

Exploring the concept of Mini Data Sprints as a methodology to assess data validity and stimulate climate conversation

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Abstract—The GREAT (Games Realising Effective and Affective Transformation) project explores new approaches that foster climate change discussion and stimulate citizen reflection. However, some citizens have limited resources for participation, even though their engagement and contributions are crucial. To address this challenge, the authors present two studies that have deployed mini data sprints (MDS). The MDS approach uses interactive data applications and visualisations to provoke citizens’ feelings, knowledge, and perspectives towards the climate conversation and presented data. These studies highlight how the MDS approach can provide data set recommendations, facilitate efficient and focused climate conversation, and improve the data literacy of the cohort.

Index Terms—Climate Conversation, Citizen Engagement, Data Sprint

I. INTRODUCTION

Providing opportunities for citizens to discuss and reflect on climate change and policy can increase policymakers’ understanding of citizens’ preferences and attitudes. The simple act of discussion can evoke the contextual and emotional drivers for climate attitudes [15]. Capturing these discussions can inform solutions and priorities to the climate crisis that are supported by a wider public. Broad citizen engagement with the climate conversation is crucial to develop an accurate overview of any given climate conversation [16].

The GREAT (Games Realising Effective and Affective Transformation) project deploys game-based approaches that foster discussions on informing policy decisions [1]. Part of the project explores new approaches and opportunities to stimulate

reflection and discussion amongst groups that historically have been hard to engage.

Data sprints are an interactive format where citizens collectively explore, discuss, and interpret a data set [2], [3]. Data sprints aim to stimulate participants’ thoughts and reflections, improve data analysis skills, and develop new insights into a data set. Data sprints can support climate conversations in multiple ways:

- The data set provides a clear focus to stimulate conversation. Examining climate-related data could foster dialogue and engagement with the climate conversation across a broad population of participants.
- A data sprint can provide researchers with new, qualitative insights on a quantitative dataset that can complement existing analysis, validate conclusions, or spark new research questions [2].
- Depending on the skill sets of the cohort, the workshop can be used constructively to assess the validity of the data collected.
- The approach can be used as an element within citizen science methodologies. Using a data set to stimulate conversation can enable citizen participation from consultation to empowerment [4]. A data sprint activity may provide context to qualitatively articulate citizen reflection and personal development within a research project. Thus helping to evaluate the impact of a citizen science approach [5].
- They can create or increase data ownership, especially when dealing with citizen-generated data. While data validity in citizen science is still sometimes challenged, a hands-on engagement with the data can help to overcome these doubts and increase the value of the data for the

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engaged citizens [6].

However, data sprints pose time and facilitation challenges for effective delivery. Normally, a data sprint is conducted over several days to a week [3]. Whilst this time frame allows in-depth discussion, exploration, and understanding of the data, the format does pose real challenges for effectively engaging citizens. On the one hand, citizens have limited resources for participation. On the other hand, climate change is a large-scale and global issue that requires a large percentage of the population to engage in discussion. Additionally, a data sprint requires some degree of data literacy amongst participants to understand the data set fully. Thus, developing alternative formats and best practices for presenting, interacting, and facilitating discussions around data sets is critical when engaging broad populations.

As a direct response to these challenges, the GREAT project team deployed a Mini Data Sprint (MDS) to foster data exploration and climate discussion that critically can be undertaken within a concise time frame of two to three hours. The research contribution is an adaptive method that combines data interaction and visualisation techniques to inform a data sprint discussion. The MDS approach aims to create an engaging space to educate data literacy and discuss culturally important topics across a broad demographic.

Two discrete pilots were conducted from diverse perspectives to investigate MDS best practices to:

- Evaluate the theme and validity of a data set.
- Foster climate conversations that highlight preferences and issues important to citizens.
- Scaffolding the development of data literacy amongst participants.

II. PILOT 1: MINI DATA SPRINT - VIENNA (AUSTRIA)

Pilot one explored the Mini Data Sprint (MDS) workshop as a method to gain new insights into a dataset and foster conversation about the climate crisis. Pilot one constitutes the first test of a time-constrained data sprint using participants with high data literacy and existing expertise in climate change. The MDS format was adapted to the participant group by analysing data with statistical software in real-time. This pilot aimed to answer the following questions:

- 1) Which aspects of the dataset are interesting or relevant for the MDS participants, including the dataset's topic and quality?
- 2) How effective is real-time data analysis using statistical software for participants' engagement with the data?
- 3) How do participants evaluate their overall experience with the data sprint, including its methodology and perceived gains?

A. Method

The MDS was organised as an in-person meeting at the Centre for Social Innovation (ZSI) in Vienna. Six female participants took part in this pilot study: Three facilitators from ZSI, two researchers from ZSI, and one researcher from the University of Vienna. Participants shared a similar view that

new approaches could be used to tackle the climate challenges and were interested in the project. All three invited researchers, and one of the facilitators was an expert in quantitative survey methods, while the other two were qualitative research experts. A free lunch was offered as an incentive for the participants.

The data sprint consisted of several steps. First, the participants were introduced to the statistical software used for data analysis (Jamovi [9]) as well as a data set from Playmob [8], one of the GREAT project partners. The Playmob data set stemmed from a survey distributed in a "Green Game Jam" context. The survey consisted of 8 questions asking participants about environmental attitudes and environmental content in games, a knowledge question about the use of trees for cattle in the Amazon, intentions to perform pro-environmental behaviour, and three demographic questions (gender, age, and age when leaving formal education). The statistical software Jamovi was presented, and basic functionality (i.e., creating tables and graphs) was explained. This element was kept deliberately short, as the workshop members were trained social scientists. In the second stage, workshop participants' questions about the data set, including methodological and climate-related questions, were collected. To address participants' interests with the data, one of the workshop facilitators operated the statistical software under participants' instructions while the image was projected on a large screen. After the analysis, participants reflected on their questions, whether they could be answered, and the limitations of the data. Finally, participants were prompted to reflect on the experience of the data sprint and were asked for feedback on the format.

TABLE I
PILOT 1 ACTIVITY DURATION

Activity	Duration (mins)
Start and introduction	10
Introduction of data set (source)	20
Introduction of JAMOMI	15
Discussion of survey questions	45
Discussion of the relation between survey data variables	20
Reflection round	10

B. Data Analysis

The research team documented the discussions using written notes and flipcharts. Further, the statistical software saved the data analysis, which provided answers to participants' interests and questions. The research team reflected on the notes, flipcharts, and analysis and developed a written summary of the main outcomes.

C. Results

Results from pilot one can be distinguished into two main aspects: participants' reflections on the dataset and participants' reflections on the methodology of the data sprint.

Firstly, participants' discussions regarding the dataset focused on survey methodological considerations rather than

how this data could inform the climate conversation. Main methodological questions were related to the response quality, clarity of survey questions and response options, and information on the survey sample, such as:

- What data can inform the degree of honesty from survey responses (did participants skip through the questions?)
- Which questions require further segmentation? Some responses are not mutually exclusive. For instance, the response options “eat 20% less meat” and “go vegan” both include eating less meat. The option “I like to follow updates and do what I can to help” includes two different aspects in one response option.
- Is the vocabulary used sufficient for a reliable understanding of the questions? The survey used terms that might have different meanings for the participants, e.g. games and game content.
- Due to limited survey space, what questions and obtainable data can best describe the respondent demographic?

Secondly, participants reflected on the methodology of the MDS and provided suggestions for improvement. They emphasised that data sprints should be guided by a narrative, an underlying issue that should be repeatedly referenced when participants discuss and develop analysis questions. Many elements within a data sprint vie for the participant’s attention (new data, new tools, new people, etc). Providing a narrative for the data analysis that underscores the importance of the activity, its potential impact, what participants can gain, and breaks down the data into more digestible information can improve participants’ focus. Further, the data presentation during the sprint needs to be carefully considered. Data should be pre-cleaned for invalid entries so discussions are focused on interpretation, not potential inaccuracies. Regarding analyses and evaluation methods, it is advisable to stick to more intuitive approaches like bar charts and frequencies. Avoid arbitrary correlations and significance tests when little is known about the data. The data analysis as a centerpiece of the data sprint, should be designed as accessible as possible. Statistical programs (Jamovi) used to explore the data set should be operated by a facilitator and not by the data sprint participants. This can help focus the discussion on the data interpretation, as these tools can be complex, unintuitive, and time-consuming for participants to learn how to use.

D. Discussion

The discussions revealed several dataset limitations, e.g. biases and lacking information on the sample and context. In turn, participants also provided valuable suggestions for increasing the dataset’s validity: how survey participation can be incentivised, strategies for assessing the validity of responses, which terms and phrases used in survey questions and response options might be confusing, and which additional information on the sample would be helpful. Such discussions suggest that the MDS approach could be part of a questionnaire validation procedure [12], framing the role of an expert committee before and after pilot testing a survey. A different participant group might reveal different focal points based on participants’

interests and existing skills, e.g. a deeper focus on climate change issues. Thus, it is crucial that researchers carefully consider their data and audience before conducting a data sprint. Each implementation of a data sprint should adapt to its audience and their interests as well as pre-existing knowledge and skills. Moreover, facilitators need to be flexible, as various levels of expertise can drive the workshop in a different direction than initially foreseen.

III. MINI DATA SPRINT, STUDENT COHORT THE UNIVERSITY OF BOLTON (UK)

Pilot two explored using a Mini Data Sprint (MDS) workshop to foster climate discussion with a student cohort. This cohort would have adequate data literacy but a varied background and experience with the climate conversation. Using best practices from pilot one, the MDS workshop provided a clear narrative, simplified the data set exploration for participants, and provided guidance on the required data literacy. The goals of pilot two were to explore the use of an MDS workshop to:

- 1) Foster climate emergency conversation
- 2) Validate MDS methodology recommendations from pilot one.

A. Method

The MDS was organised as an in-person workshop at the University of Bolton in the United Kingdom. Participants came from two student cohorts: Data Science ($n = 12$, $f = 3$), and Games disciplines ($n = 3$, $f = 0$). The cohort was given a free lunch as an incentive. The location was a computing lab where participants could clearly view presentations and a whiteboard. Each student had access to a PC where they sat.

The participants were briefed on the data sprint to engage in climate conversation. Informed consent was then gathered. Digital literacy was explored by looking at the anatomy of a graph, trends in data, and how to compare graphs. The data set for this sprint was then introduced. The IMF Climate Change Dashboard [5] was used as it provides a range of graphs describing climate change indicators across countries. At this point, participants could view the data dashboard on a PC. This introductory content took 35 minutes.

Participants were then asked to take part in three activities that clarified terminology, explored and discussed the data set, and reflected on the experience:

Activity 1: Workshop Discussion of Theme: What is climate change? This activity was used to prime thinking about climate change and discuss terminology (15 minutes).

Activity 2: Snowball Discussion: (start in groups of three, then after time combine groups) Discuss three questions based on the IMF Climate Change Dashboard. Participants were reminded that they could compare data between graphs or use a single graph to inform their thoughts. The questions posed were: What are the causes of climate change, how is climate change affecting the planet, and what can a country do to become more climate-friendly? Participants and researchers

were asked to write down the key points raised in their discussions (30 minutes) during this activity.

Activity 3: Mini Data Sprint Experience Survey: This survey (Table.III) asked a series of Likert questions. The survey enquired about previous data analysis experience, data sprint knowledge after the activities, data clarity during the data sprint, ability to discuss during the data sprint, and perception of data literacy gained from the workshop (15 minutes).

TABLE II
PILOT 2 ACTIVITY DURATION

Activity	Duration (mins)
Brief on workshop and concept of data sprint	5
Gather consent to take part	10
Digital literacy briefing	15
Introduce data set	5
Activity 1: What is climate change?	15
Activity 2: Explore data and discuss questions	30
Activity 3: Reflect on data sprint activity	15

B. Data Analysis

Both participants and researchers were asked to note any key discussion points raised during activity two. Activity two is where the expected climate attitudes and preferences would largely surface. These records were then grouped by question theme. Although the sample size was small, the mini data sprint survey (activity three) was statistically analysed to help build a picture of agreement/disagreement sentiment for each question. A one-sample T-test was performed against the midpoint (5) of the Likert scale ratings to see if scores were significantly in agreement or disagreement.

C. Analysis and Summary Responses

Answers to the questions posed in activity two are summarised below:

What is causing climate change? Increase in human population, deforestation, industrialisation, large-scale agriculture, exploitation of natural resources, burning of fuels, dumping of waste, and war.

How is climate change affecting the planet? Change in migration habits of animals, change in atmospheric substances, noticeable trends in weather pattern shifts, human and animal health metrics, sea level rises, and frequency of Flooding.

What can a country do to become more climate-friendly?

- Public education: Inform the public of climate data and how this relates to their local ecosystem.
- Waste Management: Dispose of waste with minimal impact on climate change through behaviour changes and developing more biodegradable materials. Encourage recycling at an industrial scale.
- Forest Management: Plant more trees. Increase incentives and legislation to protect and build forest areas. Identify core reasons for deforestation at a local scale.

- Decentralisation of economies and legislation: Empower regions to approach climate change locally. A regional approach may also engage more people, as it is more visible to local individuals. Better public transport enables choice of work and travel. It also enables families to be spread further apart while maintaining meaningful contact. It can help decentralise congestion hot spots that might be experiencing local health issues from pollution. Remote work was viewed as a positive to reduce travel and support the fabric of local communities.
- Greener Technologies: Greener technologies were seen as a choice that is not accessible to the many. For example, electric cars.

Responses to the MDS survey can be viewed in table. III. The survey suggests that participants perceived they had good digital literacy to interpret graphs before participating in the MDS. Most participants believed they could freely explore the given data set and did not have difficulty interpreting the graphs by the end of the MDS workshop. The survey results highlighted the discursive nature of the intervention as participants felt they could effectively represent their views and understand their perspectives. Overall, participants believed they had learnt more about data visualisations through the MDS, which indicates a learning potential from this approach.

D. Discussion

Pilot two explored using an MDS workshop to foster climate emergency conversation within a student cohort and validate refinements to this approach as suggested by pilot one (clear narrative, data literacy briefing, and graph exploration of data).

Activity two in this workshop was the focal point for discussions. Across the questions posed, participants described indicators and causes of climate change, culminating in country-level preferences for being climate-conscious. The post-workshop survey suggested that participants could add their opinions to the conversations and found these discussions useful for understanding their thoughts. Much like pilot one, the MDS workshop in pilot two can facilitate reflective and discursive conversations.

A clear narrative for the discussions was framed through the workshop context, exploring terminology, the data presented, and the questions posed. Recorded discussions suggest that participants could focus on the questions provided in the activities. The narrative for pilot one was broader, allowing the participants' background experience to direct the focus of discussion. This suggests that the MDS approach can facilitate open and more guided discussions if required, and the narrative is key to this guidance.

Both pilots explored a data set based on the expected data literacy of the cohort. If participants were tackling a data set far beyond their data literacy, then discussions would likely focus on how to approach the data set rather than attempt to interpret it. A key recommendation emerging from pilot one was that researchers should operate any unpracticed statistical software for workshop participants. Pilot two deployed a dashboard of graphs, a simple enough interaction that did not require much

TABLE III
MINI DATA SPRINT EXPERIENCE SURVEY

Survey Question	t	df	Agree (p)	Disagree (p)
Previous Experience with data analysis				
I am confident in exploring data set tables	6.39	14	<.001	1.00
I find it difficult to choose a graph for data	-4.94	14	1.00	<.001
I can understand most graphs with a little time	8.53	14	<.001	1.00
I work with data... (1 = <once per year. 9 = Every week)	7.39	14	<.001	1.00
Data Sprint Knowledge				
I am confident I could describe a data sprint	4.58	14	<.001	1.00
A data sprint was a new concept for me	0.97	14	0.175	0.825
I knew why we were exploring the data	16.84	14	<.001	1.00
My understanding of why we were exploring the data changed during this data sprint	1.67	14	0.059	0.941
I could not articulate why we explored this data	-2.24	14	0.979	0.021
Data Clarity During Data Sprint				
I felt as though I could freely explore the data	14.87	14	<.001	1.00
I wanted to view the data differently	-0.50	14	0.687	0.313
Some graphs were hard to interpret by the end	-5.45	14	1.00	<.001
I could interpret many graphs in the end	4.88	14	<.001	1.00
Ability to Discuss During Data Sprint				
I got my thoughts across during discussions	3.58	14	0.002	0.998
I found giving my opinions difficult	-3.49	14	0.998	0.002
I found my opinions conflicted with others	-5.05	14	1.00	<.001
I found the discussions helped me to understand my own thoughts	6.55	14	<.001	1.00
I got frequently distracted from the discussions	-2.47	14	0.987	0.013
Learning Outcomes				
I feel I learnt more about how to interpret data visualisations (graphs, etc.)	8.11	14	<.001	1.00

Table to summarise post mini data sprint survey to explore participant's experience of the activities. Questions have been shortened for this table. All questions were answered on a scale of 1 (strongly disagree) to 9 (strongly agree). P values of agreement and disagreement were calculated with a one-sample T-test against the mid-point of this scale, 5.

aid from the researchers. Feedback from the MDS experience survey suggests that participants could navigate this dashboard and, within the timeframe, interpret the graphs presented. Cohorts with little data literacy will likely find it easier to interpret graphs than spreadsheets, so it is recommended that raw data only be exposed within an MDS if it is pertinent to the narrative. However, as found in pilot one, those with greater data literacy may find this approach limits their agency in data analysis as well as the interests and questions they can explore. Multiple options for exploring a data set, from a dashboard to statistical program exploration, may engage a broader population, particularly to validate data.

Discussions time in both pilots was relatively short. Pilot one used 65 minutes to explore and discuss the data set, while pilot two used 30 minutes. However, for these discussions to be focused and effective there is some time needed to prepare participants. Background to the workshop, data set, tools used, data literacy, terminology, etc. This preparation is likely to need 40 - 60 minutes in the current format. Therefore, the MDS approach has two clear sections: preparation and facilitation of discussions.

IV. CONCLUSION

Through two diverse pilots, the authors explored the use of MDS as an adaptable approach to evaluate data set validity, foster climate conversations, and scaffold data literacy. Across both pilots, the MDS timeframe was sufficient to introduce a data set, explain data literacy or statistical software concepts, foster discussion, and reflect on the MDS experience. Iteration

between these pilots highlights good practice for this approach and areas for refinement.

Establishing and directing a clear narrative for the MDS workshop is crucial for steering the discussions and setting expectations. Conversations within the MDS approach are framed by participants' constructs, and consequently, maintaining an unambiguous narrative is critical to retaining focus.

In pilot one, having quantitative data experts present provided the opportunity to validate the data set. This highlighted the need to understand the data set before this discussion. Therefore, a descriptive data analysis should precede this activity for the researchers and, if possible, the participants. The pilot highlighted the need for the participants to understand the data in its context and use.

The short timeframe of MDS proved sufficient to explore the validity of data collected, provided the expertise is present. The MDS approach may be useful for any group looking to start their reflections on data validity and interpretation. It would be most effective if at least one workshop member had good data literacy. Non-data specialists like student groups or generally interested citizens may find this MDS approachable to learn about and understand their data methodologies. A small step towards data equality [14]. It can spark interest in data and data literacy and create awareness about the power of data.

Pilot two activities and data were narratively framed on climate change causes and indicators, prompting broad discussion. Consistent with pilot one, good facilitation and consistent narrative connected the data to real-world implications, scaffolded concept understanding, and expectation management relating to a deeper examination of the presented data. Utilis-

ing smaller groups for discussion that were later combined worked well to stimulate conversation across the cohort. When facilitating wide-ranging conversations across a group, there may be tension between good discussion and accurate recording of the conversations. It is, therefore, important to develop methods that accommodate these requirements.

Both pilots worked with cohorts with an assumed grasp of basic data literacy. It is, therefore, unclear whether the MDS approach would be effective with cohorts that have low levels of data literacy. Future work should consider the scaffolding, narrative contexts, and facilitation required to support discussions with those with limited data literacy. Participants in pilot two subjectively perceived data literacy improvement from the MDS workshop. Full data sprints have been argued as a good teaching space for data literacy [13], but it is unclear the extent to which the shortened MDS can achieve this. Future work should explore the data literacy learning potential for the data literate and non-literate.

Each pilot adapted the workshop to the assumed data literacy characteristics of the cohort. The short timeframe of MDS is not practical for developing knowledge and skills far beyond the general ability of any cohort instance. These adaptations highlight the flexibility of MDS in integrating various data visualisation and exploration applications to match the needs of the cohort. The MDS approach can be segmented into preparation and discussion phases. The preparation phase enables effective discussions. In the preparation phase, the cohort must develop knowledge of the data set, the data interaction approach, the data literacy to identify patterns and trends, and the discussion narrative. Developing knowledge of the data set can be adapted to different audiences through good storytelling, descriptive statistics, and activities that discuss vital jargon. However, interacting and interpreting the presented data will require data literacy scaffolding for audiences not regularly engaging with statistics. This may be an exciting line of research to expand applications and approaches used to explain the context and explore data. For example, game-based artefacts that impart elementary data literacy to the masses [10], but within the timeframe of MDS. The discussion phase requires adaptation on the part of the researchers to define protocols that enable good facilitation depending on group size and types of conversations that emerge. This facilitation needs to keep conversations on the narrative, support confidence of thought and inquiry of the data shown across all participants, help navigate the tools and data, and provide a safe space for consensus and controversy in discussions [11]

The MDS approach is conducive to exposing individual perspectives on the climate conversation, provided participants are given a consistent narrative to contextualise discussions and supporting contextual information on any terminology used. The richness of discussions recorded for both pilots indicates that the structure provides sufficient time to conceptualise ideas based on the questions posed. The experience survey administered in pilot two suggests that participants felt they could contribute ideas to the discussions, and it helped them understand their thoughts towards the climate

conversation. The approach is flexible to data visualisation and exploration approaches, applications, and technologies. In fact, the MDS approach requires adaptation to develop engaging spaces for a broad demographic that can scaffold data literacy and provoke citizens' reflections, attitudes and preferences towards culturally important topics, like climate conversation.

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REFERENCES

- [1] P. Hollins, "The Games Realising Effective and Affective Transformation (GREAT) Project – A pathway to sustainable impact on climate change policy", Apr. 2023. doi: 10.5281/zenodo.7802446.
- [2] S. Segler, J. Gantenberg, "Innovation Data Sprint in Citizen Social Sciences", Proceedings of Austrian Citizen Science Conference 2023, PoS(ACSC2023), Nov. 2023. doi: 10.22323/1.442.0019.
- [3] T. Venturini, A. Munk, and A. Meunier, "Data-sprinting: A public approach to digital research." In Routledge handbook of interdisciplinary research methods, Routledge. 2018, pp. 158-163.
- [4] IAP2, "Public Participation Pillars", [Online] March 3 2024. Available: https://www.iap2.org/resource/resmgr/-communications/11x17_public_participation_pillars_brochure20.pdf.
- [5] B. Kieslinger, T. Schäfer, F. Heigl, D. Dörler, A. Richter, and A. Bonn, "Evaluating citizen science-towards an open framework". UCL Press. 2018 pp. 81-95.
- [6] S. Cammers-Goodwin, "Open Data Insights from a Smart Bridge Datathon: A Multi-Stakeholder Observation of Smart City Open Data in Practice", Smart Cities, 6(2), pp. 676-691, Feb. 2023. doi: 10.3390/smartcities6020032.
- [7] International Monetary Fund (2024, Mar.14) "Climate Change Indicators Dashboard" [Online]. Available: <https://climatedata.imf.org/pages/climatechange-data>.
- [8] Playmob. "Welcome to Playmob" (2024, Mar.14) [Online] Available: <https://www.playmob.com/>
- [9] The Jamovi Project (2024) Jamovi. (version 2.3) [Online]. Accessed: Mar. 20, 2024 Available: <https://www.jamovi.org/>
- [10] V. Pandeliev, A. Namanloo, K. Lyons, M. Bliemel, and H. Ali-Hassan, "A Serious Game for Teaching Data Literacy". IEEE Games, Entertainment, Media Conference (GEM) Nov. 2022 pp. 1-6.
- [11] M. Kitchen, "Facilitating small groups: how to encourage student learning". The clinical teacher, 2012 9(1), pp.3-8. UCL Press. 2018 pp. 81-95.
- [12] S. Tsang, C. Royse, and A. Terkawi, "Guidelines for developing, translating, and validating a questionnaire in preoperative and pain medicine". Saudi journal of anaesthesia UCL Press. 2017 pp. S80-S89.
- [13] J. Omena, L. Cano-Orón, B. Gobbo and A. Flores, "What are data sprints for?". Dígitos. Revista de Comunicación Digital. 2022 pp.9-30.
- [14] C. D'Ignazio, "Creative data literacy: Bridging the gap between the data-haves and data-have nots". Information Design Journal. 2017, 23(1), pp.6-18.
- [15] J. Ettinger, A. McGivern, M. Spiegel, B. King, Z. Shawoo, A. Chapin and W. Finnegan, "Breaking the climate spiral of silence: lessons from a COP26 climate conversations campaign". Climatic Change. 2023, 176(3), pp.22.
- [16] S. Hügel and A. Davies "Public participation, engagement, and climate change adaptation: A review of the research literature". Wiley Interdisciplinary Reviews: Climate Change. 2020, 11(4), pp.e645.