

Climate Economics for Engineers

ENV-724 (Thalmann/Vielle/Vöhringer), Session 9, 18 Nov. 2020

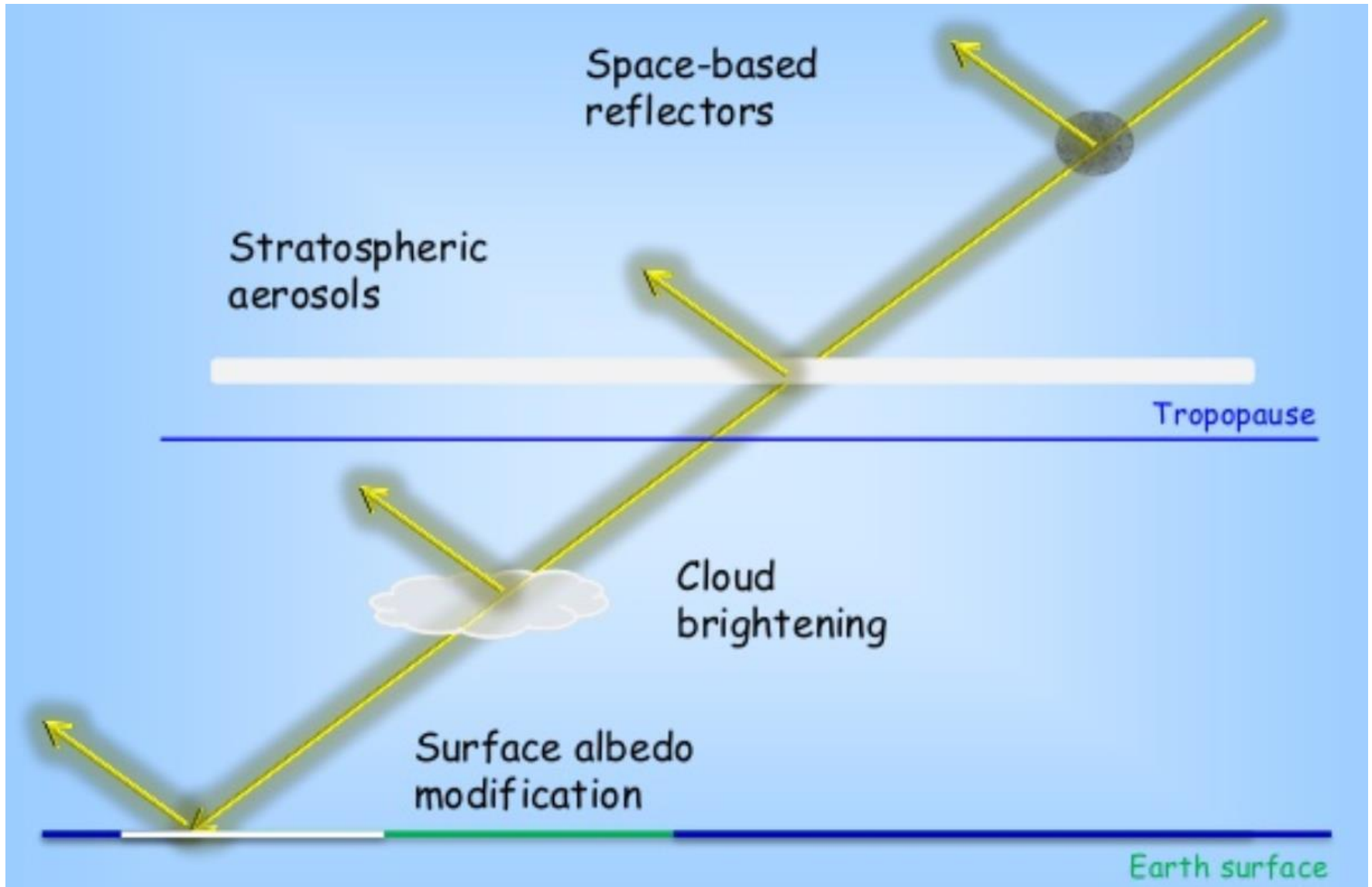


Climate Economics

Overview for today

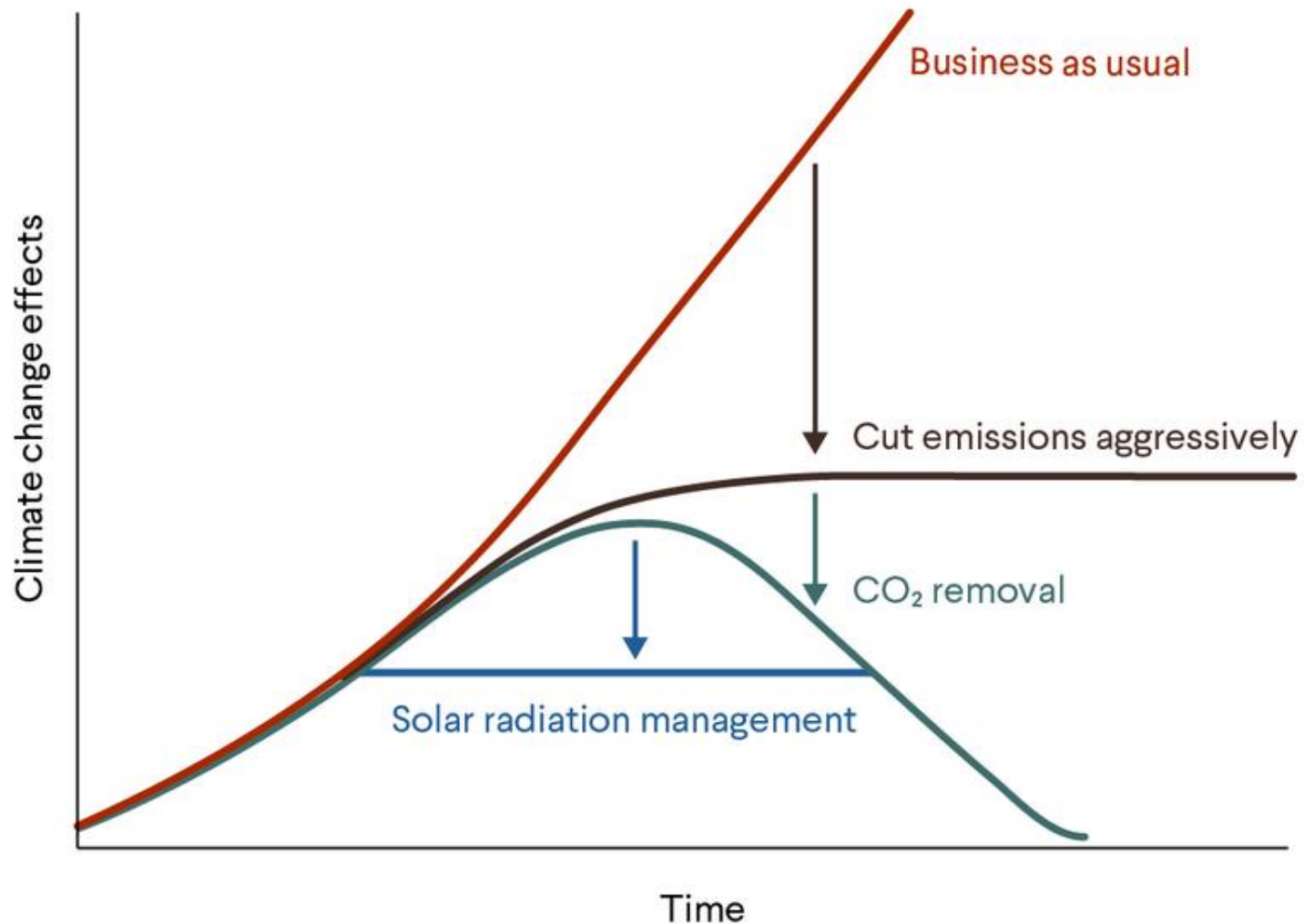
- economics of innovation
- solar radiation management
- preference change
- mitigation game
- cool down
 - some polls
 - questions concerning climate economics
 - questions concerning the final presentations

Solar radiation management Methods



Source: A. Robock, Rutgers University

Solar radiation management Timing



Solar radiation management

Effectiveness and risks

Stratospheric aerosols

Effectiveness	Feasible and potentially very effective (<i>cf.</i> volcanoes) No inherent limit to effect on global temperatures SRM method so does nothing to counter ocean acidification	High
Affordability	Small quantities of materials need to be used and moved: likely to be low cost <i>cf.</i> most other methods	High
Timeliness	Could be deployed within years/decades (but engineering issues and possible side-effects need to be resolved first) Once deployed would start to reduce temperatures within one year	High
Safety	Residual regional effects, particularly on hydrological cycle Possible adverse effect on stratospheric ozone Possible effects on high-altitude tropospheric clouds Potential effects on biological productivity	Low

Source: Royal Society 2009

Solar radiation management

Economics and governance

- high effectiveness at possibly low direct cost
 - > unilateral action possible
- effect is temporary
- large externalities
- large uncertainties
- regionally diverging climate and risk preferences
 - > regions might not prefer their historical climate (Burke 2015)
 - > potential conflicts
 - > governance: rules for decision-making, liability, testing etc.
 - > hedge the risk of uncoordinated action
 - > moratorium as a first step?

The status quo on governance

“A Swiss-led proposal that suggested an expert assessment on geoengineering and its governance, made to the Fourth Session of the UN Environment Assembly (UNEA) in March 2019, failed, unsurprisingly. Until now, most governments, civil society organizations, and climate researchers have avoided an in-depth conversation on SRM. The reasons for reluctance differ substantially. Most climate policy advocates and scientists fear that debating governance and normalizing SRM as part of the policy mix could obstruct mitigation efforts by creating the misleading perception that injecting aerosols could be a substitute for reducing emissions. Governments fundamentally opposed to massive emissions reductions either do not want to debate SRM because it would mean acknowledging that climate change is a serious threat, or they avoid a governance conversation because they do not want to bind their hands prematurely.” Council on Foreign Relations 2019

How cynical are economists?

- Oscar Wilde's Lord Darlington defines a cynic as:
« A man who knows the price of everything and the value of nothing. »
- The quote has often been applied to economists. Why?
 - economists perform «valuation» and recommend «welfare-improving» policies (as if we knew exactly what that is)
 - elusive character of value in the absence of authoritative attribution of value
 - often: attribution of value through revealed preferences
 - usually: revelation through prices
- but somehow we sense that price is not always value

The classical period (~1750-1870)

■ Paradox of value:

« The things which have the greatest value in use have frequently little or no value in exchange; on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarcely anything; scarcely anything can be had in exchange for it. A diamond, on the contrary, has scarcely any use-value; but a very great quantity of other goods may frequently be had in exchange for it. » Adam Smith 1776

■ labor theory of value (Ricardo)

- Marx: capitalists exploit working class (appropriation of profit)
- Smith: 1 beaver = 2 deer
- discussion of further determinants such as nature and rent
- disappointing results of the search for an absolute value

The neoclassical period (~1850-?)

- Hermann Heinrich Gossen (1854)
 - there is no such thing as an absolute value -> subjective value
 - pleasure diminishes with repetition
 - individually optimal: equate pleasure of the last unit
- subjective value and marginalism in microeconomics
 - utility function depends on individual preferences
 - decreasing marginal utilities, scarcity matters
 - constrained optimization:
 - utility maximization under given preferences and prices
 - maximum where marginal utilities are equal
 - valuation through aggregating individual willingness to pay

Subjective value as a liberal concept

- values attributed by authorities can be challenged
- individual preferences should guide personal decisions
- aggregated preferences matter for policy-making
- objective to enable societies to progress toward higher levels of welfare/happiness

The dilemma of static preferences

- When consumption patterns and policies in democracies reflect preferences, will we mitigate climate change?
 - revealed preferences: equilibrium models are calibrated on past decisions, which are (largely) assumed to be optimal
 - > change seems costly
 - what if we would be happier with a more sustainable life-style?
 - some embrace change, others love continuity
 - thinking mitigation as a social transformation?
 - paternalism:
 - Do we know what's best for us and decide rationally?
 - Can preferences be changed for the better?
 - What is better and who has the authority to decide that?
 - in any case: preferences change, don't they?

Preferences change, but how?

- fashion, habits, beliefs (individual \leftrightarrow social)
- preference changes can be analysed, but are hard to predict
 - has awareness about health damages changed preferences for smoking or has it merely added health effects to the decision model?
 - if preferences for smoking have changed, is this mostly because of effects to own health or also because of harm done to others?
 - certainly, habits have changed
- utility maximization under given preferences does not fully describe human behaviour
 - How do preferences relate to habits?
 - How do preferences relate to values and beliefs?

How to change preferences

- Policy levers
 - information campaigns, education -> create awareness
 - moral suasion
 - prohibition and fines
 - re-education (might well achieve the opposite)
- How liberal or paternalistic do we want the state to be?
- Economists search solutions for the humankind we have
- Change behavior, not preferences?
 - create awareness, inform about necessary contributions
 - social consensus to use policy instruments to change our habits?
 - when habits change, preferences might follow

Climate Economics

The Mitigation Game

