

Responses to threat- and solution-oriented online climate news: A system perspective

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Complexity of Life in Basic
Research and Innovation

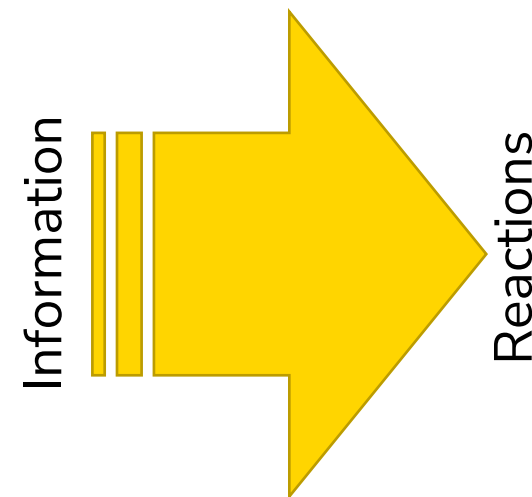
Field of Excellence
University of Graz



Motivation –

Climate news and how we deal with it

Broadcasting online news and the human factor



Linguistics
Text Mining / Machine Learning

Computational Sciences
System Sciences

Psychology
Social Sciences

Source: Vecteezy.com

Interdisciplinarity is the key - Involved researchers



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KLIMAWANDEL

"Bericht muss Totenglocke für fossile Brennstoffe sein": Reaktionen auf UN-Weltklimarat

Umweltschutzorganisation
Bericht des Weltklimarats

KLIMAWANDEL

"Österreich braucht Ökowärmegesetz"

Biomasseverband: Kioto sonst unerreichbar

Redaktion

15. Dezember 2003, 18:31, 26 Postings

Was ist dran am Klimawandel?

Klimaschutz - auf dem Weg zum Kyoto-Ziel

27. Oktober 2000, 21:02

Experten warnen vor "globalem Bürgerkrieg"

Klimawandel führe zu sozialen und politischen Konflikten - Ressourcen wie Wasser und Nahrungsmittel knapp - Umweltflüchtlinge

Redaktion

10. Dezember 2007, 12:38, 2 Postings

KLIMAWANDEL

Umweltminister Pröll: "Positives Zeugnis"

Freude über Bilanz zur wirtschaftlichen Bedeutung des Umweltschutzes

Redaktion

1. Dezember 2003, 12:38, 3 Postings

Zunahme an Dürren, Hitzewellen und Fluten nicht mehr zu stoppen

Wissenschaftler des Weltklimarats: "Ich weiß nicht, wie irgendjemand das lesen und es nicht total alarmierend finden könnte"

Niedrige Flughöhe mindert Klimabelastung

Kondensstreifen sind ebenso schuld wie Kohlendioxid

Redaktion

16. Oktober 2002, 20:15, 3 Postings

KLIMAWANDEL

"Sehr Besorgnis erregender Trend"

EU-Umweltkommissarin mahnt zur besseren Umsetzung des Kyoto-Protokolls

Redaktion

15. Dezember 2003, 18:31, 1 Posting

KLIMAWANDEL

F: "Denkbar schlechtes Zeugnis"

... als Umweltmusterland hat Österreich verspielt" - Glawischnig stimmt in

Redaktion

1. Dezember 2003, 12:38, 2 Postings

Communicative dimension –

What is the focus in Austrian climate messaging?



Conflicting climate change frames in a global field of media discourse (Broadbent et al., 2016):

- Validity of climate science,
- Scale of ecological risk,
- Scale of climate politics, and
- Support for mitigation policy

Local (geographical) dissimilarities in the climate debate are also communicated through the media

The debate in Austria is led by few opponents (Pfosser, 2014)

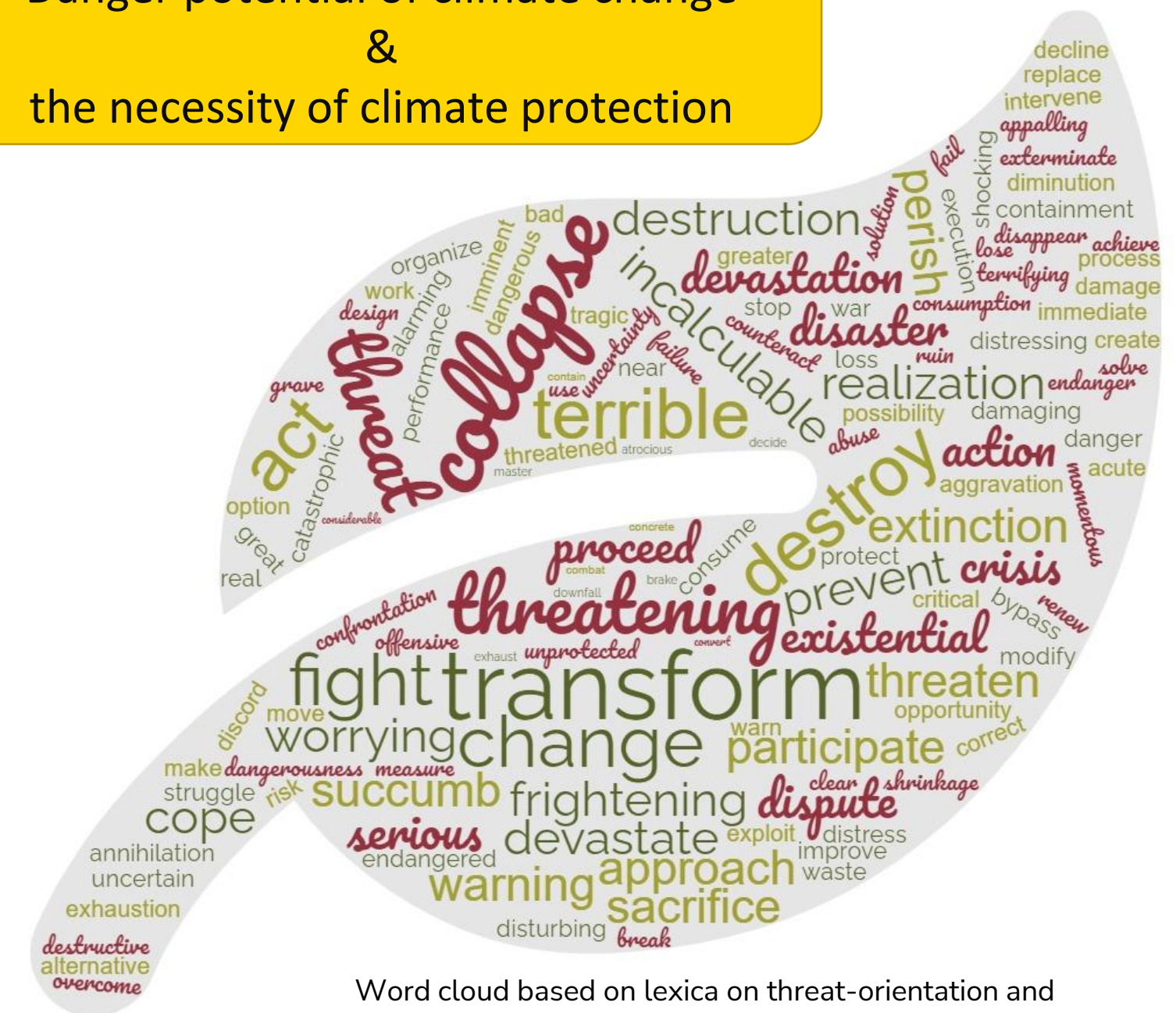
Assumption that well-informed citizens make well-informed decisions and will thus act in favor of climate change mitigation (Clayton et al., 2015)

Knowledge-deficit model (Simis et al., 2016)

(Boykoff, 2019)

(Brüggemann et al., 2018)

Danger potential of climate change
&
the necessity of climate protection



Word cloud based on lexis on threat-orientation and solution-orientation developed by Elisabeth Putterer

Entanglement of media communication and public response to online climate messaging

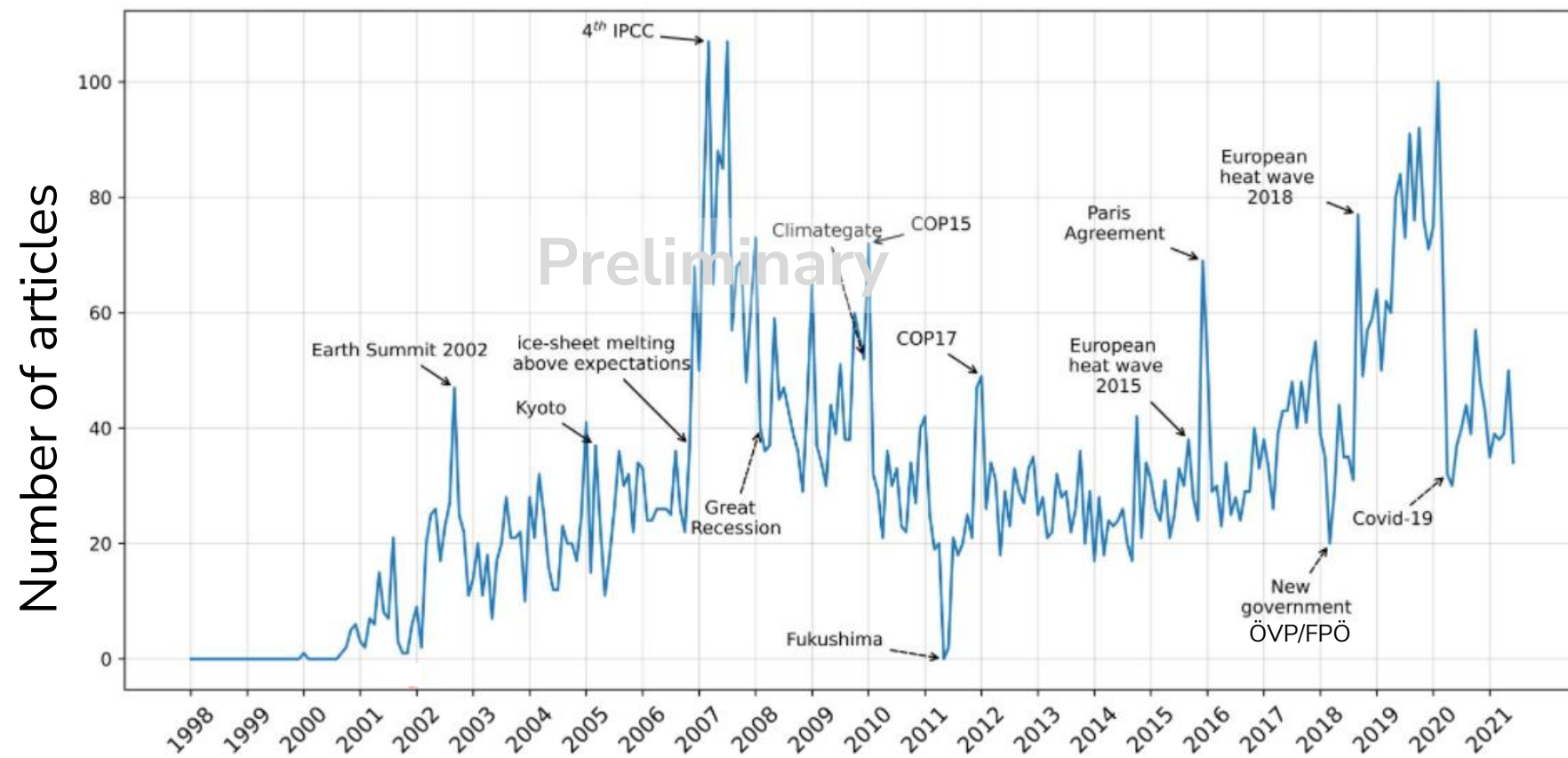


- Online media climate communication in Austria:
building a comprehensive database of media coverage on climate change from renowned Austrian online news portals over the last decades
- The magnitude and longevity of behavior reactions to climate statements :
examine anxiety-mediated reactions by means of a socio-behavioral study, and a psycho-physiological study (comparison of the self-assessment and the physiological response to threat)
- From anxiety to approach motivation:
investigate the effect of threat-oriented and solution-oriented messages on the intention to engage in climate-friendly behavior
- Societal dynamics and long-term effects:
long-term effects of climate messaging are investigated via social modeling (opinion formation and polarization and coping strategies)



Online climate news – The case study of derStandard.at

Case Study: derStandard.at – Statistics on climate change articles



Plot by Raven Adam:
Text pre-processing and topic modelling (cleaning, sorting out unrelated articles)
Final dataset: 8601 articles from 1998 – 05/2021

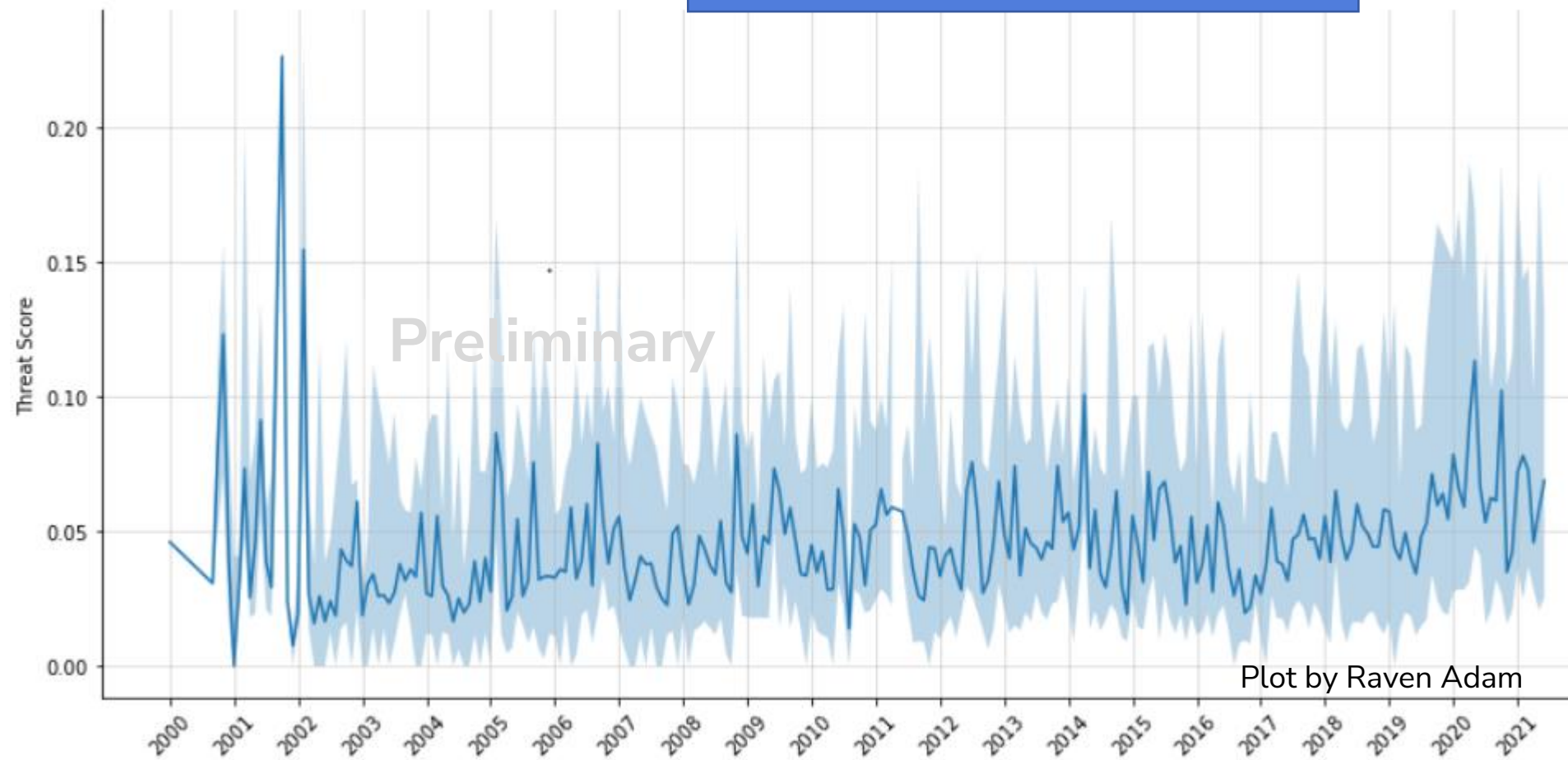


Word cloud of nouns in articles related to climate change (based on textcorpus of climate change related articles in derStandard.at)

Behind the message – Communication of the dangers



Threat-orientation per month



Topic modelling: tool to explore hidden semantic structures in a corpus

Opinion mining (sentiment analysis): used to extract subjective information, identifications of patterns in articles (e.g. positive, negative, anxiety level, ...)

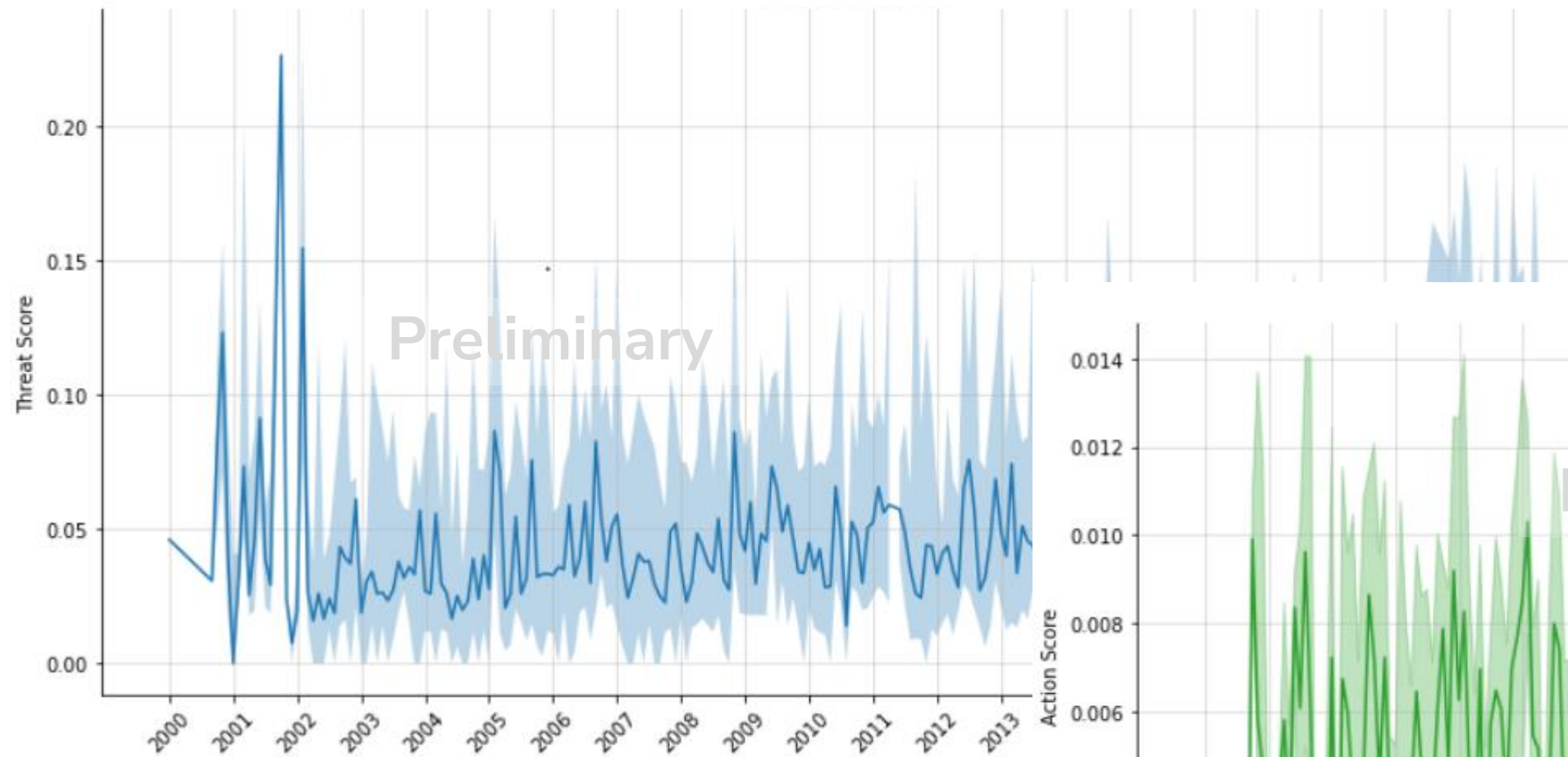
Lexicon-based approach (Bösch et al., 2018) pre-prepared sentiment lexicon to score a document by aggregating the sentiment scores of all the words in the document. The pre-prepared sentiment lexicon should contain a word and corresponding sentiment score to it.

Threat-Orientation:

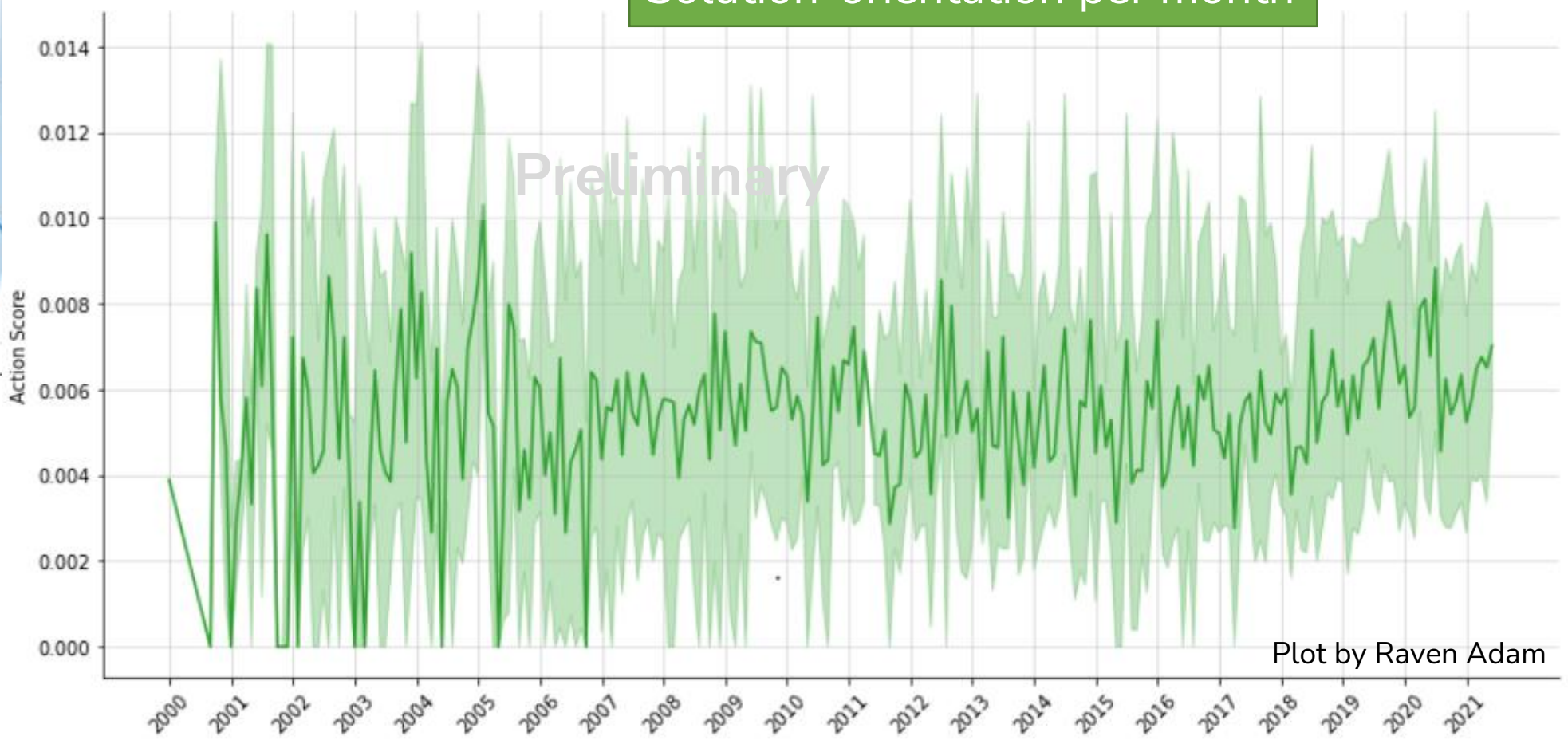
drastic phrases and metaphors such as “fight/war against climate change” (“Kampf/Krieg gegen den Klimawandel”), “devastating consequences” (“verheerende Folgen”) and “fall victim” (“zum Opfer fallen”)

Lexica on threat-orientation and solution-orientation developed by Elisabeth Putterer

Behind the message – Communication of the solutions



Solution-orientation per month

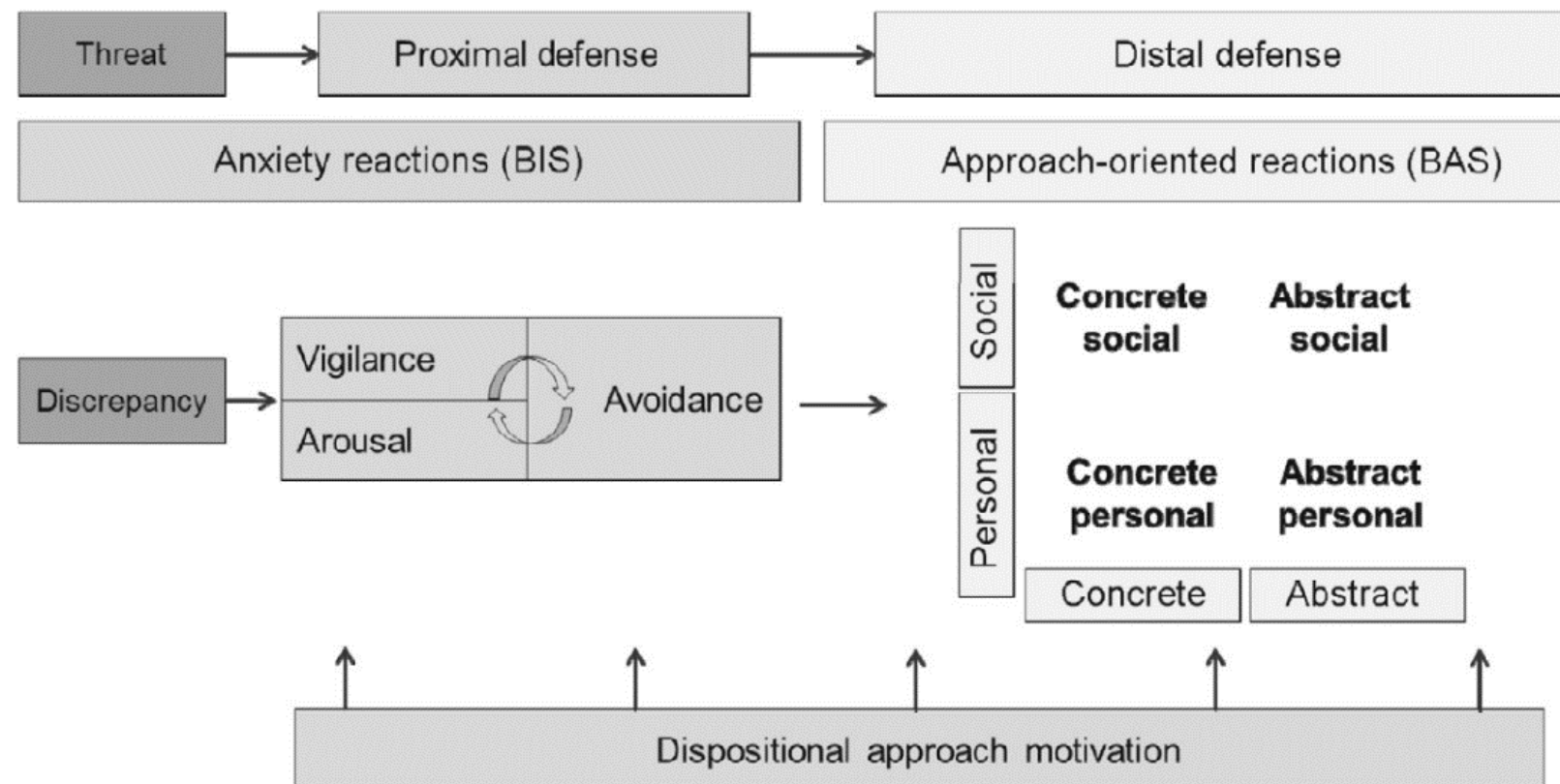


Plot by Raven Adam

Solution-Orientation:
multi-layered reporting, which includes instructive aspects, points out possibilities for action. Here the threat needs to be outlined as well, otherwise there would be no incentive for an action

A psychological model of threat and defense

Threat and defense: From anxiety to approach

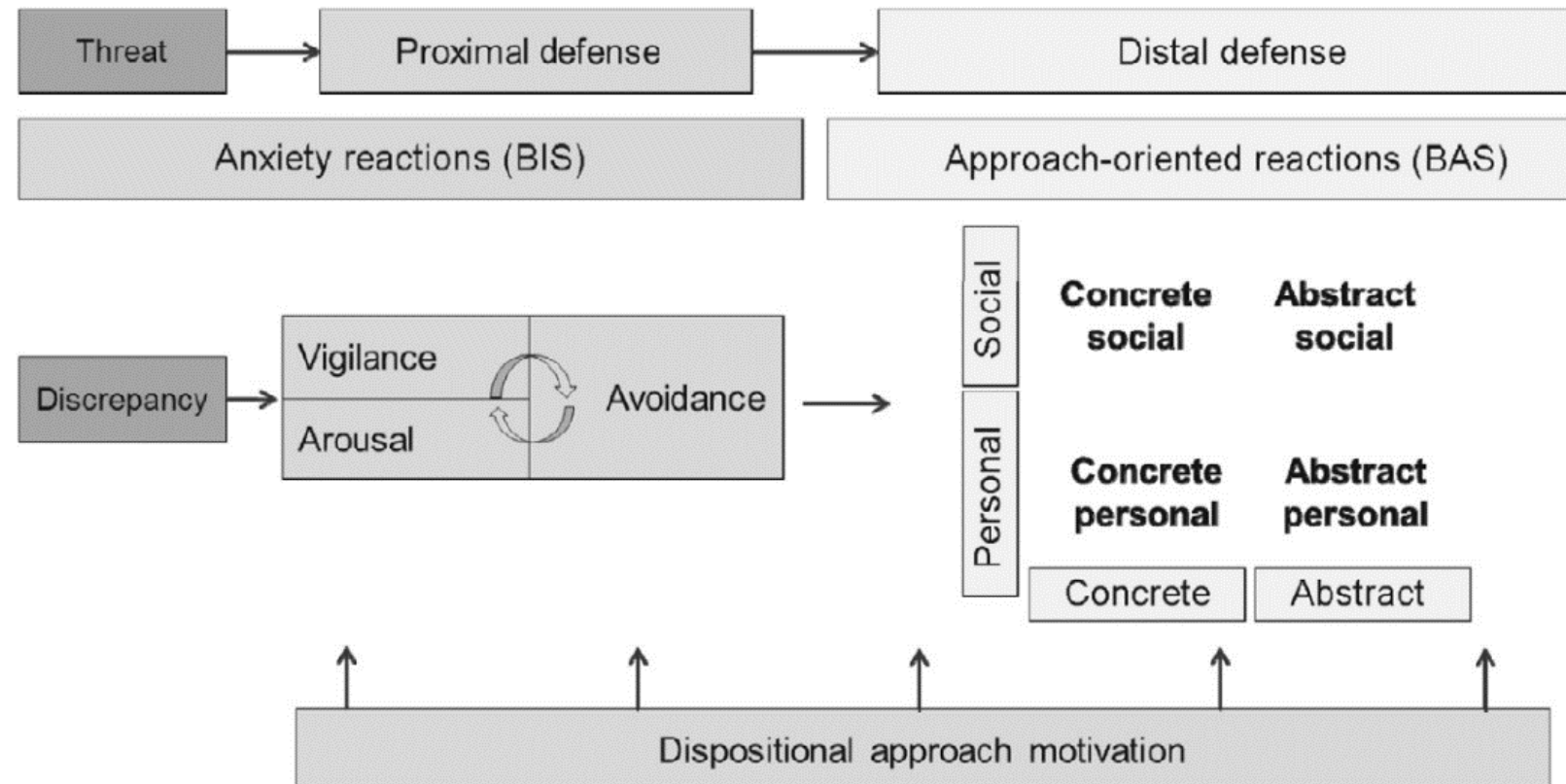


Source: Jonas et al. (2014)

- Opting for a more climate-friendly lifestyle (Fritze et al., 2018)
- Climate Anxiety (Clayton, 2020)
- Skepticism about climate change (Haltinner & Sarathchandra, 2018)

Although these three reactions may seem disconnected at first glance, they share a common background: people's responses to threats

Threat and defense: From anxiety to approach



Source: Jonas et al. (2014)

How we deal with anxiety from a social-neurological and social-psychological perspective?

Integrative general model of threat and defense processes
(Jonas et al., 2014)

Their model divide threat-related processing into the Behavioral Inhibition System (BIS) and Behavioral Approach System (BAS).

We respond to threats with anxious arousal (climate anxiety) that needs to be dealt with. Symptoms such as avoidance (climate skepticism) indicate a BIS reaction, seeking an effective solution to the problem at hand (climate-friendly actions) indicate a BAS reaction (Uhl et al., 2018)

In both states people try to relieve anxiety but in an active BIS state, they tend to use symbolic actions as coping mechanisms and turn to more rewarding aspects of life, even if these aspects are unrelated to the actual threat or its solution.



Climate-friendly behavior

Dimensions of Climate-friendly behavior – Impact and Cost

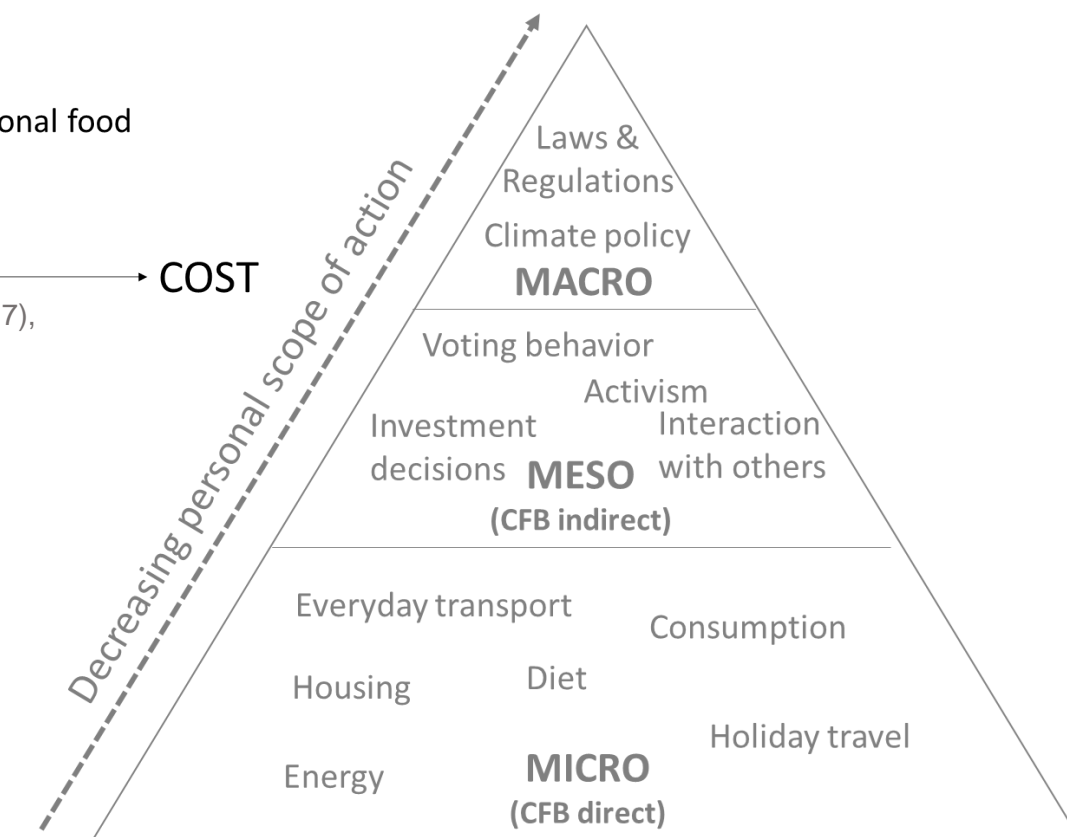
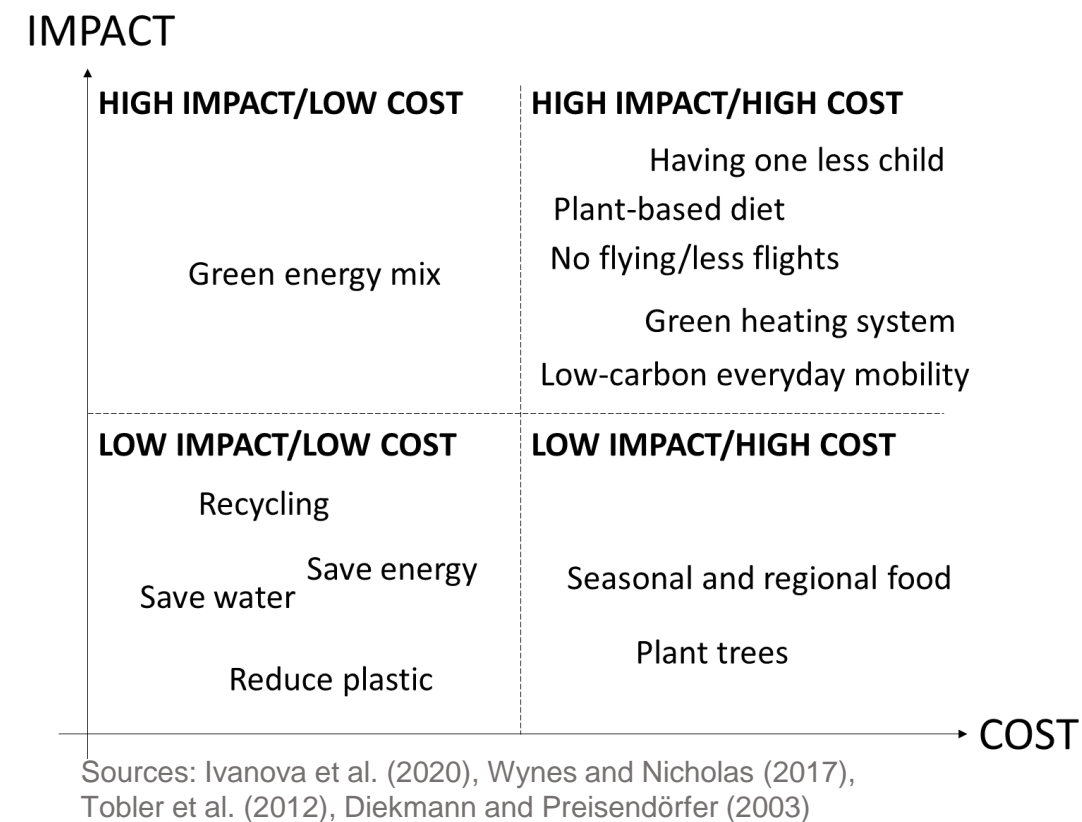


Following the narrative that climate action has to be presented to the public in the form of “simple and painless steps” (Thøgersen & Crompton, 2009)

Low-cost behaviors often also have only limited impact in terms of emission reductions

“Cost” in this context refers, for example, to financial costs, time expenditure, or general inconvenience (Tobler et al., 2012)

Climate-friendly behavior is a sub-category of pro-environmental behavior (Steg and Vlek, 2009) for the specific context of climate change mitigation with an explicit focus on behavior that reduces greenhouse gas emissions.

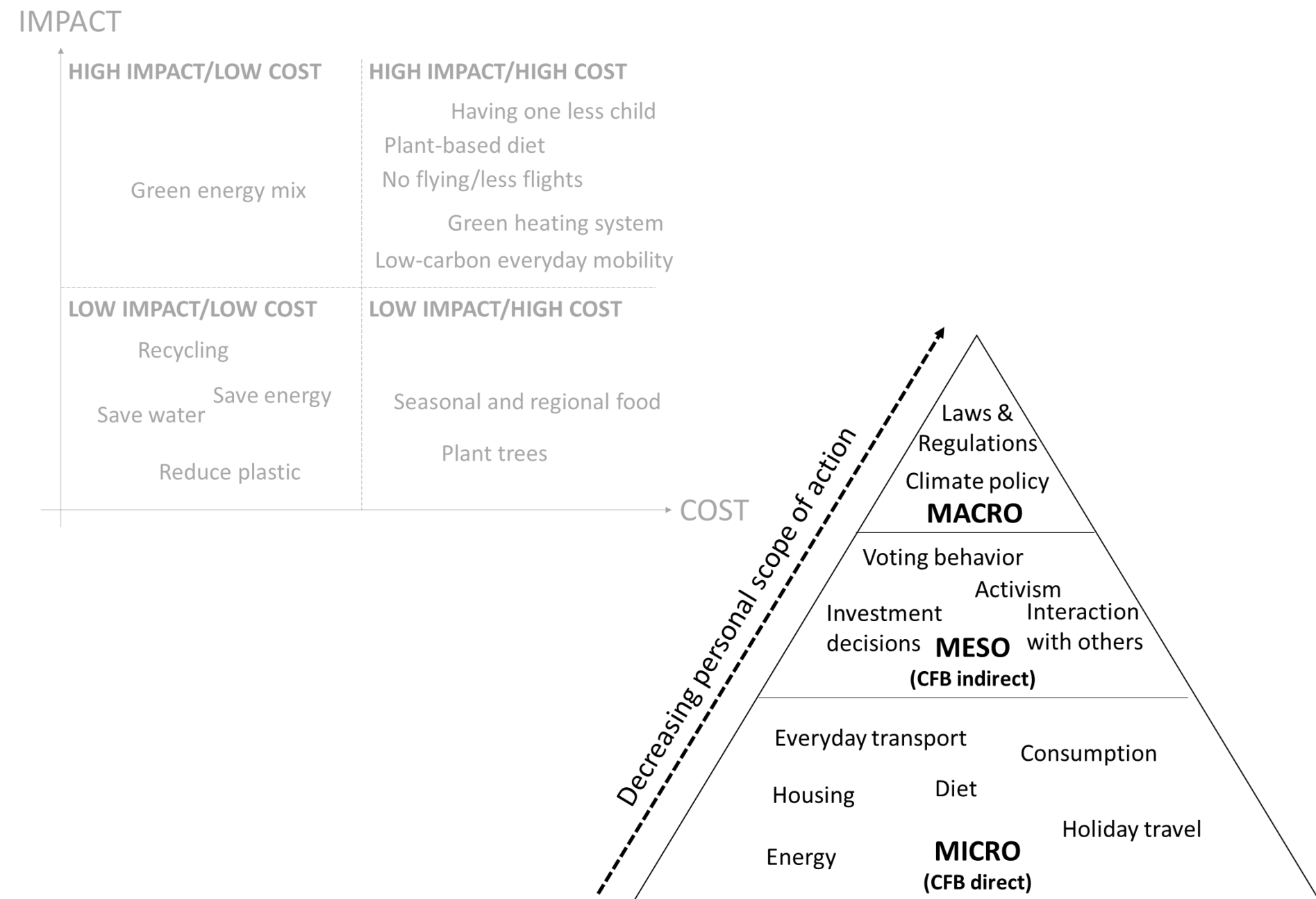


Dimensions of Climate-friendly behavior – Personal scope of action



As the personal scope of action differs depending on the concrete decision-making context and CFB can occur in both direct and indirect ways. (Thaller et al., 2020)

- (1) Private CFB encompasses diverse individual choices on the micro-level and has a direct impact on GHG emissions (e.g., mobility choices or energy use);
- (2) Community-based activities performed by individuals have an indirect impact on GHG emissions and are located at the meso-level (e.g., voting or donating).
- (3) On a broader scale, people's support of governmental climate strategies and economical regulations is categorized on the macro-level, providing the context for climate relevant actions



The system perspective – An agent-based model on long-term impact of threatening climate messaging

Social Simulations – What is agent-based modelling?



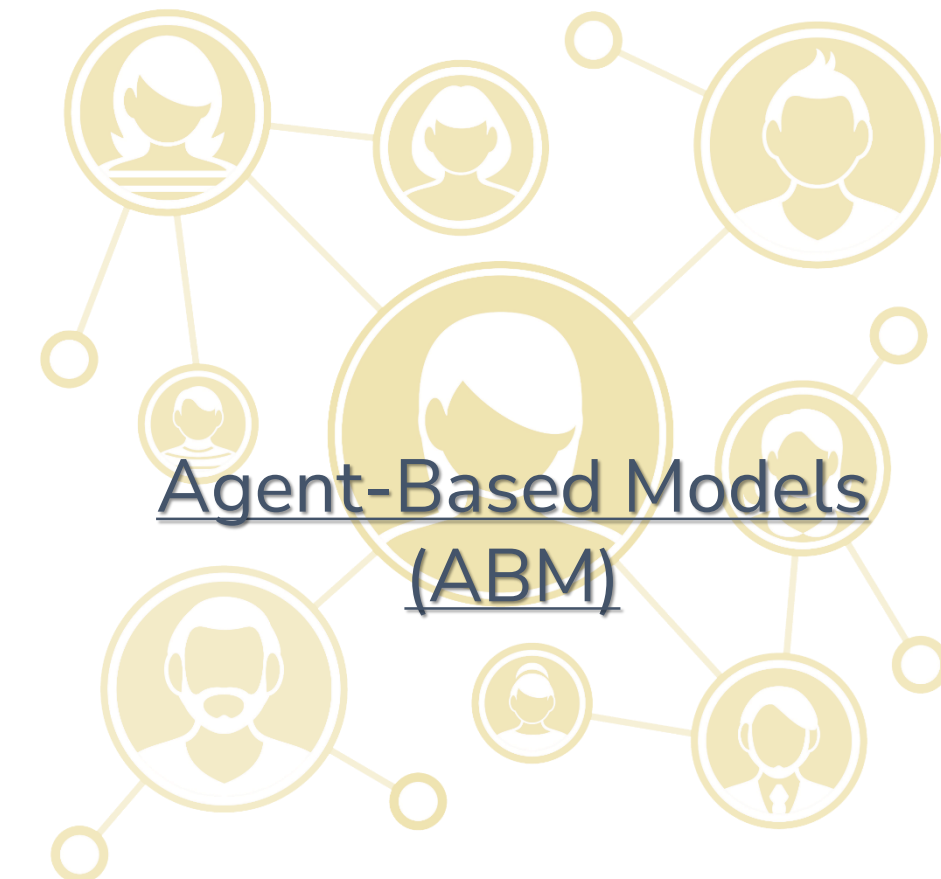
Social network analysis

1. Complex large-scale problems
2. Small-scale structures
3. Emergent phenomena

→ High heterogeneity: large-scale systems that are not easily accessible to a purely mathematical treatment

Dynamical processes on networks

- Link-neighbours interaction (micro-level)
- System state (macro-level)
- Dynamics depend on diverse system control parameters
- Monte Carlo method provide stochastic variations



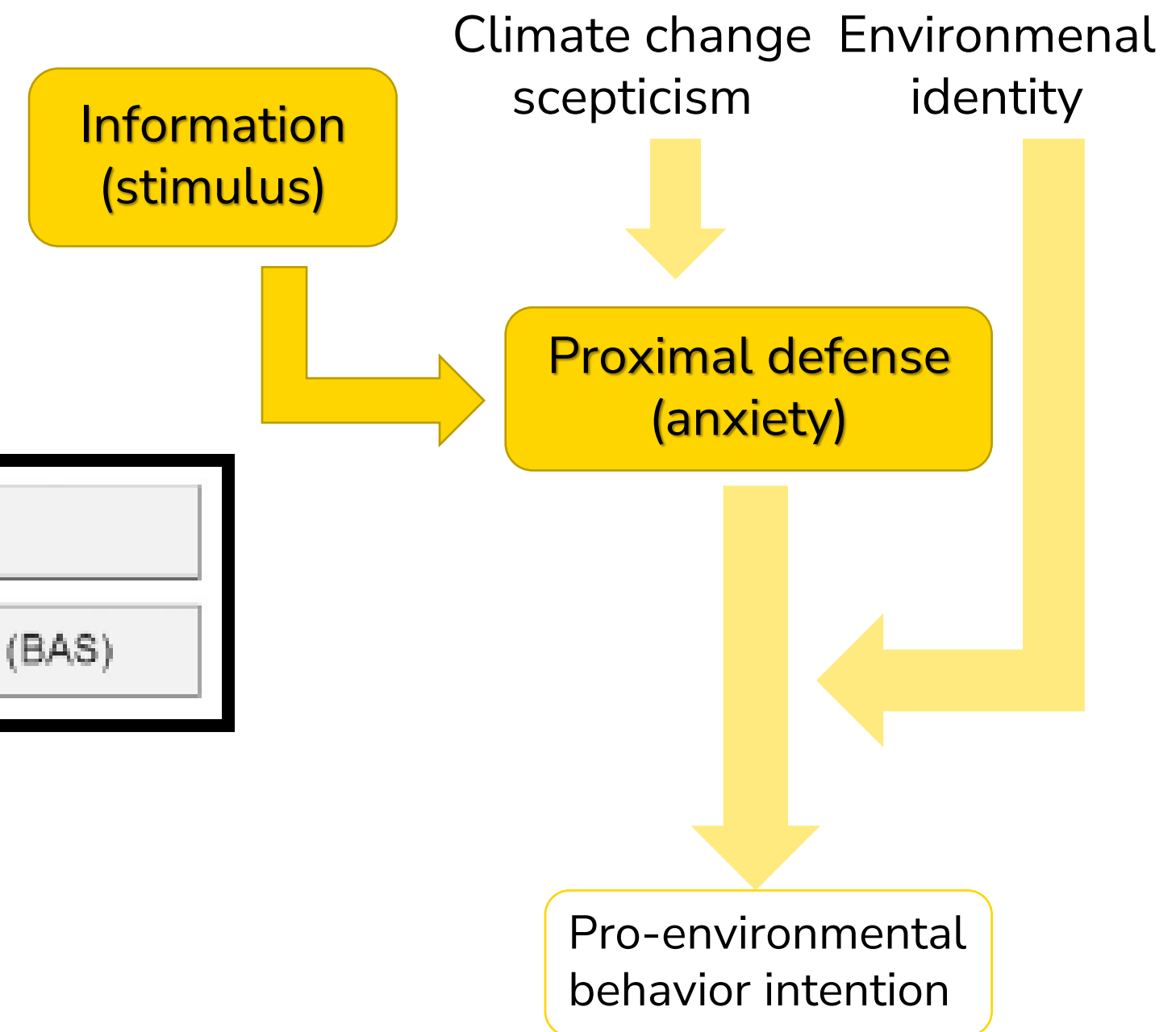
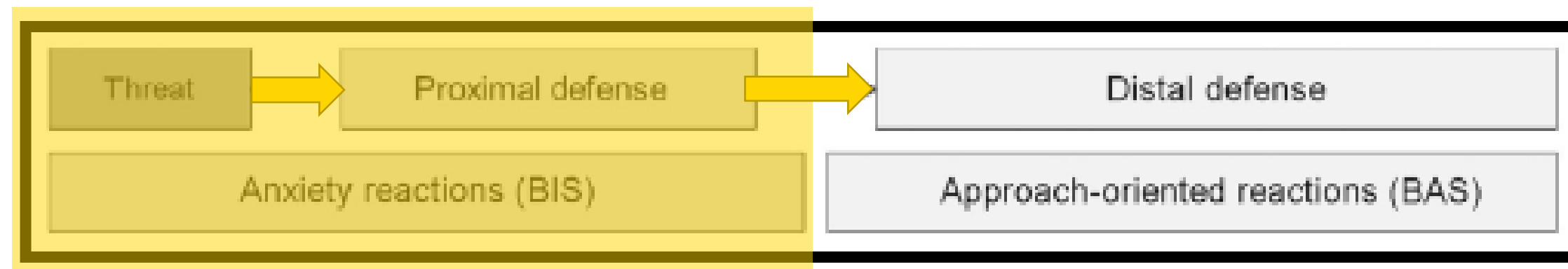
Dynamical properties and behaviour:
1.) What laws/rules does an individual abide by?
2.) Who does this individual interact with?
3.) How do individuals respond when interacting?

Agent-Design – From verbal model to formal model



Behavioural Inhibition System (BIS):

Avoidance, increase efforts to suppress or distract and distance from anxious thoughts

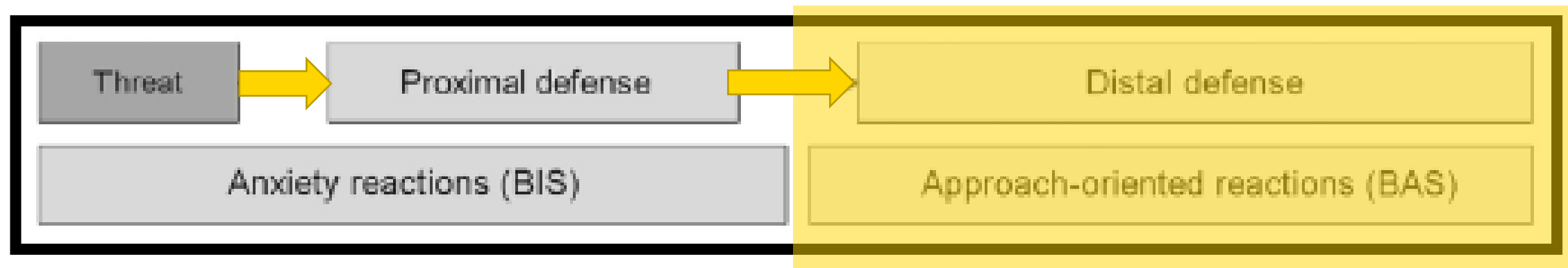


Agent-Design – From verbal model to formal model



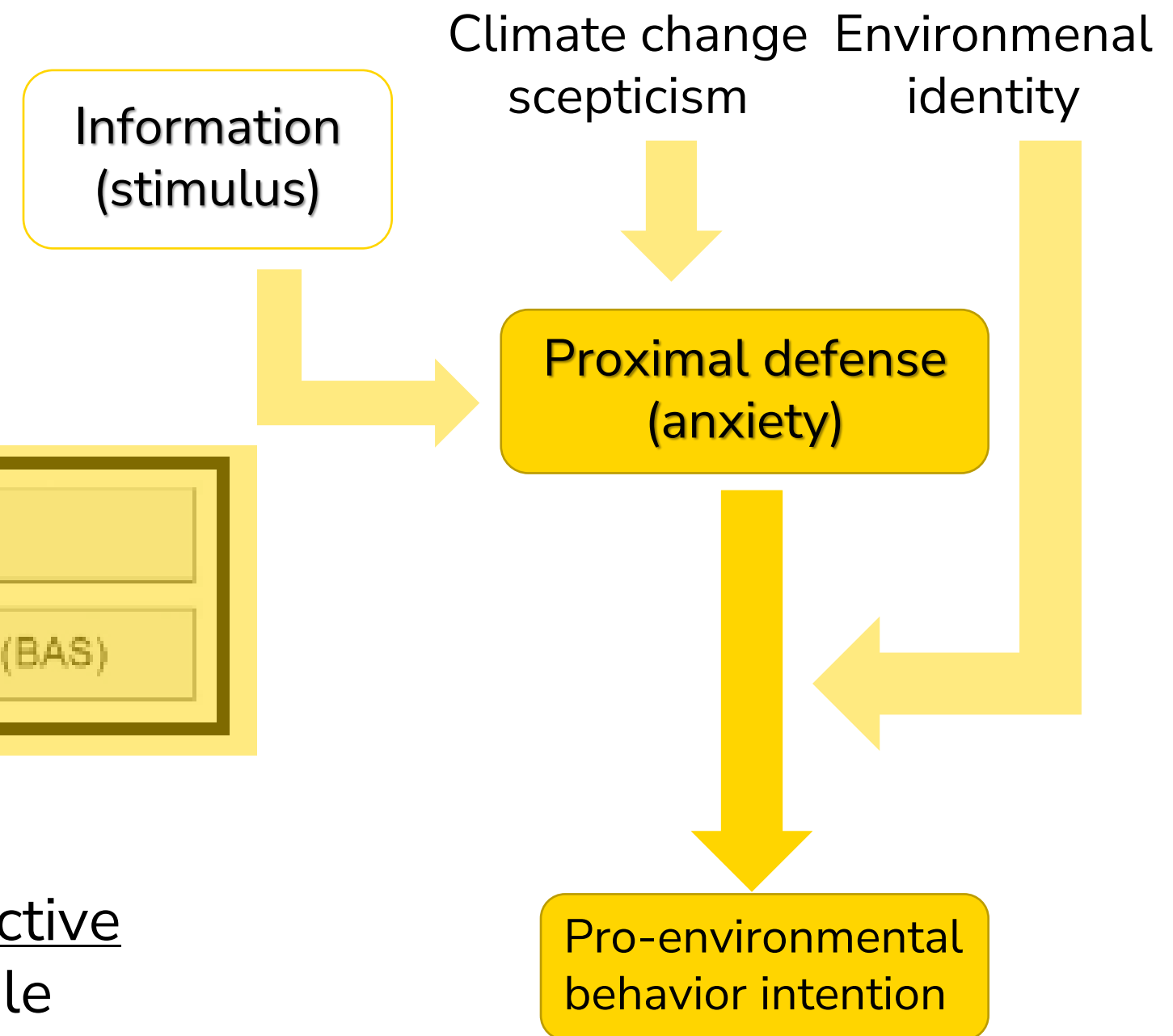
Behavioural Inhibition System (BIS):

Avoidance, increase efforts to suppress or distract and distance from anxious thoughts



Behavioural Approach System (BAS)

Approach motivation: a second way to, striving for an effective solution, more likely if the discrepancy appears manageable



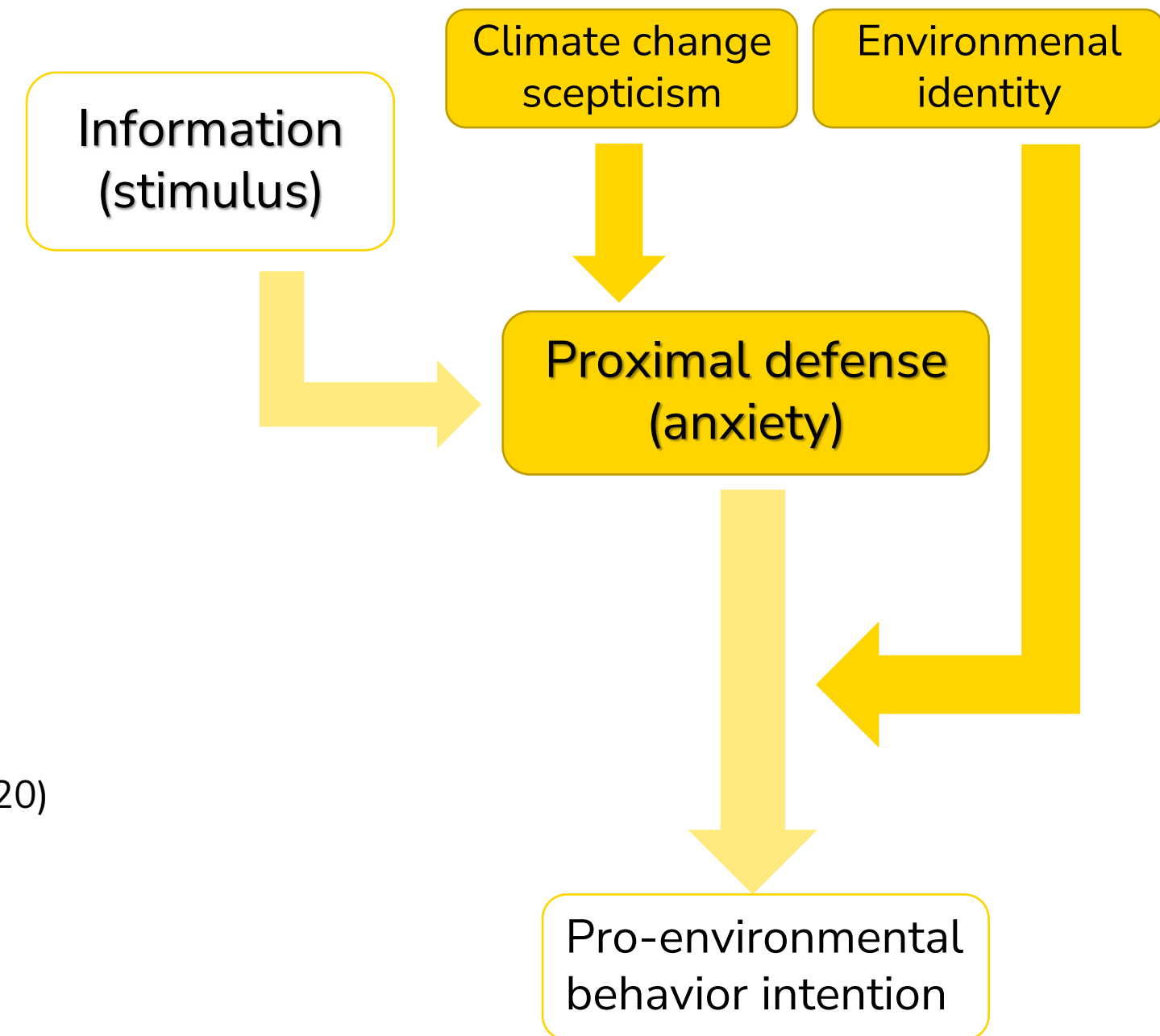
Agent-Design – From verbal model to formal model



Important moderators for pro-env. behavior

Environmental psychology identifies two significant characteristics that mediate how people respond to environmental threats:

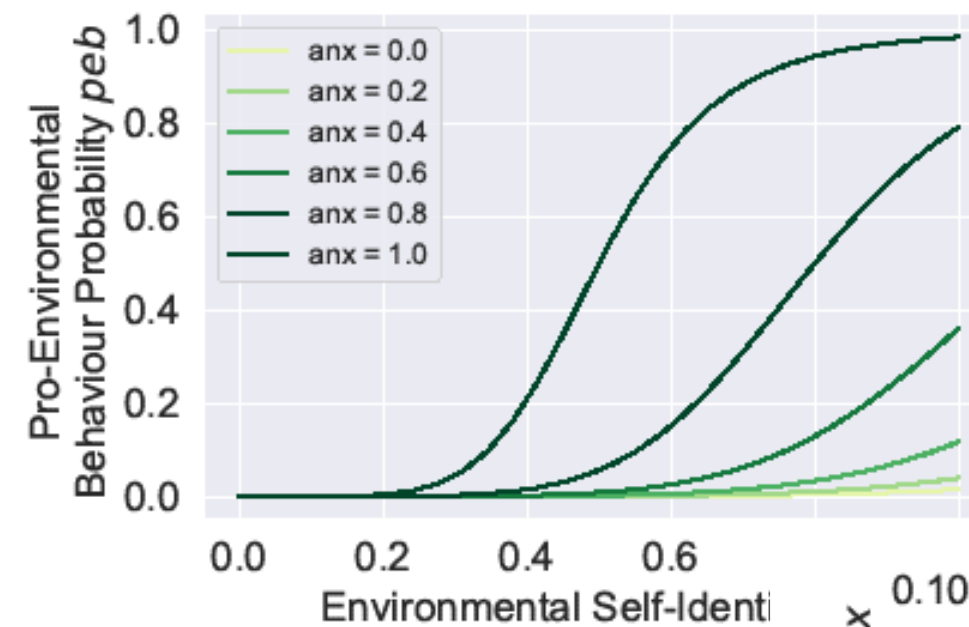
- Climate change scepticism
(Haltinner & Sarathchandra, 2018; Hoffman, 2011; Hornsey, Fielding, et al., 2016)
- Environmental self-identity
(van der Werff et al., 2013; Moser and Kleinhüchelkotten 2018, Hamann & Reese, 2020)



Long-term impact of threatening climate messages - The complete Model



ABM on long-term impact of threatening climate messaging on a model society (opinion dynamics, intention dynamics)

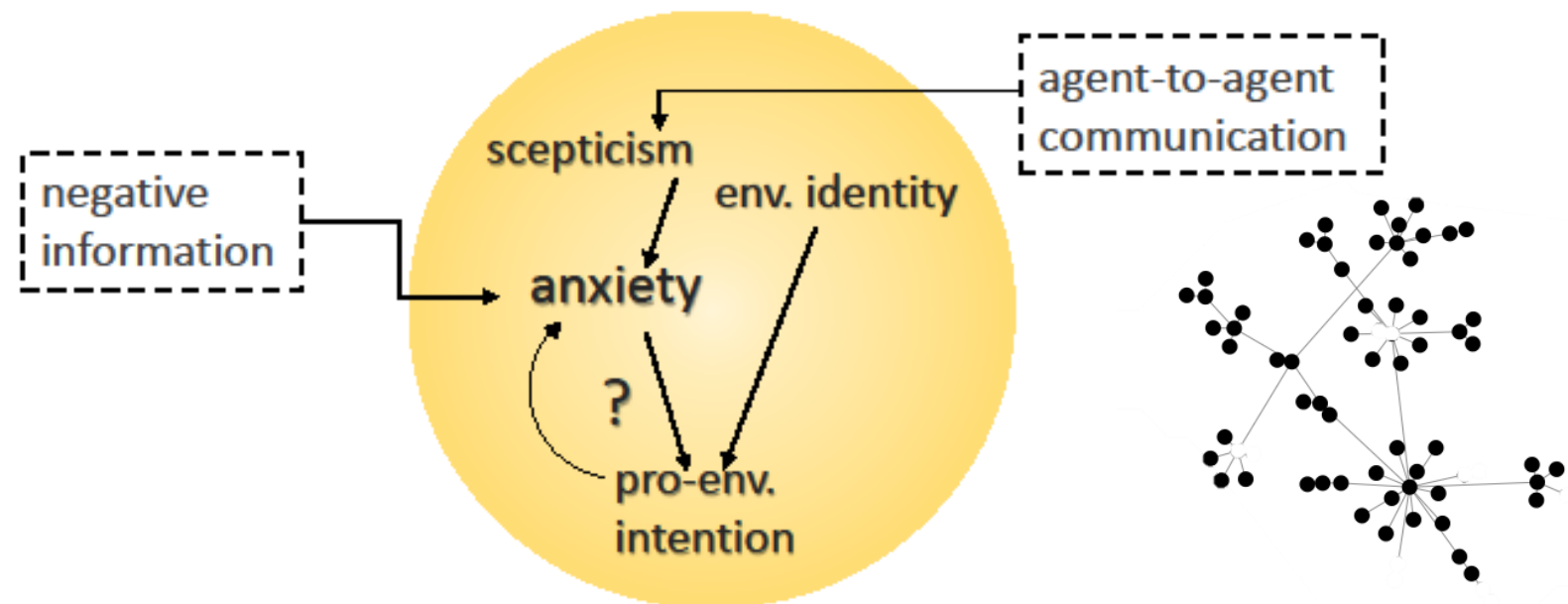


Function design related to empirical data
Uhl et al. 2016, 2018

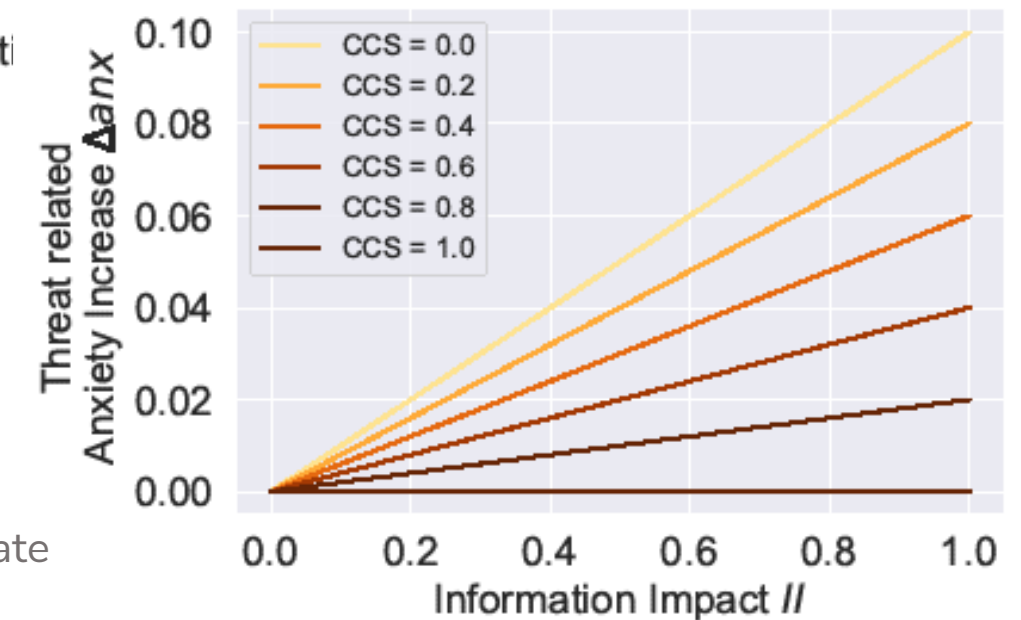
Hill Function

$$\frac{x^\lambda}{x^\lambda + h^\lambda}$$

Agent architecture scheme



Scale-free Social interaction network



Kapeller, M. L., & Jäger, G. (2020). Threat and Anxiety in the Climate Debate—An Agent-Based Model to Investigate Climate Scepticism and Pro-Environmental Behaviour. *Sustainability*, 12(5), 1823.

Main Results – Responses to long-term climate messaging



Opinion Dynamics

How does population climate scepticism develop?

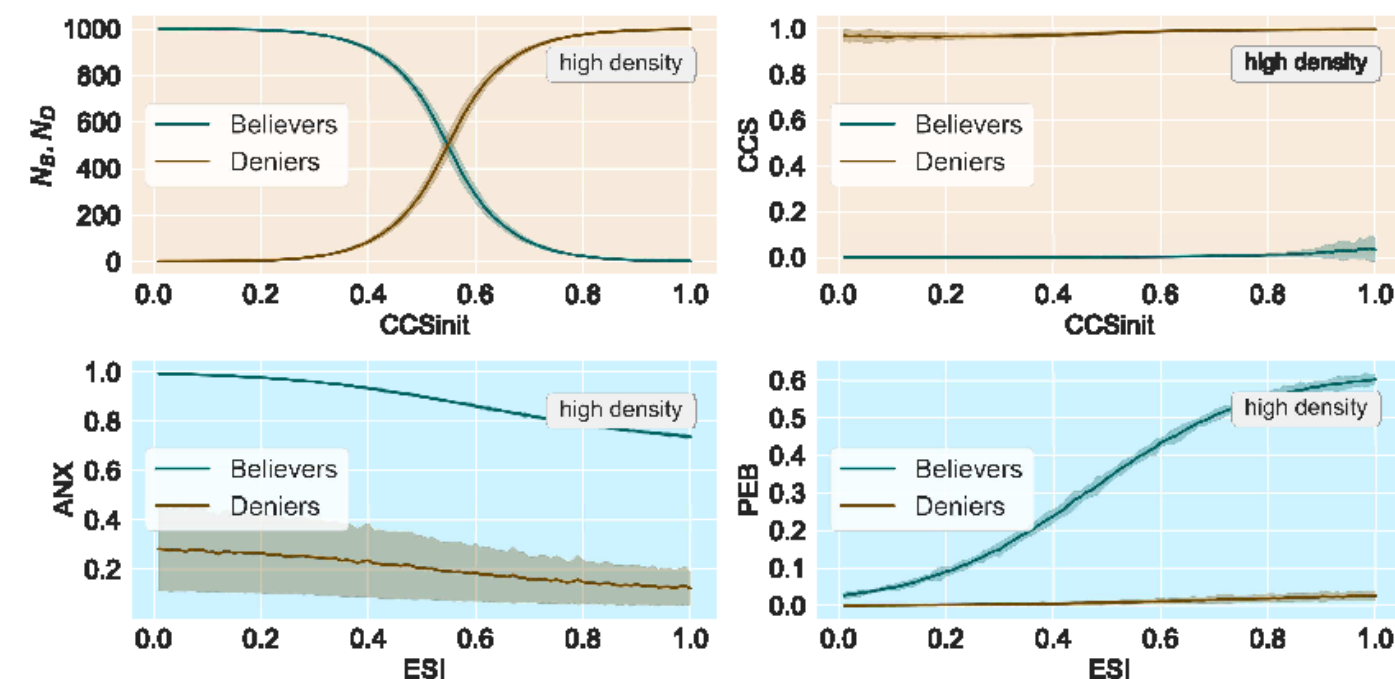
Division into climate sceptics and climate believers

→ Polarization

- For all initial population types (high to low scepticism, high to low environmental self-identity)
- For high information density (long-term)

Intention Dynamics

What conditions facilitate increases in pro-environmental behavior?



Kapeller and Jäger (2020)

Main Results – Responses to long-term climate messaging

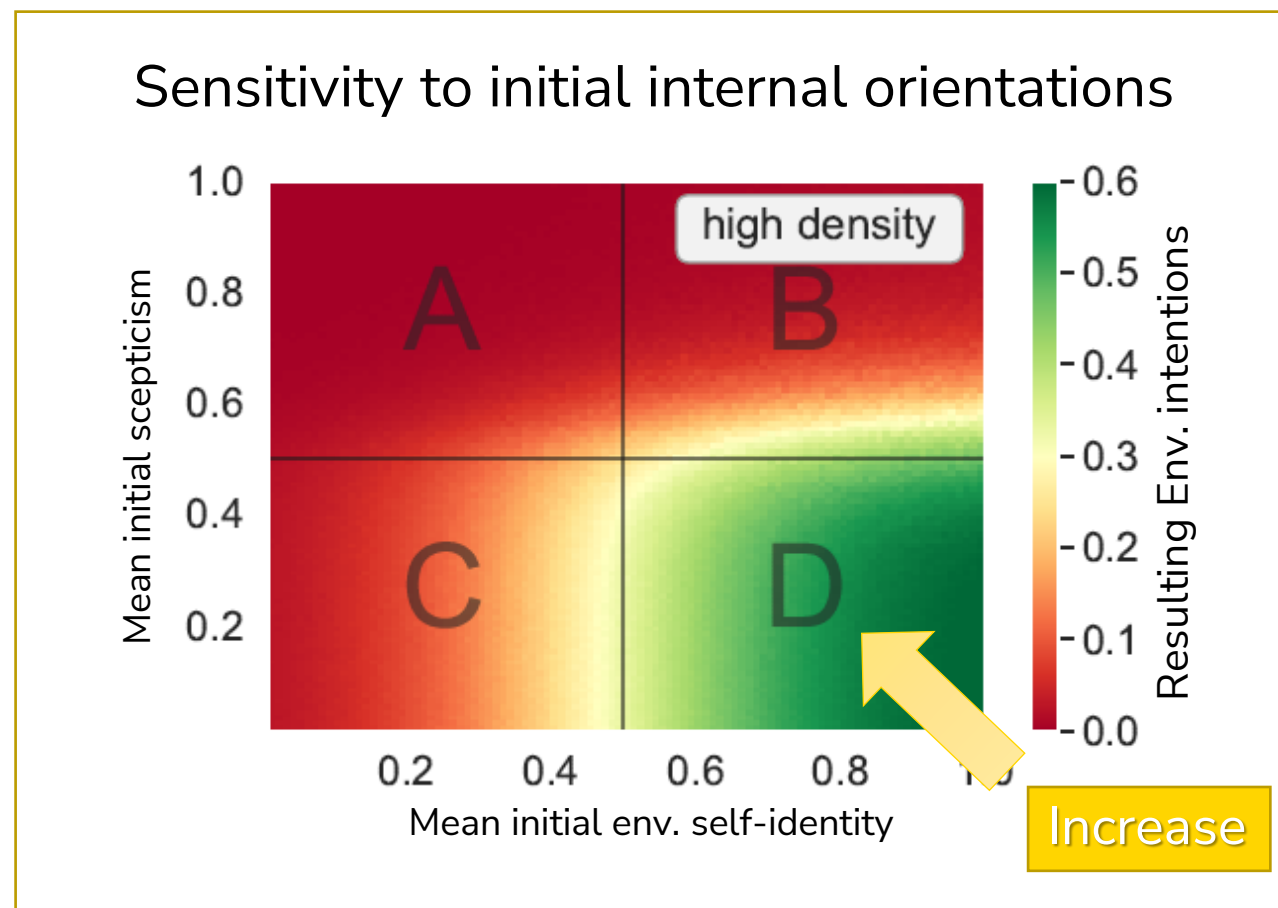


Opinion Dynamics –

How does population climate scepticism develop?

Intention Dynamics –

What conditions facilitate increases in pro-environmental behavior?



Three key conditions for the majority to respond approach motivated:

1. Sufficiently high environmental self-identities
2. High information density (longterm)
3. Majority has to be open to the topic from the beginning

Kapeller and Jäger (2020)

Main Results – Responses to long-term climate messaging



Opinion Dynamics –

How does population climate scepticism develop?

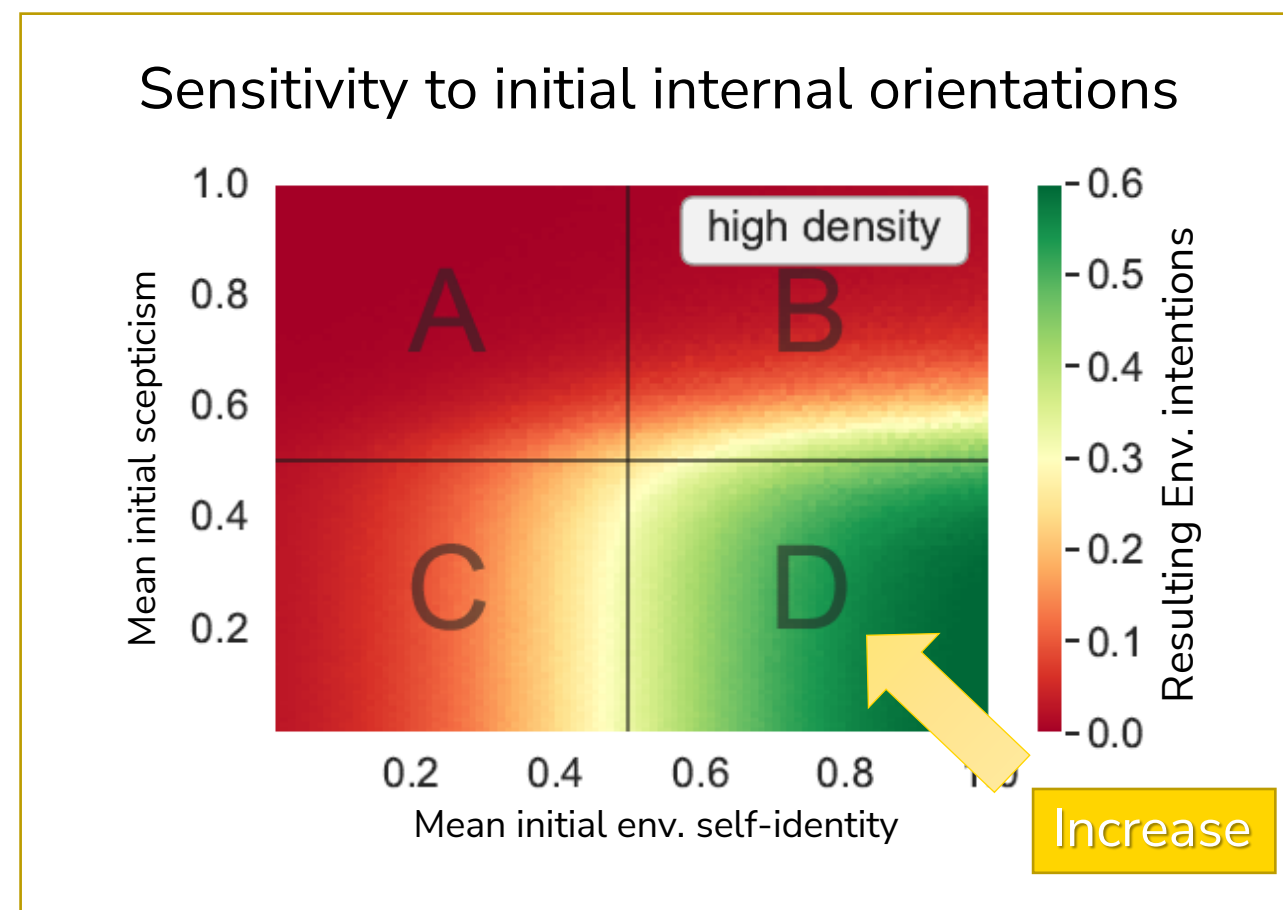
Intention Dynamics –

What conditions facilitate increases in pro-environmental behavior?

Additional complication 1:

Increased collective feeling of concern and tension
(high levels of anxiety throughout the population)

→ Many simulations show highly anxious
populations with no significant ecological
intention increase



Kapeller and Jäger (2020)

Main Results – Responses to long-term climate messaging



Opinion Dynamics –

How does population climate scepticism develop?

Intention Dynamics –

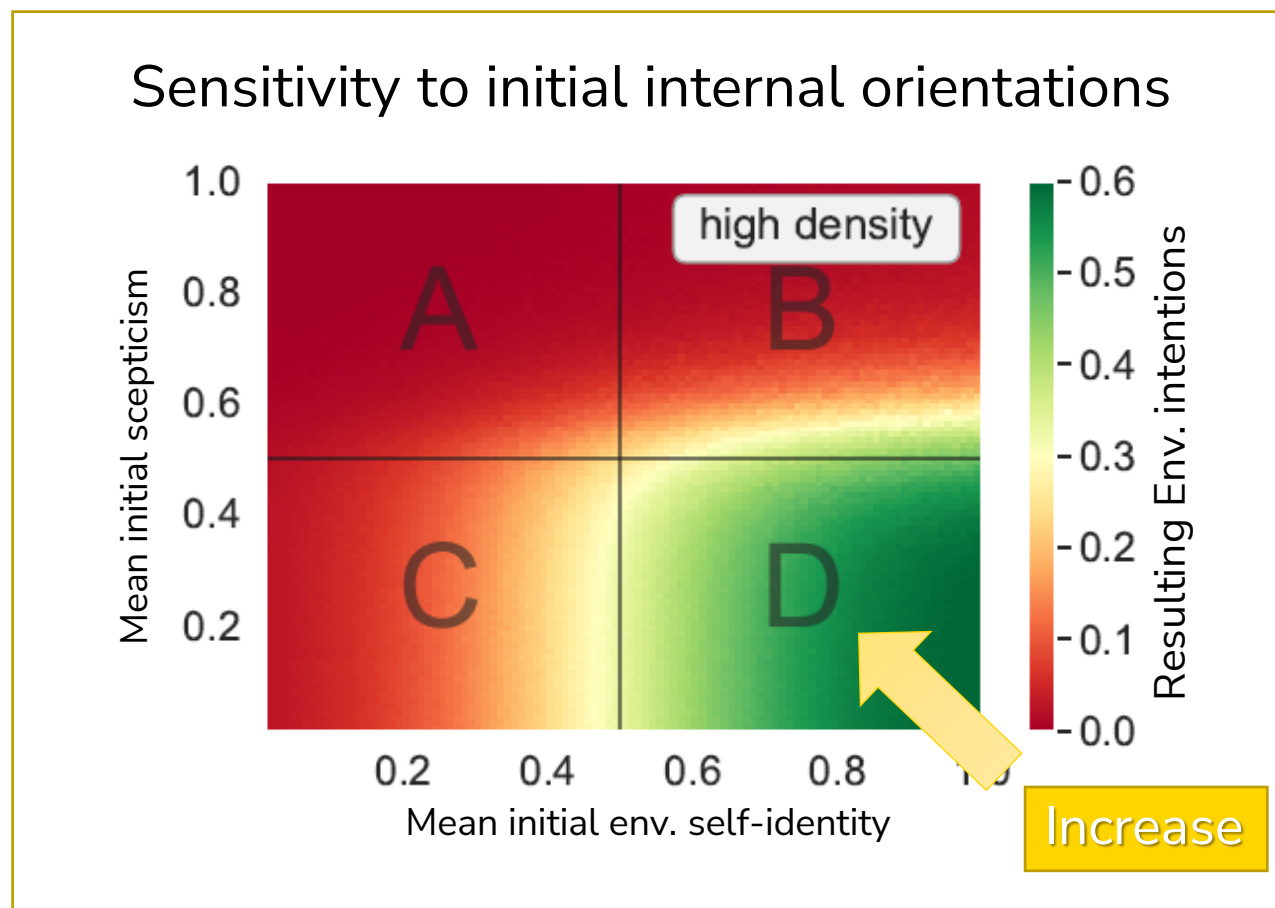
What conditions facilitate increases in pro-environmental behavior?

Additional complication 2:

The spread of climate scepticism is higher (in comparable model societies), the higher the density of threatening information.

There is no optimal solution:

- Not enough information: average approach motivation response remains low
- High information: average approach motivation increases but number of climate deniers (free-rider) rise



Kapeller and Jäger (2020)



In order to reach the goal of sustainable lifestyles through climate messaging, telling the severe consequences of climate change is only part of the solution.

We need to think about how to diversify information and introduce the psychological perspective on rhetoric and communication of threatening messages.

Thank you!

Rhetoric and Framing –

How to distinguish threat- and solution-orientation?

Pretesting of climate statements – How to frame a message



Perception of threat-orientation and solution-orientation of preliminary climate statements (pretest, 100 participants)

3 Statement-classes of problem description

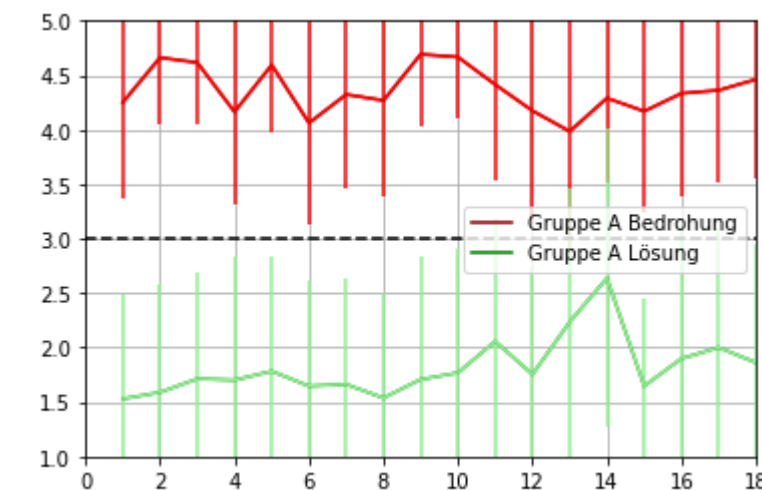
- Threat-orientation
- Solution-orientation
- Neutral content

Results: overall good distinction but some topics are more difficult to present (loaded)

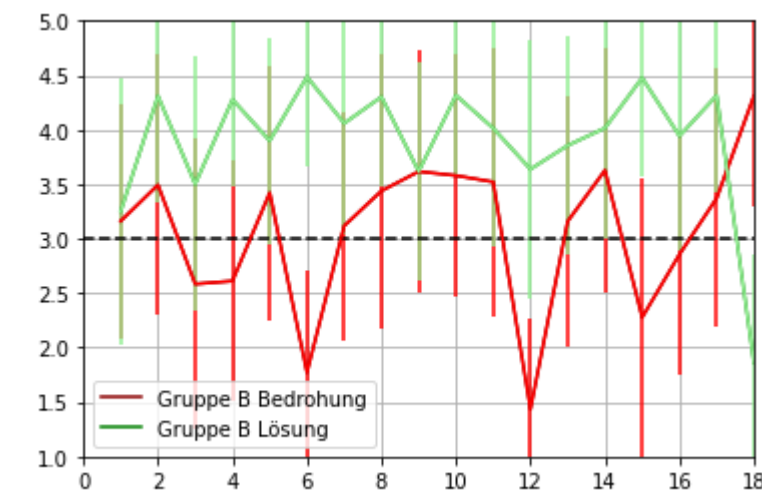
- Nutrition (many written comments added)
- Politics

The respective statements will be adjusted according to methods and criteria of textlinguistics, linguistic pragmatics and discourse analysis. Metaphors, different types of speech acts and generic patterns such as description, explanation, argumentation, narration and instruction will, for instance, play a central role.

Statements class: threat-oriented



Statements class: solution-oriented



Topic Model - Methods

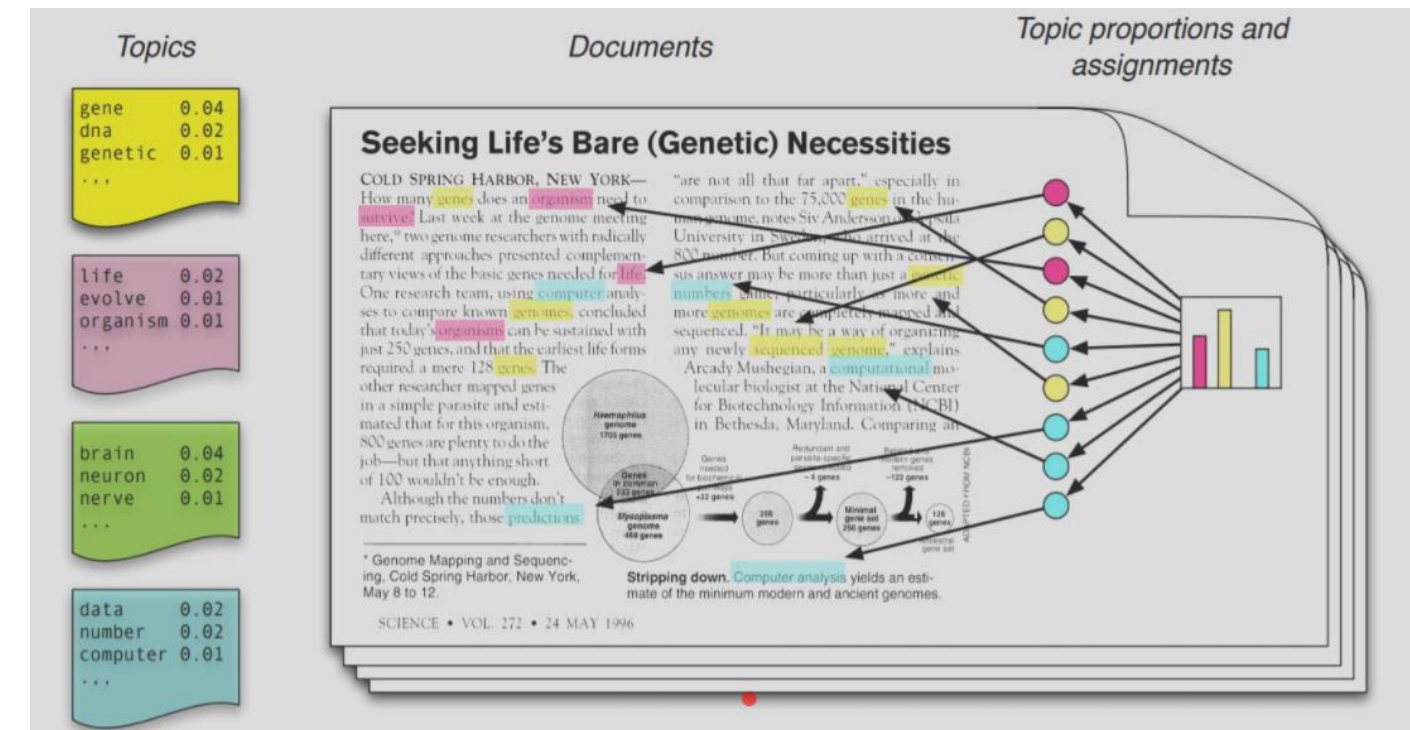


Topic Model

- Find patterns in word usage and group documents based on shared patterns
- Hierarchical probabilistic models
- Documents are turned into unordered “bags-of-words”
- Topics are collections of words that are likely to occur in the same document

Dynamic Topic Model

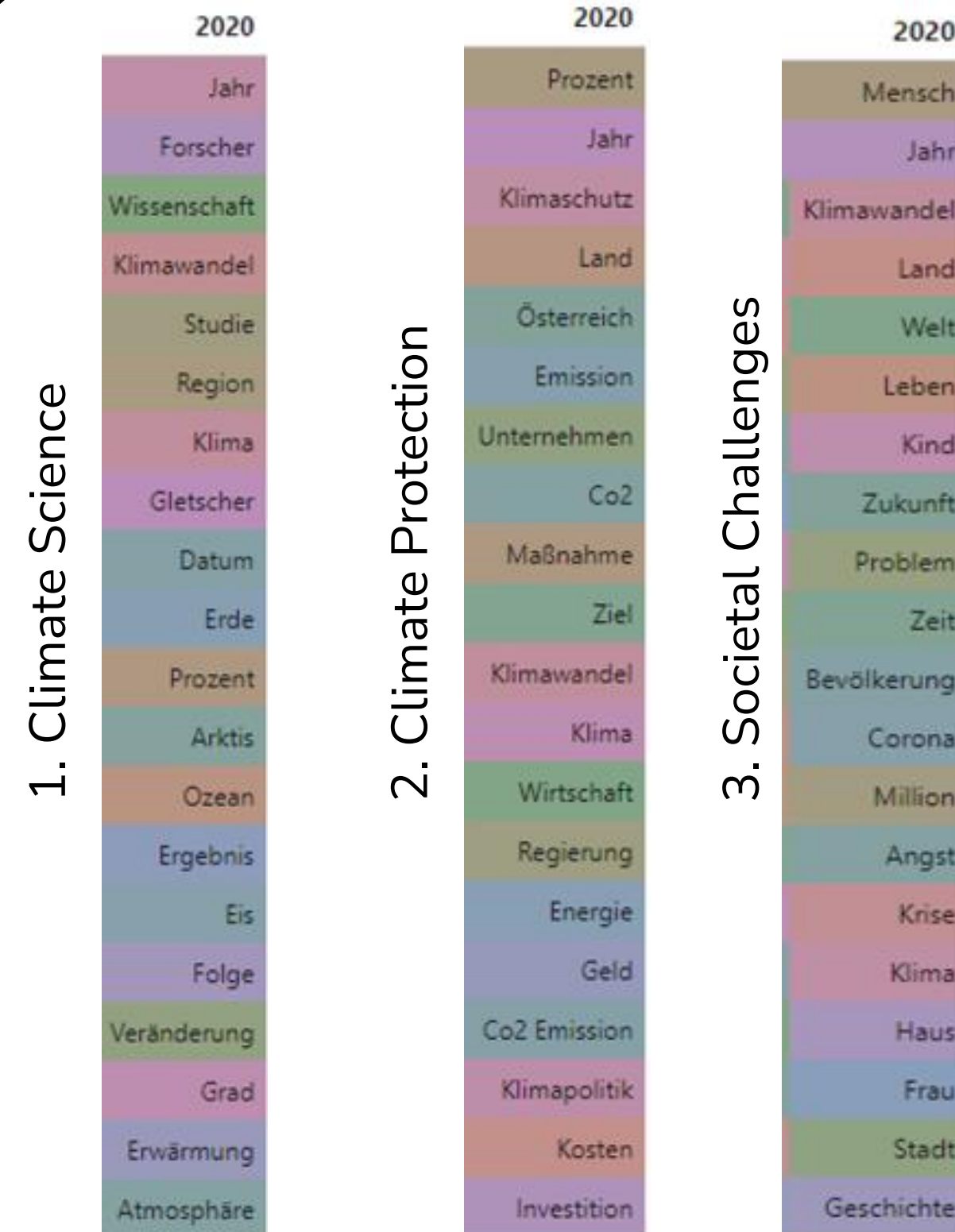
- Introduce temporal evolution into Topic Models
- At each time-step word probabilities are updated from new documents



Further aspects – What are the (hot) topics?

Topic Modelling

1. Climate Science
2. Climate Protection
3. Societal Challenges
4. Regional Environmental Impacts
5. International Politics and Conferences
6. Individual Commentary
7. Scientific and Research and Technology
8. Regional Drivers and Mitigation Efforts
9. Global Environmental Impacts



General rhetoric concepts in the climate debate



- Solution-oriented journalism movement (Hermans & Drok, 2018) intends to reshape the common norms of the journalistic profession in terms of objectivity/subjectivity and value neutrality and calls for a replacement of scandalization and pure alarmism in the interest of societal wellbeing.
- Fear and hope messages (Nabi and Myrick, 2019)
- Sustainability in journalism (Olausson et al., 2017)
- Applied linguistics grasps the variety of communication about the climate problem by distinguishing between basic types of speech acts (i.e. assertive, interrogative, declarative, commissive, directive, expressive speech acts), elementary generic patterns (i.e. description, explanation, argumentation, narration, instruction) (Reisigl, 2020).
- The contrast between mockery on the one side and alarmism on the other (Whitmarsh, 2011) leads to a confusing picture of the climate debate for the general public. This is reflected in the perceived lack of scientific consensus of human-made climate change, where only about one third (24 – 35%) of respondents in four European countries (France, Germany, Norway and United Kingdom) stated that the vast majority of scientists agree on the matter (Steentjes et al., 2017)

Psychological factors



- How information on climate change is processed depends on a variety of factors, such as trust in the messenger, or prevalent biases (Clayton et al., 2015).
- Often the lack of belief in climate change is highly linked to political conservatism. However, this does not automatically mean that climate action is impossible to encourage within right-wing or conservative groups (Hornsey, Harris, et al., 2016), but rather that communication has to be done differently than for climate change believers (Hornsey & Fielding, 2020)
- High scores on pro-environmental self-identity or similar constructs such as biospheric values are traditionally associated with more CFB (van der Werff et al., 2013). However, this association does not necessarily hold for high-cost situations (Moser and Kleinhüchelkotten 2018) and may depend on the perceived self- and collective efficacy of taking a particular action (Hamann & Reese, 2020). There is a need to look more closely at different types of CFB and the influence of potential psychological mediators and moderators that help explain the effectiveness of climate change communication.