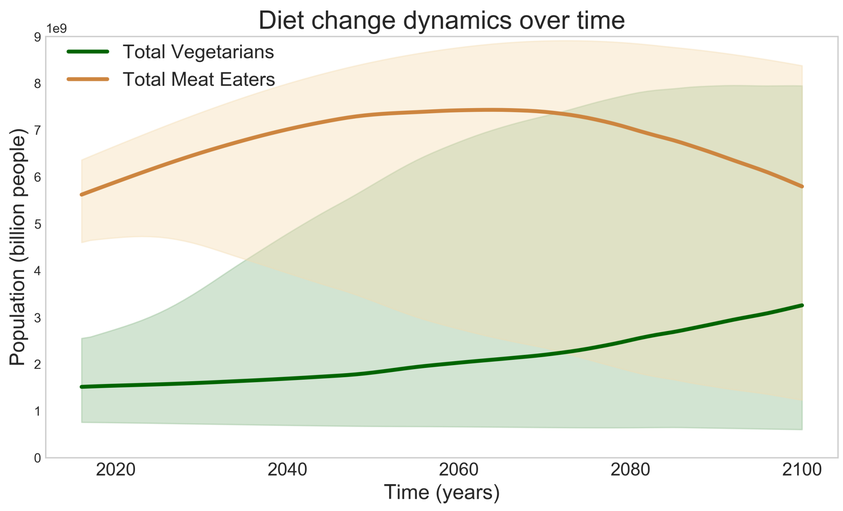
Theory of Planned Behavior (TPB)

- The distinction between intention and actual behavior
- Intentions are formed by *perceived behavioral control, subjective norms,* and *attitude.*

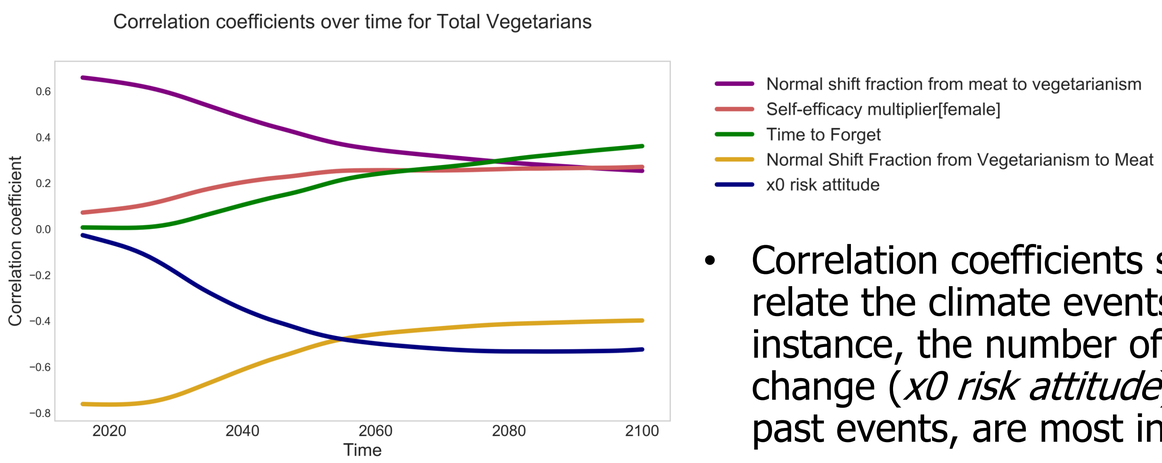
Protection Motivation Theory (PMT)

- Actions are determined by *threat appraisal* and *coping appraisal*.
- The coping appraisal is driven by *self-efficacy*, *response efficacy*, and *response cost*.

- The model is based on a diffusion/adoption structure. It also accounts for the income-dependent change in meat consumption.
- In the reference simulation, the vegetarian population increases until 2100, yet not at a rate sufficient to mitigate the adverse environmental impacts of agriculture.
- Uncertainty ranges result from a multivariate sensitivity analysis with 500 simulations and ±50% parameter ranges.



The factors that determine *Perceived Threat*, for instance, the **number of events** that trigger change or **time to forget** the past events, are most influential on long-term diet change dynamics.



- Correlation coefficients show that the factors that relate the climate events to the attitude, for instance, the number of events that trigger change (*x0 risk attitude*) or *time to forget* the past events, are most influential.

References

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