Master's Thesis

How Did It Evolve? Developing a Policy Design Experiment for Sustainability Transitions of a National Museum of Modern and Contemporary Art

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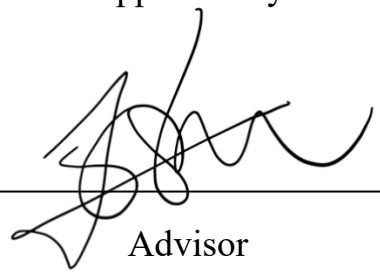

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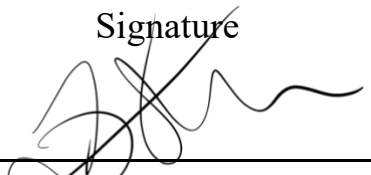

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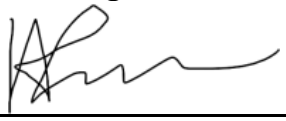

Sunghee Ahn

Abstract

As museums and cultural institutions have responded to the environmental challenges posed by the climate crisis, they have become critical arenas in driving sustainable design practices. Designers can contribute to those communities for sustainability transitions on multiple scales of society and various timelines by using their creative and decisive agency. However, there needs to be more practical knowledge of the design approaches for operationalizing sustainability transitions of such institutions. This thesis presents a multi-layered account of the development process of a policy design experiment for sustainability transitions at the National Museum of Modern and Contemporary Art in South Korea. The author retrospectively traced the entire process, conducted interviews with the project team members, including the director and student designers, and performed a thematic analysis to identify how the process could evolve. The findings suggest that the process of a policy design experiment for sustainability transitions of a public art museum follows a non-linear and complex process intertwined with multiple design activities. This research's insights can inspire design researchers, practitioners, museums, and cultural institutions seeking systemic and long-term innovation for sustainability.

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I Introduction

In response to the climate crisis and the challenges posed by the Anthropocene, museums and cultural institutions have designed themselves for sustainability with diverse approaches. This includes influential institutions, such as the International Council of Museums, Tate Modern, and the Museum of Modern Art, which have officially declared their adoption of sustainability as a core objective (Tate Modern, n.d.; Museum of Modern Art, n.d.-b). Notably, guidelines for achieving environmental sustainability have been developed by organizations such as Museums for Climate Actions and the International Committee of Museums and Collections of Modern Art (McGhie, 2021; CiMAM, 2021). At the individual museum level, The Design Museum has implemented a design research program focused on sustainability (The Design Museum, n.d.). Moreover, there are active movements to achieve carbon neutrality, with initiatives such as the German Federal Cultural Foundation's pilot project testing measurement systems with local cultural institutions (German Federal Cultural Foundation, 2021). These efforts position museums and cultural institutions as critical arenas in driving the adoption of sustainable design practices and fostering innovation and collaboration within the broader context of Design for Sustainability Transitions.

Design for Sustainability Transitions (hereinafter DfST), as an emerging field, highlights radical innovations of entire systems to achieve sustainability. DfST embraces multiple perspectives on systemic interventions, spanning from niche to grand levels, as well as from the short- to long-term time-frames (Geels, 2002). Given the complex and dynamic nature of this approach, vision development and involvement of diverse stakeholders are among the key aspects of DfST (Hyysalo et al., 2014; Ceschin, 2014; A. Gaziulusoy & Ryan, 2017; Irwin, 2019). Designers are generally recognized as possessing creative and decisive agency in producing alternative products and services within the context of DfST (I. Gaziulusoy & Erdoğan Öztekin, 2019). Therefore, designers can use their ability for museums and cultural institutions seeking sustainability.

However, there needs to be more practical knowledge on the design approach for museums, which have the potential to be key players in operationalizing DfST. Case studies are required to foster this area, as transitions research basically relies on case-based research methods, emphasizing the need for multiple in-depth single case studies (Köhler et al., 2019, p. 18). Additionally, as DfST emphasizes a process-oriented approach, rather than focusing solely on output (A. Gaziulusoy & Ryan, 2017), there is a clear need to examine the non-linear design trajectories that enable transitions projects.

This thesis reports on the development process of a policy design experiment that ultimately seeks sustainability transitions for the National Museum of Modern and Contemporary Art (hereinafter MMCA). The research provides a multi-layered account of how the policy design experiment which aimed to have impacts at multiple scales, evolved through a complex process. The author recollected all data documented during the entire process to create a visual representation of the project chronicles and conducted one-on-one interviews with three designers and a director from the project team. By offering key insights that enabled the design process, this research aims to inspire design practitioners seeking sustainability transitions in a relevant context.

1.1 Approaches of museums and cultural institutions to environmental sustainability

Museums and cultural institutions around the world have increasingly dedicated themselves to sustainability. In 2019, the International Council of Museums, a non-governmental membership organization representing museums and relevant workers worldwide, officially adopted the UN's Sustainable Development Goals in 2019 as its core objective (McGhie, 2021, p.20). Tate Modern, the national gallery of international modern and contemporary art in the United Kingdom, declared a climate emergency in 2019 and has undertaken various efforts to achieve sustainability. These include operating in a sustainable way, raising public awareness, working in partnership with external experts, and establishing an environmental policy (Tate Modern, n.d.). The Museum of Modern Art, a leading art museum in the United States, renovated its building to incorporate energy-efficient systems and advanced climate control technologies (Museum of Modern Art, n.d.-b). The Ambasz Institute, established by the Museum of Modern Art, aims to promote sustainable interaction between architecture and the natural environment (Museum of Modern Art, n.d.-a).

One common approach of museums and cultural institutions to environmental sustainability is the production and distribution of guidelines and toolkits that other museums can follow or draw inspiration from. Museums for Climate Action, a global initiative that engages museums and cultural institutions, published an online "toolbox" in 2021. This toolbox covers various aspects that museums can utilize to contribute to sustainability, depending on their specific contexts (McGhie, 2021). The toolkit aimed to provide all basic and relevant information that museums should acknowledge for climate actions. Similarly, the International Committee of Museums and Collections of Modern Art developed the "CiMAM Toolkit on Environmental Sustainability in the Museum Practice," which provides practical information and examples that museums can immediately utilize (CiMAM, 2021). In South Korea, the Asia Culture Center published a report that showcases research and practices from around the world and provides guidelines for planning and operating sustainably in response to the climate crisis and the Anthropocene (ACC, 2021). The Korea Culture and Tourism Institute also focuses on "eco-friendly perspectives of culture and arts" (Youngsoon, Hoon, & Kyuwon, 2021).

At the individual museum level, various internal projects have been implemented, including exhibitions and research programs, across museums and cultural institutions. For instance, the Design Museum has initiated a design research program called Future Observatory, which encompasses activities such as curating exhibitions, organizing events, providing funding, publishing research reports, and facilitating residency programs, all aligned with its cultural mission of addressing environmental issues. (The Design Museum, n.d.) This program Similarly, art museums in South Korea, including the Museum of Contemporary Art Busan and Seoul Museum of Modern Art, have organized exhibitions to raise public awareness about museum's responsibility in the climate crisis and the Anthropocene (Museum of Contemporary Art Busan, 2022).

There are also reports from art and cultural institutions that specifically highlight the gravity of carbon neutrality. The German Federal Cultural Foundation (Kulturstiftung Des Bundes as the original title in German) conducted a pilot project in collaboration with 19 local cultural institutions to measure

carbon footprints and work towards achieving climate neutrality, according to its report, "Carbon Footprinting in Cultural Institutions: Documentation of the Pilot Project and Work Materials." The project integrated sustainability efforts into its funding system (German Federal Cultural Foundation, 2021, p.16). The Carbon Literacy initiative, aimed at providing carbon literacy training, offers toolkits that include detailed steps for museums to become certified in Carbon Literacy (Carbon Literacy, n.d.). In terms of museum management, Lambert and Henderson propose an alternative methodology for measuring the environmental impact of museum loan activities, based on a case study of the National Museum Wales (Lambert & Henderson, 2011).

These examples demonstrate the diverse approaches museums and cultural institutions take towards sustainability, including adopting sustainable design practices, such as implementing architectural solutions, providing guidelines, conducting pilot tests, promoting educational initiatives, and producing academic reports. It is evident that museums and cultural institutions recognize the challenges posed by the climate crisis and Anthropocene and are actively engaging in efforts to address them because "climate change is bad news for everyone" (McGhie, 2021, p.11).

1.2 Design for Sustainability Transitions

DfST is a genus of design research and practices that seek to facilitate long-term transformation in socio-technical systems to achieve sustainability. It is rooted in sustainability transitions research, which draws upon, for example, systems theories, sustainability science, system innovations, and transitions theories (I. Gaziulusoy & Erdoğan Öztekin, 2019, p. 12). The Sustainability Transitions Research Network (STRN) distinguishes this research from other sustainability debates based on several key characteristics: (1) Socio-technical systems are multi-dimensional and involve diverse fields, making the process co-evolutionary; (2) It is a multi-actor process that necessitates the knowledge and efforts of multiple stakeholders in society; (3) Recognizing that some changes are radical and rapid while others are deeply entrenched and stable; (4) Transitions are not achievable in the short term, but they require a long-term perspective; (5) The outcomes of innovations in sustainability transitions are uncertain and unpredictable; (6) Given the multi-dimensionality and multi-actor nature of sustainability transitions, different stakeholders may contest related notions, ideas, and values; (7) Public policy plays a crucial role in providing normative directionality as sustainability transitions are a public good that may not easily benefit private actors (Köhler et al., 2019, pp. 2-3). The systemic complexity, multi-dimensionality, and long-term nature of sustainability transitions are captured in the widely recognized Multi-Level Perspective (MLP) framework, which serves as one of the foundational theoretical frameworks in this field (Geels, 2002) (refer to Figure 1). DfST aligns with sustainability transitions research in its understanding of sustainability issues and the practices employed to address them.

Given the significance of adopting a multi-perspective in socio-technical transitions for sustainability, which encompass dynamic and complex nature, DfST places general emphasis on system thinking, a participatory approach, and long-term vision development (I. Gaziulusoy & Erdoğan Öztekin, 2019). First, a participatory approach is essential because the multi-dimensional nature of socio-technical sys-

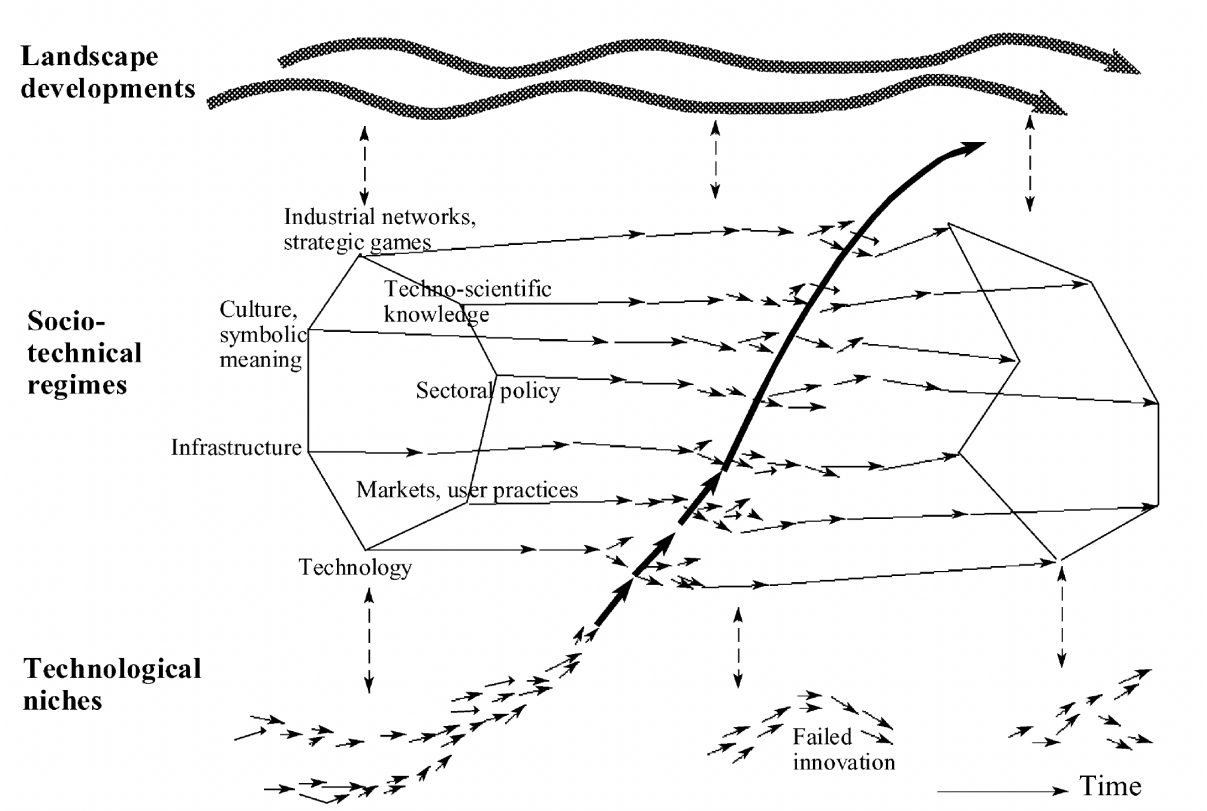

Figure 1: A dynamic multi-level perspective on technological transitions by Geels

tems necessitates diverse knowledge and contributions from various stakeholders involved in the co-evolutionary process. Moreover, since different stakeholders may hold divergent notions and values, engaging a diverse range of individuals within a community is necessary to establish a normative direction. Secondly, a vision serves as a guiding force in DfST as socio-technical transitions unfold over the long term and are characterized by uncertainties regarding their success. In such circumstances, a shared vision can provide direction and be a pivot for engaged stakeholders. The vision generation process itself can also offer directionality among stakeholders and gain advocates during the process (Irwin, 2019).

The emphasis on participatory methodologies and long-term vision development is manifested through various practices in DfST. For instance, Irwin sheds light on the collaborative engagement of multiple stakeholders in developing visions and establishing present activities. This approach, known as backcasting, involves strategic planning by starting with a desirable future vision and then working backward to identify the necessary steps for its realization (Irwin, 2019; Bibri, 2018). Similarly, the Design for Product-Service System (PSS) involves the formalization of PSS concept visions and the development of strategic pathways through the involvement of academics, local companies, city officials, and users (Ceschin, 2014). Gaziulusoy and Ryan highlight the participatory development of vision and scenarios for systemic transformation (A. Gaziulusoy & Ryan, 2017). Additionally, Hyysalo et al. propose one way of "participatory futuring" with lead users to facilitate strategic planning (Hyysalo et al., 2014). Although the level of the designer's agency in driving the transitions is acknowledged differently from

each, scholars generally accept the creative and decisive power of designers in producing alternative products and services (I. Gaziulusoy & Erdoğan Öztekin, 2019).

Due to its emerging nature, DfST requires an expansion of its case study archive to share practical knowledge and further its goal of sustainability transitions (I. Gaziulusoy & Erdoğan Öztekin, 2019, p. 11). Given its process-oriented approach, which prioritizes the process rather than the final output (A. Gaziulusoy & Ryan, 2017), an examination of participatory design processes aimed at sustainability transitions becomes imperative. Furthermore, sustainability transitions research explicitly acknowledges the reliance on case-based research methods. Given the intricate narratives and non-linear development trajectories of each unique context, sustainability transitions research advocates for the documentation of diverse single case studies (Köhler et al., 2019).

II Method

This research focuses on providing a report on the perspectives on what facilitated the design development process of the policy design experiment for sustainability transitions of MMCA. Its objective is to investigate the various dimensions that contributed to the process. The author initially gathered and synthesized all relevant raw data to achieve this, creating a visual representation of the project chronicle. Subsequently, interviews were conducted with the project team members to collect their different perspectives on the project's process. Following the interviews, the data were subjected to thematic analysis to identify meaningful patterns and dimensions. Before delving into the narrative of the research method, the story of the entire process is provided in the following to enhance the reader's understanding of the overall project.

2.1 Project description

The project is divided mainly into two phases: the phase for planning and preparation, and the second is a series of participatory workshops. The team underwent a 5-month long period for planning from early March to early August. Then the series of workshops proceeded from August 10th to November 23rd.

2.1.1. Planning and preparation

MMCA, one of the most prestigious public contemporary art museums in South Korea, selected carbon neutrality as the theme for its interdisciplinary art project in 2022. Although this was not the first instance of an art museum dealing with environmental concerns worldwide, MMCA's approach stands out as they aimed to achieve carbon neutrality by involving diverse stakeholders, including visitors, museum staff, and external human resources, and engaging them in critical discussions on the social, technical, and cultural aspects of an art museum's response to the Anthropocene. To this end, they endeavored to accurately measure the museum's carbon emission rate and convened a diverse range of experts to gain multiple perspectives on the agenda. New Design Studio (hereinafter the Studio), a service and policy design laboratory in a research-oriented university in South Korea, was among the professionals invited to contribute to this initiative, with the author being part of the Studio. The Studio's role was to work at the intersection with citizens to seek policy and behavioral changes necessary for the museum's transition to carbon neutrality.

As other design projects are, we initially underwent the fuzzy front end. What made this project much more difficult was its ambitious goal to be both practical, in terms of the impacts on the involved people, and artistic, as it was part of an art program. For this, regular meetings with curators, a coordinator, and a researcher of MMCA were helpful. We had approximately 11 meetings from March to November. In the first meeting on March 17th, we could be aware of the curator's general direction of the project. We also presented our rough plans based on the primary research, including a direction of using the experiential future concept to empathize with the future of the climate crisis. However, as they were a mere rough big picture, we could not find one intriguing concept. Worse, it was difficult to comprehend how to

define and scope many professional notions. Although we tried to tackle it by performing famous design methods such as Journey Map, Persona, and How Might We questions, there was little development.

We carried out an internal ideation session for a couple of hours to sketch and share ideas among team members. First, we drew ideas by hand and then organized them to be communicable with each other in a digital form. We had eight visualized ideas, which were then synthesized and developed for a week and narrowed down to concrete versions of two concepts for the concept proposal to the curator. The first concept was a relay workshop starting with children to establish a virtual carbon neutrality task force, Energy Department. The other was a system game idea to generate policy ideas from visitors for the museum's carbon neutrality based on extreme scenarios. Although in the concept proposal on April 7th, the curator welcomed both concepts, the Energy Department concept should be dropped as it was revealed from the conversation with the curator that there had already been an Energy Department in charge of the energy operation of the Museum. We should use a different title to avoid possible confusion. Moreover, we also left out the system game idea because the assigned workshop duration was too short to perform the high-dimensional game for ordinary people. We could develop ideas more sharply after identifying what to keep and drop out.

We began developing the project concept centering around the idea of engaging children as a starting point for the series of workshops. As children are the victims who will suffer the longest from the climate crisis in the future but do not have any agency to change the status quo that colonizes the future planet, it sounded reasonable to listen to their voices first. In this way, we could empower them in the decision-making process, at least within the project, which shapes the project as an art form. That is, we placed them as the first runners and made their voices heard in the subsequent workshops for adults and museum staff.

After we agreed upon the fundamental concept, we encountered numerous practical challenges in developing the project. We had approximately 30 rounds of internal meetings and ideation workshops to address them. We also studied the climate scenario reports published by the Intergovernmental Panel on Climate Change (Pörtner et al., 2022, hereinafter IPCC). We began concretizing the workshop order and style and creating visual materials based on emerging ideas and accumulated knowledge. The team's design solution for achieving carbon neutrality at MMCA was a policy design experiment that engaged multiple stakeholders in envisioning carbon-neutral futures and generating policy ideas that could be adopted by the museum. The participants, including citizens of all ages, MMCA staff, and decision-makers, took part in a series of relay workshops facilitated by the Studio's designers. Figure 2 provides an overview of the process of the series of workshops.

After concretizing the project's overall structure, we engaged with many of the museum's stakeholders. For example, we observed how the citizen stakeholders interact with and give feedback to the museum in the Customer Advisory Group and Children Advisory Group in mid-June. We also ran a discussion session with seven staff from the museum and its foundation to gain their feedback and ideas on our project June 23rd. Moreover, a week before the children's workshop, we conducted a pilot test with two schoolchildren to validate our approach and find missing points. The planning and preparation stage ended with the pilot test. The following section outlines how the participatory workshops were

Figure 2: Overview of the workshop process

	1st Phase	*2nd Phase*	*3rd Phase*
Target group	Elementary school children	Teenagers and adults	Museum decision-makers
Number of participants	54	110	6
Co-design activity	- Imagining 2081 - Exploring the museum - Writing a letter	- Imagining 2061 - Speculating 4 extreme museum scenario and discussion - Writing a letter	Discussion about the policy ideas driven from citizen's voice
Tools and Materials	Storybook	- Fictitious newspaper - 4 extreme museum scenarios	3 temporal frameworks filled with 104 policy ideas
Number of sessions	4 sessions	8 sessions	A meeting
Timespans	August 10 to 11	September 3 to November 16	November 23

conducted and how they were interconnected in a unique manner.

2.1.2. A series of participatory workshops

The series of citizen workshops started with elementary school children (See Figure 2). Over the course of two days in August 2022, a total of 54 children participated in four sessions. They were invited to imagine themselves as future citizens in the year 2081 and explored the future self, society, and the museum in the climate crisis for around 2 hours. Through the use of audio-visual aids, such as a storybook based on climate scenarios reported by the IPCC (Pörtner et al., 2022), the designers helped the children empathize with the future and stimulate their imagination. Immersed in the story, they were guided to problematize the current state of MMCA through a touring activity in the museum building. The session concluded with an activity where the children were encouraged to write letters to the adults and the museum of 2022 urging them to change their mindsets and behaviors to prevent a dangerous future and create a more sustainable world. Figure 3 provides the scenes of some activities that took place during the children's workshop.

The next phase of the citizen workshop involved teenagers and adults, with a total of 110 participants. This consisted of 12 teenagers, 34 individuals in their twenties, 42 people in-between 30 and 45, and 22 participants above the age of 46. The workshops were divided into eight sessions, held at two-week intervals from September to November 2022. The overall format of these workshops was similar to that of the children's workshop: immersing themselves in envisioning their future selves, society, and the museum in the climate crisis and then demanding changes. However, there were two significant differences in the details compared to the children's workshop.

Figure 3: Scenes of the series of workshops

The first difference was the use of a design fiction artifact, which changed from a storybook to a newspaper article. The newspaper articles in high fidelity as a real one served the purpose as the storybook, allowing teenage and adult participants to better empathize with and critically examine the future scenarios in the climate crisis. The second difference was the inclusion of group discussions based on four extreme future scenarios of a carbon-neutral MMCA. These scenarios were presented as representative illustrations with concept titles and follow-up questions aimed to spark critical speculations. The designers created these scenarios based on the results of the children's workshop, incorporating their hopes, concerns, and new suggestions (see the illustrations and concept titles of the extreme future scenarios in Figure 4). Participants were assigned to different scenario groups and engaged in heated discussions to identify possible issues posed by the extreme scenarios and explore alternative solutions, without being noticed that the scenarios derived from children. Like the children's workshop, partici-

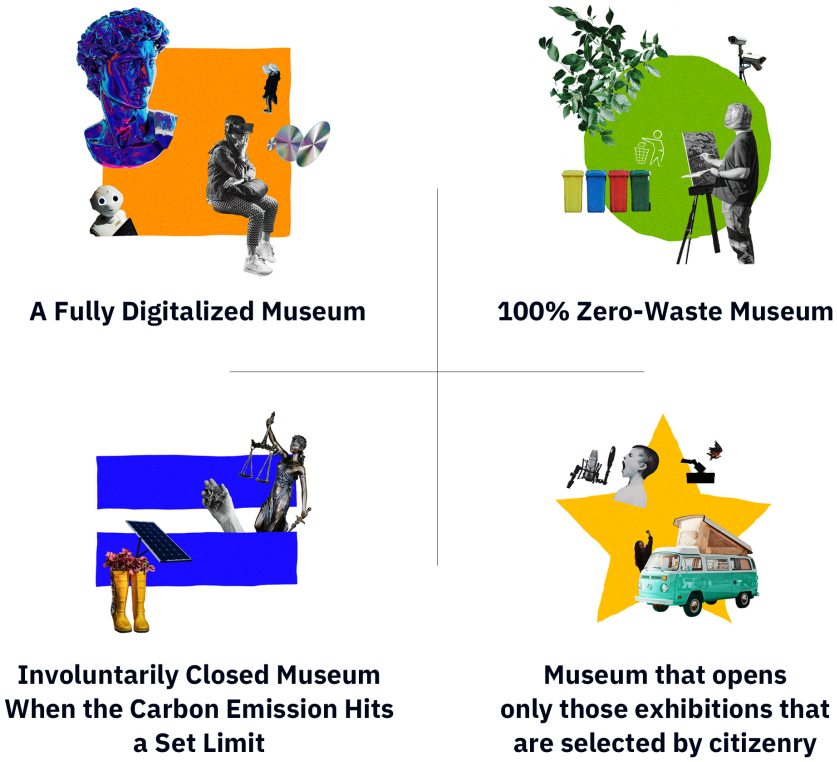

Figure 4: The illustrations and concept titles of the four extreme future scenarios of the carbon-neutral MMCA, provided to the participants for group discussions

pants concluded each session by writing demanding letters to the museum. Through these workshops, the designers were able to gather hopes, concerns, values, preferences, and new suggestions related to the carbon neutrality of MMCA from citizens of all ages.

The final phase of the participatory project involved a discussion on policy changes toward a carbon-neutral museum with six decision-makers of MMCA, including the director and curators. In a two-hour meeting, the design team presented the project and provided a policy framework on which the over 600 voices from the citizen workshops were synthesized into 104 policy ideas (see Figure 5). The policy framework, originally developed by the Policy Lab in the UK, is entitled "Government as a System," which is a matrix encompassing the 56 roles and actions of a government ranging from forcing regulations to soft interventions (Siodmok, 2020).

The extensive workshop results could be synthesized and organized within this framework to be presented to the museum. In order to be more effective, the policy ideas within the framework were categorized into three temporal orders: (1) what the museum has already been doing well in relation to carbon neutrality, (2) what the museum should and could implement immediately, and (3) what the museum should consider in the long-term view. These matrices were suggested during the meeting and triggered discussions among participants regarding feasibility and viability. This final meeting concluded by handing over a booklet of letters from citizens, demanding change and urging the museum to strive

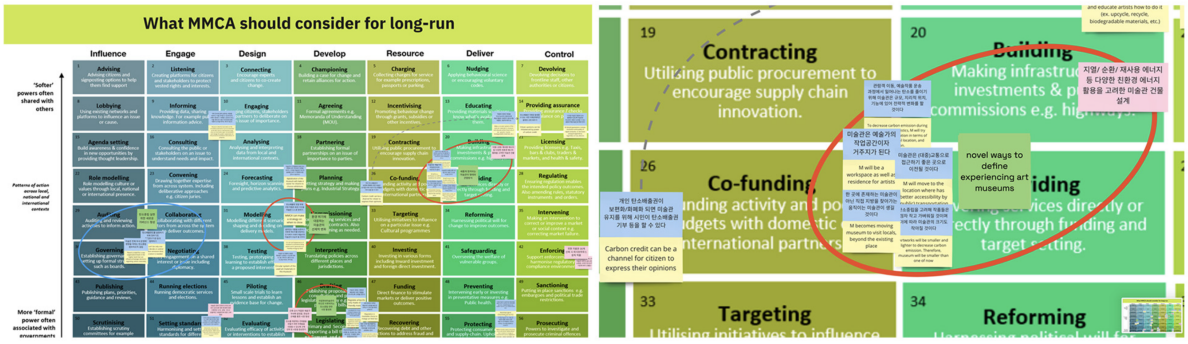

Figure 5: The process of mapping policy ideas on the "Government as a System" framework

Figure 6: Scenes of the final meeting with MMCA's decision-makers

for a more sustainable future.

This policy design experiment was developed through collaboration with diverse stakeholders and employed multidisciplinary approaches. Throughout the entire process, including a five-month planning and preparing stage as well as the series of workshops, various opportunities and challenges arose due to the project's novel approach, not following existing workshop models or frameworks. Therefore, there is a need to find an effective way to communicate the narrative of the non-linear and complex design process.

2.2 Data sources and collection

The analysis of the project's design process began with gathering all relevant written and saved records. Figure 7 presents the list of the raw data corpus used by the author. For example, the designers meticulously documented meeting notes, which encompassed internal team communications and official meetings with external individuals such as MMCA curators and researchers. Online note-sharing platforms were employed to ensure the comprehensive recording of all activities, enabling each tracing of the project's trajectory. Additionally, official letters, proposals, photographs, videos, and tangible materials were securely stored in a cloud drive service. Furthermore, the author maintained a private journal throughout the entire process of reflection and planning, which served as a valuable data source for the

retrospective analysis.

Figure 7: The corpus of raw data

Category	*Item*	*Content*	*Format*
Written record	Meeting note	107 notes of team's internal communications and official communication with external individuals such as MMCA curators and researchers	Online note-taking platform
	Sketch and activity	32 online boards of team's internal activities, such as sketches, ideation, brainstorming, and analysis	Online note-taking platform
	Private journal	98 notes of the author's private reflections written throughout the entire process (written in Korean)	Online note-taking platform
Official record	Proposal	Official proposals submitted to the museum	Digital files in a cloud drive service
	Email communication	Email communication exchanged between the Studio and MMCA	Email service
Visual aid	Photo and video	Visual records of the process and workshops by the Studio and MMCA	Digital files in a cloud drive service
	Tangible material	Visual artifacts and activity sheets created by the team	Digital files in a cloud drive service

*All data are from the period between March 8 and November 29, which was the very first conversation about the project and the last meeting.
*All data are written in interchangeably English and Korean.

2.2.1. Visualization of the project chronicle

The first step the author took to investigate the evolution of the project was to create a visual representation of the project chronicle. This involved synthesizing scattered records, including ideas and conversations from various platforms in different formats, into a cohesive visual timeline. An online collaboration platform facilitated this process. By categorizing events according to their nature, such as external stakeholder collaboration, participation, and internal communication, the author was able to identify timely challenges, our approaches, and notable findings or advancements. Examining the synthesized history of the project enabled the author to recall significant moments that might have otherwise been overlooked, gaining a comprehensive understanding of the sequence of events.

While the initial version of the visualized project chronicles served the author's retrospective purposes, there was a need to simplify the complex and extensive timeline for effective communication during follow-up interviews with the project team members. Without simplification, understanding the contents within the limited interview duration would be challenging. Additionally, there was a risk of the author's preconceptions and personal preferences influencing the descriptions and highlighted points. To address these concerns, a simplified and objective version of the timeline was developed. This upgraded timeline focused on presenting key events involving museum personnel or occurring within the museum in the upper part, the design team's communications and activities in the lower part, and individual designers' involvement at the bottom. Selected key moments were supplemented with brief descriptions or relevant photos to trigger the interviewees' memories. Notably, the key challenges, approaches, and

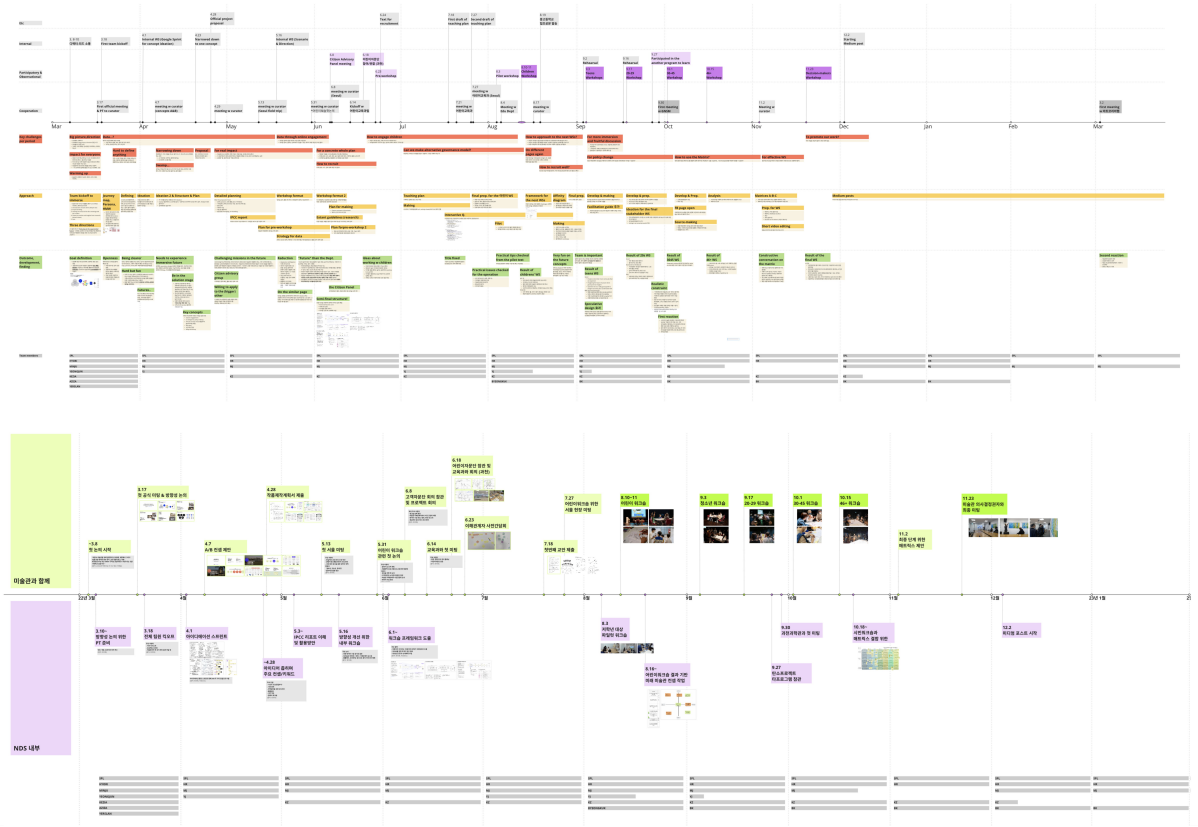

Figure 8: Two version of visualized project chronicle: the upper is the first extensive version and the bottom is the simplified and objective version

findings or advancements from the initial version were mostly omitted in this second version to minimize the potential influence of the author's biases. Figure 8 provides the two versions of the visualized project timeline.

In summary, the visualization of the project chronicle served two purposes. Firstly, creating the visual representation facilitated the author's self-retrospection and reflection, enabling her to discern what actually occurred throughout the entire design process. Secondly, the upgraded version of the timeline was utilized during interviews. The simplified and objective visualized timeline allowed the interviewees to reflect on their experiences and highlight specific moments that influenced the design development.

2.2.2. Interviews on the process with the project team members

A series of follow-up interviews were conducted from May 15th to 18th 2023, six months after the project's completion. The interviewees consisted of the team's director and three designers, all of whom played significant roles in the process (See Figure 9). Each one-on-one interview lasted approximately 50 minutes and aimed to gather the interviewees' thoughts on the significant aspects, inflection points, and key insights or lessons learned during the design process. As an interviewer, the author made efforts to facilitate their recollections of the project chronicle, while avoiding leading them towards specific

interpretations, allowing each participant to recall their past experiences independently. The interviews were audio-recorded.

Figure 9: List of interviewees

Code	*Position*	*Age group*	*Periods of being involved in the project*
A	Student designer (intern)	20-29	March, April, and July to early August
B	Director	40-49	March to November
C	Student designer (intern)	20-29	March to mid-October
D	Student designer (Master's)	20-29	August to November

*The process lasted from March 8 to November 24

The interviews began with a sensitization phase, where the interviewees were presented with a variety of photographs related to the project to evoke their general impressions. Subsequently, the author introduced the visualized project chronicle and encouraged the interviewees to think aloud about significant points corresponding to specific moments on the timeline. The focus of the discussion was on the project's evolution. Upon completing the retrospective review, the interviewees were asked to mark inflection points in the design process using red stickers, regardless of the number. As a concluding question, they were invited to share their thoughts on the unique characteristics of the process for this particular case, a policy design experiment for sustainability transitions of a public art museum.

2.3 Data analysis

After conducting the interviews, the voice recordings were transcribed into digital texts using the AI voice records management program. Then the author rectified errors that the program had not accurately understood. Once the texts were corrected, the author assigned codes to references of key Dimensions (code D), inflection Points (code P), and other/Etcetera relevant aspects (code E) in the design process. The code system was designed to indicate the interviewee (alphabetized for anonymity), the category, and the number. For example, the code "A-D001" indicates that the quote is from Interviewee A, falls under the Dimension category, and is the first code within Dimension by Interviewee A. The encoded quotes were compiled and organized in Excel. The author then summarized lengthy mentions for simplicity. The list of the encoded quotes can be found in the Appendix. Subsequently, the quotes were transferred to an online collaboration platform for thematic analysis.

The author approached the analysis of the encoded quotes in two ways. Firstly, quotes related to the inflection points in the design process were integrated into the visual timeline created by the author as a resource for self-retrospection and interviews. This allowed the author to understand the contexts of each point and identify thematic patterns among the different inflection points highlighted by the interviewees. Secondly, the encoded quotes were iteratively grouped to extract key perspectives on enabling the development process. The following section presents the results of the analysis.

III Findings

The analysis of the data derived from the visualization of the project chronicle and interviews with the project team member underwent three phases. Firstly, it was found that the members' perceptions differed on the inflection points during the design process. Starting with this finding, the author could divide the design process into two parallel processes of reducing uncertainties and developing the project's structure and details. Then, the analysis was concluded with the key activities that enabled the processes. The followings explain this analysis result.

3.1 Multitude of perceptions on the inflection points during the design process

Through the analysis, it has been observed that there were variations among the interviewees regarding the perceived inflection points where significant development occurred in the design process (see Figure 10). On average, each interviewee identified four inflection points, resulting in a total of thirteen. While there were instances where the participants selected the same points, their reasons often differed. For instance, Interviewees A and B both emphasized the first official meeting with the curator of the Museum and the Studio, but for different reasons. Interviewee A considered this meeting important to establish the overall direction in the initial stage, stating, "During the discussion on the direction of the first official meeting, I felt it was crucial to align our understanding of stakeholders' needs and determine how we can meet them. It played a significant role in our progress" (A-P005). In contrast, Interviewee B highlighted this moment because it marked the emergence of one of the project's core concepts, the future. Interviewee B mentioned, "Now that I think about it, I'm missing something really important, which is that we're going to take these students back to 2061, year 81, when we thought we were going to use the future" (B-P009). Further discussion led us to identify this moment as the first official meeting, during which one of the three initial directions involved showcasing the future world in the context of the climate crisis.

Rather than a specific date, particular periods in the design process were recognized as a significant turning point. One such example, identified by Interviewee C, was the period spent analyzing the IPCC report. Interviewee C recalled how studying the report allowed them to empathize with the consequences of the climate crisis and our project's responsibility, which added depth to the project details. Interviewee C shared, "Until then, I had been someone participating in a cool and enjoyable design project. But through this research, I realized the gravity of the situation and how people are taking action. [...] It was a moment when I truly felt the seriousness of climate change, and it left a deep impression on me" (C-P006). Interviewee C further emphasized, "When deciding to the future setting, we discussed which year to send the participants to and why. We explored various possibilities through discussions. In the IPCC report, there were four or five climate crisis scenarios, and we planned to base our workshops on one of them. During these discussions, there were moments when we had to determine the kind of future we wanted to discuss or present to the public" (C-P007). Another identified period was when the team created the tangible materials, which marked the beginning of radical development compared to the incremental phase before. Interviewee A explained, "It seems that more progress was made during

Figure 10: Multi-perceptions on the inflection points during the design process

Inflection point	*Date*	*Interviewee*	*The reasons they saw the moment as an inflection point*	*Code*
First official meeting between the designers and curator	Mar 17	A	We could identify the general direction and make terms between their expectations and our capabilities.	A-P002; A-P005
		B	The futures, one of the core ideas, emerged, which determined the subsequent direction and decisions.	B-P010
Intensive ideation session of the team	Apr 1	C	The scattered individual ideas could be synthesized into team's shared ideas.	C-P001; C-P002
Proposal of two different concepts to the curator	Apr 7	A	The relay workshop starting from children solidified as a core concept.	A-D001; A-D002; A-D003
Concretizing the structure as an art form	Apr	B	We determined and started to create an art form that encapsulates our political intention in the structure.	B-D005; B-D006; B-P001; B-D009
Examination of the IPCC report	May	C	The efforts to understand the IPCC report motivated us to be empathic about the future and strengthen the details of the artifacts.	C-P004; C-P005; C-P006; C-P007; C-P008; C-P009
Materials creation	Jun to Aug 7	A	By starting the materials creation, team discussions for development could be more constructive.	A-D005; A-D006; A-D007; A-D008; A-P003; A-P004
Pilot test with school children	Aug 3	C	This reduced many uncertainties on conducting a workshop with children and enhanced our confidence.	C-D013; C-P010; C-P011; C-P012
Citizen workshop (children)	From Aug 10 to 11	D	We could validate the effectiveness of our approach and develop the next sessions.	D-P001; D-P002
Analysis of the children's workshop	Aug 16 to late Aug	B	We could create four extreme future scenarios that enhanced the project quality	B-P002; B-P003; B-P004; B-P005
		C	We successfully transformed the result of the children's workshop into an effective form.	C-D014; C-D015; C-P016; C-P017
		D	After the children's workshop, there was a significant change in the project direction, and we could build more concrete and realistic plan for the next sessions.	D-P004; D-P005
Citizen workshop (teenagers)	Sep 3	D	We could validate the effectiveness of our approach and develop the next sessions.	D-P001
Citizen workshop (aged over 46)	Oct 15	D	We could validate the effectiveness of our approach and develop the next sessions.	D-P001
Analysis of the citizen workshops	Oct 18 to Nov 22	B	We analyzed the data from the citizen workshop and suggest it to the museum, with the help of the policy framework borrowed from the Policy Lab.	B-P006; B-P007
		D	Analyzing the citizen workshops, we could build more concrete and realistic plan for more constructive conversation in the final meeting with the museum's decision-makers.	D-P006; D-P007
Final meeting with decision-makers	Nov 23	D	We could validate the effectiveness of our approach and develop future steps.	D-P001

the approximately two-week period when we were creating materials for workshop preparation than in the previous month and a half of conversations" (A-D006). Additionally, Interviewees B, C, and D emphasized the periods of analyzing the data from the children and citizen workshops as turning points when the dispersed data came to be synthesized and had shapes to be communicated (B-P002; B-P006; C-D014; D-P004; D-P006).

There were different inflection points that one interviewee highlighted for the same reason. Interviewee D identified the workshops for children, teenagers, and adults over 46 years old, as these workshops provided an opportunity for the team to evaluate the effectiveness of their approach in a real-world context so that they could build more constructively the next sessions. Interviewee D explained, "I marked

these three workshops to indicate the moments where we could assess the outcomes of our planning intentions and design decisions (D-P001)... So, it was a chance for us to continuously evaluate whether the design, artifacts, and workshop structure we created, based on carbon neutrality and the climate crisis, were truly effective. If they were ineffective, it was a time for us to identify what went wrong and where things did not align (D-P002)."

In some cases, interviewees highlighted a common inflection point for similar reasons. The analysis of the citizen workshop results stood out to Interviewees B and C because they could utilize the policy framework, known as "Government as a System," created by the UK's Policy Lab to analyze the extensive data and propose it to the Museum. Interviewee B explained, "So, at that time, the question was, how should we actually organize these? When things were chaotic, I suggested using this framework and seeing how it went (B-P006)... Even though we implemented it, it was still too complex. Therefore, I proposed dividing it into more rational categories, such as things that the museum is already doing well, things that need to be done immediately, and things that should be considered in the distant future. By presenting and discussing these categories, I believed it would capture the decision-makers' attention, especially since we included urgent matters (B-P007)."

In summary, it was found that the team member's perceptions differed from each other in the design development process. For instance, the ones that someone highlighted most were sometimes not regarded as important as that much; the same inflection points were perceived as critical for different reasons. Although their perceptions were multitude, the author found that the process can be generally categorized into two parallel processes. The following section explains how they progressed in parallel.

3.2 Two parallel processes: reducing uncertainties and developing the structure and details

By correlating the results of the interviews with the extensive visualized project timeline, the author found out that the entire process was intertwined with two parallel processes, reducing uncertainties and developing the project's structure and details (see Figure 11). The project team members kept mitigating uncertainties, confusion, and unpredictability surrounding, for example, the project direction, professional terms, and collective understanding. At the same time, they have developed the structure and details that shaped the project since the first emergence of the core concepts. These two parallel processes were not mutually exclusive but somewhat interdependent.

The process of reducing uncertainties included various inflection points, such as the first official meeting between the designers and curator, the intensive ideation session of the team, the pilot test with school children, the citizen workshops (involving children, teenagers, and adults over 46 years old), and the final meeting with the museum's decision-makers. Figure 11 provides insights into how these inflection points helped overcome uncertainties, confusion, and unpredictability.

For instance, the first official meeting between the designers and curator was regarded as an inflection point by Interviewee A, as it reduced uncertainties establishing the project's overall direction through discussions aligning the museum's needs with the Studio's capabilities. For this reason, the fo-

Figure 11: Two parallel processes: reducing uncertainties and developing the structure and details

Inflection point	*Process*	*Challenge*	*Activity*	*Result*	*Code*
First official meeting between the designers and curator	Reducing	Uncertainty on their needs and project direction	Focused conversation between the designers and curator	Identification of the general direction and the common ground between their needs and our capabilities	A-P002; A-P005
	Developing	Lack of core ideas of the project	Ideation of using the futures	Emergence of the futures, as one of the core concepts of the project	B-P010
Intensive ideation session of the team	Reducing	Confusion on what to focus and how to handle the various research result	Internal session among team members to brainstorm and share each other's ideas	Identification of what to focus	C-P001; C-P002
	Developing	Dispersed ideas		Synthesis of scattered individual ideas into the team's shared ideas	
Proposal of two different concepts to the curator	Developing	Needs to determine specific directions	Creation of the two concept directions	Solidification of the idea to start with children for the citizen workshop	A-D001; A-D002; A-D003; A-P001; A-P006
Concretizing the structure as an art form	Developing	Lack of the artistic value in our project concept	Decision to explore a way to create the workshop as an art form	Creation of an art form that encapsulates our political intention in the structure	B-D005; B-D006; B-D009; B-P001
Examination of the IPCC report	Reducing	Low understanding of the meanings of the climate crisis and our project	Examination of IPCC report	Motivation to empathize with the future and have responsibility for our project	C-P004; C-P005; C-P006; C-P007; C-P008; C-P009
	Developing			Strengthening the details of the design fiction artifacts with scientific facts.	
Materials creation	Reducing	Uncertainty on our design direction	Creating materials and artifacts for the workshop	Sharing each other's ideas	A-D005; A-D006; A-D007; A-D008; A-P003; A-P004
	Developing	Slow progress		More constructive and radical development of the project	
Pilot test with school children	Reducing	Unpredictability on the real workshop	Testing the workshop with school children	Confirming the structure and details and enhancing our confidence	C-D013; C-P010; C-P011; C-P012
Citizen workshop (children)	Reducing	Uncertainty on the validity of our approaches	Implementing	Validation of the effectiveness of our approach	D-P001; D-P002
	Developing	Lack of clarity in planning for the subsequent sessions		Constructive development of the subsequent sessions	
Analysis of the children's workshop	Developing	Confusion on how to handle the vast amount of data	Categorizing the data with specific criteria	Synthesis and transformation of data to enhance the project's quality and concretize the plan for the next sessions	B-P002; B-P003; B-P004; B-P005; C-D014; C-D015; C-P016; C-P017; D-P004; D-P005
Citizen workshop (teenagers and age over 46)	Reducing	Uncertainty on the validity of our approaches	Implementing	Validation of the effectiveness of our approach	D-P001
	Developing	Lack of clarity in planning for the subsequent sessions		Constructive development of the subsequent sessions	
Analysis of the citizen workshops	Developing	Confusion on what to focus and how to handle the multitude result	Analyzing the data on the policy framework	Synthesis and transformation of data into an effective form	B-P006; B-P007
				Crystallization of the project aim and realistic plan for the next	D-P006; D-P007
Final meeting with decision-makers	Reducing	Uncertainty on the validity of our approaches	Implementing	Validation of the effectiveness of our approach	D-P001

*"Reducing" means reducing uncertainties
*"Developing" means developing structure and details

cused conversation between them was "significantly important," according to Interviewee A (A-P005). The intensive ideation session among team members also played a crucial role in reducing uncertainties. Interviewee C recalled a period of confusion when they were unsure how to handle various references.

Interviewee C described the process as transitioning into "a different phase" (C-P001) through the intensive ideation session because they could identify what to focus on (C-P002).

Additionally, the pilot test with school children helped mitigate uncertainties and boost the team's confidence. Interviewee C remembered the team's initial concerns about implementing the workshop for children, given their lack of prior experience. However, the pilot test provided valuable insights, validating approaches and easing their worries. It allowed Interviewee C to envision the actual workshop vividly. Interviewee D has the same perspective as Interviewee C when highlighting citizen workshops. Interviewee D viewed the citizen workshops as reducing uncertainties by validating the effectiveness of their approach (D-P001; D-P002).

The other parallel process involves developing the structure and details of the project, which includes, for instance, concretizing the structure as an art form and the analysis of children's workshops. Firstly, as the project began to emphasize creating an art form, it gained a more nuanced structure. Interviewee B highlighted a turning point where they recognized the lack of criticality in the initial ideas of the project's structure (B-D006). This realization eventually led to one of the core characteristics of the project, demonstrating a structure that "in itself threw artistic and political value" (B-D009).

Analyzing the data from the children's workshop, as the second instance, was vital in developing the project's structure and details. The Studio needed to synthesize data such as children's imaginations, hopes, worries, and demands to the museum, and transform them into an effective form acceptable to subsequent participants. The team dedicated efforts to analyzing this data after the children's workshop concluded. Interviewee B emphasized the significance of this process, which resulted in creating four extreme future scenarios that played a crucial role in connecting each session of the citizen workshop. Interviewee B recalled an intense discussion among team members in the late evening to align the levels of each scenario (B-P005). Interviewee C also emphasized how this process allowed them to transform the data into a new form. According to Interviewee C, the use of two axes as criteria played an important role in effectively organizing the data, stating, "...when we applied these axes, my thoughts instantly clarified and became more distinct" (C-D015).

Meanwhile, as shown in Figure 11, both two processes of reducing uncertainties and developing the structure and details simultaneously occurred at various inflection points. For example, examining the IPCC report not only helped the team overcome their limited understanding of the climate crisis and the project's responsibility but also added depth to the project details. Interviewee C explained that reading the IPCC report helped them realize the seriousness of the climate crisis when they initially lacked a clear understanding of the project's meaning (C-P004). Interviewee C believed that the serious contemplation of the report enhanced the quality of design fiction artifacts, such as the storybook and newspaper article, created based on scientific facts (C-P009). Additionally, the phase of creating materials played a role in alleviating uncertainties in team communication and refining the project's details. Interviewee A noted that during the process of refining the materials, they became a tool for conversation among designers (A-D008).

Given the analysis above, it is evident that the project followed a non-linear and complex process intertwined with two parallel processes of reducing uncertainties and developing the structure and de-

tails. This finding enabled the author to identify the types of activities facilitating these processes and categorize them thematically. The upcoming section will explore this analysis, aiming to offer insights into the interplay of critical activities that contribute to facilitating the design process.

3.3 Key activities of the design process that enabled reducing uncertainties and developing structure and details

The activities that facilitated the processes of reducing uncertainties and developing the project's structure and details were classified into seven key themes (see Figure 12). Firstly, it was necessary to identify the client's needs and factual information to mitigate uncertainties. Interviewee A emphasized the significance of this aspect by highlighting the first official meeting as a pivotal moment. They recognized the importance of aligning the team's understanding of the museum's requirements and formulating strategies to meet them. Additionally, Interviewee B supported this perspective by illustrating how a revelation during the curator's discussion with the Studio influenced the project's trajectory. Specifically, the initial concept of the virtual "Energy Department of MMCA" was abandoned after discovering that a similar title had already been assigned to an existing department in the museum during the meeting (B-D003). However, Interviewee B noted that this incident prompted them to approach concept generation with a more critical perspective (B-D004).

Figure 12: Key activities of the design process that enabled reducing uncertainties and developing structure and details

Key activity	*Process*	*Related inflection point*	*Code (supportive code)*
Identification of the client's needs and facts	Reducing	· First official meeting between the designers and curator	· A-P002; A-P005 · (B-D003; B-D004)
Framing with key ideas that rely on designers' intuitions	Developing	· First official meeting between the designers and curator	· B-P009; B-P010; B-P011; B-P012; B-P013 · (B-D009; C-E008)
Integration of data and tools for ideas synthesis	Developing	· Analysis of the children's workshop · Analysis of the citizen workshops	· B-P005; C-P017 · B-P006; B-P007; B-P008; D-P006; D-P007 · (C-D015; D-D012; D-D013; D-D014)
Holistic understanding of scientific facts	Both	· Examination of the IPCC report	· C-P004; C-P005; C-P006; C-P007; C-P008; C-P009 · (C-D007; B-D013; B-D014; B-015)
Deep and lengthy conversations to enhance collective understanding	Both	· Examination of the IPCC report	· C-P007; C-P008 · (C-D001; C-D002; C-D003; D-D001; D-D002; D-D008; D-D009)
Visualization of ideas for team communication	Both	· Intensive ideation session · Materials creation	· C-P001; C-P002; C-P003 · A-P003; A-P004 · (A-D005; A-D006; A-D007; A-D008; A-D010)
Iterative tests to validate the approach	Both	· Pilot workshop · Citizen workshops (children, teenagers, and aged over 46)	· C-P010; C-P011; C-P012 · D-P001; D-P002 · (C-D013; D-D003)

*"Reducing" means reducing uncertainties
*"Developing" means developing structure and details
*"Both" means the process underwent both reducing uncertainties and developing structure and details

Secondly, critical ideas rooted in the designers' intuitions played a significant role in framing the project's direction and aiding its structural development. Framing determines the quality of design projects as it is the key of the design abduction (Dorst, 2015, p. 53). The concept of the future, one of the project's core characteristics, emerged during the early stages, particularly around the first offi-

cial meeting, and framed the subsequent design decisions. Interviewee B emphasized the importance of incorporating the future as an agenda for carbon neutrality, as it prompted the following exploration of speculative design (Dunne & Raby, 2013) and design fiction (Bleecker, 2009), which contributed to the project's structure (B-P009; B-D010). When discussing the origin of the idea and its relevance, Interviewee B and the interviewer assumed that the future resonated with the carbon neutrality agenda because it might not feel immediately realistic and pressing (B-P013). Interviewee C shared a similar assumption, saying "the net-zero agenda itself may be futuristic" (C-E008). While these assumptions were made in retrospect, the designers at the time naturally drew inspiration from future-oriented ideas and among various resources from grounding research, which guided and framed the subsequent design efforts and decisions in establishing the project's structure.

The third key activity is a holistic understanding of scientific facts that could reduce uncertainties and refine the project details. Interviewee C emphasized this aspect, highlighting how it helped the team to grasp the gravity of the climate crisis and the project's responsibility (C-P006). As a result, it sparked intense discussions among team members regarding the artifacts they were creating based on the scientific facts from the report (C-P007), ultimately contributing to enhancing the quality of design fiction pieces such as the storybook and newspaper article (C-P009), which played a crucial role in the successful completion of the project (B-D013; B-D014; B-015).

The fourth critical activity revolves around the significance of deep and lengthy conversations among team members in fostering collective understanding and advancing the design process. Through continuous discussions, designers could uncover even minor discrepancies or contradictions in their understanding and align their perspectives. Interviewee C highlighted the wide range of discussions they had to convey the team's message and achieve the project's goals while comprehending the scientific facts from the IPCC report (C-P007). According to Interviewee C, these efforts ultimately propelled them to achieve a high level of detail (C-P009). Furthermore, they recalled instances of in-depth conversations about the project's identity and direction, which helped overcome ambiguity in the initial stages (C-D001; C-D002; C-D003). Interviewee D supported this, stating that these profound and extensive conversations facilitated the crystallization of shared goals, values, stances, and expected outcomes of the project (D-D001; D-D002).

The visualization of ideas also played a pivotal role in design development, particularly regarding team communication. Interviewee A underscored the importance of materials creation, facilitating constructive communication among team members. According to Interviewee A, these materials served as the communication tool for contemplating their practical application (A-D008). Additionally, Interviewee C emphasized the value of the intensive ideation session, where ideas were given shape and shared among team members, mainly when uncertainty surrounded the utilization of various references (C-P001). Through this process, scattered individual ideas were synthesized into "our ideas" and turned into a new phase (C-P002; C-P003).

The sixth activity facilitating progress was integrating data and tools for synthesizing ideas. Synthesis is considered one of the core attributes of design practices (Kolko, 2009, p. 1). We particularly synthesized ideas during the analysis stages of the children's and citizens' workshops. To analyze the

results from the children's workshop, Interviewee C emphasized using criteria consisting of two axes that helped organize the data. They highlighted how mapping the data along these axes allowed clarity and organization (C-D015). Similarly, during the chaotic phase of analyzing the extensive data from the citizens' workshops, Interviewee B found the "Government as a System" policy framework made by the UK's Policy Lab to help synthesize and transform the scattered data (B-009). Interviewee D also supported this, arguing that the framework enabled them to deal with vast data (D-D014). In both cases, integrating tangible and concrete tools with the data allowed the team to manage and make sense of the information effectively.

Lastly, iterative tests played a crucial role in validating the team's approaches. Since the pilot test with school children, the project has iteratively interacted with targets in the series of workshops, with each session serving as an iterative opportunity to evaluate their designs. Interviewee D highlighted the significance of these iterations, noting that they contributed to the success of later sessions (D-D003). Consequently, many of the citizen's workshops were identified as inflection points by Interviewee D (D-P001). Interviewee C also emphasized the importance of the pilot test as it alleviated their concerns, confirmed design issues, and provided a clear vision of the actual workshop (C-P010). The iterative tests provided them with certainty and confidence and allowed for the refinement of project details realistically and accurately.

IV Discussions

As a case study of the design development process for a policy design experiment for sustainability transitions of a public art museum, this report contributes to the transitions research area. It does not aim to develop a replicable framework or model but offers a comprehensive account of the design process enabling a sustainability project. As the field emphasizes the need for "in-depth single case studies" (Köhler et al., 2019, p. 18), the detailed narrative of this design process can serve as an inspirational case in the research archive of transitions research. Furthermore, since this case was situated within the unique context of a public art museum in South Korea, it provides practical knowledge about operationalizing sustainability transitions research in relevant future contexts. It serves as an example of how design activities for sustainability transitions in a public art museum can be approached and how it differs from other contexts.

This report can also serve as a source of inspiration for designers seeking innovation in a broader context of sustainability. Given the extensive scope and objectives of the project, the design team invested significant time and effort in framing and defining, partly due to our ambitious goal of creating multiple impacts. However, it is essential to note that sustainability transitions research inherently about "big picture" questions. Scholars in the field believe that the rapid growth of this area can be attributed to the enthusiasm and creativity generated by these broad inquiries (Köhler et al., 2019, p. 3). Therefore, the challenges we encountered during the process, stemming from the project's expansive scope and objectives, may also arise in other design activities focused on sustainability transitions. While this report does not provide replicable "design solutions," it offers valuable perspectives to reduce uncertainties and develop the project's structure and details. These insights can inspire designers working within specific contexts with unique challenges and problems.

In addition, this project's non-linear and complex design process can reassure designers who are exploring new design approaches. Many interviewees, even including the interviewer, acknowledged that the process of this project was particularly ambiguous and challenging, compared to their previous projects. This was partly due to our experimentation with a new approach. While our approaches may align with existing design theories, as observed by some researchers, we did not adhere to a conventional design framework; instead, we ventured into uncharted territory to identify the optimal intervention point within the specific context. Transition design emphasizes the importance of "new ways of designing' as a fundamental element of its framework. It underscores the learning and evolving process of transition design through novel approaches facilitated by a mindset focused on long-term change (Irwin, 2015). We were aware of the potential challenges inherent in adopting new ways of designing within a non-linear and complex process. Therefore, the narrative of our design process can provide reassurance to designers who may feel uncertain and disoriented when attempting innovative approaches to achieve sustainability within their own specific contexts.

Beyond the design community, this research has the potential to inspire museums and cultural institutions to collaborate with designers for sustainability. As highlighted in the introduction, museums and cultural institutions worldwide have made significant efforts to address the challenges posed by the

climate crisis. However, although these efforts often need radical innovation to transition the entire system for sustainability, they instead tend to be incremental. Even when institutions are willing to undergo radical transformations for sustainability, they often face complex and interconnected problems involving social, cultural, technical, and economic issues. DfST can be a valuable approach as it recognizes the wicked problems inherent in complex systems related to sustainability and explores alternative solutions to address them. In this context, the insights presented in this report can contribute to museums and cultural institutions by enhancing their understanding of the design process and facilitating better communication with designers.

However, it is important to acknowledge that this research lacks the perspectives of the museum staff and citizen participants who are the main actors of transitions. The investigation focuses solely on the designers' perspectives since designers explicitly led the process. The absence of their voice limits the depth of exploration regarding the potential implications and opportunities of the design process within the broader context. A more in-depth case study should incorporate multiple perspectives from different stakeholders involved in the process, providing a more contextualized narrative. Therefore, future research on the design process for sustainability transitions in a public institution should involve perspectives not only from designers but also from other stakeholders.

On a personal level, the motivation to analyze the design process of this project stemmed from one factor: the intriguing nature of the journey itself. Beyond the surface-level impacts, benefits, and appeal of the experiment to the museum and design community, all of us, the project team members, agreed that the experience of the policy design experiment for MMCA was a significant opportunity for learning and exploring. As we delved into the challenges and opportunities of collaborating with a public art museum, we gained insights into new concepts such as sustainability transitions, design futures, citizen empowerment, and the museum's sustainability efforts. These lessons have opened up new possibilities for us. It is worth noting that the process, rather than the completed output, has left these legacies. As Dixon indicated, inspired by Dewey's notion of experience and pragmatism, design enquiries can transform not just things and consequences but also meanings and relations encountered (Dixon, 2019, pp. 15-16). It was a completely non-linear, complex, and fuzzy journey. While the perspectives on enabling a design process discussed in this research may not be entirely novel and could be perceived as commonplace or trivial occurrences in all design activities, it is essential to acknowledge what specifically facilitated the process of learning and exploring for sustainability transitions. In doing so, we can appreciate design inquiry as not only producing a great outcome but also a process for growth.

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Appendix

Appendix 1. Original excerpts and simplified and clarified version in English of the interviews cited in the thesis

Code	Original Excerpts	Simplified & clarified version in English
A-D001	우리 너무 돌아가는 거 아닌가라는 포인트들이 있었어요. 예를 들면 a/b 콘셉트 제안이 4 월 7 일이죠 저는 사실 이때 이미 우리가 할 거 다 나왔다고 생각해요. 4 월 7 일 날 근데 그 다음에 이제 지금 아래 "아이디어 좁히며 주요 키워드 콘셉트 도출"이라고 4 월 28 일자에 나와 있는 게 있는데 저는 이게 사실 도출은 아니었다고 생각해요. 저는 검증이었다고 생각해요.	Our big picture was captured at the time of the two concept proposals, and the rest of the year was just a time of validation.
A-D002	a/b 중에서 어린이부터 시작한 콘셉트이 있었는데 그때부터 사실 저희가 할 수 있는 코어 아이디어가 나왔는데 근데 저희가 이 아이디어 자체가 굉장히 좋은데도 불구하고 뭔가 우리가 기존 거를 계속 보다가 보면 조금 물릴 수가 있잖아요. 그러니까 이게 정말 좋은 디자인인데 계속 보면 그럴 수도 있잖아요. 저는 그런 거 좀 있었다고 생각해요.	Even though I really liked the idea of working with children in both concept proposals, I think we spent a lot of time doubting and validating ourselves.
A-D003	근데 그런 과정들이 사실, 아이디어를 좁힌다는 느낌이라기보다는 기존의 이 a/b 콘셉트이 정말 괜찮은가라는 거를 확인하기 위해서 다른 아이디어들도 던져보고 이렇게 좀 검증하는 시간으로 저는 그렇게 생각이 됐었거든요.	After two concept pitches, the idea was not narrowed down, but rather validated to make sure the concept was really good.
A-D005	실제로 이 서비스 디자인이, 발전이라고 해야 되나요? 그러니까 정말 저희가 디자인했다고 생각되는 과정이 매터리얼을 만들었을 때, 시각적 매터리얼을 만들었을 때.	The real evolution of the concept began when we started creating visual materials.
A-D006	그 이전 한 달인가요 한 달 반 동안 대화를 하면서 나눴던 어떤 진전보다 한 3 일에서 4 일 정도 매터리얼을 만들어, 그 정도는 아니고 한 2 주 정도를 매터리얼을 만들면서 썼던 기간에 좀 더 서비스 디자인을 워크숍을 준비하면서 더 많이 진전이 이루어진 것 같거든요.	It seems that more progress was made during the approximately two-week period when we were creating materials for workshop preparation than in the previous month and a half of conversations
A-D007	그 도구를 만들면서 실제로 이 사람들이 어떻게 쓸 수 있을지에 대해서 고민을 많이 했었잖아요. 근데 그 과정에서 분명히 준이랑 김 교수님 따님 그렇게 리허설 하는 그 과정도 있었고. 결국 그것도 매터리얼을 만들면서 했었잖아요.	As we created the material, we started thinking a lot about how people would actually use and adopt it.
A-D008	만드는 게 실질적으로 우리가 최종 워크숍에 쓰이지 않더라도 그거 자체가 워크숍을 하는 참여자들과 디자이너 간의 대화 도구가 아니라 디자이너들끼리도 대화 도구가 됐었다고 생각이 들어요.	Even if some materials weren't used in the final workshop, it became a conversation tool among the designers working together.
A-D010	리서치 같은 경우에는 조금만 내려도 mmca 가 확 올라가죠. 대신 얘는 힘을 주기가 굉장히 어렵죠. 뭔가 이걸 찾고 이러기가 그 다음에 이 a/b 콘셉트 같은 경우에도 얘보다는 조금 더 멀리 있어가지고 움직이는 방향이 있어서 좀 그거 하지만 그래도 이 리서치로만 변화시킬 수 없는 걸 좀 더 힘을 주기가 힘들고 메터리얼이나 이런 것들은 딱 적당한 위치에 있었던 것 같아요.	While research is easy to do and can easily influence a project, things like creating materials and coming up with A/B concepts are harder to do but are not possible with research.
A-P001	a/b 컨셉 제안이 하나 있고요.	Two concept pitches were one of the most important inflection points
A-P002	첫 공식 미팅의 방향성 문의도 되게 큰 파트였던 것 같아요. 왜냐하면은 17 일 거랑 4 월 7 일 거랑 그러니까 이게 거의 이해관계자랑 대화하는 게 거의 중심이면서	It's important to start the conversation with stakeholders by discussing direction at the first formal meeting.
A-P003	이 파일럿 워크숍이랑 이 뭐였지 8 월 초부터 8 월 11 일까지를 제가 생각하는 어떤 가장 큰 그거라고 했었거든요. 제가 아까 얘기했던 매터리얼을 만드는 기간이 8 월 10 일 날 어린이 워크숍이 7 월 27 일자부터 근데 저희 현장 미팅은 제가 없어서 모르겠는데 무슨 동화책 만들고 그 다음에 어떻게 피티 만들고 이 기간이 7 월 말 중순부터 8 월 11 일이었잖아요. 그때 기간이 되게 컸었던 것 같고	A big evolutionary period was around the time of the pilot test, when we started building the material in earnest.
A-P004	실제라기보다는 그냥 매터리얼을 만들던 시기가, 실제 그러니까 워크숍에 쓰이는 것뿐만 아니라 디자이너들끼리 대화하면서도 그게 발전이 됐던 것 같아서 매터리얼을 만들던 시기 전부가 다 저한테는 좀 진전이 되게 크게 일어났던...	We've made great progress internally with tangible materials and concrete communication between designers.
A-P005	첫 공식 미팅의 방향성 논의 같은 경우에는 우리가 실제로 그 이해관계자의 어떤 니즈랑 그 다음에 저희가 할 수 있는 것들을 좀 맞춰가는 과정에서 그 의미가 되게 컸다고 생각이 들었고요. 그런 부분에서 굉장히 컸던 것 같고	During the discussion on the direction of the first official meeting, I felt it was crucial to align our understanding of stakeholders' needs and determine how we can meet them. It played a significant role in our progress
A-P006	a/b 콘셉트 제안 같은 경우에는 얘가 3 월 17 일 때 나왔던 얘기들이 좀 그 방향성이나 어떤 식으로 워크숍을 진행해 나갈지를 구체화하는 과정 중에서 되게 큰 진전이 있었어서	This was a big step forward for us because we had a great direction from the two concept proposals.
B-D003	여기 어디쯤에 우리가 굉장히 크리티컬하게, 그거 있었잖아요. 탄소 중립 부서, 네 맞아요. 그런데 그거를 미팅을 과천과학관이랑 하면서 이 위에 어딘가 있어야 될 텐데 그건 안 된다라는 식의 그런 얘기를 성용희 학예사님한테서 우선은 그러니까 에너지 부서 자체가 국현에 존재하고 그 에너지	When we first came up with the idea of an 'Energy Department', we were convinced that we should go with this concept, but after a meeting with the curator, he told us that a department

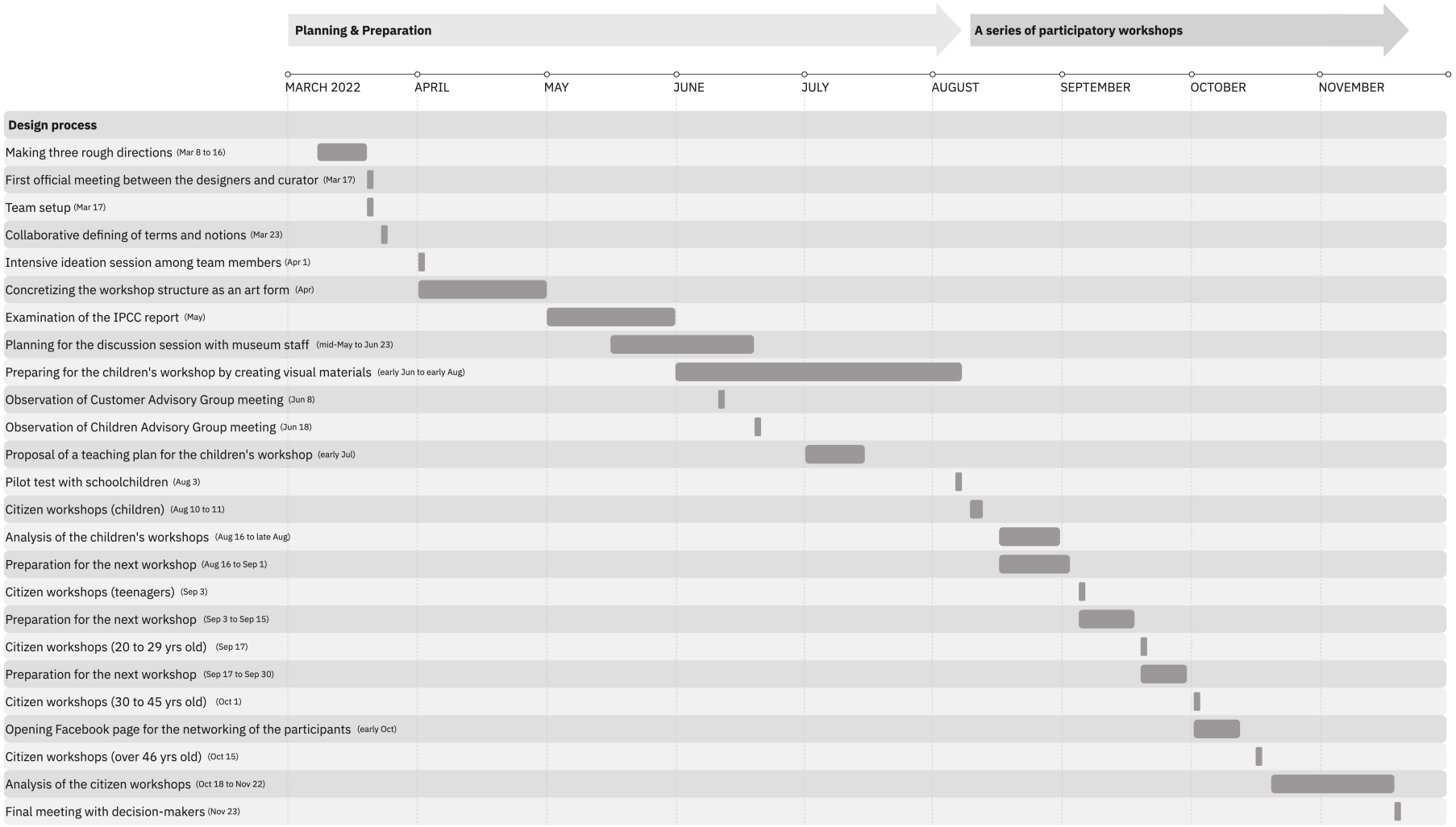
	부서는 새로운 걸 하는 게 아니라 그냥 관리하는 조직이기 때문에 그게 탄소 중립 부서라고 하면 그런 오해가 있을 수 있고 그러니까 부정적인 이미지를 우선 주고 시작할 수도 있는 데다가 그게 새로운 혁신을 하는 TF 라고 보이기보다는 그냥 관리하는 부서로 보일 수도 있고 이런 여러 가지 문제 때문에 그렇게 안 갔으면 좋겠다라고 강하게 한번 들었던 것 같아요. 왜냐하면 제 기억에는 국현이 탄소 중립 부서 혹은 tf 를 만든다면 이런 질문이 딱 나왔을 때 제가 그 팀원들이 다 있는 자리에서 효리한테도 그랬고 뭐 끝났네 뭐 좋은 거 나왔네 이제 이거 정리하면 정리하면 되겠다. 이렇게 해서 이렇게 갑시다 이렇게 했는데 그러고 나서 굉장히 강하게 그렇게 얘기를 들어서 그렇게 가면 안 되겠다. 또 이렇게 뒤집혔던 것 기억이 있거든요. 그게 언제였는지 모르겠네요.	with the same name already exists in the museum and that the department does not innovate for carbon neutrality, but simply manages energy, so using the same name could be confusing and create a negative image.
B-D004	가지고 이때 제안을 할 때 에너지 부서 릴레이 이런 걸 드렸는데 그때 성용희 학예사님은 사실 제 기억에는 둘 다 좋다. 근데 에너지 부서가 조금 어렵다. 에너지 그게 있다 이미 그래서 저희가 그럼 뭐가 되어야 하느냐, 라는 얘기를 하면서 또 아이디어 자체도 좀 더 디벨럽이 되고 더 크리티컬하게 보고 그러면서 좀 디벨롭이 됐었던 것 같아요. 그래서 나왔던 게 탄소 중립 부서	As a concept for the workshop, we proposed the Energy Department, but we withdrew it after the curator told us that the title already existed, so we looked at it more critically while redeveloping the idea, and the result was the Carbon Neutrality Department.
B-D005	이게 어쨌거나 예술적 가치가 있어야 한다. 여긴 미술관이니까 그 사람들이 와서 예술을 본다 혹은 경험한다는 것은 저는 이건 뭐 제가 굉장히 예술을 편협하게 보는 걸 수도 있는데 그걸 보고 정말 에스테틱한 감동을 느끼거나 그게 아니면 자신의 생각에 도전을 받거나 둘 중에 하나는 반드시 있어야 된다고 생각하거든요. 둘 다 있으면 제일 좋지만	We believed that an experience in an art museum should be aesthetically pleasing, challenging, or both, so we thought our project should be the same.
B-D006	우리가 예술이라고 하는 것은 계속 그렇게 우리 시대가 가지고 있는 어떤 사고의 한계 fixation 이런 것들을 깨줄 수 있는 힘이 있어야 된다고 믿어서 그래서 이제 그리고 그런 것들이 시대 정신을 반영해서 그 시대가 보지 못하고 있는 것들을 보여줘야 된다고 생각을 했었고. 이 아이디어들에서 그런 크리티컬함이 없다라는 생각이 많이 들었던 것 같아요. 그래서 저도 기억이 나는데 여기 퍼플 10 에서 제가 이렇게 삼각형 그리면서 그때 영어로 회의할 때니까 케지아 있었을 때 그래서 이제 이런 표현을 쓰면서 이게 아 예술로서의 가치가 있는 형태를 가졌으면 좋겠다라는 게 하나였고	Art should reflect the zeitgeist and show what the zeitgeist doesn't see, and I remember emphasizing art form to my students because the early ideas we were putting out were lacking in that regard.
B-D009	이 프로젝트를 두 줄로 요약하라고 하면 시민참여 그리고 특히나 어린이의 참여를 가지고 와서 그것이 유의미한 어떤 대화로 이어질 수 있다는 걸 보여줌으로 인해서 그 자체가 예술적 가치 정치적 예술적 메시지를 던질 수 있는 가치가 있고 두 번째로는 그렇게 해서 나온 결과물이 국현에서 정말 쓸 수 있든 없든 국현에 뭔가 시사하는 바가 많은, 그리고 어떤 영국에서 만든 그 프레임웍에 앉혀져서 적어도 그 데이터를 그냥 날 것으로 보지 않아도 되는 구조를 제공했다. 이 두 가지의 큰 의미가 있다고 생각을 하고요.	The project can be summarized in two ways: The first is the civic engagement, where the participation of children, in itself, threw artistic and political value and led to a meaningful dialog, and the second is the effective delivery of policy proposals that have implications for museums and can be applied to the UK framework.
B-D013	사실은 여기 다 모든 게 디테일이라고 생각한다고 했잖아요. 그런데 디테일이 중요하지 않다는 뜻은 아니에요. 그러니까 얘네가 전체 틀을 바꿀 수도 있어요.	This is not to say that the details don't matter, as you can change the whole thing by tweaking the details.
B-D014	결국은 이 디테일들이 완성이 될 수 없으면 워크숍은 존재하지 않는 거고 결국은 이 디테일들이 전체 구조를 바꿀 수도 있는 거고 예를 들면 어린이들한테 탄소 중립이 뭔지 짧은 시간 안에 이해시킬 수 있는 방법이 전혀 없다. 그럼 어린이 워크숍을 이렇게 할 수 없겠죠. 근데 우리가 방법을 찾아냈고 그게 결과적으로는 그럭저럭 잘 통한 것 같거든요. 그러면서 애들은 너무 공포심으로 몰아넣지도 않았고 그래서 괜찮았던 것 같고	It's the details that get the job done. For example, consider how we effectively taught children to understand carbon neutrality in a short amount of time, through detailed workshop session design.
B-D015	신문으로 했던 거 굉장히 효과적이었던 것 같고 심지어 갱지까지 민주가 찾아가서 자기 내 돈 내산으로 갱지를	Newspapers were a great way to communicate the climate crisis. The effort to use newsprint papers to showcase details paid off
B-P001	워크샵 스트럭쳐에서 아트폼 이거 얘기했던 게 언제인지 모르겠네요. 그게 되게 중요할 것 같은데	A key inflection point was the emphasis on workshop structure and artform.
B-P002	저는 어린이 워크숍이 끝나고 청소년 워크숍으로 넘어가는 시점에 우리가 이거를 이걸로 이제 통역해야 되는데 거기에서 저는 그러니까 여기랑 여기에서 학생들이 우리 팀원들이 되게 마음고생이 심했던 것 같거든요. 그때 여기에서 나온 결과물들을 4 개의 시나리오로 빡세게 딱 정리하고 얘를 어떻게 활용할 지가 정해졌단 말이에요.그게 저는 되게 중요했다고 생각해요. 저는 이 어른, 청소년 포함해서 이게 다 같은 폼이었는데 여기서 제일 중요한 건 이거였다고 생각해요.	The team struggled to interpret the results of the children's workshop. But the four scenarios they created proved invaluable in later workshops.
B-P003	그렇다고 해서 이 앞에 나왔던 신문이나 이런 게 안 중요하다는 게 아니고 이게 이제 당연히 기본을 깔아줬기 때문에 일로 넘어올 수 있어.	The newspaper distributed before the four future scenarios was also important. The newspaper would have enabled the discussion of the four future scenarios
B-P004	이 네 개의 익스트림 시나리오를 우리가 만들어내지 못했다면 그리고 결국은 얘가 얘와 얘의 링크잖아요. 그러면서 이게 없었다면 이게 기폭제가 돼서 특히나 20 대 워크숍 30 대 워크숍 굉장히 깊이 있는 대화와 중요한 어떤 가치에 대한 질문들을 많이 던졌는데 그게 이게 없었다면 안 됐을 거라서	The depth of discussion in the teen to adult workshops would not have been possible without the four extreme scenarios generated by the children's workshops.

B-P005	아이디어가 5 개인가 7 개 있었는데 걔네가 레벨과 층위가 잘 맞지 않아서 정리하는데 약간 고생을 했고 그래서 마지막에 세 개를 정했는데 나머지 하나가 안 정해졌나 아무튼 그래서 그걸 딱 빡세게 정리한 날이 있었어요. 약간 늦게까지. 네 맞아요. 그런 날이 하나 있었는데 그날이 매우 기억이 나고요.	We had a lot more concept candidates before we settled on four, and it took some time and a lot of hard work for the team to refine and narrow it down to four.
B-P006	그래서 이제 이걸 도대체 어떻게 정리할 거냐, 해가지고 혼돈의 카오스 막 이러고 있었을 때 이걸로 해보면 어떻겠냐 라고 제가 제안을 드렸고	So, at that time, the question was, how should we actually organize these? When things were chaotic, I suggested using this framework and seeing how it went.
B-P007	그런 다음에 그럼에도 불구하고 너무 복잡하니까 그래서 이걸 약간 합리적으로 나누어서 이미 잘하고 있는 거 그리고 즉시 해야 할 거. 먼 미래에 해야 할 걸로 나눠서 이거를 사람들이 보고 논의하는 것만으로도 이렇게 하면 이제 코에다가 후크를 딱 거는 효과가 생기지 않나 왜냐하면 당장 해야 될 거에다 집어넣어버렸으니까. 그러면 이제 못하게 했으면 여기다 넣으면 되고 잘하고 있는 거 여기다 넣으면 되니까 이제 해야 되는 것만 남는 거잖아요. 그래서 이거를 말하자면 이렇게 이용을 한 거죠.	Even though we implemented it, it was still too complex. Therefore, I proposed dividing it into more rational categories, such as things that the museum is already doing well, things that need to be done immediately, and things that should be considered in the distant future. By presenting and discussing these categories, I believed it would capture the decision-makers' attention, especially since we included urgent matters.
B-P008	근데 이제 이걸 제안한 건 우리가 제안한 거고 이 사람들이 그때부터 오너십을 가질 수 있게 만들어주려고 했던 건데 이것도 잘 안 됐지.	Our intention was to divide the matrix into those three levels so that the museum could take ownership of it, but it didn't work out that way.
B-P009	생각해 보니까 진짜 중요한 게 하나 빠졌네요. 뭐냐면 우리가 미래를 이용하겠다고 생각한 시점 이 학생들을 2061 년 81 년으로 데려가겠다.	The idea of harnessing "the future" for a net-zero agenda is also a key inflection point.
B-P010	그러니까 이거랑 이게 잘 잘 잘 합쳐지지 않았나 그래서 어떻게 보면 여기서 아까 소설 이야기도 했고 그렇죠 동화책 이야기도 했고 신문 이야기도 했지만 뭔가 엠파틱한 언더스탠딩을 만들어내는 게 되게 유효했다라는 생각이 들거든요. 근데 그게 정확히 왜냐하면 어느 시점부터는 너무 당연하게 여기고 작업을 했기 때문에. 명확히 나오진 않지만 뭔가 그랬겠네요. 지금도 기억이 나는 것 같고 우리가 이렇게 아이디어 스프린트를 할 때 사람들을 미래로 데려가는 이야기들을 하기도 했던 것 같고 미래를 이용하는 그리고 크리티컬 디자인 우리가 다 같이 speculative design 영상이나 이런 걸 보기도 했죠. 디자인 픽션 영상 같은 거 보기도 했고. 그러면서 그거랑 이거랑 이제 이렇게 컨버지가 되면서 이 구조에도 영향을 미쳤을 것 같고 뭐 명확히 트레이스 백 되는 건 아니겠지만 그런 영향들이 있었을 것 같은데요.	I think the process of exploring things like speculative design and design fiction, from the time we had the idea of using imagined futures, made us understand things more empathetically and influenced the whole structure.
B-P011	미래라는 키워드는 계속 조금... 처음부터 끝까지 있었구나.	Future keywords were present from the very beginning of the project
B-P012	유효한 것 같아요. 그게 유의미한 건 미래로 가기 때문에 현재의 어떤 제약들을 많이 없앨 수 있고 그리고 그걸 공감적으로 상상할 수 있게 도와줌으로써 무엇을 바라는지 말할 수 있게 하고 세 번째로는 그렇게 세상이 바뀌어도 안 바뀌는 게 뭐지? 이걸 확인할 수 있고 그게 좀 되게 재밌는 것 같아.	It's interesting how setting the story in the future allows us to: 1) move beyond the constraints of the present, 2) imagine empathetically, and 3) see what hasn't changed in the world despite this.
B-P013	근데 사실은 어쩌면 너무 당연할 수도 있고. 그게 탄소 중립이라는 게 당장 지금 우리가 뭐 살기는 불편하지만 죽을 정도로 불편한 건 아닌데 미래를 걱정하기 때문에 하는 거니까 그리고 우리가 아마 자연스럽게 이 미래에 대해서 사람들이 공감하지 못하고 느끼지 못하기 때문에 지금 행동을 바꾸지 않는 게 아닐까 이런 얘기를 하지 않았을까요? 그래서 그걸 좀 이렇게 공감적으로 상상할 수 있게 도와줘야겠다. 이런 얘기도 했었을 것 같고	It might be natural to come up with the idea of using future to address the net-zero project. We may have assumed that because it doesn't directly harm our lives right now, and because we don't empathize with a climate crisis future, we can't change our current behavior.
C-D001	한 4 월 5 월 이 사이에 머리 아프게 정말 이거 그래서 어떻게 되는 걸까 막 헤매고 있을 때 언니랑 저랑 미팅을 했었잖아요. 줌 미팅. 여기서 한 8 시간 했던 게 줌 미팅 이전인지 이후인지 잘 모르겠지만 저는 아무튼 그 시기가 되게 인상 깊거든요.	My favorite part of the design process was the long hours of brainstorming with my teammates.
C-D002	어린이부터 시작해서 청소년 이렇게 하면 재밌겠다. 근데 어떻게 하지? 나중에 생각해 보자 이렇게 했었어요. 그렇게 했던 줌미팅이 인상 깊고 그러고 나서 여기 퍼플 9 에서 막 정말 머리를 싸맸잖아요. 누구를 모집하며 어떤 장소에서 무엇을 위해서 어떤 방식으로 할 건지 얘기를 한꺼번에 나누는 시간이었는데 그때 저는 뭐가 문제인지 모르겠는데 그 이어폰 이렇게 엉킨 것처럼 어디서부터 어떻게 해야 될지 모르겠는 뭔가가 있어요.	There was a period in our early internal discussions where we were stuck with a mix of practical and fundamental problems.
C-D003	그게 당장 어떤 결과를 만들어내지는 못했더라도 그러니까 우리가 워크숍 이렇게 진행할 거야 하고 제안서 같이 딱 나오지 않았더라도 엄청나게 도움이 됐던 순간이었던 것 같아요.	Long discussions to find the solution to a tangled problem, even if they didn't produce a tangible result, were considered beneficial in the long run.
C-D007	그리고 당시에 좀 어려웠던 건 그런 게 있어요. 디자인 워크숍 세션들 간의 관계를 짜면서 동시에 시나리오를 제공할 거니까 그게 과학적 기반이 있어야 돼서 ipcc 리포트를 읽고 이해하는 거.	It was challenging to organize the workshop in detail while also understanding the IPCC report to build a scientific foundation.

C-D012	이걸 해서 우리가 무엇을 알아냈지 이걸 했기 때문에 시민 참여 워크숍이 뭔가 달라진 게 있을까 하면 저는 잘 모르겠어요. 근데 이 당시에는 너무 헤매고 있었고 무엇이든 재료가 필요했기 때문에 큰 도움이 되었던 것 같아요, 이 순간에서.	I don't know how the pre-discussion session changed the direction of the workshop, but at the time I felt lost and needed materials for anything, so that was helpful in itself.
C-D013	사실 저는 이때 좀 무서웠어요. 7 월 말에서 8 월 초에 우리가 준비한 워크숍이 어떻게 진행될지 저는 디자인 워크숍 준비 이런 걸 할 때 항상 머릿속으로 상상을 해봐요. 가자마자 뭐를 준비해야 되고 이다음에 세션이 진행되면 사람들은 어떻게 반응할까 그다음 나는 어떤 준비를 해야 하지 이런 상상을 하는데 모르겠는 거예요. 어린이들이랑 같이 해본 적도 없고 이런 교육 프로그램을 워크숍도 해본 적이 없어서 어떻게 진행될지 감이 안 됐는데 파일럿 워크숍 해보니까 너무 괜찮다 너무 잘 될 거야 이런 믿음이 생겼어서 좋았었고요. 어린이 워크숍도 즐겁게 진행을 했었죠.	I was scared because I had never run a program for children before, and I couldn't imagine what it would be like to run an actual workshop, but after doing the pilot test, I was able to get a feel for it and believe that it could work.
C-D014	이 어린이 워크숍 결과를 분석해서 다음 워크숍을 쓸 수 있는 작업을 만들어내는 활동이라고 할까요 기간이 너무 즐거웠었어요. 그거를 분석하면서도 계속 회고하면서 배우는 게 있고 성찰하게 되는 거가 있었던 것 같아요. 우리가 워크숍을 어떻게 준비했었고 애들은 이런 대답을 해주네 왜 이런 대답을 했을까 하는 것도 있고 그거 모아오면서도 그 과정 자체가 저는 되게 즐거웠거든요. 어린이들이 한 말을 다음 재료로 만든다는 그 순간도 재밌었고.	I enjoyed the process of analyzing the results of the children's workshops and creating materials for the next workshop, reminiscing about the previous workshops and being creative.
C-D015	얘네를 이 매핑을 했기 때문에 두 축으로 골고루 보겠다는 마음을 갖고 콘셉트를 다시 보니까 걔네가 구체화되는 것도 있고 머릿속으로 정리가 됐었어요. 전에는 재밌는 아이디어들이 여러 개가 있다, 였는데 이 축을 가져오는 순간 머릿속에 좀 정리가 되었어서 그것도 명확해졌던 순간이라 인상 깊어요.	As we mapped it out along two axes with the intention of ensuring a balanced view, the data started to take shape, and my thoughts became organized. Previously, we had interesting data, but they were somewhat scattered. However, when we applied these axes, my thoughts instantly clarified and became more distinct. It was a memorable moment when everything fell into place.
C-P001	아이디어를 내고 걔가 a/b 콘셉트으로 뽕 전환된 거... 사실 이 아이디에이션 스프린트 전까지는 저 스스로 많이 헤맸었어요. 그러니까 새로 처음 보는 재밌는 재료들도 많고 자료들 레퍼런스가 막 있고 다른, 뭐랄까, 프로젝트들 이런 걸 찾아보고 했었잖아요. 그래서 재밌어 보이는 건 너무 많은데 그래서 이거를 어떻게 할 건지가 전혀 감이 안 오는 거예요. 근데 이 아이데이션 해보는 과정 자체가 뭐가 됐든 어떻게든 꺼내놔서 서로 공유한다는 게 저한테는 뭔가 바뀌었어요. 그 전과 달라졌어요.	At a time when we had no idea what to do or how to do it, the internal ideation session was the first turning point in our design evolution when the team bounced ideas off each other and narrowed it down to two ideas.
C-P002	그게 ab 콘셉트으로 줄어져서 우리 팀의 의견이 된 것도 인상 깊었고 이 아이데이션 할 때는 내 아이디어 너 아이디어 이렇게 여러 개가 있었는데 그게 두 개로 우리 팀의 아이디어가 된 게 저는 인상 깊어서 여기 빨간 점을...	Through this process, scattered individual ideas were synthesized into "our ideas" and turned into a new phase
C-P003	개인으로 봤을 때 데스크 리서치하면서 인풋을 계속 늘려나가다가 아이디에이션 스프린트 했기 때문에 아웃풋을 만들어냈는데 그게 팀의 과정에서 보면 개인들의 아웃풋들이 사실은 팀의 인풋인 거예요. 그래서 우리 팀의 재료들. 그래서 개를 한 번 더 가공해가지고 콘셉트 a/b 가 나온 것이 아닌가 그러면 이걸 어떻게 볼 수 있을까?	The team's input through ideation was actually a product of each team member's output. This led to the team's output of A/B concept proposals
C-P004	당시에 너무 잘 모르겠어서 뭘 하는지 모르겠고 멋있는 거 재밌는 것만 아이디어를 냈던 것 같은데 ipcc 리포트 보고 나니까 좀 좀 깨달은 것 같아요. 정말로 미래가 있고 우리는 정말 큰일 났구나. 이거를 좀 느낀 순간이었던 것 같아요.	It wasn't until I saw the IPCC report that I realized that our future was in real danger.
C-P005	기후 위기에 대해 경각심을 느끼게 하는 그 수단들이 다 효과적인 그게 다르겠지만 저는 이때 막 리포트 찾아보면서 그걸 더 잘 이해하려고 다른 기사를 본다거나 하면서 공부하는 과정에서 확실히 좀 더 뭐랄까, 몰입하게 되는 순간이 있었던 것 같아요. 숫자가 이렇게 변한다 하면 뭐 그런가 보지 하는데 기온이 올라가는 게 그래서 세상에 어떤 일이 있을 건데 알아보려고 하고 그러면 세상이 이렇게 변하면 또 어떤 문제가 생겨나는데 이런 식으로 생각하게 되니까	Through the activity of connecting the numerical climate crisis scenarios in the IPCC report with the actual impacts on individuals and society through other books and articles, my awareness of the climate crisis was raised.
C-P006	저는 여기 전까지는 그냥 멋지고 재밌는 디자인 프로젝트에 참여한 사람이었는데 이걸 찾아보고 있으니까 진짜로 심각한 일이 있고 그거를 위해서 뭔가를 하고 있구나 이거를 엄청 크게는 아니지만 딱 조금이라도 처음 느끼는 순간이었어요. 기후 변화에 대해 심각함을 느꼈던 순간이었기에 인상 깊습니다.	Analyzing the IPCC report really made me realize the severity of the climate crisis and the importance of this design action we're taking.
C-P007	얘기할 재료가 생겨서 미래를 설정하는 거에 있어서도 몇 년도를 보낼 건데 왜 그때로 보낼 건데 그럼 그때 그런 얘기도 했었죠 뭐, 시나리오가, 정말 별 얘기 다 했잖아요. 그 아니 시나리오가 4 개 5 개 있으면 어떤 시나리오를 기준으로 설정해서 워크숍을 세팅할 건데 이런 논의를 하면서. 그러면 nds 가 말하고 싶은 아니면 nds 가 시민들에게 보여주고 싶은 미래는 어떤 모습인 건데 이런 결정을 해야 되는 순간도 있었어	We analyzed the climate crisis scenarios in the IPCC report together and had a deep discussion about how to interpret and communicate our own intentions.

C-P008	다음에 만든 뉴스 기사나 아니면 동화책이 정말 우리가 말하려고 했던 그 딱 그 시나리오를 제대로 전달하고 있는 게 맞나 이런 고민이 저는 들었었거든요. 그래서 당시에는 되게 섬세하게 탄소 배출이 지금처럼 이어지는 시나리오 혹은 지금보다 완화되었는데 완전히 사회적인 변화를 이뤄내지는 못한 시나리오 막 그런 논의를 나눴었잖아요. 근데 그 논의에 비하면 동화책이나 신문 기사가 정확히 그 시나리오를 따르고 있는 것이 맞는지 계속 스스로 질문하게 되는 거예요.	The question remains whether fairy tales and newspaper articles have captured the intention of interpreting the IPCC report from our own perspective.
C-P009	그래도 이때 진지하게 고민했기 때문에 그 동화책이나 신문 기사를 더 잘 만들려고 아니면 더 과학적인 팩트 기반으로 하려고 노력하려는 동기부여가 됐을 수도 있을 것 같고요.	I think the critical discussions we had while analyzing the IPCC report motivated us to make better fairy tales and newspaper articles based on scientific facts.
C-P010	아무래도 이 파일럿 워크숍 했을 때... 아까 말했던 거랑 똑같아요. 그냥 그전에 확신을 갖고 싶었는데 이게 어떻게 될지 그려보고 싶었는데 해보니까 바로 그려졌다. 그래서 그냥 그대로 진행. 엄청나게 큰 수정이 있지 않고 재료를 바꾼다든지 그런 식으로 되게 짧은 시간 안에 수정 빨리 거치고 어린이 워크숍 바로 갔던 것 같고.	The pilot test gave us confidence in how the workshop would be run. No major revisions
C-P011	워크숍 몰입을 위해서 배경 설정하는 게 너무나 중요한 건 아는데 그거를 엄청 열심히 생각해도 도저히 모르겠었잖아요. 우리가 갖고 있는 재료들도 많고 누가 올지도 모르고 세팅을 어떻게 하고 그리고 현실적으로 그게 가능한지도 모르고 그래서 막 위에 그거 조명 달고 막 했었는데...	There were times when I had no idea how I wanted to run the workshop, and there were times when I was confused about the details of the on-site setup (lighting issues, etc.).
C-P012	저는 어쩌면 그런 고민들도 막상 해보고 나니까 괜찮아 다 괜찮아 그냥 하니까 그냥 다 괜찮아 약간 그런 마음을 가졌던 것 같아요.	The pilot test alleviated many of my concerns and confusions about how to proceed in the field.
C-P014	매트릭스에 올리는 것도, 나는 아무런 전문성도 없고 이걸 제대로 이해하지 못했는데 그냥 내가 미로에 얹은 게 그게 정말로 정책 제언 그게 될 수 있는 건가 약간 쫄았었던 것 같아요. 당시에	Without understanding the matrix, there were doubts and fears about posting citizen comments here and turning them into policy ideas.
C-P015	당시에 저에게는 정책이라는 거는 뭔가 다른 세상의 이야기 어떤 복잡하고 어려운 것 이런 생각이 있었고 시민 워크숍에서 나왔던 아이디어들은 너무 당연하고 일상적이고 누구나 생각할 수 있는 이야기들. 근데 걔랑 정책이랑 갭이 너무 크다고 느꼈던 것 같아요. 저는 그래서 이 매트릭스 준비물은 있는데 그리고 시민들 아이디어 준비물도 있는데 개랑 개가 정말로 같은 곳에 있을 수 있나 이런 고민을 했던 것 같아요.	Citizen ideas are seen as too general and mundane, while policy is seen as complex and difficult, and it was questionable whether the two could be brought together with a matrix as a tool.
C-P016	당시에 저는 이게 시나리오를 만들 거구나 어떻게든 되겠지 이런 마음이었어요. 근데 막상 정말 만들려고 보니까 그래서 어떻게 만드는 거지 그래서 어떻게 해야 되는 거지 하는 생각이 있었지만 우리끼리도 재밌게 하니까 만들어졌던 것 같고요.	We weren't sure how to process the results of the children's workshop, but we made it fun for ourselves.
C-P017	아이디어들이 사실 걔네를 목록으로만 놓고 보면 별거 아니게 느껴질 텐데 그냥 디지털 미술관 그렇구나 하고 말 수도 있는데 우리가 그걸 어떻게든 어린이들한테 나온 아이디어니까 얘를 다음 워크숍 재료로 가공할 거야라는 좀 강한 의지가 있었어서... 이게 되게 즐겁게 진행된 것도 있고 더 멋지게 나온 것도 있는 것 같아요. 우리가 노력을 많이 기울였기 때문에 처음 어린이들한테서 나온 데이터 자체가 그렇게 막 반짝반짝하지 않았더라도 그거를 어떻게든 가공하려는 노력이 있어서 재미있는 네 가지 시나리오로 나왔던 것 같아요.	The children's workshop data is not special in and of itself, but we felt strongly that it needed to be processed and communicated in some way, which led to four interesting concepts
C-E008	네. 탄소 중립 의제 자체가요 지속 가능성을 생각한다는 것 자체가	The net-zero and sustainability agenda itself may be futuristic.
D-D001	구조적으로나 이런 건 아니지만 우리 안에서 정확히 이 탄소 중립에 대한 스탠스를 어떻게 가져갈 것인가도 고민했던 순간이었던 것 같아서 저는 되게 의미 있었던 시간이었다. 그게 어떻게 보면 미약할 수는 있지만 되게 중요한 방향이라고 생각이 들어요.	A team discussion just before the children's workshop to clarify our own position on carbon neutrality helped set the direction.
D-D002	청소년 워크숍이었나 20 대 워크숍이었나 전날 우리가 되게 그 숙소에서 오랫동안 어떤 질문을 할 것인가인데 그 질문을 고르는 과정도 우리가 이 워크숍의 진정한 목적은 무엇이고 어떤 결과물이 나오게끔 하되, 그 결과물의 방향성을 정하되 그것이 이제 시민들의 생각을, 뭔가 픽세이션을 주거나 억압하지 않는 선에서 어떻게 열린 토론을 이끌어낼 것인가라는 그 중심을 잡는 과정이었다고 생각이 들어서 저는 이제 그때 비로소 우리가 명확한 스탠스를 잡지 않았나 어떻게 보면 복잡하고 어렵지만 되게 중요한 우리 안에서의 가치에 대한 대화를 좀 나눴던 것 같아서 그때 어떻게 보면 그 미티게이션이랑 워크숍 결과 기반 미래의 미술관 콘셉트 작업이라고 지금 미티게이션이랑 뭐였죠 반대말, 어댑테이션, 이런 것들을 기반으로 사실은 이제 큰 틀이 잡혀져 있었는데 그걸 어떻게 전달하느냐의 전달 방식에 대해서도 우리가 고민을 어떻게 보면 해보면서 또 다듬어진 시간이었던 것 같아요. 그게 이제 초반부에 들었던 생각이고요.	The night before the teenager workshop, it was important to discuss what questions to ask the citizens, so that we could establish a center, a foundation, a stance: the true purpose and values of the project, and the direction of the desired outcomes.
D-D003	지금 과정을 좀 돌이켜 보니까 우리가 그냥 액션을 되게 잘했다라고 생각했는데 그 액션 사이사이에도 이렇게 이터레이션이 다 있었던 것 같아요. 그래서 그 액션을 쪼개서 이터레이션을 돌려보면서 우리가 이 짧은 2 주 간격으로 워크숍을 진행 했었잖아요. 그 2 주 간격 동안 짧게 전체	The series of workshops acted as an iteration, allowing us to make steady progress and succeed later in the process.

	워크숍 어떻게 보면 우리가 이렇게 길게 크게 본 거를 이제 하나의 워크숍 단위로 쪼개보고 이걸 어떻게 할지 우리끼리 이터레이션을 돌리면서 그 형태는 어떻게 될지 그런 것들을 통해서 나온 결과물이 특히 형태가 아닌가 싶어서 덕분에 이때 우리가 또 잘 방향을 다듬은 덕분에 원래 의도대로 되진 않았지만 오히려 더 성공적으로 후반 워크숍들이 잘 되지 않았나라는 생각도 들고요.	
D-D008	생각해 보니까 우리가 아까 중간중간에 하루 전날 워크숍 질문들을 어떻게 할 것인가 촘촘히 고민했던 그런 시간들 그런 것들도 어떻게 보면 이 결과물에 의해서 또 같이 고려하면서 고민했던 것 같아요.	In the deep discussions we had throughout the project, we probably didn't say it out loud, but we were thinking about the final step of turning citizen workshops into policy ideas.
D-D009	워크숍 다음 날의 워크숍을 위한 게 제일 크긴 했지만 염두에 둔 게 지금 생각해 보면 가장 중요했던 게 에이전시라는 단어였어요. 고민했던 게 그래서 어떻게 이 시민들의 바를 정책 아이디어까지 실어 보낼 것인가가 또 큰 고민이었어서. 우리가 논의가 길어졌던 부분 중에 하나도 이 당장의 결과물이 어떻게 이어질 것인가 하는 그 편에 염두에 뒀기 때문이 아닌가 지금 생각이 드네요.	While the discussions between workshops were ostensibly to prepare for the next workshop, we kept using the word "agency" because we were also thinking about how to connect citizen input to policy ideas, which may have contributed to the length and difficulty of the discussions.
D-D012	제가 시민들의 아이디어를 어피니티 하면, 어피니티 한 거를 이렇게 모아보면 정책이 되겠다라고 했는데 그때 제가 팀원들을 설득을 못 했거든요. 그때 제가 이게 어피니티끼리 뭉치면 정책이 될 것 같다. 그게 저는 막연한 생각이 있어요. 이것도 막연한 생각	Before the matrix, I had the idea of working citizen ideas into affinity diagrams to become policy ideas.
D-D013	보기 전에. 근데 저 스스로도 논리가 부족한 거예요. 왜냐하면 이게 어떻게 정책이 돼, 했는데 그 이 매트릭스가 약간 저는 트랜스포밍 시킨 것 같아요. 그러니까 원래는 그냥 시민들의 아이디어였는데 사실은 저는 저게 하나의 그물망이라는 생각이 교수님 그 말 하셨던 것 같은데 그거를 축을 전환한 느낌이었어요. 저 매트릭스에 얹으니까 그러니까 단순히 그냥 아이디어였는데 저 위에 얹으니까 그 아이디어가 착착착착 붙으면서 물론 떨어져 나가는 것도 있었지만	The matrix was a tool that transformed citizen input that might otherwise be overlooked into something effective as a policy idea.
D-D014	그 시민들의 아이디어를 보면 상상이고 현실적이지 못한 계속 선입견이 있었는데 그걸 저 위에 얹으니까 맥락이 바뀌면서 말이 되더라고요. 현실적인 그래서 어떻게 보면 우리가 시민들의 아이디어를 구체적인 정책의 형태로 연결 짓지 못하는 부분이 있었는데 그걸 저 매트릭스가 되게 좀 성공적으로 도와줬다. 그래서 저도 처음에는 이 아이디어 덩어리들을 모으면 되지 않을까라고 했는데 그 덩어리를 저 위에 얹어버리니까 정책이 될 수 있겠다는 생각이 들더라고요.	Applying citizen input to the matrix, which may not be considered realistic, solved the problem of not giving concrete form to citizen input and allowed it to be contextualized into policy ideas.
D-P001	미술관과 함께-에 세 개를 한 건 사실 저는 이 세 개를 한 건 우리의 기획 의도와 디자인을 결과를 확인할 수 있는 시간들이어서 저는 체크를 다 세 개를 다 했거든요.	I marked these three workshops to indicate the moments where we could assess the outcomes of our planning intentions and design decisions.
D-P002	그래서 그들에 대한 조사 이해도 있었지만 그래서 우리가 탄소 중립과 기후 위기를 바탕으로 만든 이 디자인과 아티팩트 그리고 워크숍의 구성이 정말 유효했는가 그리고 만약에 유효하지 않았다면 어디서 뭐가 안 맞았는지를 저는 계속 확인할 수 있는 시간이었어요.	So, it was a chance for us to continuously evaluate whether the design, artifacts, and workshop structure we created, based on carbon neutrality and the climate crisis, were truly effective. If they were ineffective, it was a time for us to identify what went wrong and where things did not align.
D-P004	우선 어린이 워크숍 결과 기반은 우리가 어떻게 보면 가장 처음 얻은 워크숍 결과물로 분석을 해봤던 시간이었는데 이걸 통해서 또 다른 방향성을 좀 기존의 방침을 크게 수정한 시간이었던 것 같은데 그래서 이 시간이 되게 의미 있게 저는 느껴져요.	After the children's workshop, the existing direction was significantly revised
D-P005	그래서 어떻게 보면 우리가 전체적인 디자인 프로세스를 이미 크게 짜기도 했지만 구체적으로 어떻게 할 것인가라는 좀 현실적인 계획들을 다시 수정하고 피드백할 수 있었던 시간이어서 이때가 중요하게 생각이 들었고	The time right after the children's workshop was important because it allowed us to make more realistic plans about what we were going to do in addition to the big picture.
D-P006	10 월 18 일부터 진행했던 매트릭스를 위한 결합을 위한 프로세스, 이 시간도 이제 전체 워크숍을 돌아보면서 우리가 최종 결과물을 위해서 수정하는 시간, 결과물을 도출하는 시간이었잖아요. 물론 단적으로 결과물을 도출해서 중요한 시간이기도 하지만 특히 저는 이 시간도 앞에 어린이 워크숍 결과 기반 미래 미술관 컨셉트 작업 시간처럼 이 두 시간이 또 의미 있었던 이유는 우리끼리도 이 프로젝트의 목적이 무엇이고 어떤 결과물을 만들어내야 되고, 또 그 시간에 어떤 유의미한 결과물을 위해서 어떻게 또 워크숍을 짜야 하고 약간 결과와 더불어서 그럼 이걸 어떻게 전달할 것인가도 같이 고민했던 거예요.	Applying citizen feedback to the matrix was important because it allowed us to set more specific goals and begin to explore realistic options.
D-P007	저 미팅이 원래는 워크숍이었다고 저는 이해를 했거든요. 그것처럼 궁극적으로는 어떤 아웃풋을 도출할 것이고 그걸 위해서 어떻게 커뮤니케이션 시킬 것인가를 고민했던 시간이어서... 이 시간이 되게 과정이 유의미했던... 그래서 그 시간들이 이 프로세스를 좀 탄탄하게 잘 바꿔주지 않았나	Worked on the matrix to ensure quality communication in the final meeting



Appendix 2. Project chronicle

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To my colleagues, Seongbeom Kim, Sungwon Ryu, Taean Yoo, Gahui Yoon, Jinyoung Chun, Aziza Abdyrazakova, Makida Gebregiorgis Tesfaye, and Yerslan Ababayev. Thank you all for filling the lab with laughter, happiness, support, and caring. Being in the lab with all of you was like a strong fence, helping me to get through the grueling thesis writing period safely.

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understanding and support. The patience I needed on this academic journey was learned from you.

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In my master's program at UNIST, which was a new challenge, and in this thesis, I did not accomplish anything by myself. I bow my head in gratitude for all the connections and encounters I have had along the way.

Ulsan, July 5, 2023
Hyori Lee

저의 작은 첫걸음인 이 논문은, 제 주변 분들의 격려와 응원, 도움 없이는 가능하지 않았습니다. 가장 먼저 세 분의 심사위원이신 이승호, 김황, 안성희 교수님께 감사 말씀 올립니다. 저의 새로운 도전을 이끌어주신 지도교수이신 이승호 교수님. 저조차 저를 믿지 못할 때 누구보다 제가 하고자 하는 바를 지지해주시며 가능성을 넓혀주셨습니다. 막막하고 불안했던 연구 초행길에서 어떻게 해야 올바르면서도 신나게 운전할 수 있는지 교수님을 통해 배울 수 있었습니다.

언제나 따뜻한 배려를 잃지 않으셨던 김황 교수님. 교수님과 이야기 나눌 때면 늘 깊은 존중을 느낄 수 있었습니다. 교수님께서 새로운 관점으로 제게 전해주신 많은 조언들을 가슴에 새기며, 연구를 넘어 더 넓고 깊게 아는 사람이 되고자 하는 마음을 다졌습니다.

우연히 이어진 인연을 소중히 여겨주신 안성희 교수님. 첫 만남에서의 긴장이 무색할 정도로, 마지막까지 저에게 신중한 조언과 따뜻한 응원을 지속해주셨습니다. 교수님과 소통하며, 냉철한 비판과 온화한 태도가 마음만 앞서는 초심자에게 얼마나 큰 힘이 되는지 깨달았습니다.

논문 작성 기간 동안 많은 도움을 주셨던 Ian Oakley 교수님, James Andrew Self 교수님께도 감사 말씀 드립니다. 교수님들을 통해 치밀하고 엄정한 연구 과정에 대해 제대로 배울 수 있었습니다. 동시에 지식을 탐구하고 창출하는 과정의 순수한 기쁨과 성취도 깨달았습니다. 두 분께 배우며 석사 과정을 마무리한 것은 저에게 행운이었습니다.

그리고 국립현대미술관 프로젝트에서 함께했던 성용희 학예사님께도 깊은 감사인사 드립니다. 비록 일로서 만났지만, 학예사님과 이야기 나눌 때마다 저는 배우는 것이 너무나 많아 선생님으로 여겼습니다. 좋은 가르침을 스스럼 없이 주셔서, 함께하는 기회를 만들어주셔서 영광이었습니다.

국립현대미술관 프로젝트를 함께했던 나의 동료들, 곽병국, 박영준, 한민주, Kezia Odelia에게 특별히 감사인사 드립니다. 논문에도 썼듯, 국립현대미술관 프로젝트는 저에게 잊을 수 없는 순간들을 선물한 과정이었고, 그건 오직 여러분과 함께해서 가능했습니다. 뛰어난 능력과 섬세한 감수성을

지닌 여러분과 일할 수 있어 영광이었습니다.

웃음과 행복, 응원과 배려가 가득했던 연구실을 채워준 동료들, 김성범, 류성원, 유태안, 윤가희, 전진영, Aziza Abdyrazakova, Makida Gebregiorgis Tesfaye, Yerslan Ababayev에게도 감사인사 드립니다. 여러분과 함께 한 연구실 생활은 든든한 울타리와 같아서, 고된 논문 작성 기간을 안전하게 버티도록 도와주었습니다.

학교 밖에서 저를 지지해준 소중한 나의 동료, 최혜민, 이예나, 데이비드 님에게도 감사 말씀 올립니다. 자기 분야에서 최선을 다하면서도 언제나 저에게 지혜와 우정을 나누어주었던 여러분 덕분에 연구생활 사이사이 뜨겁고 아름다운 순간들로 채색할 수 있었습니다.

마지막으로 연구를 넘어 제 모든 것을 지탱해준 나의 사람들에게 소중한 감사의 말씀을 드리고 싶습니다. 많은 말을 뒤로 한 채 묵묵히 제 여정을 지원해준 나의 두 부모님, 어머니, 아버지 그리고 시어머니, 시아버지. 때때로 어린애처럼 투정 부리며 당신들의 사랑과 희생을 갈구하던 저에게 언제나 “괜찮다, 괜찮다” 안심시켜주셨습니다. 다시금 들어온 학문의 길에서 필요했던 인내는 오롯이 당신들께 배운 것이었습니다.

그리고 자신의 길을 가겠다고 바쁜 아내와 어미를 위해 투쟁하듯 배려하고 희생해준 나의 두 남자, 동우와 보근. 날것의 나를 있는 그대로 사랑해주는 당신들이 없었다면, 당신들을 만난 후의 저는 무엇도 가능하지 않았습니다. 앞으로 제 삶과 연구가 조금이라도 특별하고 가치가 있다면, 그것은 당신들과의 평범한, 그래서 가슴 벅찬 일상이 제게 심어주는 삶에 대한 겸허한 태도 덕분일 것입니다.

끝으로, 어떻게 살아야 하는가를 알려주신 저의 영원한 스승, 한동원 교수님. 교수님의 가르침에 비하면 소박하기만 한 작은 발걸음이지만, 저는 이 논문처럼 쉼 없이 방황하며 나아가고 있습니다. 앞으로 연구자로서 또 한 인간으로서 이룰 저의 모든 성취는, 교수님의 어깨 위에서 누리는 특권일 것입니다.

새로운 도전이었던 울산과학기술원에서의 석사 과정과 이 논문에서 그 무엇 하나 저 혼자 이룬 것은 없습니다. 마주친 모든 인연에 머리 숙여 감사 드립니다.

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이효리

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