Why do we do extreme event attribution?

aglae.jezequel@lmd.ens.fr

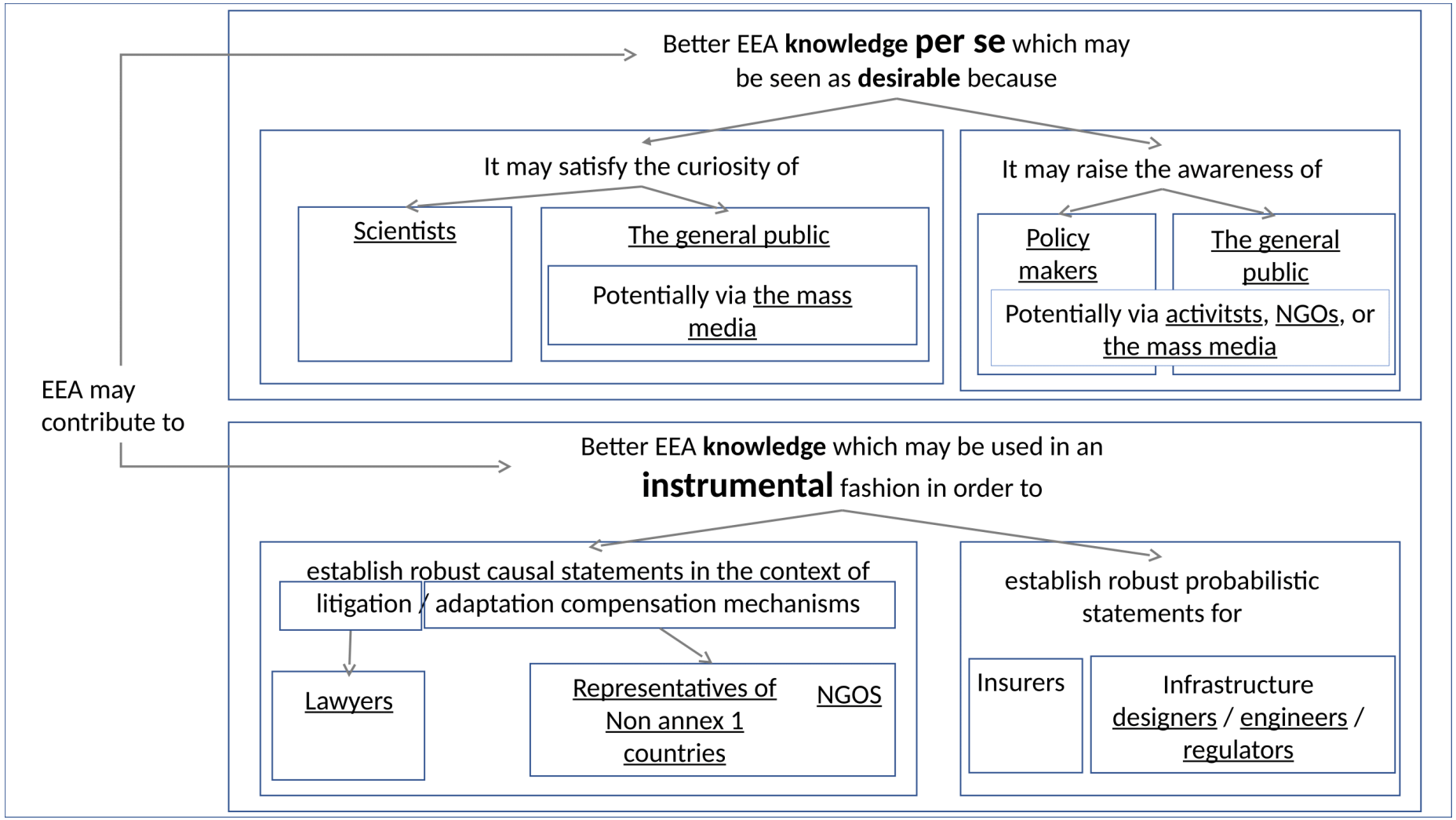
We are not doing our science in a vacuum

- ‘‘ Science speaks truth to power’’ - a chimera - Collinridge and Reeve (1986)
- Epistemic and non-epistemic values - Kuhn (1977)
- Different definitions of what useful means

Beginnings of EEA - non-epistemic values

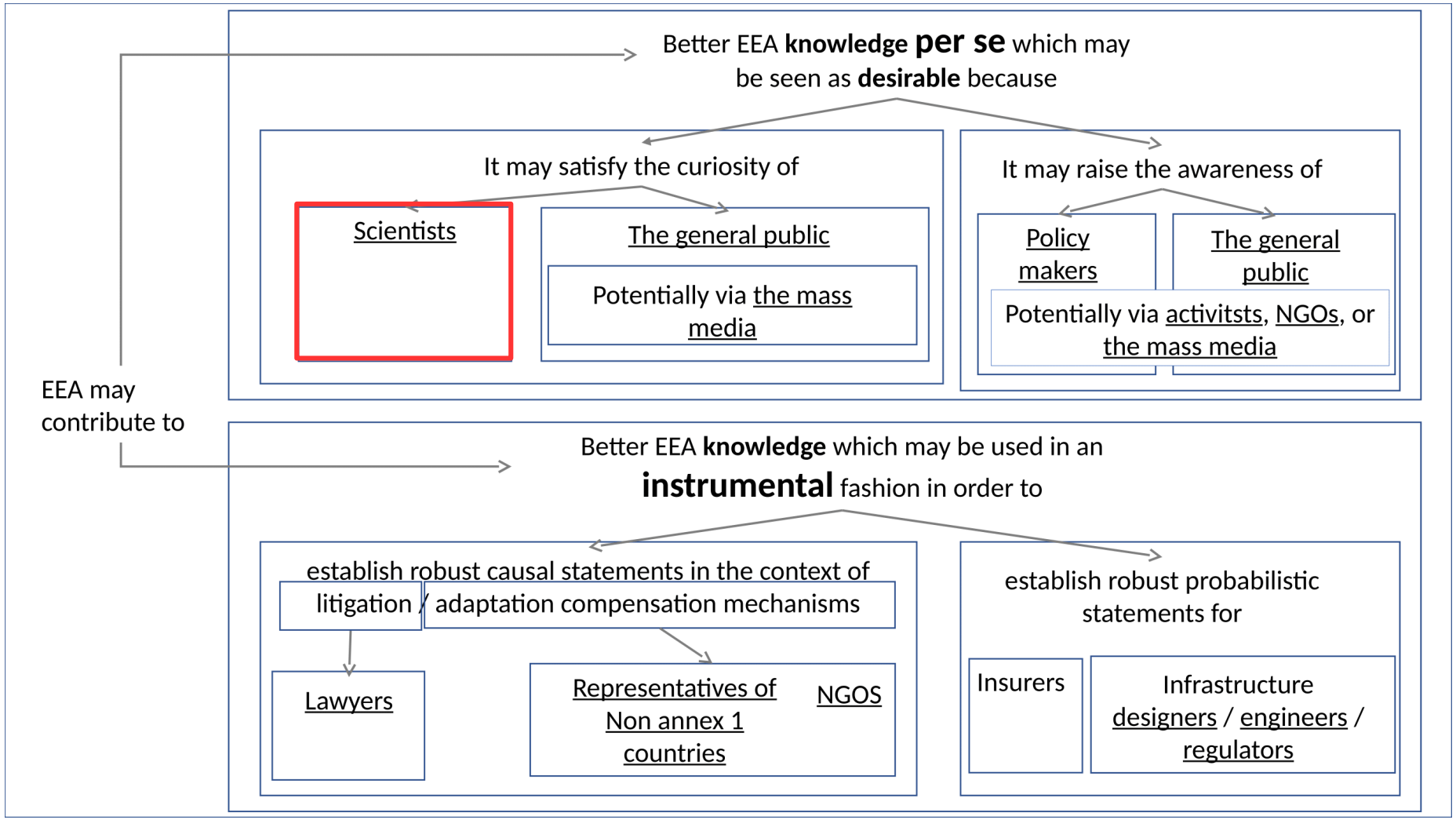
- “Politicians have many things to worry about, so perhaps it is time to consider some apolitical mechanisms for redistributing the costs of climate change” – Allen (2003)
- “Our approach could prove a useful tool for evidence-based climate change adaptation policy” – Pall et al (2011)
- There can be “subjectivity” in EEA results, which “may simply open up new spaces for political contestation, but now hidden in the language of science” – Hulme et al (2011)

For who and what for? - Perspectives from EEA scientists



Jézéquel et al. (2020)

For who and what for? - Perspectives from EEA scientists

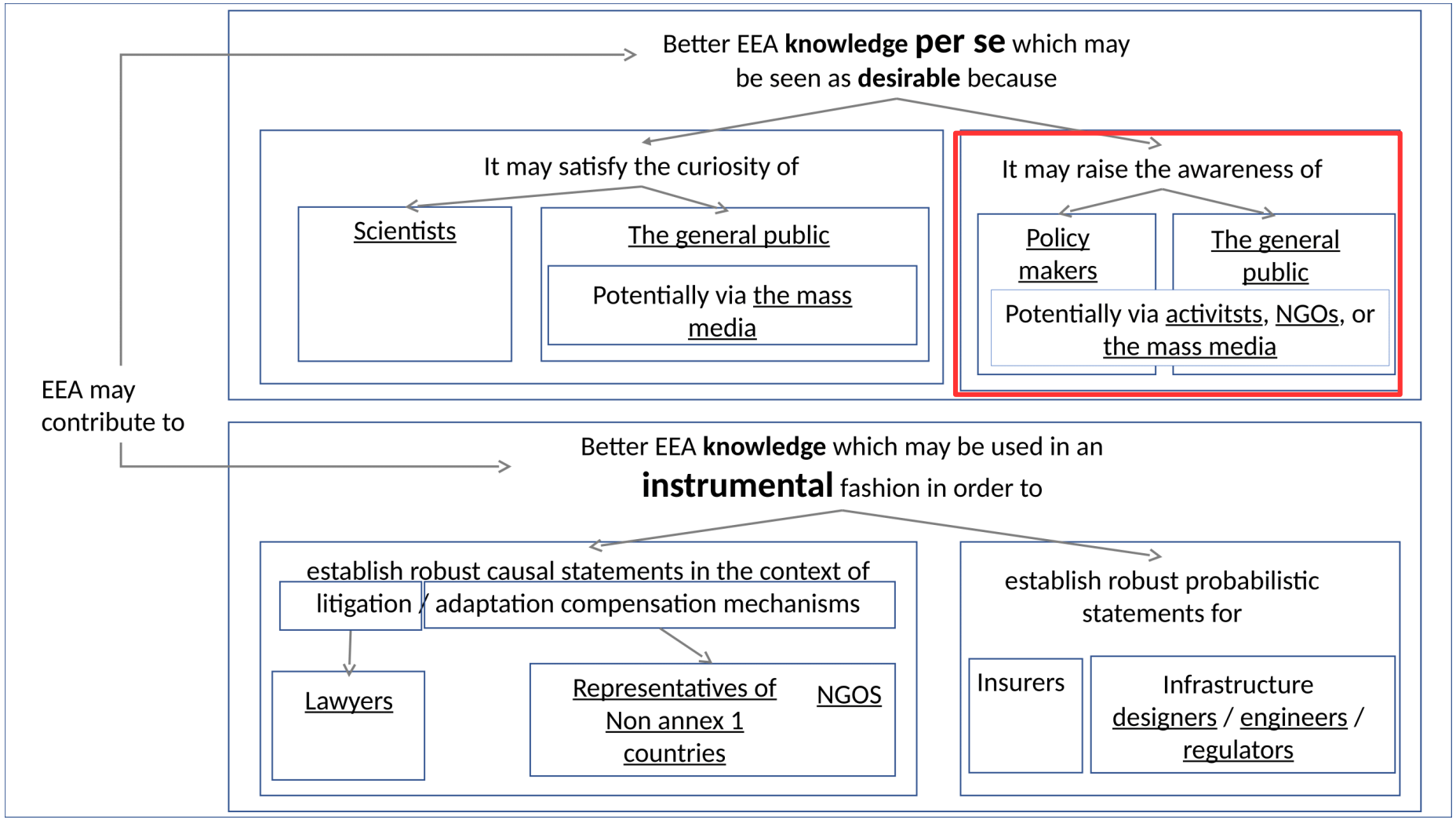


Jézéquel et al. (2020)

Scientific interest

- Diverging views:
  - ‘‘from a scientific perspective it is maybe not quite as useful’’
  - “from a scientific point of view, it’s extremely interesting.”
- ‘‘a little bit like ambulance chasing’’; ‘‘that is what paparazzi do.”
- Most often a secondary motivation

For who and what for? - Perspectives from EEA scientists



Jézéquel et al. (2020)

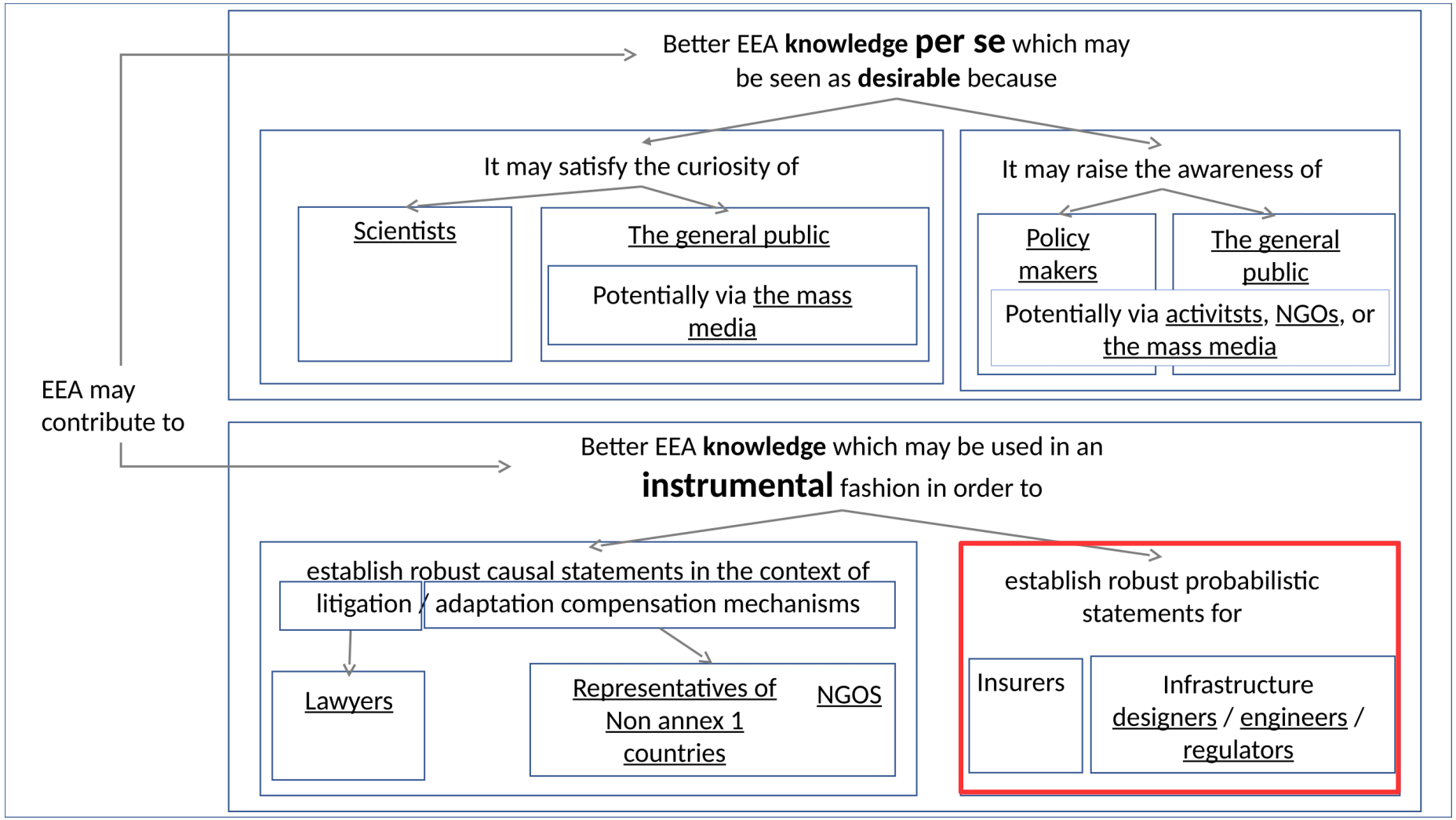
Awareness raising

- Answer frustration regarding the « invisibility of climate change » - *Rudiak-Gould (2013), Hulme (2014)*
- There is a clear increase in media coverage and a link with climate change that wasn't done before… but how does that compare with other news?
- ‘‘I am under the impression that quantifying the change in probability of occurrence is not their first interest, what concerns them the most is whether there is an anthropogenic contribution or not.’’
- ‘‘people make attribution statements without scientific evidence if we do not provide scientific evidence. I think overall it makes more sense to do it with the scientific evidence we have’’
- Are we feeding rolling-news media?

Some important context on awareness raising

- In the US, the perception of climate change is driven by political orientation, and the influence of climate extremes is not discernible – *Maquart et al (2014)*
- There is a ‘‘modest, but discernible’’ effect of extreme events on climate change awareness, but only for recent events, hinting at a short-term phenomenon – *Konisky et al (2016)*
- Extreme weather exacerbates political polarization on climate change, rather than change the initial opinion of the affected people – *Bohr (2017), Hamilton et al (2016)*
- Lack of studies outside of the US and of the role of attribution statements.

For who and what for? - Perspectives from EEA scientists



Jézéquel et al. (2020)

EEA for insurers?

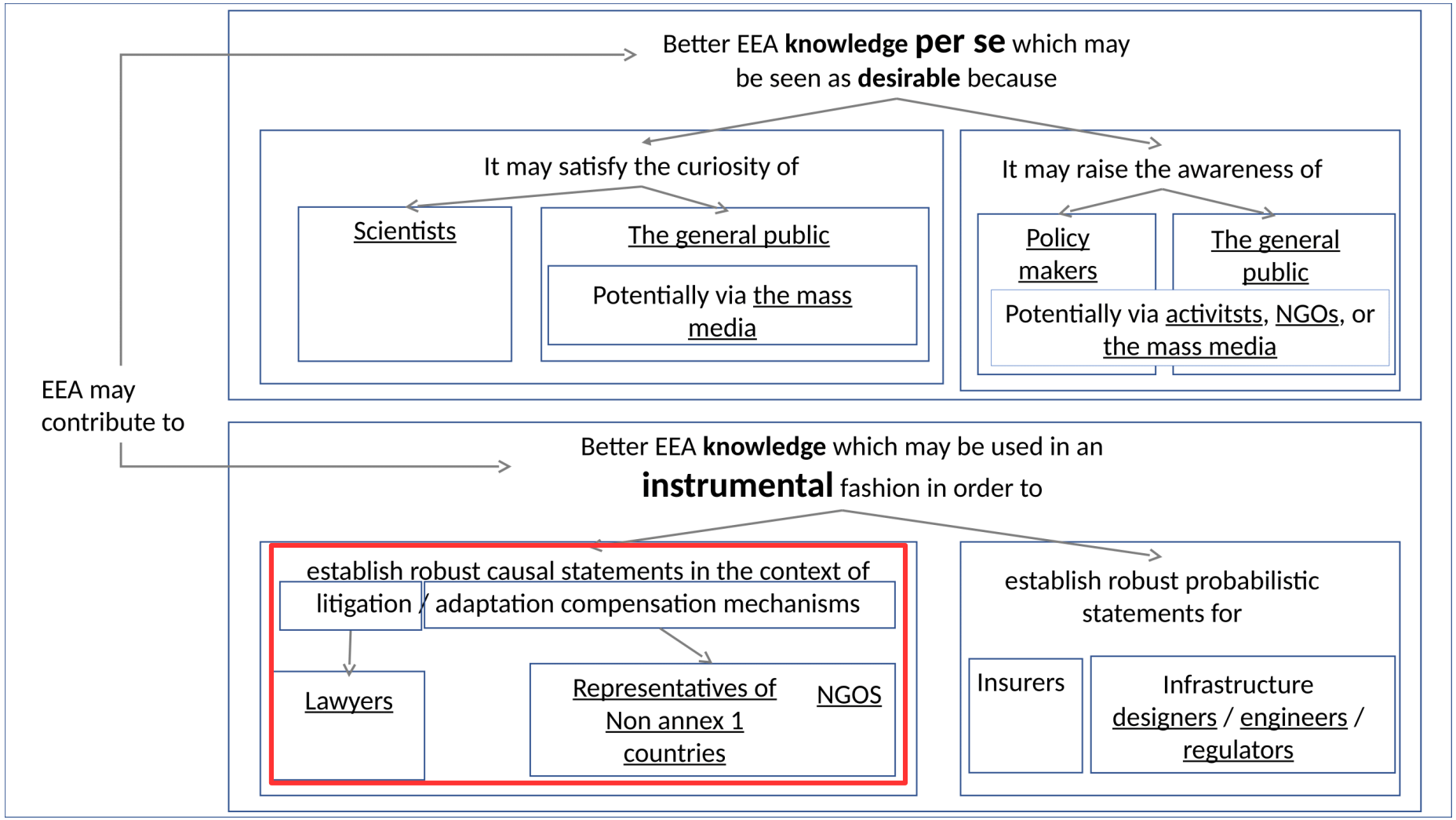
- There is a general interest… but
  - No added value to the existing information
  - Other components of risk are more important
  - It is not applicable in existing business processes
- ‘‘despite the fact that most of the interviewees were certain that EEA is relevant, no one was convinced that the added value of EEA is currently large enough to pay for it.’’
- “insurers don’t care at all about the causal explanation. [. . .] what really matter is the risk, and its evolution’’

EUCLEIA project reports

EEA for adaptation?

- Stott et al (2013) – EE as catalysts of adaptation?
  - EE could be ‘‘harbinger[s] of the future.’’
  - possible cases of misattribution ‘‘could lead to poor adaptation decisions’’
- ‘‘the net effect of extremes on larger policy structures remains ambiguous in the literature, with the hint that even a strong signal does not necessarily ratchet policy adaptation’’ – Travis (2014)
- EEA adopts an ex-post perspective
- Hulme (2014)
  - Adaptation should be based on robust decision-making.
  - Adaptation funding should be based on vulnerability to extreme weather events, rather than attributability.
- ‘‘Most stakeholders found that [EEA] would not change their own motivation or way of taking action. They told to be rather in need of information about vulnerability, potential impacts and promising adaptation options; such information was not perceived to be enhanced by EEA results’’ - EUCLEIA

For who and what for? - Perspectives from EEA scientists



International law
Loss and damage

Jézéquel et al. (in preparation)

EEA for climate change litigation?

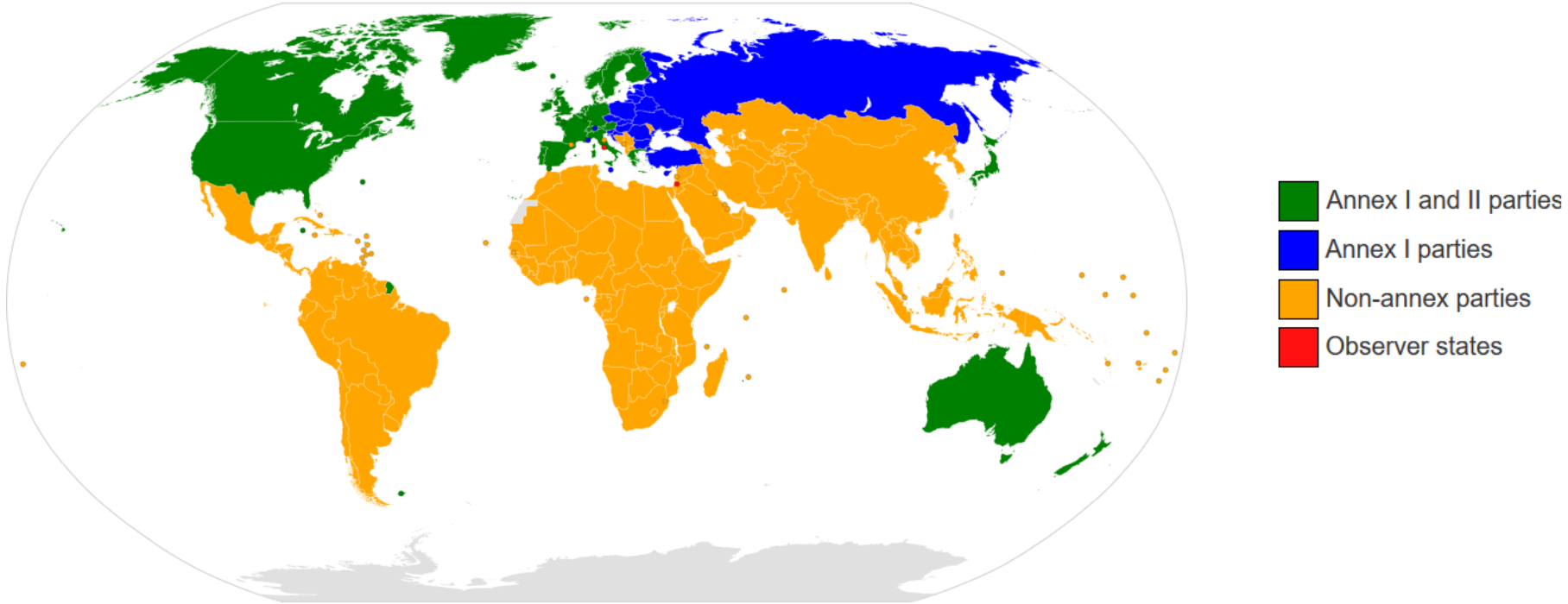
- See Lisa Lloyd's lecture and papers

1992 – Rio Earth Summit: Creation of the United Nations Framework Convention on Climate Change (UNFCCC)

<u>3 fundamental principles :</u>

- **The Precautionary principle**
- **The « Common but Differentiated Responsibilities & Respective Capabilities » principle**
- **The « Right of development » principle**

Members of the UNFCCC: different categories for different shares of responsibilities



Annex I Parties refers to members of the OECD in 1992 +countries with economies in transition (former USSR countries + Turkey).

Annex II Parties refers to the OECD members of Annex I: they are required to provide financial resources for developing country Parties and technologies for all non-Annex II Parties.

A short history of climate international negotiations

Rio Earth Summit (1992): where it all started !
=> Creation of the **United Nations Framework Convention on Climate Change (UNFCCC)**

Kyoto (COP3 - 1997): the first (and yet flawed) international agreement to reduce GHG emissions

=> Signature of the **Kyoto Protocol**

Copenhagen summit (COP15 - 2009): the last big failure in reaching a binding climate regime

Paris agreement (COP21 – 2015): universal climate regime for all Parties with provision for periodic review of nationally determined contributions (NDC)

A short history of climate international negotiations

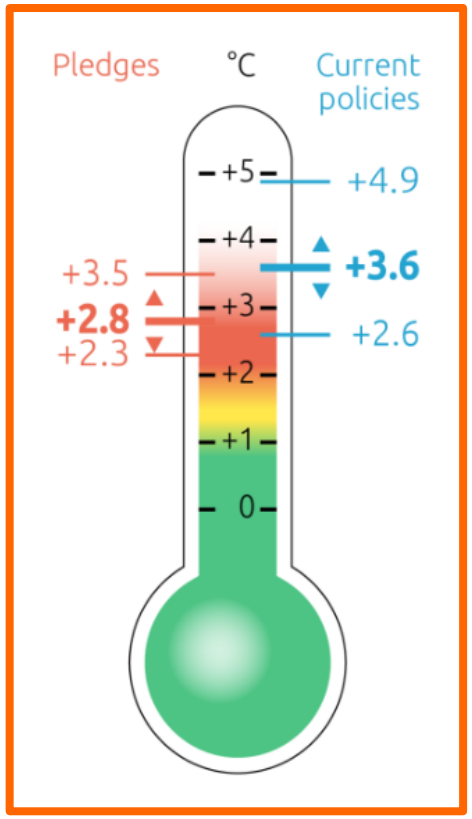
Rio Earth Summit (1992): where it all started !
=> Creation of the **United Nations Framework Convention on Climate Change (UNFCCC)**

Kyoto (COP3 - 1997): the first (and yet flawed) international agreement to reduce GHG emissions

=> Signature of the **Kyoto Protocol**

Copenhagen summit (COP15 - 2009): the last big failure in reaching a binding climate regime

Paris agreement (COP21 – 2015): universal climate regime for all Parties with provision for periodic review of **nationally determined contributions (NDC)**



Main topics of discussion

Equity and Differentiation

Share the responsibility between historical, current and future emissions, as well as emissions per capita, considering national circumstances and global carbon budget

Mitigation

Action to move towards low-carbon societies by the end of the century to stay below 1.5 or 2°C

Adaptation

Adapting to climate change consequences & Building resilience to reduce climate vulnerability

Loss & Damage

Implement a mechanism to respond to climate disasters

Transparency

Regarding the contributions : onitoring, Reporting & Verification (MRV)

Financing

Reach US$ 100 billion for developing countries by 2020, and further increase investments in low-carbon development & technologies

Capacity-Building

To improve poor and vulnerable countries capacity to enhance climate action

Technology Transfer

Help developing countries to have access to low-carbon technologies

Attribution of extreme events in climate negotiations

Bonn June 2015 intersessions

"To anyone who continues to deny the reality that is climate change, I dare you to get off your ivory tower and away from the comfort of you armchair. [...] you may want to pay a visit to the Philippines right now." "We must stop calling events like these as natural disasters. [...] It is not natural when science already tells us that global warming will induce more intense storms."

Yeb Sano about Haiyan at COP19 in December 2013

Loss and damage

"Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, **including extreme weather events** and slow onset events, and the role of sustainable development in reducing the risk of loss and damage."

Article 8.1, Paris agreement (2015)

"From a scientific perspective, [...] the first challenge in implementing the WIM would be to estimate where and when loss and damage can be attributed to anthropogenic climate change"

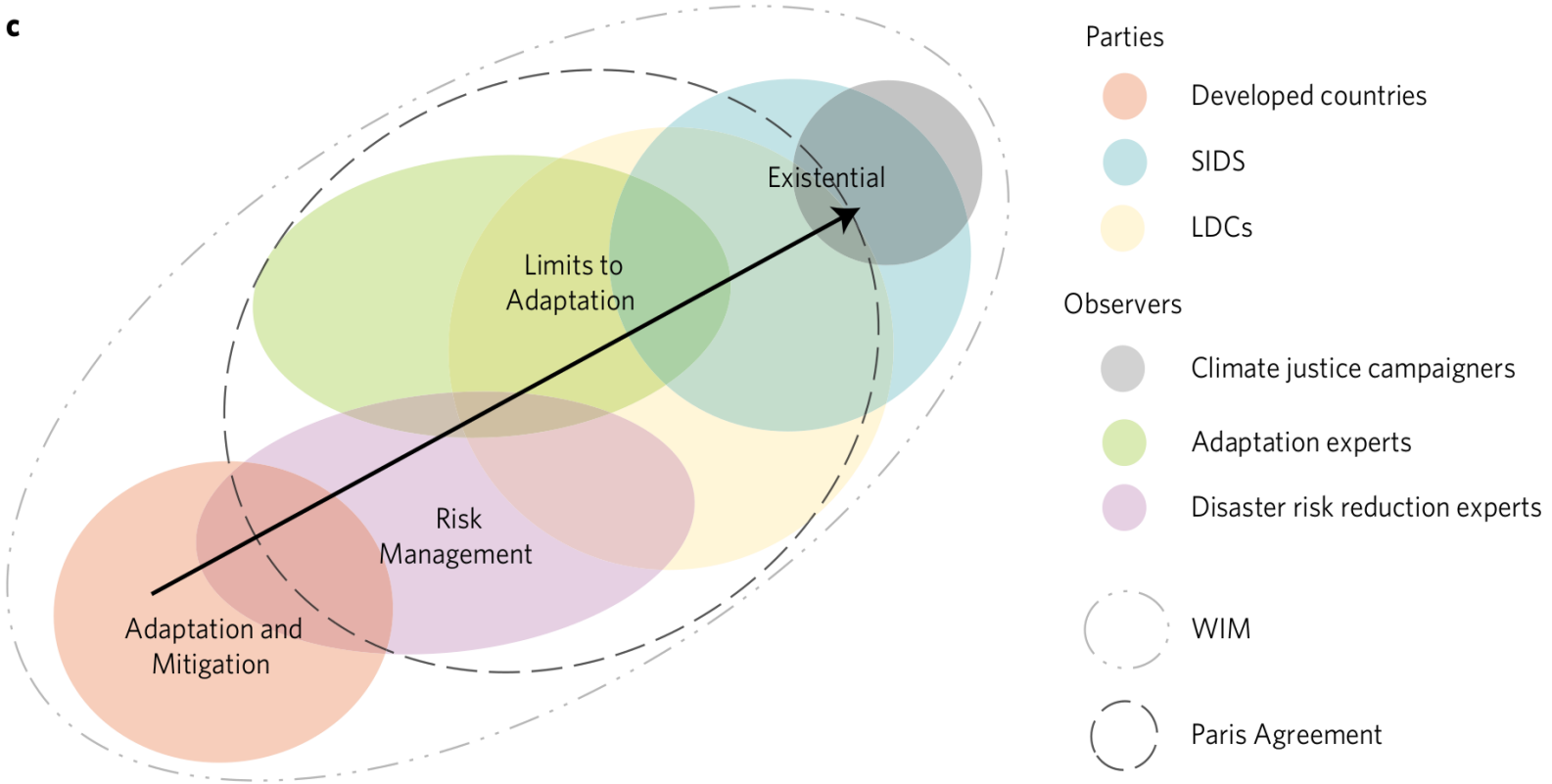
"a body of scientific evidence is growing, which is highly relevant to the WIM, yet is seen as a distraction from the negotiations"

James et al (2014)

Loss and damage

"Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, **including extreme weather events** and slow onset events, and the role of sustainable development in reducing the risk of loss and damage."

Article 8.1, Paris agreement (2015)



Boyd et al (2017) Nature Clim. Change

Using EEA for Loss and Damage?

Controversy: divergence of perspectives in the literature on the potential use of EEA for L&D (e.g. *Hulme et al (2011), James et al (2014)*)

What are the perspectives of L&D stakeholders?

Parker et al (2017) interviewed a panel of 31 stakeholders in 2014:

- Little awareness of EEA
- Lack of agreement on its potential use

Limitation: their panel was a mix of different stakeholders (climate scientists, social scientists, NGOs, delegates, private sector...)

Jézéquel et al. (2019)

My contribution:

- What do EEA scientists think of the use of their results for L&D?
- What do L&D delegates think of the use of EEA results for L&D?

→ **Could EEA results be useful for L&D? How?**

Datasets and methodology:

- 1 corpus of **L&D delegates** and affiliates – **12 interviews** (2016/2017)
- 1 corpus of **EEA scientists – 9 interviews** (2016/2017)
- Both samples are **saturated**
- Small sample size explained by the relative **homogeneity** and **small size** of both populations

Jézéquel et al. (2019)

Lack of communication between two groups of interviewees

A majority of delegates consider EEA could be useful for awareness raising

BUT Interviewees point out **6 hurdles** for a practical use of EEA in negotiations:

- **2 technical hurdles:**
  - Lack of confidence in EEA results
  - Lower attributability of extreme events in the most vulnerable countries

- **4 political hurdles:**
  - the apportionment of responsibilities between emitters
  - the definition of the extreme events
  - the apportionment of responsibilities between the ones who failed to mitigate and the ones who failed to adapt
  - the risk of only dealing with the attributable part of an event

Jézéquel et al. (2019)

Data injustice

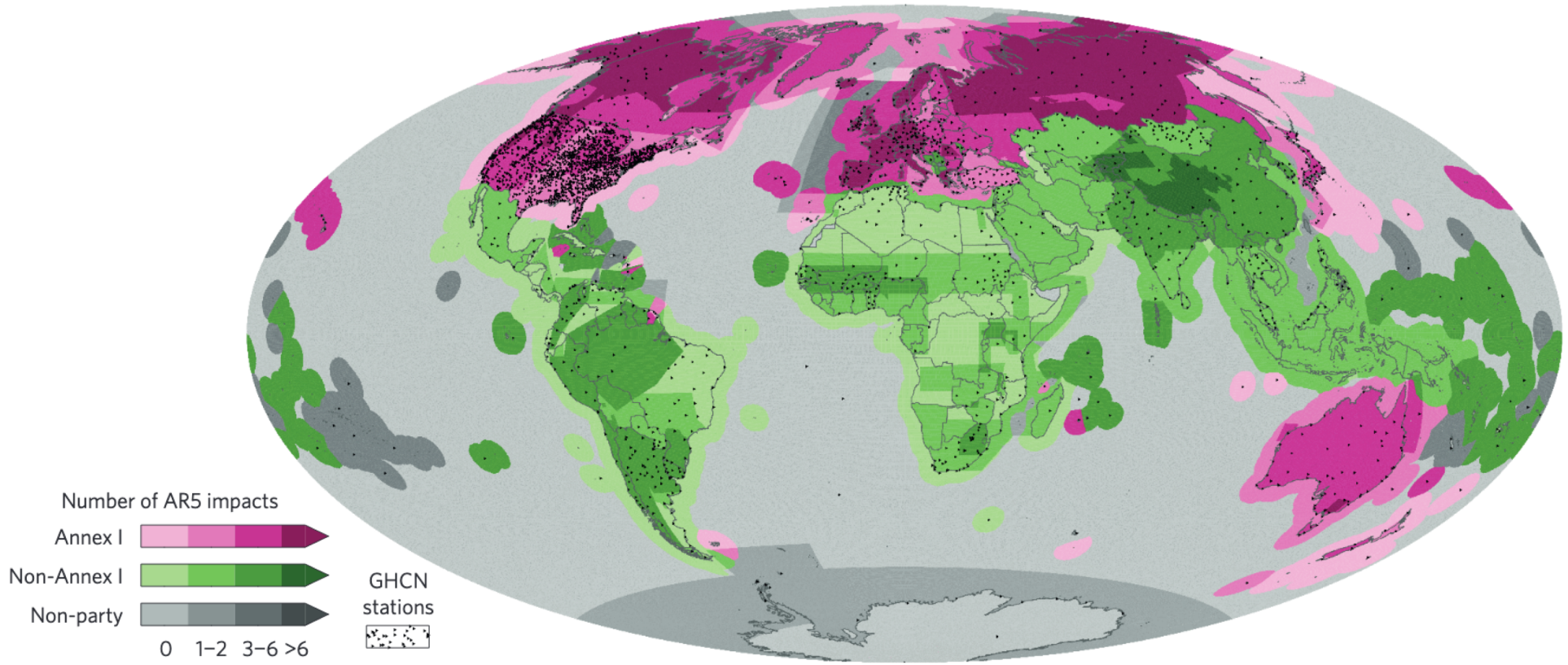


Figure 2 | World map showing the distribution of Global Historical Climatology Network (GHCN) stations and the number of detected impacts as assessed in the IPCC AR5[6]. It distinguishes between Annex I countries (in purple colours), Non-Annex I countries (in green colours) and regions not party to the UNFCCC (grey colours). The GHCN is the largest publicly available collection of global surface air temperature station data. The shaded regions correspond to the regional extent of relevant climatic changes for various impacts, rather than of the impacts themselves, as determined in ref. 7; a few impacts are not included due to insufficient information for defining a relevant region.

Huggel et al 2016

Data injustice

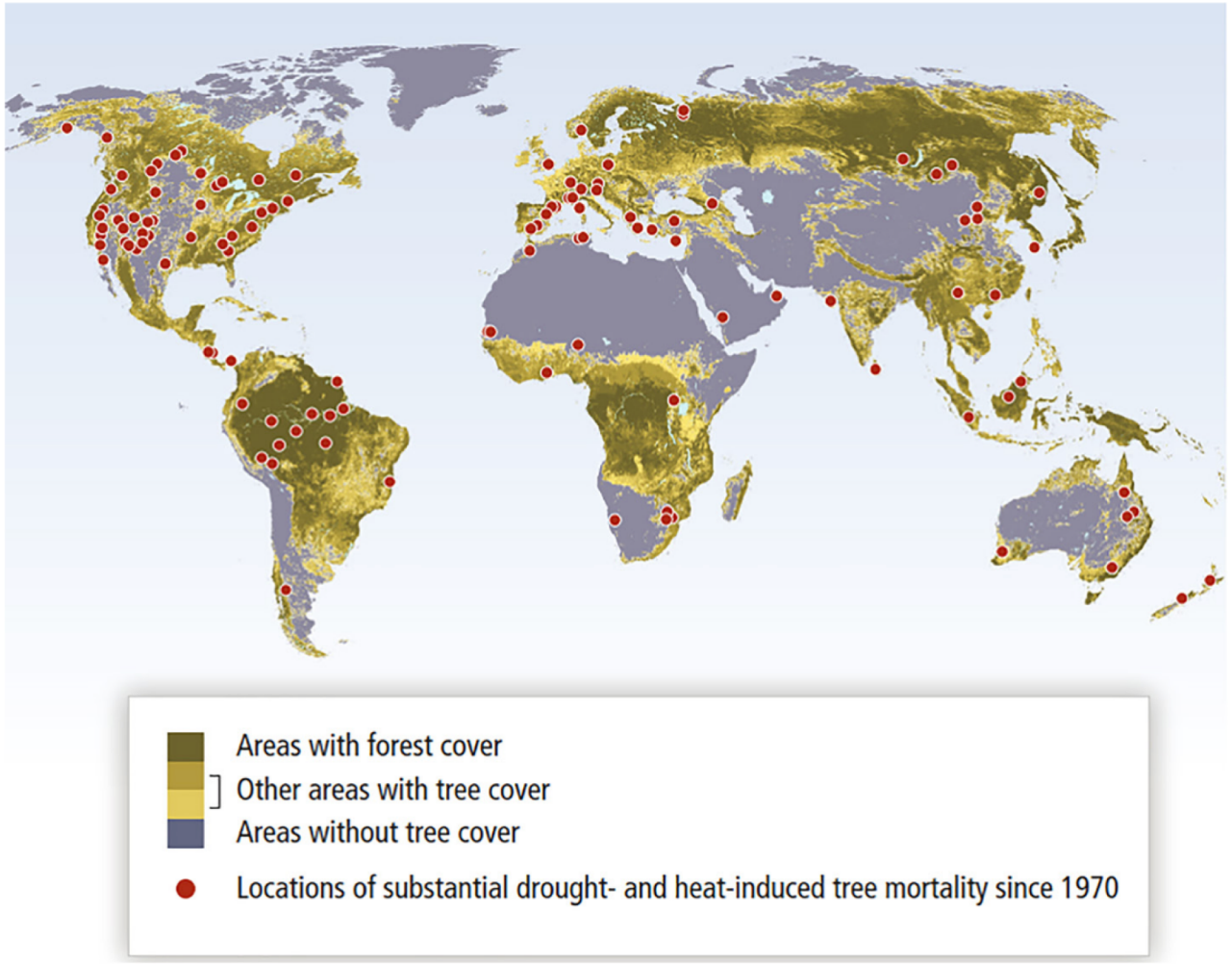
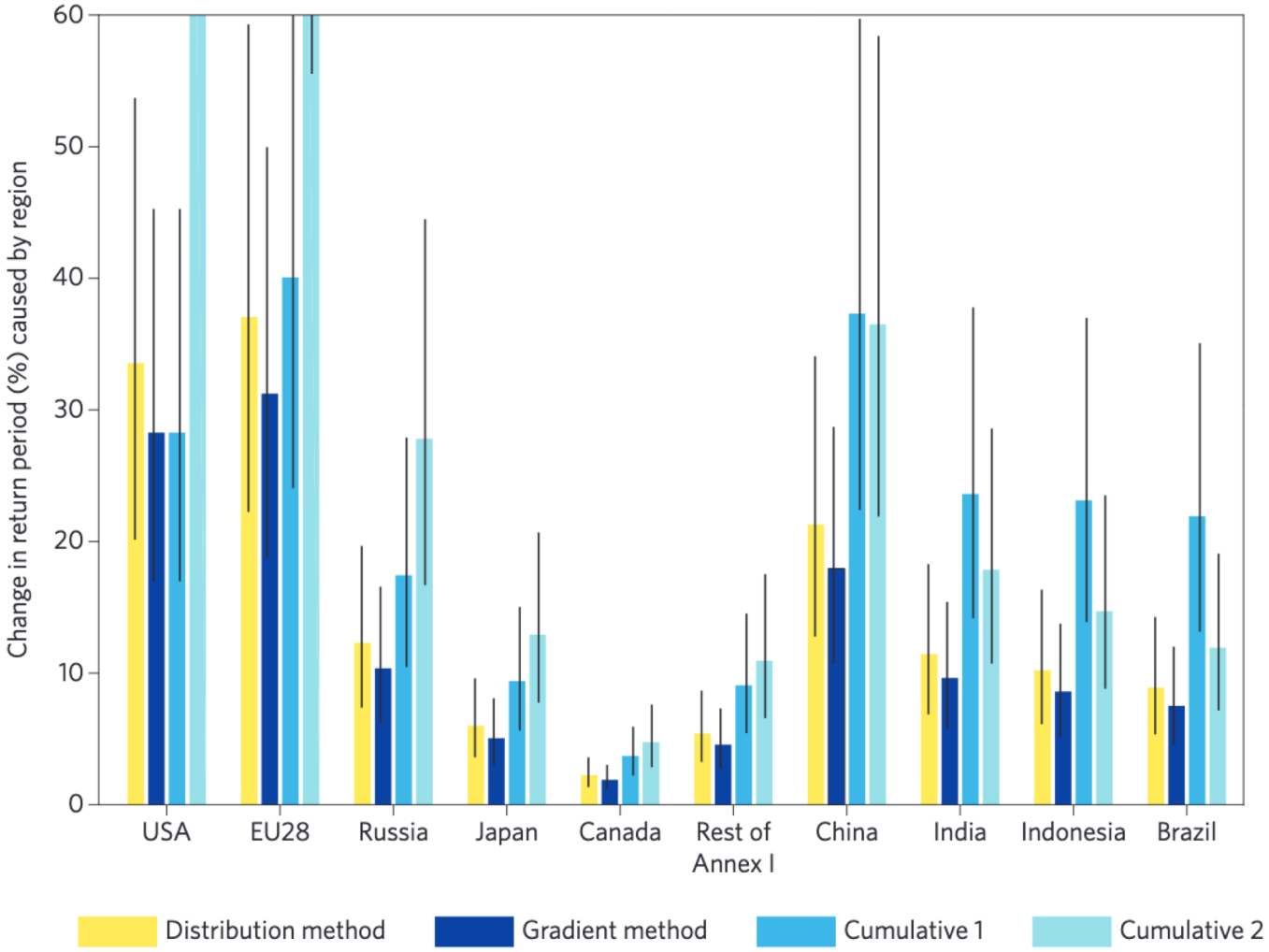


Figure 2. Locations of substantial drought- and heat-induced tree mortality around the globe over 1970–2011. *Source*. From IPCC AR5 Technical Summary, Figure TS2.C (Field et al., 2014).

Olsson et al 2022

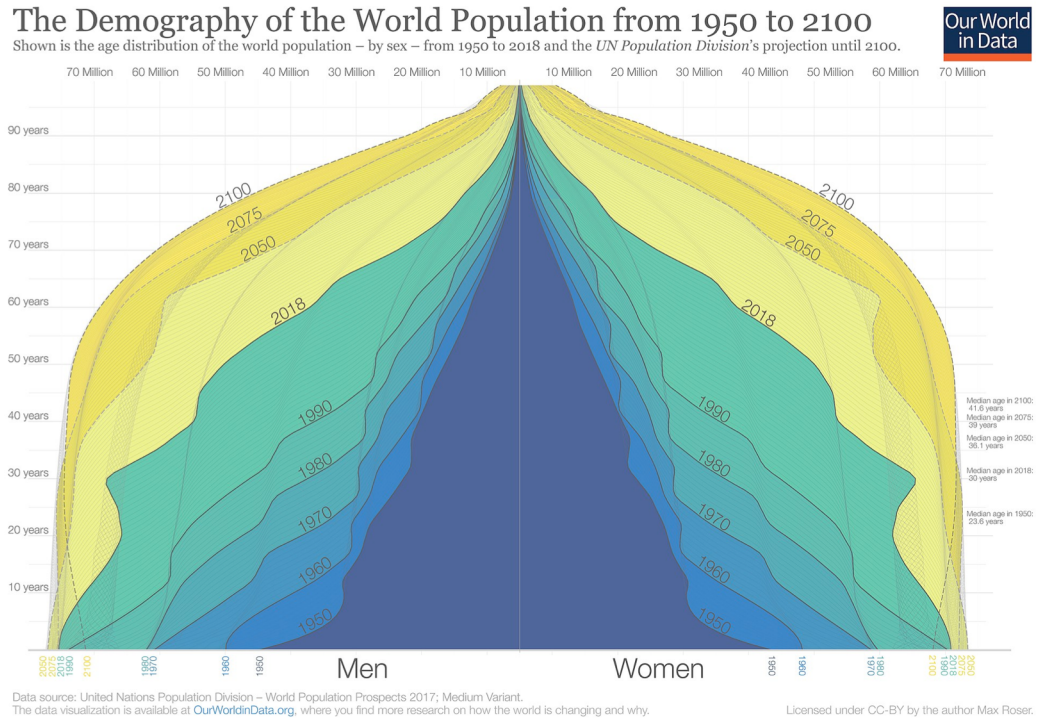
Apportionment of responsibilities between emitters

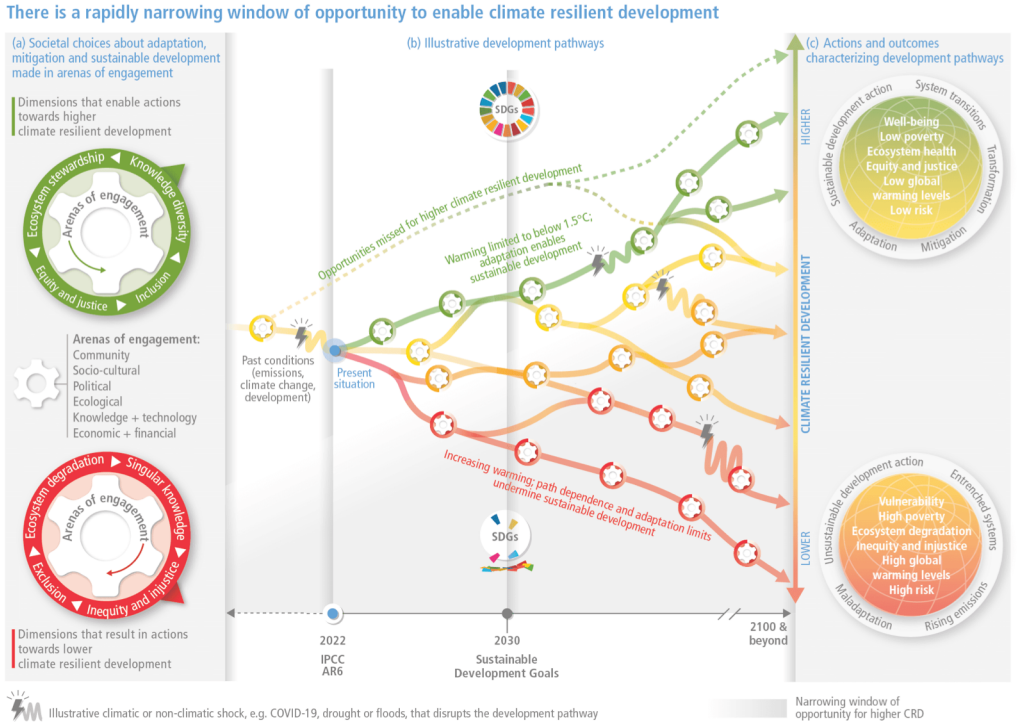


Otto et al 2018

Non stationarity of non-climate factors

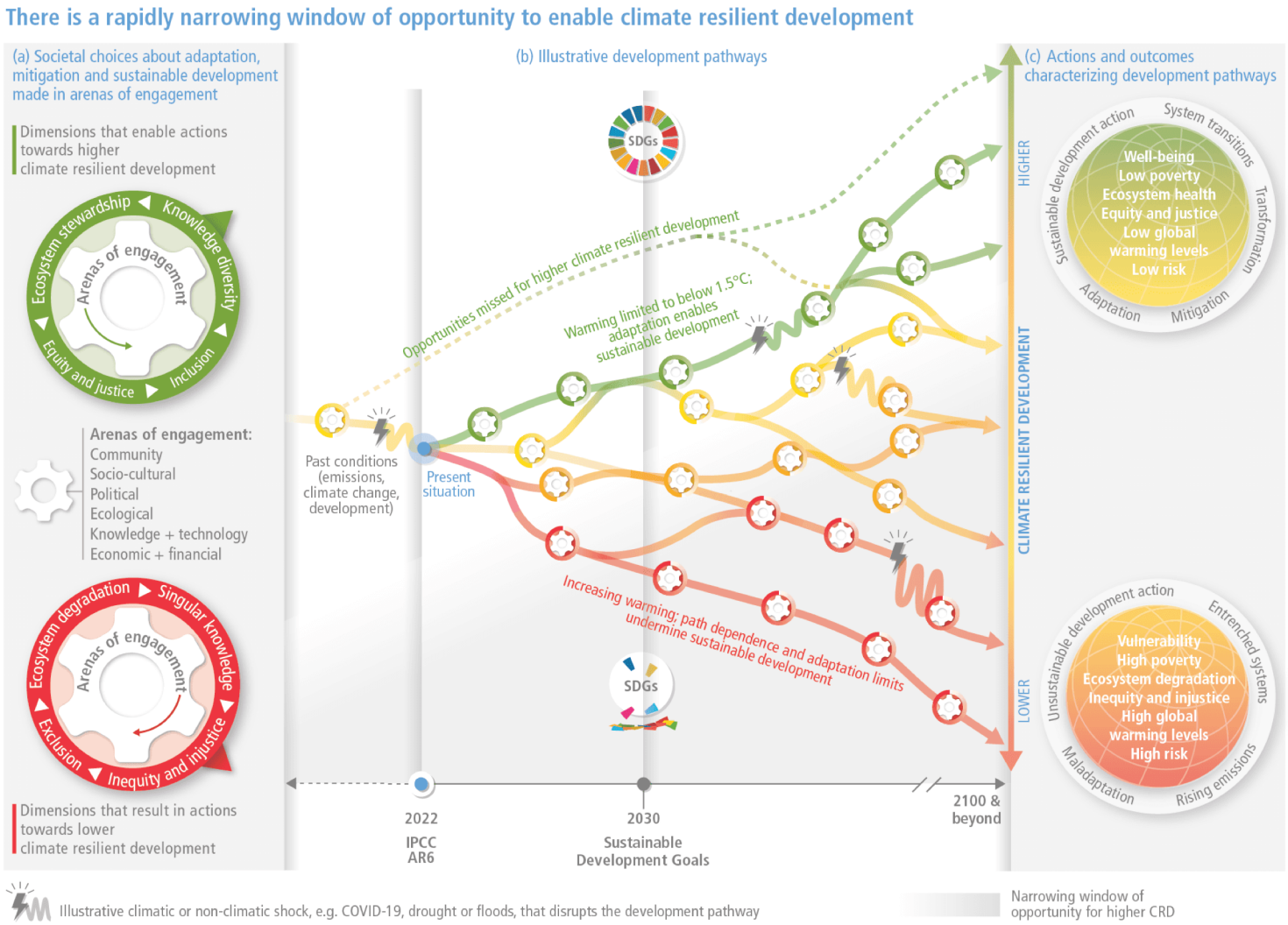
"a purely statistical approach to extreme event attribution (EEA) is politically and ethically problematic because of its inherent bias toward understating the role of climate change only" – Olsson et al (2022)





IPCC AR6, WG2, SPM

Non stationarity of non-climate factors



IPCC AR6, WG2, SPM

Defining the event – a very tricky question

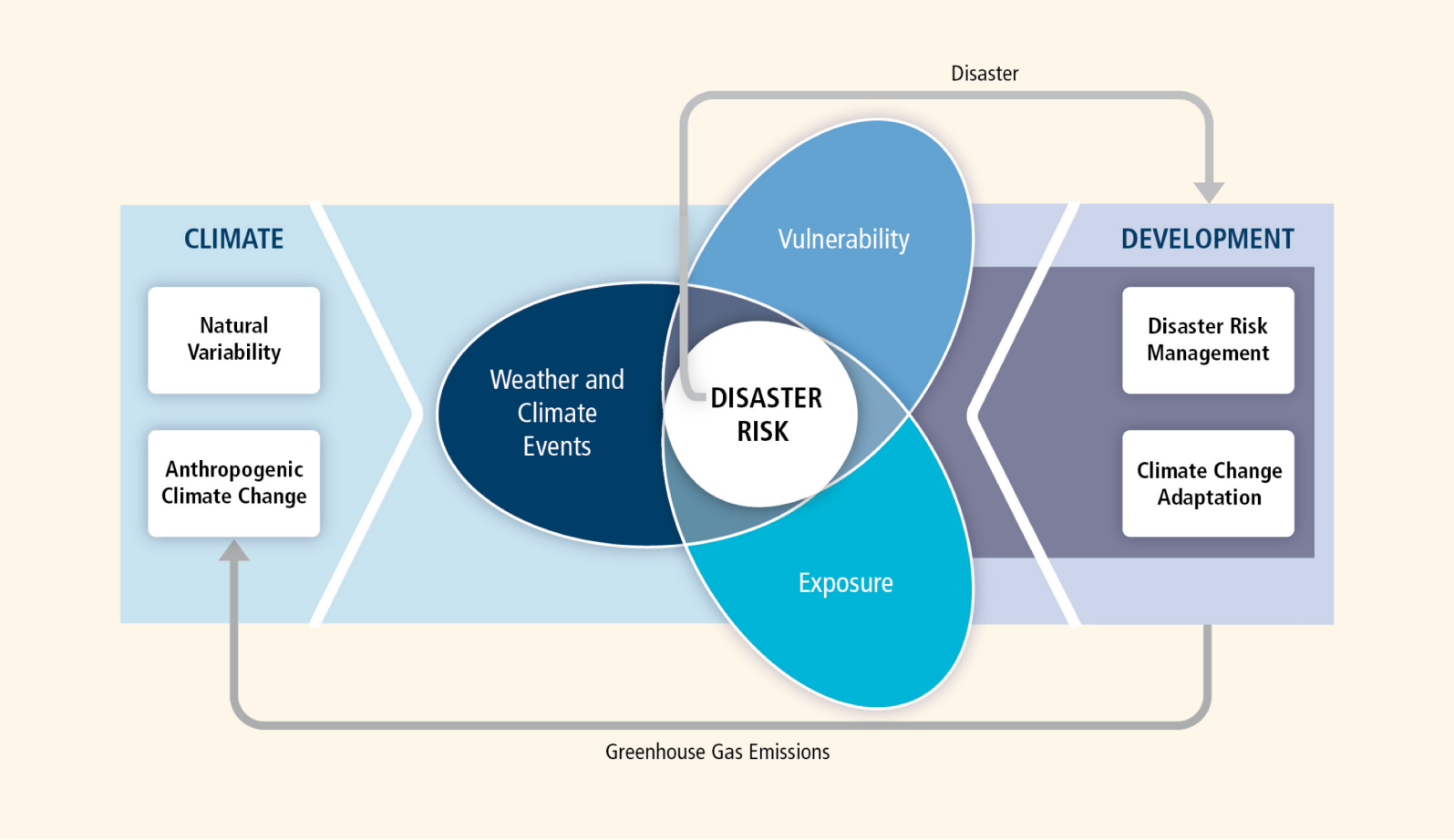
Different types of « events »

- Extreme weather events
- Slow-onset events

UNFCCC, introduction in the Cancun agreement (COP16)

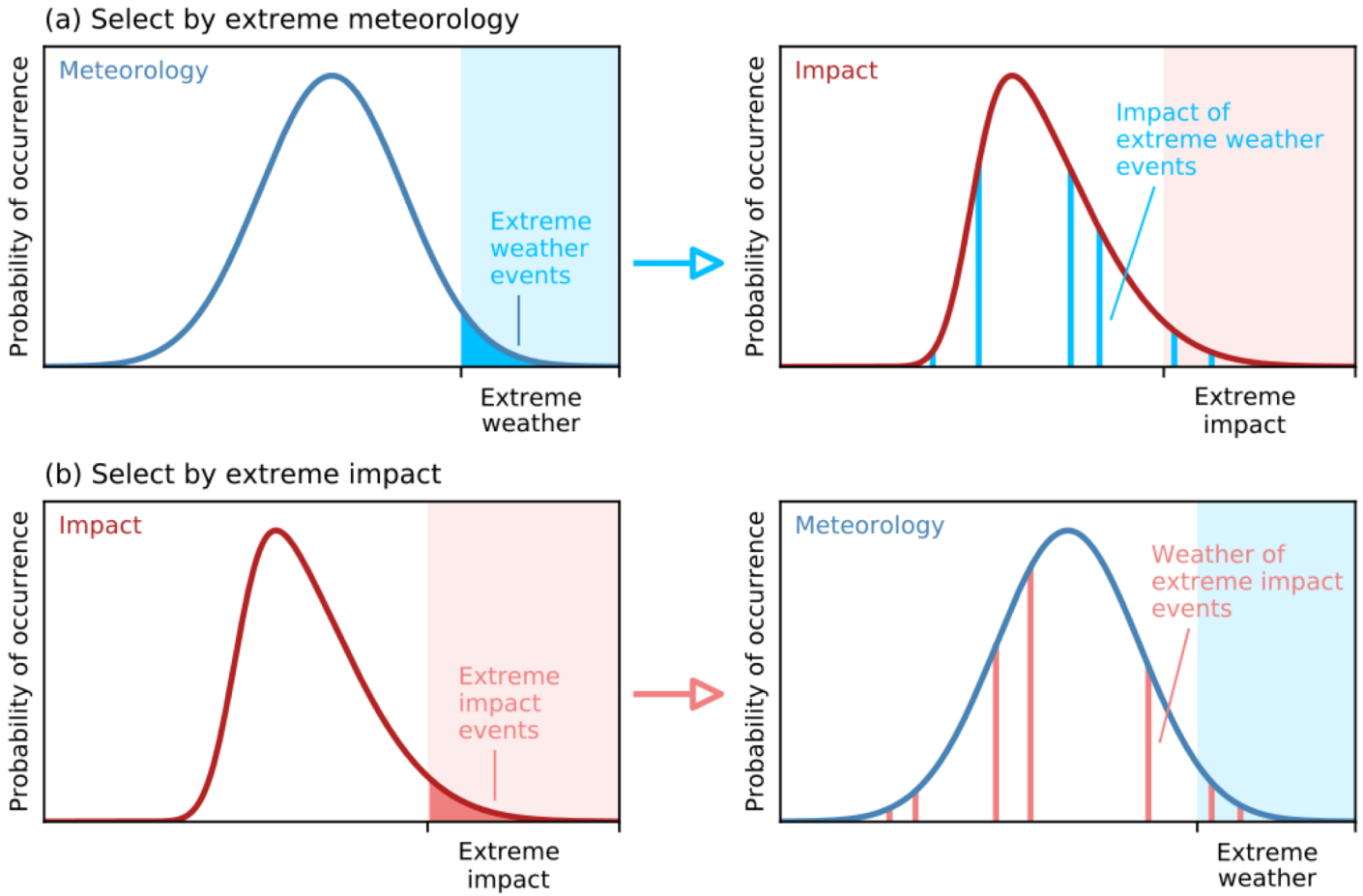
- Which events are worth considering vs which events are attributable?

From hazards to risks



AR5 – Chapter 1

Difference between impacts and extreme events



Van der Wiel et al (2020)

Difference between impacts and extreme events

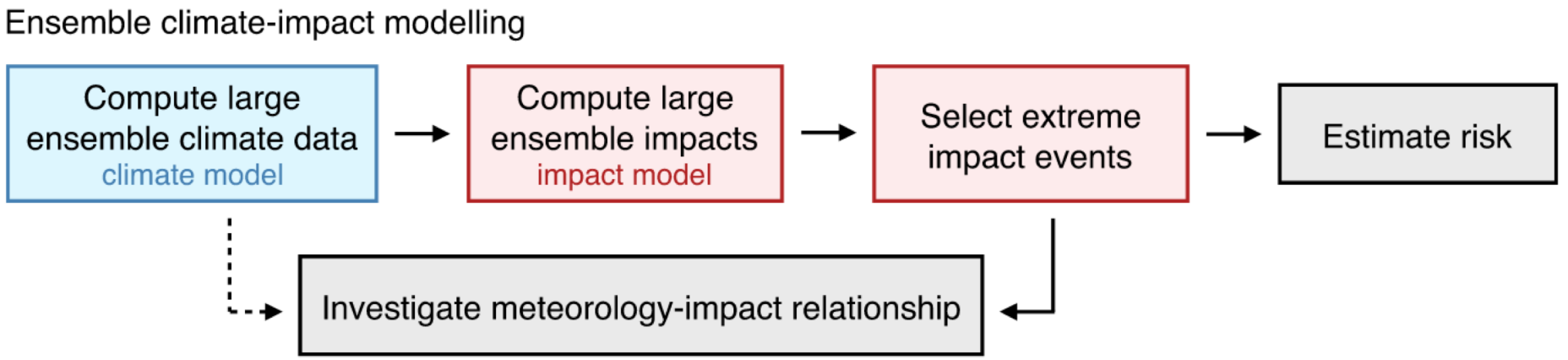


Figure 1. Schematic diagram of the 'ensemble climate-impact modelling' approach. Full arrows indicate consecutive research steps, the dotted arrow indicates a flow of data.

Illustrative example: potato crop yield in the Netherlands - AquaCrop-OS v5.0a impact model

Van der Wiel et al (2020)

Difference between impacts and extreme events

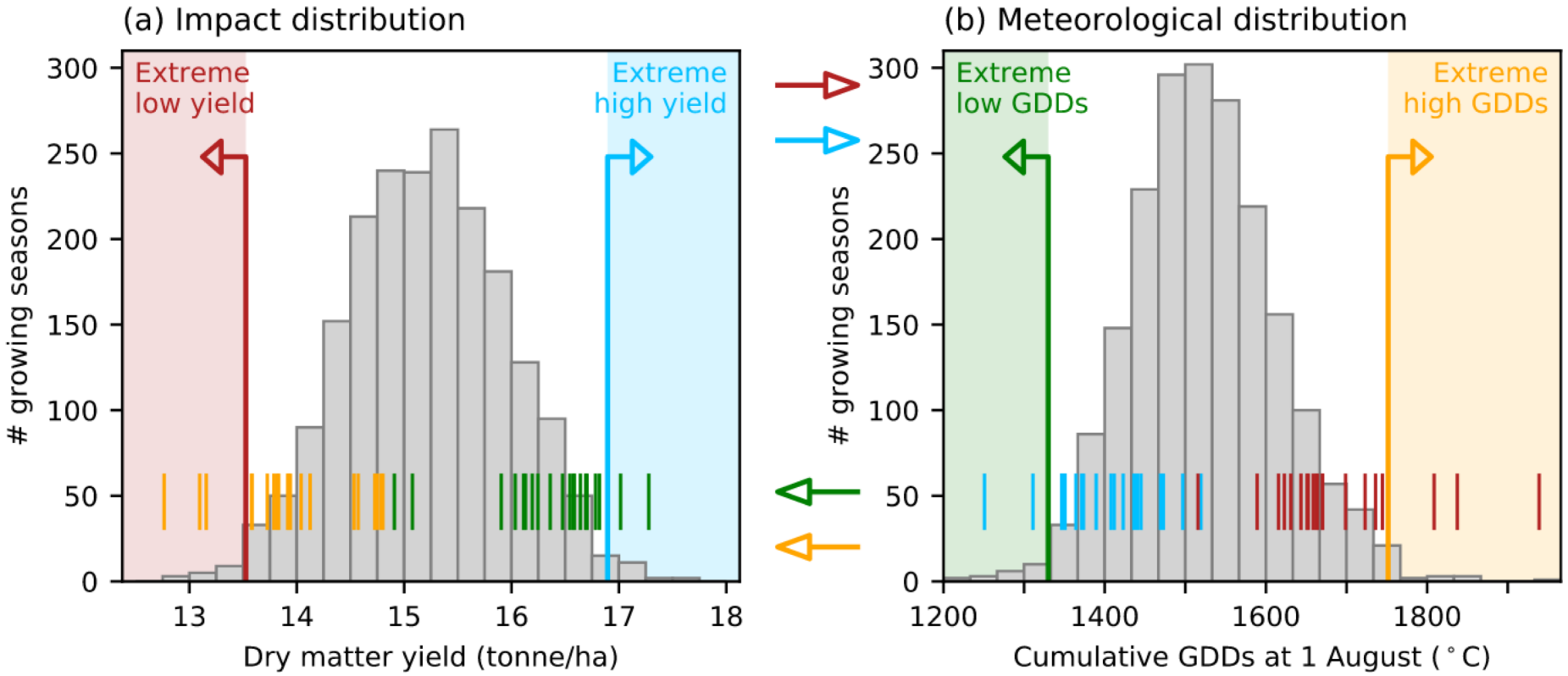


Figure 3. Histograms of (a) dry matter yield (tonne/ha) and (b) cumulative GDDs at 1 August (°C). In each distribution the 1-in-100 year events are selected (noted with arrows and colour shading). These selected events are identified in the other distribution by means of short vertical lines of the same colour.

Van der Wiel et al (2020)

Losses and damages

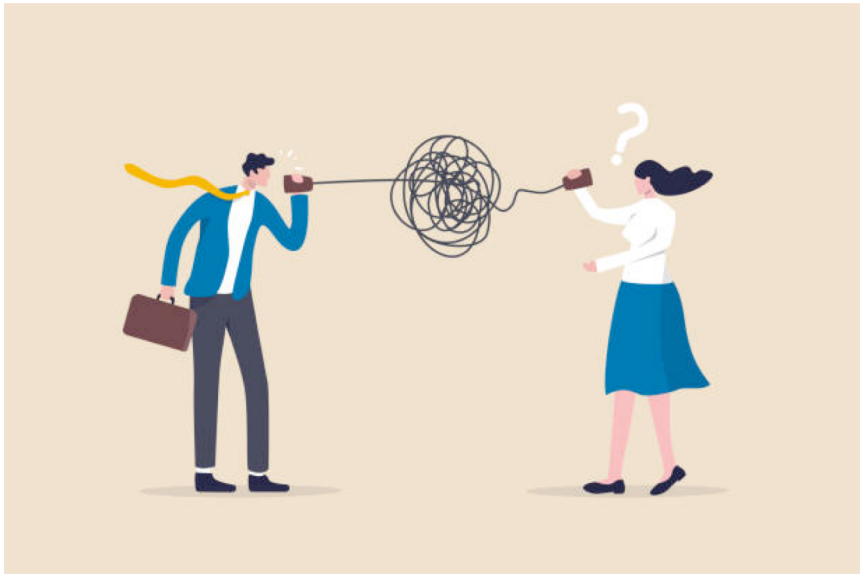
- Economic losses
- Non-economic losses

UNFCCC

- How would we account for non-economic losses? Is it desirable?
- " If L&D is increasingly pursued through the use of EEA, there is a very big risk that many, if not most, of the problems "associated with climate change" will remain unattributed." – Olsson et al (2022)

Different communities speaking different languages

- Interdisciplinarity
- Co-construction with non-academic actors



Climate services

- ‘‘Climate services provide climate information in a way that assists decision making by individuals and organizations. Such services require appropriate engagement along with an effective access mechanism and must respond to user needs.’’ – WMO definition
- ‘‘Climate services involve the provision of climate information in such a way as to assist decision-making. The service includes appropriate engagement from users and providers, is based on scientifically credible information and expertise, has an effective access mechanism and responds to user needs.” – IPCC definition
- Driven by users? Driven by service providers?

We are not doing our science in a vacuum