Research program

Context, Objectives, Challenges

Since 1988, the Intergovernmental Panel on Climate Change (IPCC) has been assessing and synthesising scientific knowledge on climate change to inform policy-makers. This organization, structured around well-established groups of thousands of actors and processes, produces reports in cycles of five to seven years according to three working groups (WG1: The Physical Science Basis, WG2: Impacts, Adaptation, and Vulnerability, WG3: Mitigation of Climate Change). Future scenarios and pathways are seen as "the backbone of integration" across the IPCC Working Groups communities and a major tool for supporting political decision-making on mitigation and adaptation (Meinshausen et al., 2024).

The IPCC currently faces significant challenges. Firstly, the volume and diversity of the literature to be considered is increasing considerably, extending well beyond the realm of physical science towards socio-economic aspects, particularly on mitigation and adaptation, and scientific discussions are occurring in parallel, with limited interaction between the various sub-themes (Hermansen et al., 2023). Secondly, there is an urgent need to produce knowledge that can foster decision and lead to concrete action, which calls into question the length of assessment cycles. Indeed, the seventh assessment cycle started in July 2023, and is expected to conclude around 2030, the year by which global greenhouse gas (GHG) emissions should have reduced by around 50% and the year in which the 1.5°C threshold may be crossed (IPCC, 2021). The IPCC Workshop on the Use of Scenarios (IPCC, 2023) helped identify opportunities related to these challenges, including the establishment of a "*community-based 'live' database*", that "*would need a framework and formalised process to enable community participation and enhance its legitimacy*" (Pirani, 2024). Finally, the operation of the IPCC is being seriously undermined by the actions of the Trump administration, in particular with the dismantling of Working Group III (Tollefson, 2025).

This leads us to ask the following questions: How does the IPCC produce different variants of future scenarios? How are the assumptions underlying these scenarios debated and defined? What tools, in particular digital ones, are used during the negotiation phases regarding these scenarios and their assumptions? What impact might current events have on the processes of building and coordinating scenarios? How can we work with the IPCC organisation to co-design new processes and tools (such as a "*community-based 'live' database*") to meet its current challenges? What lessons can we learn from this *action research* (Checkland and Holwell, 2007) about structured collectives mediated by digital technology, and about methods and good practice for participative design at scale?

Approach, Originality, Methods

Most studies on how IPCC works have focused primarily on internal processes and procedures, and on how the resulting outcomes can lead to relevant policies (Hermansen et al., 2023). In our case, we aim to analyze the situation from a socio-technical perspective, examining both the organizational and human processes and the digital tools employed. With access to IPCC key stakeholder's experience, we will study the current network of processes and tools, assessing their strengths and weaknesses and identifying levers of intervention to address current challenges. To this end, we will implement an original methodology of "participatory design at scale" (PDS), specifically designed for the needs of this project, enabling us to tackle the level of the organization. To develop the PDS methodology, we will rely on three complementary perspectives from sociology, Human-Computer Interaction (HCI) and systemic design. In particular, we will draw on Actor-Network Theory (Callon, 2001), which is particularly well suited to socio-technical studies. In practice, we will draw on the participatory design techniques used in HCI (Schuler & Namioka, 1993), which focus on the scale of individuals rather than organizations, as well as on systemic design methods (Jones & Van Ael, 2022), which focus on the level of organizations, but which are not specifically designed to integrate digital tools. Building on our experience with UX design, participatory design techniques, and systemic design methods, and following an *action design research* approach (Sein et al., 2011), we hope to generate insights on two aspects. Firstly, we aim to gain a better understanding of the human processes and digital tools that support IPCC in scenario coordination, and to make recommendations for addressing the challenges identified. Secondly, we anticipate that this case study will facilitate the identification of insights beyond this specific context, particularly in the areas of socio-technical analysis of structured organizations and participatory design methodologies in large-scale settings.

Adequacy with the objectives of the PEPR eNSEMBLE and the PC4 CONGRATS

The IPCC organization under study is a perennial collective, mediated by digital tools, with a "hybrid" status: it is neither a company, nor a self-organized community open to all, where each person decides on his or her contribution. The study of the co-evolution of digital tools and the IPCC community will make use of the available theory produced in WP2[1], and the observations made may feed into, confirm or challenge the theoretical concepts of WP2[1]. With regard to WP3[1], the methodology based on systemic approaches specifically designed for this case study, and the feedback on its implementation, will enable us to contribute to a "Participatory Design at scale method handbook", as well as to derive theoretical findings on participatory design at scale. Finally, in line with WP4[1], this case study will highlight the singularities of this type of collective (structured, with policy-oriented objectives), and what this implies from a theoretical and methodological point of view (similarities and adaptations to be made).

Project organisation

Duration: 2 years

Partnerships: **Catherine Letondal** (ENAC LII, HCI) et **Marina Casula** (IDETCOM, Sociology).

Catherine Letondal will contribute her expertise in the domain of participatory design techniques for HCI, complemented by her knowledge of systemic design and prospective scenarios. Marina Casula will provide the sociological dimension, using actor-network theory, which she has previously adapted in participatory contexts, notably through her "fuzzy object methodology" (Rouyer & Casula, 2013), in addition to her systemic perspective.

Anticipated research activities and milestones:

These stages are presented as a guide, but the methodology employed will be refined at the start of the project, and will adapt/evolve as the project progresses.

- → **Literature Review and Methodology**
  - ⇒ Literature review of IPCC organization studies
  - ⇒ Literature review on co-design at scale and systemic design methodologies
  - ⇒ Definition and stabilization of the "co-design at scale" methodology
- → **Interviews to understand the existing** interactions/processes and digital tools (through the prism of theoretical concepts developed in WP2[1])
  - ⇒ Interviews with people already studying IPCC processes (outsiders specializing in IPCC)
  - ⇒ Interviews with IPCC members (insiders) to understand the processes & digital tools
    - Looking for representativeness (role, gender, etc.)
    - Examining usual interactions as well as exceptional cases (non-operation, discontinuation of contributions, etc.)
    - Exploring their understanding of the IPCC as a whole and their place within it
- → **Co-design of a co-evolution cartography of IPCC interactions and digital tools** (using and feeding into WP3[1] methodological productions).
  - ⇒ Workshop to co-design a first version of the cartography and identify levers for action
  - ⇒ Interviews with IPCC members to challenge this cartography
  - ⇒ Publication of this cartography and related findings
- → **Co-design of an evolution of digital tools and processes**
  - ⇒ Co-design workshops with IPCC members based on the cartography (prototyping of the digital tool - process pair)
  - ⇒ Recommendations based on the workshops
- → **Reflexivity and overall findings**
  - ⇒ Feedback to the theoretical concepts of WP2[1]
  - ⇒ Reflexion on the the singularities of this specific case study
  - ⇒ Contribution to a "Participatory Design at scale method handbook"
  - ⇒ Theoretical findings on participatory design at scale
  - ⇒ Publication of the findings

[1] Work Packages of the PC CONGRATS as described in the presentation document

date (month)*	activity
M+0 → M+6	Literature Review and Methodology
M+1 → M+6	Interviews to understand the existing interactions/processes and digital tools
M+6 → M+12	Co-design of a co-evolution cartography of IPCC interactions and digital tools
M+12 → M+16	Analysis, and publication of the cartography and related findings
M+12 → M+18	Co-design of an evolution of digital tools and processes
M+18 → M+24	Analysis and overall findings
M+20 → M+24	Publication of the analysis and overall findings

*date is expressed in months from the starting date of the project

Feasibility:

The risk of this research lies in the availability of stakeholders involved in the production and coordination of scenarios and pathways to participate in interviews and workshops. Fortunately, we are in contact with Valérie Masson-Delmotte, former co-chair of IPCC Working Group I, who has kindly agreed to facilitate our connection with relevant stakeholders, such as Robert Vautard, the co-chair of IPCC Working Group I for RA7, Jan Fuglestvedt, who played an important role in coordinating between the Working Groups on the use and evaluation of scenarios in AR6, Nicolas Bellouin and Olivier Boucher for the aviation sector, as well as researchers involved in the formulation of scenarios at the IIASA institute, at the European level, and at the CIRED, at the national level. In addition, we are in contact with Jean-Daniel Fekete and Vanessa Peña-Araya, two HCI researchers at the Inria Research Lab Aviz who collaborate with researchers from Working Group I of the IPCC and are interested in the project. Finally, we have contacted researchers who are interested in the mechanisms of the IPCC from different perspectives and who it might be interesting to interview at the beginning of the project, such as the sociologist Béatrice Cointe.

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