1. Overview about modelling strategies:

* The macroeconomics of climate change (2013)
* Tol (2008): The economic impact of climate change : Assessing the economic impacts of climate change: An updated CGE point of view
* Hallegatte and Corfee-Morlot (2008): The economics of climate change impacts and policy (ie p. 10) (literature review)
* Hope et al (2006): Spotlighting Impacts Functions in Integrated Assessment
* Example UK: Gosling et al (2011): Climate Observations, projections and impacts: United Kingdom
* Vurren et al (2009): How well do integrated assessment models simulate climate change?
* Batten (2018): Climate change and the macro-economy: a critical review

1. Basic models:

* Nordhaus, Boyer (2000): Warming the World, Economic Models of Global Warming **(RICE/DICE)**
* Manne (2004): **MERGE**: An Integrated Assessment Model for Global Climate Change
* Hope (2006): The Marginal Impact of CO2 from **PAGE**2002: An Integrated Assessment Model Incorporating the IPCC’s Five Reasons for Concern
* Tol (1995), Tol (2005): Emission Abatement versus Development as Strategies to Reduce Vulnerability to Climate Change: An Application of **FUND**
* Verburg et al. (2007): A multi-scale, multi-model approach for analysing the future dynamics of European land use (**IMAGE**)
* Popp (2004): **ENTICE:** Endogenous Technological Change in the DICE Model of Global Warming
* **GTAP-E(F):** Global Trade Analysis Project modified for climate change in Berrittella et al (2006) in tourism and Bosello et al (2011) for sea-level rise
* **ICES**: GTAP-E(F) with myopic expectations and endogenous capital acc. (Eboli et al. 2010: impacts on growth and the distribution of income globally)

1. Strategies to include climate change in macro models

Acemoglu et al (2012): The Environment and Directed Technical Change

* Clean and dirty inputs in production sector with substitution elasticity
* S describe the quality of environment

Heal (2017): The economics of climate (DICE model)

Stern (2013): The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models

Dietz, Stern (2015): Endogenous Growth, Convexity of Damage and Climate Risk: How Nordhaus' Framework Supports Deep Cuts in Carbon Emissions

**Deryeng et al. (2011), Deryng et al (2014):** Global crop yield response to extreme heat stress under multiple climate change futures

* This study applies the global crop model PEGASUS to quantify, for the first time at the global scale, impacts of extreme heat stress on maize, spring wheat and soybean yields resulting from 72 climate change scenarios for the 21st century

**Popp (2004):** ENTICE: endogenous technological change in the DICE model of global warming p. 748

* Includes level of fossil fuels used at time t and costs of fossil fuels
* measures effective energy units
* Cost of these fossil fuels are subtracted from total output

**Przyluski, Hallegatte, Nadaud (2012):** Weather trends and economy-wide impacts

* Modelling impacts on transport and capital

**Calzadilla et al (2011):** The GTAP-W model: accounting for water use in agriculture

Water and agriculture are intrinsically linked. Water is essential for crop production and agriculture is

the largest consumer of freshwater resources. However, this link is commonly ignored by economic

models mainly because water use is not reported in the national economic accounts. Few regions have markets for water. This paper describes the new version of GTAP-W, a multi-region, multi-sector computable general equilibrium model of the world economy. The new version of GTAP-W

distinguishes between rainfed and irrigated agriculture and introduces water as an explicit factor of

production for irrigated agriculture. Moreover, the new production structure accounts for substitution possibilities between irrigation and other primary factors. The new model has been used to study a variety of topics including: irrigation efficiency, sustainable water use, climate change and trade liberalization. This paper is a technical description of the data and features added to the standard GTAP model.

**Tsigaris, Wood (2016):** A simple climate-Solow model for introducing the economics of climate change to undergraduate students

* Damage function with temperature anomaly in year t
* From Stern (2013):
* From Dell et al. (2012):

**Kahn et al. (2019):** Long-Term Macroeconomic Effects of Climate Change: A Cross Country Analysis

* Variables used: deviations from historical norms of temperature and precipitation
* Affects production function (see p. 8-12)

**Lecocq, Shalizi (2007):** How Might Climate Change Affect Economic Growthin Developing Countries? A Review of the Growth Literature with a Climate Lens (p. 16)

* Shocks and gradual changes likely cause damages to capital or labor (diminutions of stock of capital, change in depreciation rate, change in productivity, effect on technical change, reduction in labor supply)
* Non-market effects of climate change in the utility function by quality of environment (exogenous)

**Frankhauser, Tol (2005):** On climate change and economic growth (p. 3)

Climate change:

**Deryugina and Hsiang (2014):** Does the Environment Still Matter? Daily Temperature and Income in the United States

* Models the effect on earnings by farming (f) and non-farming (n) sectors with defensive costs and transfers

with (analog):

**Hallegatte et al. (2007):** Why economic dynamics matter in assessing climate change damages : illustration on extreme events

* Model change in capital stock with extreme weather events

**Anthoff et al (2006):** Global and regional exposure to large rises in sea-level: a sensitivity analysis

**Anthoff et al (2010):** The economic impact of sea-level rise

* wetland value at time t at country i
* is wetland lost to date
* maximum amount of wetland can be lost to sea-level rise
* is per capita income

**Rowhani and Raimankutty (2016**): Influence of extreme weather disasters on global crop production

In recent years, several extreme weather disasters have partially or completely damaged regional crop production1–5. While detailed regional accounts of the effects of extreme weather disasters exist, the global scale effects of droughts, floods and extreme temperature on crop production are yet to be quantified. Here we estimate for the first time, to our knowledge, national cereal production losses across the globe resulting from reported extreme weather disasters during 1964–2007. We show that droughts and extreme heat significantly reduced national cereal production by 9–10%, whereas our analysis could not identify an effect from floods and extreme cold in the national data. Analysing the underlying processes, we find that production losses due to droughts were associated with a reduction in both harvested area and yields, whereas extreme heat mainly decreased cereal yields. Furthermore, the results highlight ~7% greater production damage from more recent droughts and 8–11% more damage in developed countries than in developing ones. Our findings may help to guide agricultural priorities in international disaster risk reduction and adaptation efforts. In many regions of the world, there have been

**Dell et al. (2012):** Temperature Shocks and Economic Growth: Evidence from the Last Half Century

T measures weather

**Elshenawy, Robinson, Willenbockel (2016):** Climate change and economic growth: An intertemporal general equilibrium for analysis for Egypt p. 684

**Nordhaus, Yang (1996):** A Regional Dynamic General-Equilibrium Model of Alternative Climate-Change Strategies (RICE Model)

1. Econometric models/panel analysis

**Marx et al. (2019):** Non-linear Impacts of Climate Change on Income and Inequality in Viet Nam

* Regress precipitation and temperature on log per capita income (cf. p. 10-11)

**Zivin und Neidell (2014):** Temperature and the Allocation of Time: Implications for Climate Change

**Bloesch and Gourio (2015):** FED Chicago: Temperature with Snow p. 6

**Colacito et al (2018):** Temperature and Growth: A Panel Analysis of the United States