

# **SISCODE CO-DESIGN FOR SOCIETY IN INNOVATION AND SCIENCE**

## **DELIVERABLE 3.4: EXPERIMENTATION REPORT LAB'S JOURNEYS AS CASE-STUDIES**

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No. 788217



<b>Work Package</b>	3
<b>Task</b>	3
<b>Due Date</b>	30/11/2020
<b>Submission Date</b>	30/11/2020
<b>Deliverable Lead</b>	IAAC
<b>Dissemination Level</b>	Public
<b>Document Nature</b>	<input checked="" type="checkbox"/> R-Report and Demonstrator <input type="checkbox"/> O-Other
<b>Authors</b>	Marion Real, Felicitas Schmittinger, Anastasia Pistofidou and Milena Juarez Calvo, Asger Nørregård Rasmussen and Malte Hertz Janzen, Carla Sadini, Laura Cipriani, Mirko Gelsomini, Stefano Maffei, Massimo Bianchini, Agnieszka Włodarczyk, Monika Machowska, Aleksandra Gabriel, Isidora Stojacic, Evdokimos Konstantinidis, Despoina Mantziari, Despoina Petsani, Panos Bamidis, Gonçalo Praça and João Marques, Anja Köppchen and Gene Bertrand, Grace D'Arcy, Aude Ghilbert and Matteo Merzagora
<b>Reviewers</b>	Tedora Aibu (SPI), Jennifer Eckhardt and Eva Wascher (Tudo)
<b>Status</b>	<input type="checkbox"/> Plan <input type="checkbox"/> Draft <input checked="" type="checkbox"/> Working <input type="checkbox"/> Final <input type="checkbox"/> Submitted <input type="checkbox"/> Approved

The information, documentation and figures in this deliverable are written by the SISCODE project consortium under EC grant agreement 788217 and do not necessarily reflect the views of the European Commission. The European Commission is not liable for any use that may be made of the information contained herein.

## Revision History

Revision	Date	Author	Organization	Description
0.1	06.11.2020	Real Marion	IAAC	Plan
0.2	09.11.2020	All		Update Lab Part
0.3	12.11.2020	Schmittinger F	POLIMI	Corrections
1.0	13.11.2020	Real Marion	IAAC	Integration
1.1	21.11.2020	Aibu Tedora	SPI	Revisions
1.2	23.11.2020	Eva Wascher and Jennifer Eckhardt	TUDO	Revisions
2	24.11.2020	Real Marion	IAAC	Integration 2
2.1	25.11.2020	Schmittinger F	POLIMI	Final changes
3	26.11.2020	Real Marion	IAAC	Final Version

## Abbreviations

Table 1: List of general abbreviations relevant for deliverable (or labs sections)

Abbreviations	Expanded
WP	Work-Package
BSO	Business Support Organisation
CUBE	Cube/Continium museum
CV	Ciencia Viva-Agencia Nacional para a Cultura Cientifica e Tecnologica
DDC	Danish Design Center
DoA	Description of Action
ENoLL	European Network of Living Labs
EU	European Union
H2020	Horizon 2020 programme
IAAC Fab Lab Barcelona	Fab Lab Barcelona in Institut D'arquitectura Avancada De Catalunya
ICT	Information, Communication and Technologies
KTP	Krakowski Park Technologiczny Sp Zoo
Maker	Underbroen/Foreningen Maker
PA4ALL	Biosense Institute
Polifactory	Polifactory è il makerspace – fab lab del Politecnico di Milano
POLIMI	Politecnico di Milano
RRI	Responsible Research and Innovation
SGD	Science Gallery Dublin
SISCODE	Co-design for society in innovation and science
SPI	Sociedade Portuguesa de Inovação
STI	Science Technology and Innovation
Thess-AHALL	Thess-AHALL / Medical Physics Laboratory
TUDO	TU Dortmund University
TRACES	Association Traces ThéoriesTheories et RéflexionsReflexions sur L'Apprendre la Communication et L'Education Scientifiques

The information, documentation and figures in this deliverable are written by the SISCODE project consortium under EC grant agreement 788217 and do not necessarily reflect the views of the European Commission. The European Commission is not liable for any use that may be made of the information contained herein.

## Table of Contents

Revision History.....	3
Abbreviations .....	3
Table of Contents .....	4
Table of Tables and Figures .....	4
1. Executive summary .....	7
2. Reminder: the experimentation in the context of SISCODE .....	10
3. Methodology .....	14
4. Description of the case-studies resulting from the long-term experiments .....	18
4.1. Remix El Barrio by IAAC Fab Lab Barcelona.....	19
4.2. BodySound by Polifactory.....	47
4.3. Plastic In Plastic Out (PIPO), by Maker / Viadukten .....	68
4.4. LET'S TALK ABOUT THE AIR by KRAKOW TECHNOLOGY PARK (KTP).....	84
4.5. ICT for Agricultural schools by PA4ALL .....	100
4.6. Partners of Experience by Thess-AHALL AUTH .....	112
4.7. Caiaques as rio by CIENCIA VIVA, .....	128
4.8. The Co-design canvas by CUBE DESIGN MUSEUM.....	147
4.9. OPEN MIND by SCIENCE GALLERY DUBLIN.....	170
4.10 AI as co-spectators by TRACES.....	186
5. Dissemination and relation with other WP's.....	207
6. Conclusions .....	209
7. References and Acknowledgements .....	214
Annex: template of the case studies.....	216

## Table of Tables and Figures

Table 1: List of general abbreviations relevant for deliverable (or labs sections) .....	3
Fig 1.1: Overview of the outcomes of the Labs - Extraction from MIRO board.....	9
Fig 2.1: The design-based learning framework .....	11
Fig 2.2: Application process of the design-based learning framework.....	12
Fig 4.1.1: Timeline of IAAC Fab Lab Barcelona's journey .....	24
Fig 4.1.2: Artefacts of the co-design activities (phase 1, 2, 3) .....	25
Fig 4.1.3: Main artefacts for the first loop of prototyping.....	28
Fig 4.1.4: Open Air Biomaterial workshop in the urban garden by and for Remix El Barrio	30

Fig 4.1.5.: Sample of Remix El Barrio Projects .....	35
Fig 4.1.6. Co-creation Management's dialogic and source of tension .....	37
Fig 4.1.7: Stakeholders network dynamic for Remix El Barrio .....	40
Fig 4.2.1: BODY SOUND co-creation process .....	52
Fig 4.2.2: BODY SOUND experimentation lab with children .....	54
Table 4.2.1: Criteria of clustering.....	55
Fig 4.2.3: User journey as an outcome of the workshop.....	55
Fig 4.2.4.a: Opportunity map, b. Idea generation sheet .....	57
Fig 4.2.5: Synthesis of the interviews with policy makers .....	58
Fig 4.2.6: BODY SOUND pro .....	60
Fig 4.2.7: BODY SOUND web .....	60
Fig 4.2.8a "WELCOME" phase of BODY SOUND WEB .....	62
Fig 4.2.8b: "TEST" phase of BODY SOUND WEB .....	62
Fig 4.2.9: Padlet platform for users' evaluation.....	64
Fig 4.2.10: Recording platform for co-design with therapists <a href="http://www.bodysound.org/edutest">www.bodysound.org/edutest</a> .....	64
Fig 4.3.1: Initial Draft of ecosystem model. By Stine Broen Christensen .....	74
Fig 4.3.2: Co-design workshop. Tools: idea card, mapping, problem definition .....	74
Fig 4.3.3: LCA & Infographic in collaboration.....	75
Fig 4.3.4: Game and stakeholder mapping by AAU students & Maker, workshop .....	75
Fig 4.3.5: Maker Meet Up and Open Lab Day in May 2019.....	76
Fig 4.3.6: Maker Meet Up and Open Lab Day in May 2019.....	77
Fig 4.3.7: Moments and Cases for prototypes. ....	78
Table 4.3.1: Evolution of the outcomes for Maker's journey .....	80
Fig 4.4.1: Slides presenting main goals and assumptions of the Air Protection Programme .....	95
Fig 4.4.2: Presentation of the Platform for Monitoring of Industrial Pollutions.....	96
Fig 5.1: The feedback session conducted on ZOOM.....	107
Fig 5.2. The AgroSense platform and the equipment installed in the schools.....	109
Fig 4.6.1: Concept of 'Partners of Experience' .....	114
Fig 4.6.2: Structure of the Partners for Experience program.....	114
Fig 4.6.3: Pillars selection for Partner Experience.....	121
Fig 4.6.4: Methodology evaluated by the participant of the programme .....	122
Fig 4.6.5: Description of the three thematic groups.....	122
Table 4.6.1: Summary of the activities of the Partners of Experience programme .....	123
Fig 4.7.1: Artefacts of co-creation - Ciencia Viva Journey .....	135
Fig 4.7.2: Photo of the workshop of validation in the Pavilion of Knowledge .....	137
Fig 4.7.3: Caiaques ao Rio! [a prototype] .....	140
Fig 4.8.1: Overview of the territory .....	149
Fig 4.8.2: a) Museumplein Limburg (c)Shift, b) Ransdaal village .....	151
Fig 4.8.3: Visitors' workshops: a) poster, b) live session .....	154
Fig 4.8.4: Framing workshop trainees Province of Limburg .....	156

Fig 4.8.5: a) Ideation session at Cube, b) illustration Future Citizens Lab_(c)Tejo Haas ....	156
Fig 4.8.6: Co-Design Workshops a) November 2019, b) March 2020 .....	158
Fig 4.8.7: Online Co-design workshop with the canvas (october 2020) .....	160
Fig 4.8.8: Overview of the Co-design canvas and cards .....	163
Fig 4.9.1: Main insights after the first loop of Open Mind .....	178
Fig 4.9.2: OPEN MIND Prototype Timeline .....	179
Fig 4.10.1: TRACES' journey sketch.....	188
Fig 4.10.2: Two approaches to prototyping un co-creation processes .....	191
Fig 4.10.3: Needs of addressing the challenge for various stakeholders.....	193
Fig 4.10.4: Objectives of the prototype for various stakeholders.....	196
Fig 5.1: Interconnection of work packages in SISCODE .....	208
Table 5.1: Synthesis of the co-creation journeys .....	209
Table 5.2: Synthesis of the (potential) transformations in each ecosystem of co-creation.	210
Table 5.3: List of best practices of adaptation from Covid-19's situations in each Lab. ....	212
Table 5.4: Challenges and inspiring practices for co-creation .....	213
Fig 4.6.1: Photo of the first interactive session between the Labs. ....	215

## 1. Executive summary

This deliverable aims at describing the results of the experimentation conducted in the 10 SISCODE labs from January 2019 to October 2020. In this document, SISCODE partners have focused their attention on narrating the phenomenon of co-creation and its nature throughout the single co-creation journeys by diving into the ecosystem- and organisational transformations that happened all along the experimentation. To better capture such transformations, it was decided to elaborate a collection of case-studies based on the co-creation journey of each lab. Inspired by WP2 analysis of case-studies and biographies, a methodological frame has been proposed to retrace the co-creation process.

Each case-study contains 8 parts: a synthesis of the pilot's journey followed by a description of the initial context, the challenge, the co-creation process of the envisioned solution, an update of the status of the solution, a short overview of the transformations triggered at the organisational and ecosystem level, and finally, a set of conclusive reflections and list of acknowledgements and references.

All the case-studies have been written by the lab ambassadors themselves to create unique and in-depth narrations. Iterations of reviews have been done by IAAC|Fab Lab Barcelona and POLIMI before the integration of the contents in one main document, officially reviewed by SPI and TUDO.

The deliverable is separated in six parts: Following the executive summary (Part 1), the document starts by reporting an overview of the aims and activities of the WP3 experimentation (Part 2). Then, it introduces the methodology of case-studies and describes the writing process (Part 3). The core part of the deliverable is developed in part 4, containing the description of the individual 10 case-studies carried out by IAAC|Fab Lab Barcelona, Polifactory, Maker, KTP, PA4ALL, ThessAHALL, Ciencia Viva, Cube Design Lab, Science Gallery Dublin and TRACES. Part 5 briefly presents the dissemination strategy in relation to this report and the activities reached out by other work packages. Finally, some conclusions are presented in Part 6, integrating preliminary elements of synthesis that could serve as intermediary objects to feed further discussions and works, mainly the preparation of the assessment report (D3.5) and other work-in-progress activities.

The description of the case-studies showed that co-creation is highly context-dependent and shaped fundamentally by the people involved. At the organizational and ecosystem level, those narratives are highlighting the importance of looking not only at micro activities and effective design practices but also at the dynamics of such ecosystems and the impact they are generating both internally and externally.

The labs and their ecosystems attested a capacity building on co-creation at various levels. They mainly improved their knowledge on how to better *engage* stakeholders, better *organise* and facilitate co-creation and scale outcomes of such journeys. A variety of stories,

tools, prototypes and outcomes created in the journeys can be seen as the heritage of this experimentation to be extracted to collect good practices and feed the knowledge repository of the SISCODE project.

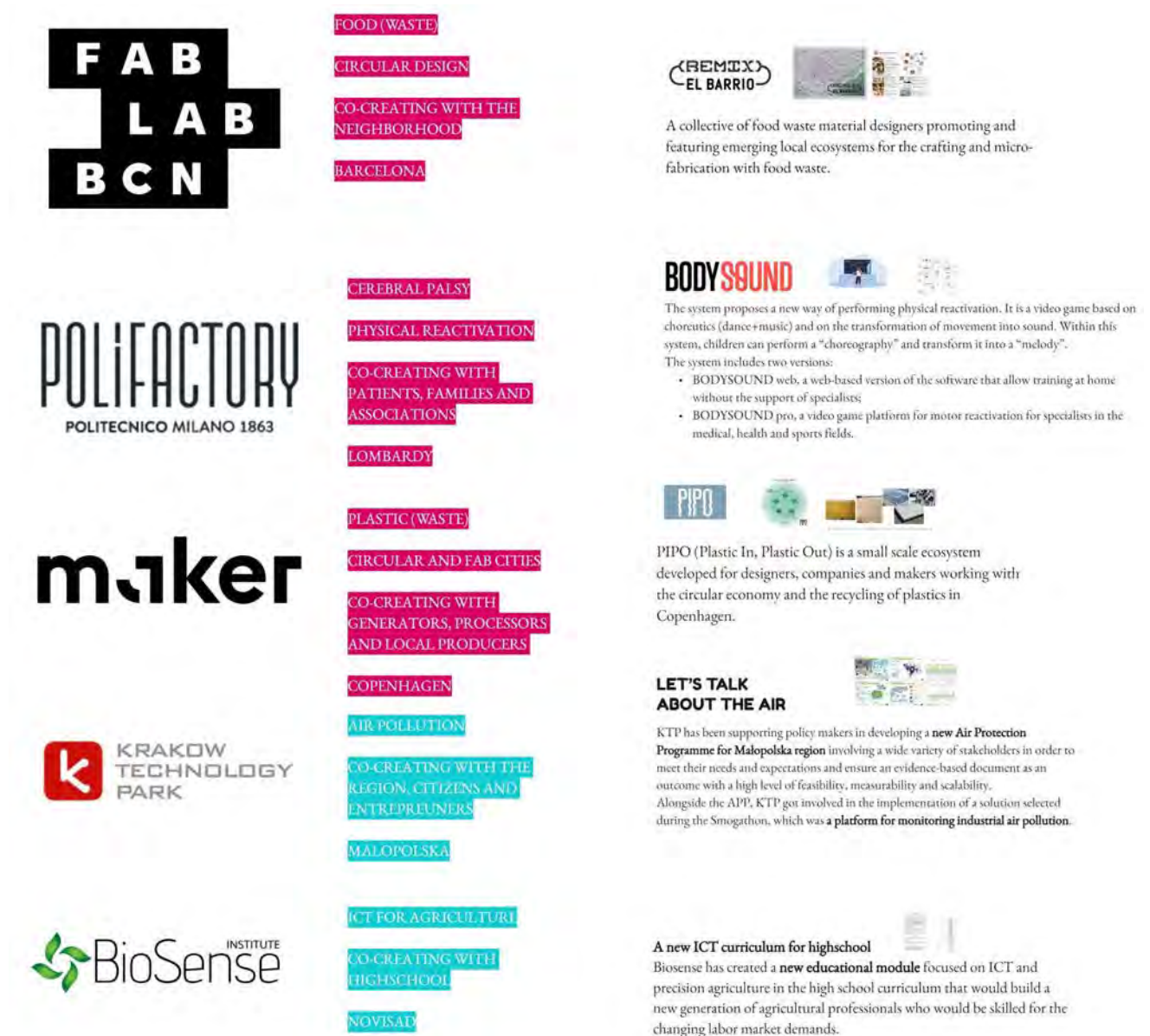




Fig 1.1: Overview of the outcomes of the Labs - Extraction from MIRO board<sup>1</sup><sup>1</sup> [https://miro.com/app/board/o9J\\_lfwhbJM=](https://miro.com/app/board/o9J_lfwhbJM=/)

## 2. Reminder: the experimentation in the context of SISCODE

As mentioned in previous deliverables and the description of action (SISCODE DoA), SISCODE aims to tackle the challenges of active actor engagement and the effective integration of co-creation in STI policy making to operationalise RRI practices in real contexts.

In order to obtain concrete knowledge and insights on this operationalisation, an array of real-life experiments has been planned, carried out and observed within the project.

The goal of this field study has been to increase knowledge, both on the practice of RRI and the insertion of co-creation practices in STI policy making.

This action research is aimed to shed light on the effectiveness and efficacy of tools and methodologies of co-creation to bridge the identified gap between the phase of ideation and the one of implementation (SISCODE D1.3) to be able to actually provoke changes by involving society in science and innovation.

Co-creation is not only to be applied punctually, but throughout the entire process aiming at provoking a learning effect and capacity building, both inside the organisation and the surrounding ecosystem involved through actor engagement of policy makers, stakeholders, local actors and citizens.

The labs chosen for the pilots were selected to represent the greatest possible variety in terms of location, field and disciplines of work. Each pilot tackled a specific, local problem often connected to their field of activity. The process of carrying out this co-creation journey within SISCODE has been planned with a duration of 18 months, which later was extended to 21 months due to the Covid-19 pandemic.

Apart from their distribution all over Europe and their differences in size of organisation and context of work, they all belong to one of the following networks of labs:

- The Fab City Foundation
- The European Network of Living Labs (ENoLL)
- The European Network of Science Centers and Museums (ECSITE)

### **The co-creation process**

There are a variety of slightly different definitions related to the process of co-creation which lead to the formulation of a specific and clear definition to be used all throughout the project. It has been defined here as “a non-linear process that involves multiple actors and stakeholders in the ideation, implementation and assessment of products, services, policies and systems with the aim of improving their efficiency and effectiveness, and the satisfaction of those who take part in the process” (SISCODE D1.3, 2018).

Starting from this definition, a theoretical framework has been developed based on the process of design (Dorst, 2010) and the experiential learning model by Kolb (Kolb, 1983) as a basis for the experimentation.

This framework depicted below therefore combines the two aspects of learning and experience as the two fundamental elements to be explored (Fig 2.1). Apart from serving to plan the overall process of the pilots, it also supported their guidance and activities throughout the process as well as the monitoring and later, analysis and comparison.

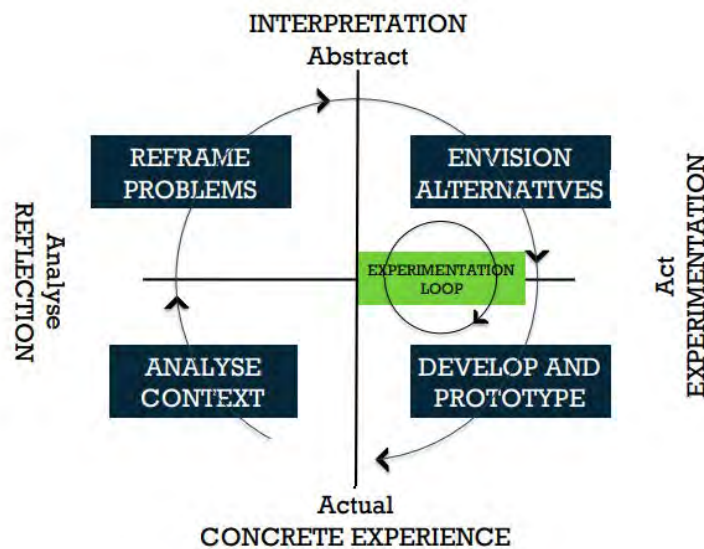


Fig 2.1: The design-based learning framework

The cyclical framework consists of four phases, that, once concluded, iterate the process starting again from the first phase. During the initial stage, a concrete experience representing the actual, current situation is analysed as a whole including the entire surrounding context. Moving to the second grade, the situation is analysed more in depth to be fully understood reflecting on problems and root causes.

After having identified the key problem, the process turns into something more abstract to allow the ideation of a new solution to the problem defined earlier. This idea developed is then experimented in the final phase of development and prototyping. The inner circle of experimentation between the phase of ideation and prototyping enhances the core aspects of SISCODE. That is to say, it bridges the gap between co-creation and co-production, and activates the iterative nature of the prototypes in their testing phase, which then should be evaluated and improved to reach the best solution in the end.

Complementary to the framework as a more theoretical base for the experimentation, a supporting toolbox has been developed, both as a support for the pilots in tackling their specific challenges as well as to enhance the learning effects triggered with the application of co-creation (Fig 2.2).

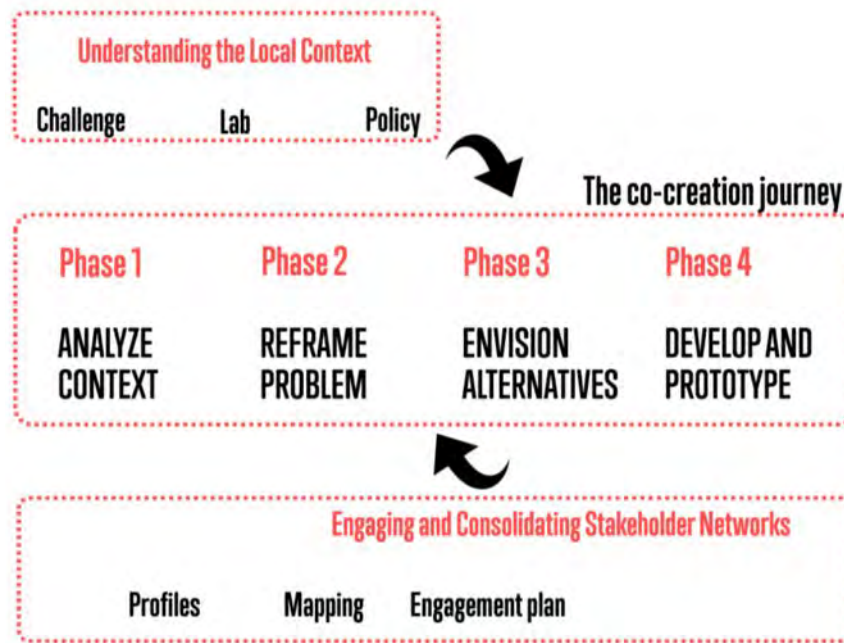


Fig 2.2: Application process of the design-based learning framework

### Planning of activities

WP3 was officially launched in november 2018. The labs preliminarily met and envisioned some ideas of challenges. Subsequently, they received individual first training sessions where they could learn about co-design, better understand the overall approach, discuss about their own ecosystem and define various dimensions of their journeys. After finalising these co-creation journey plans (SISCODE D3.1, 2019) and their co-creation engagement and dissemination plans (SISCODE D3.6, 2019), they could start with the first research activities and building connections with their stakeholders. All the labs went through a cycle of co-design activities that led to the creation of local co-creation communities and to the definition of a “concept” that they selected to be explored in over the cycles of activities. Both processes and concepts have been gathered in the deliverable D3.2 (SISCODE D3.2, 2019) as well as relevant qualitative insights concerning the use of design approaches, the engagement of stakeholders, the importance of both, individual and organisational capacity building in co-creation.

At the end of July 2019, labs were ready to start with prototyping activities and enter into a cycle of loops of development and testing, allowing them to refine their solutions and give more fidelity or impacts to their concepts. As a first step, a collective understanding of the notion of prototypes was built and disseminated among the partners taking into account the diversity of solutions (from product, service, system, exhibition) proposed by the labs. A set of pedagogical materials have been jointly developed by POLIMI, IAAC|Fab Lab Barcelona and Cube integrating the basic principles of prototyping, digital fabrication, service design including some examples and case studies of their application. Then, a specific learning workshop (online or in-person) has been proposed to each lab or groups of labs belonging to the same network according to their previous experiences in prototyping to support them in

designing their own process of prototyping. The labs were encouraged to develop a multi-stakeholder service design experience and run a process with at least 2 cycles of iteration of developing, prototyping and evaluating. This phase of prototyping and development lasted one year, from October 2019 to 2020. The labs shaped their journeys, carried out many activities facing many complex situations like the outbreak of the Covid-19 pandemic in March 2020. The contingency management plan set up by the SISCODE lead manager integrated the labs's constraints and created a space of dialogues to better envision the possible adjustments to be done. As a result of the aforementioned, an extension from July to October was implemented for the labs to end their experimentation and recommendations to transform their physical planned activities to online activities when it was possible and relevant. All the labs came up with new strategies and activities, and could provide a final description of their prototypes that were tested in different set-ups with various types of stakeholders. The deliverable D3.3 (SISCODE D3.3, 2020) explicitly described the status of the solutions proposed by each lab, integrating a blueprint of their offers, a demonstrator and additional information about their prototyping and evaluation process. An infographic has been done to synthesize those findings, accessible publicly at this direction: [https://miro.com/app/board/o9J\\_lfwHbJM=/](https://miro.com/app/board/o9J_lfwHbJM=/).

### **Support and assessment procedures**

All along the co-creation journeys, there have been a variety of supporting and monitoring procedures in act to take advantage of the wide range of capacities present in the project consortium. Support consisted of three major elements: an evolving toolbox, peer learning exchanges through bi-monthly calls and regular individual check-ups with the supporting partners. The labs could receive specific support on dissemination from ECSITE on sustainability from SPI, on engagement of policy makers from DDC, and design and prototyping approaches by IAAC, CUBE and POLIMI. Partners looked for joining the effort to both follow the advancement of the labs and optimise time and support.

Additionally, an assessment framework has been set up to gather, mainly qualitative data, from the pilots during their journeys to monitor and evaluate their progress. Initially planned to measure solely the success of the single pilots, the assessment framework soon turned into an instrument to measure impact on a greater level retrieving data on changes and transformations caused in the pilots' organisations and ecosystems beyond the single prototype. This assessment framework will be described in the deliverable D3.5 due in January 2021.

This current deliverable (3.4) is focusing on the phenomenon of co-creation and is looking to dive into the ecosystem and organisational transformations that happened all along the experimentation. By jointly consulting between research and practitioners, it has been decided to elaborate a collection of case-studies based on the co-creation journey of each lab, narrating them as case studies after the conclusion of their co-creation journey. The

following chapter provides a detailed overview of the methodology applied as well as the process of writing.

### 3. Methodology

As mentioned previously, capturing the co-creation journey by developing them as case-studies was considered as the best way to exhibit the experimentation processes. This section will explicitly give more insights on why it is an appropriate method for the SISCODE's experimentation, explain the structure elaborated for each case and detail the process of writing between the involved partners.

#### **Why did we select case-studies as a means to build the experimentation report?**

The members of the consortium have reflected on the best way to capture the results of the experimentation with the following criteria to be met:

- **Function as a pillar for the development of other work packages (further project development and elaboration of results)**

Considerations on the most suitable format to be further analysed as well as triangulated and compared with the results of WP1 and WP2. While WP1 is concentrated on existing theoretical research and literature, WP2 analysed existing examples of 55 co-creation case studies (SISCODE D2.2, D2.3, 2020).

- **Accessibility to readers external to the project (Dissemination)**

An introduction to each pilot and context had to be provided. This included a reasonable level of details of what happened during the co-creation journey of each lab. It aims to describe the narratives of the complex processes that were developed during the 21 months of experimentation.

- **No overlap with other tasks (Project logic and division of tasks)**

For the assessment and evaluation of the single pilots as well for a comparative analysis among them, D3.5 has been planned to be an assessment report with a specific focus on results.

#### **The structure of the case-studies**

To build case-studies that express the complexity of the Real-Life Experimentation, we developed the aforementioned guideline. This guideline is based on previous findings of SISCODE as well as the structure used for the case analysis of existing cases of co-creation in Europe (SISCODE D2.2, 2020).

Inspired by the work done in WP2 through the analysis of case-studies and biographies, we adopted case-studies as a methodological frame to retrace the co-creation process. A case-study was defined “as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not



clearly evident; and in which multiple sources of evidence are used.” (Yin (1984, p.23). According to this definition, case-studies are precious to report real-life happenings of interest that are highly dependent on their context of application.

In (SISCODE D2.3, 2020), Co-Creation case-studies and Co-Creation Innovation biographies were set up to analyse co-creation through an ecosystemic perspective. An ecosystem model was created to serve as “a heuristic for the purpose of an in-depth exploration of co-creation processes” (ibid.). Inspired by an approach to social innovation (SI) ecosystems (cf. Kaletka, Markmann, and Pelka, 2017), the heuristic aims at giving cues to researchers to better understand the macro, meso and micro-level on which co-creation ecosystems are created and transformed. They introduced four interconnected layers that need to be elicited and observed when analysing the co-creation processes (norms, structures, roles and functions). Alongside the work that has been done in WP1 (literature and theoretical review), the heuristic was enriched and adapted for empirical research of co-creation in contexts.

It then served as a base to envision what could be the structure of case-studies for the description of the co-creation journeys:

- **Macro-Cultures.** Some elements, like regulatory and political frameworks, need to be integrated regarding the norms and cultures surrounding the various territories involved in SISCODE that shape the way to promote new values and practices in sciences, technology and innovation.
- **Meso-Structures.** A rich description of the labs and their transformations will permit the subtleties of each region to become visible together with the type of networks. It will also allow particular contexts to better frame the maturity of labs, as well as their effective power of actions at various scales.

As the core of the experimentation is situated at the micro-level of co-creation processes, an important part of the case-studies will focus precisely on the function and actors-roles level of the model:

- **Function.** The objective was the creation of a learning playground for each pilot to enhance the lab's capabilities related to co-creation and to explore its effect and changes triggered at various scales. The overall approach, with the design and diffusion of the toolkit, the moments of peer-to-peer learning, the regular follow-ups and interventions has impacted each lab in its perceptions and practices of co-creation. They gained organisational and technical skills to facilitate and orchestrate co-creation. This needs to be captured in the case-studies.
- **Actors and Roles.** The journey of each lab is specific to the challenge, thus affecting the initial motivations of the labs and the engagement of their direct ecosystems of stakeholders. The customisation of the process, the tools and outcomes are original and specific to their investigation and cannot be detached from the context or the people participating, co-creating, making, debating around new objects, new

techniques, processes or systems. The description of the journeys themselves will be the core of the case-studies and need to drive the relation towards the other dimensions.

Based on those specifications inspired by the case-study template used in WP2 and the overall approach of the experimentation, it was decided to report the guidelines as an index, anticipating that each part will be laid out later on sharing their underlying rationale. Apart from the general structure that the case-studies should take, the guideline provides some key points or guiding questions for each chapter and subchapter to stimulate the author of the study towards an in-depth description containing already some reflections while reporting activities, actions and reactions.

1. Synthesis of the pilot's journey
2. Initial context
  - 2.1. External context and ecosystem
  - 2.2. Organisational background
3. Challenge
4. The co-creation process of the envisioned solution
  - 4.1 Context analysis
  - 4.2 Problem framing
  - 4.3 Envisioning solutions
  - 4.4 Developing and prototyping
  - 4.5 The role of policies and policy maker engagement
5. Status of the solution
  - 5.1. Concept
  - 5.2. Sustainability strategy
6. Transformations triggered and outcomes
7. Conclusive reflections
8. References

In addition, every section contains an explanation and a set of questions aimed at triggering a detailed and in-depth description of the experimentation, while stimulating reflection during the writing (*see Annex - Template of the Case-studies*)

For example, in part 3 - "Challenge", there is a dedicated section to "Describe the challenge in detail keeping in mind and including the following points: derivation of the challenge, how has the decision to tackle this specific challenge been made, who was involved in deciding and defining the challenge".

### **The process of writing with the involved partners**

The draft template of case-studies was proposed to the labs and WP3 partners during the consortium meeting held in Copenhagen in February 2020. Due to the Covid-19 pandemic and some partner's suggestions, the template was revised and presented to the labs once again in one of the bi-monthly calls at the beginning of May. The uncertainties and restrictions in act due to the pandemic led the support team to give more flexibility to the labs on the way they were digging into the activities of writing and extend the final deadline of the case-studies' delivery. Shared google documents have been transmitted to each lab through posts on



Basecamp (an online sharepoint for the SISCODE consortium). Check-ups about the advancement of the case-studies were done during the regular individual lab meetings co-organised between Polimi, IAAC and SPI from May to October 2020. The labs could show their advancement in the online shared document, raise their emerging doubts and debate on specific parts or writing techniques to better elaborate in their cases. In September 2020, IAAC fixed the deadline of delivery for the 6th of November requiring the labs to conclude their cases, permitting time for reviewing and interacting on the final version presented in this document. Even if the template was giving indications in terms of lengths, the labs requested to extend it so that they can testify to all the different elements they wanted to share with the internal members of the consortium and beyond. It was collectively decided to accept this request acknowledging that in many cases, the extension of the overall experimentation has been necessary to conclude the prototyping phase. However, in all cases, there have been additional activities conducted and the relevant influence of those circumstances brought up results and reflections worth documenting in detail as a fundamental element of the respective journeys.

This enhancement of freedom and spaces led to more fruitful and diversified contents for the readers. Nonetheless, more advanced homogenisation of the contents could be done in further publications planned to be extracted from this overall experimentation (*see part 5*).

All of the case-studies have been written by the lab ambassadors. Iterations of reviews have been done by Marion Real (IAAC) and Felicitas Schmittinger (POLIMI) before the integration of the contents in one main document, officially reviewed by SPI and TUDO.

## 4. Description of the case-studies resulting from the long-term experiments

The case-studies will be presented in the following order:



1.IAAC|  
Fab Lab Bcn



6.ThessAHALL



2.POLIFACTOR  
Y



7.Ciência Viva



3.MAKER



8.Cube  
Design Lab



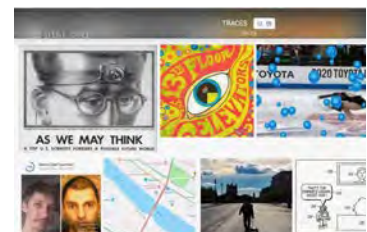
4. KTP



9.Science Gallery  
Dublin



5.PA4ALL

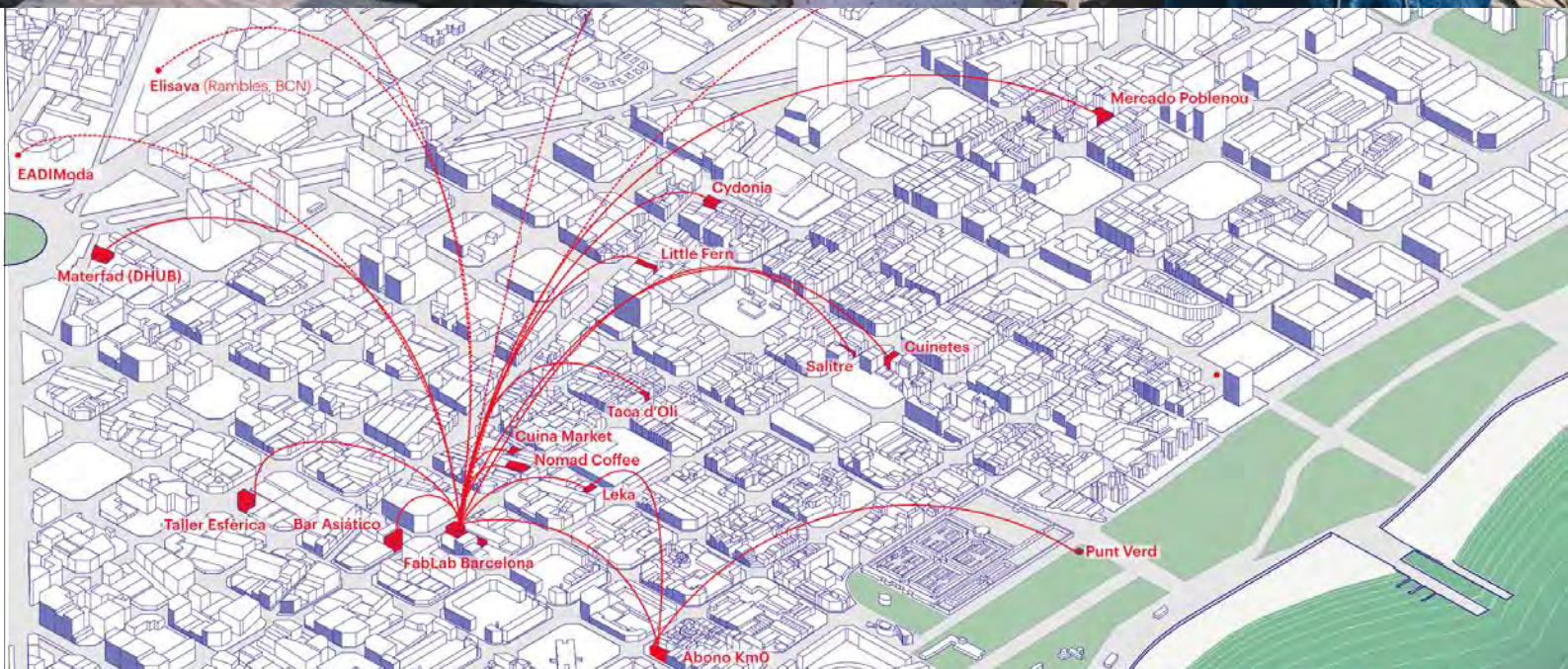


10.Traces



#### 4.1. Remix El Barrio by IAAC|Fab Lab Barcelona

*written by Marion Real, Anastasia Pistofidou and Milena Juarez Calvo*





### 4.1.1 Synthesis of the pilot's journey

IAAC|Fab Lab Barcelona was founded as one of the first Fab Labs in the European Union in 2007 and is a benchmark in the powerful network of over 1800 Fab Labs in over 100 countries. IAAC|Fab Lab Barcelona can now be defined as an innovation centre that analyses how to live, share and produce in cities. As part of the transition into Industry 4.0 and leading the Fab City initiative<sup>2</sup>, IAAC|Fab Lab Barcelona focuses on the human-scale and the everyday experience; identifying opportunities in rising trends across seven strategic areas of expertise: Sense Making, Productive Cities, Materials and Textiles, Future Learning, Civic Ecology, Distributed Design, and Emergent Futures.

Co-creation is at the core of all the research projects, aiming to engage communities and foster dialogues and knowledge between localities. Several European projects have been pioneers for co-creation, citizen science and distributed design like DDMP<sup>3</sup>, ISCAPE<sup>4</sup> and Making Sense<sup>5</sup>. Fab Lab Barcelona is also innovative and proactive in education as it supports original programmes such as Fab Academy and Fabricademy, and coordinates in IAAC the Master in Design for Emergent Futures. The originality of the educational approach relies on the concept of learning by doing.

Barcelona's pilot co-creation journey started with the ambition to reinforce the embedding of the Fab City Global Vision into the locality of Barcelona, more specifically in the neighbourhood of Poblenou where the Fab Lab is situated, starting from the idea that neighbourhoods (aka barrios) have the perfect size and scale to test and initiate societal transformations. With this journey, the team looked at the introduction of circularity and community engagement, reimagining what could be the role of makerspaces such as fab labs in fostering such changes. Raising awareness on the impact of the Catalan food ecosystem, the increasing production of plastic and inspired by emerging projects from the new bioeconomy, the local team decided to focus on the topic of food, waste and crafts. They addressed the issue of food waste connecting with the local, creative maker ecosystem as well as food stakeholders and social networks in Poblenou. They made a strong emphasis on creating synergies between local needs and resources through co-creation and learning-by-doing activities. Remix El Barrio was born with the ambition to propose a learning and development space to foster and nest new practices based on crafting with food waste. Remix El Barrio is now a collective of designers who proposes projects with food leftovers using artisan techniques and digital manufacturing. They collaborate with agents from the Poblenou neighbourhood to promote a more local and circular ecosystem.

---

<sup>2</sup> <https://fab.city/>

<sup>3</sup> <https://distributeddesign.eu/>

<sup>4</sup> <https://www.iscapeproject.eu/>

<sup>5</sup> <http://making-sense.eu/>

## 4.1.2 Initial context

### 4.1.2.1 External context and ecosystem

In 2014, the mayor of Barcelona together with the representatives of IAAC|Fab Lab Barcelona challenged cities worldwide to produce everything they consume themselves by 2054. Since then, with the emerging Fab City foundation created in December 2018, a set of values and engagements have been agreed to and signed by each city involved, Barcelona included. The Fab City vision is now an ongoing experimentation in more than 30 cities in Spain, co-exploring the implementation of the full-stack model.

#### What's the local context in Barcelona?

Barcelona is reputed to create significant actions to better involve citizens in the development of the city like the collaborative platform DECIDIM<sup>6</sup>. They also propose dedicated action plans for education, entrepreneurship and social innovation through Barcelona Activa.

Concerning circular and sustainable policies, Barcelona has undertaken successive action plans for transforming the city towards more resilience and sustainability. The last action plan (from 2018 - 2030)<sup>7</sup> highlights 18 axes, out of which 4 are directly related to our challenge that is supporting virtuous cycles, responsible consumption, zero waste and food sovereignty. That plan officialised the political engagement of the city to both, establish a new programme of training for circular economy, impulse the consumption of products from waste revalorisation and local food cooperatives and the development of local Fab Labs.

The city of Barcelona is also highly involved in the development of food sovereignty and the fight against food waste with the Generalitat, the public institution in charge of the Catalonia region. An important law<sup>8</sup> regarding this has been signed and a dynamic network of stakeholders is now operationalising the strategy. According to their own declarations, "Becoming the World Capital of Sustainable Food 2021 enables them to push for a food transition that will strengthen local sustainable economies and will improve the health of both people and the planet"<sup>9</sup>.

#### What about the barrios and Poblenou in particular?

Barcelona is renowned for the original character of each of its 73 neighbourhoods – Los Barrios. They believe that the barrios play an important role in generating societal transformations as they could expand individual behavioural changes to a community and neighbourhood level – reconnecting individual intentions and local initiatives to public institutions<sup>10</sup>. Thus, from 2016, there has been a development plan in place aiming to create

<sup>6</sup> <https://www.decidim.barcelona/>

<sup>7</sup> [https://www.barcelona.cat/barcelona-pel-clima/sites/default/files/documents/climate\\_plan\\_maig.pdf](https://www.barcelona.cat/barcelona-pel-clima/sites/default/files/documents/climate_plan_maig.pdf)

<sup>8</sup> [http://residus.gencat.cat/en/ambits\\_dactuacio/prevencio/malbaratament\\_alimentari/](http://residus.gencat.cat/en/ambits_dactuacio/prevencio/malbaratament_alimentari/)

<sup>9</sup> <https://alimentaciosostenible.barcelona/en>

<sup>10</sup> <https://www.freepress.coop/les-cooperatives-obreres-de-sants-libro/>

self-sufficient neighbourhoods to empower citizens to actively tackle challenges in the future. This plan has multiple objectives:

- supporting local trade to stabilise local economies and develop industrial capacities;
- emphasising the need for a social economy;
- intervening when urban deficits arise; and
- meeting needs for rights to health, education, equity and so on<sup>11</sup>.

Poblenou is a neighbourhood situated in the North-East area of Barcelona, in the Sant Marti district. In the last century, Sant Marti was dubbed the ‘Catalan Manchester’ due to the vast range of textile factories and worker cooperatives. In 2000, the City Council approved a new urban planning ordinance aimed at transforming the industrial areas of Poblenou into a hub for innovative industries and activities. After 17 years of renovations and transformations, Poblenou is now a diversified maker area and innovative neighbourhood with art, culture and educational institutions. Poblenou consists of high-technology and ecologically efficient buildings situated alongside old factories preserved for heritage and social dynamism<sup>12</sup>.

#### 4.1.2.2 Organisational background

The IAAC|Fab Lab Barcelona is situated in Poblenou, inside the Institute for Advanced Architecture of Catalonia (IAAC<sup>13</sup>). The building, a former ceramics factory, has been turned into a laboratory for prototyping ideas. The team is continuously prototyping the Fab City Barcelona creating bonds with local stakeholders for more than 10 years.

IAAC|Fab Lab Barcelona uses the digital fabrication facilities to prototype, fabricate and test these ideas in the real world for research, education and innovation having conducted 18 European Research projects since 2014.

IAAC|Fab Lab Barcelona cannot reduce co-creation to a one-way approach and considers the importance of each context and its involved actors to build communities and develop projects. The main values behind the co-creation approaches for the lab rely on digital empowerment, community engagement, shared infrastructure, information access, knowledge sharing, open source philosophy, peer2peer production and learning by doing. All the projects are guided by the use of tangible artefacts and the intent to better appropriate fabrication technologies to citizens. Prototyping and distributed infrastructures are at the core of the community of makers and their main strength to succeed in engaging with a wide variety of stakeholders. Efforts are usually made to better understand the process of creation and to disseminate it in a transparent, pedagogical and clear way.

One of the best examples is the EU project “Making Sense”, where a co-creation approach to run a citizen sensing project was designed and disseminated based on real experiences. The

---

<sup>11</sup> <https://pladebarris.barcelona/es/objetivos-del-plan-de-barrios>

<sup>12</sup> <https://www.siscodeproject.eu/repository/case-studies/decidim-barcelona-repensem-22>

<sup>13</sup> <https://iaac.net/>

Making Sense approach is explicitly described in a dedicated book entitled “Citizen Sensing: A toolkit”. The approach is based on 4 cross-cutting principles that are empowerment, changemaking, openness and co-creation itself described as a practice of collaborative development that supports multiple individuals to work together on the created playground, using a wide range of resources and ideas, methods and tools for the development of new actions and objects.

### 4.1.3 Challenge

The accelerated urban population growth and the related increasing intensity of material flows in linear supply chain models are provoking important paradoxes in cities. One of these paradoxes is the fact that one-third of the food produced is being wasted all along the food supply chain (Gustavsson et al 2011). This leads both to challenges and opportunities related to the management and revalorisation of organic waste as energy, bio-based products, food, and feed, which are better described by the term “Bioeconomy” ([European Commission 2018](#)). The design of new systems for the bioeconomy highly depends on the territorial context and invites us to rethink on how to transform stakeholder networks so as to enable communities to learn, create and manufacture new systems. These should be equipped with more eco-efficiency and sufficiency, raising knowledge about local food waste, reducing it and using it as a resource for the exploration of opportunities for material creation, new forms of crafts and micro-fabrication systems.

This is aligned with the recent works of material designers that consider the creation of materials from alternative sources as of great interest and as mean for the reduction of the environmental footprint of conventional materials (Camere, Karana 2018). Circular initiatives such Fruit Leather, [Orange Fiber](#), [Vegea](#), [Malai](#), [Piñatex](#), [Ecoplaso](#) and new waves of designers are already transforming food and agricultural waste and surplus into valuable products. Platforms, books and databases (e.g. [Fabtextiles's books](#), [DIYMaterials](#), [Materiom](#), [Food Waste explorer](#), [Chemarts Cookbook](#)) are being created to share practices, data, recipes and projects, while innovative courses (e.g. Fabricademy, Aalto Chemarts, Master in Design through New materials) are already integrating such circular design practices into their curriculum considering product life cycles.

To better sustain those new practices into science and society, efforts remain to incubate the emerging practices into new territorialities and understand their capacity to be deployed in specific contexts.

*How could co-creation foster the development of innovative ecosystems by  
crafting and micro-fabricating with food surplus and waste?*

The journey of IAAC|Fab Lab Barcelona explores this question through an intervention in the neighbourhood of Poblenou with the aims to identify and stimulate the development of new synergies among the local community in order to co-develop educational and logistic supports for better redistributing, upcycling and composting food locally.

#### 4.1.4 The co-creation process of the envisioned solution

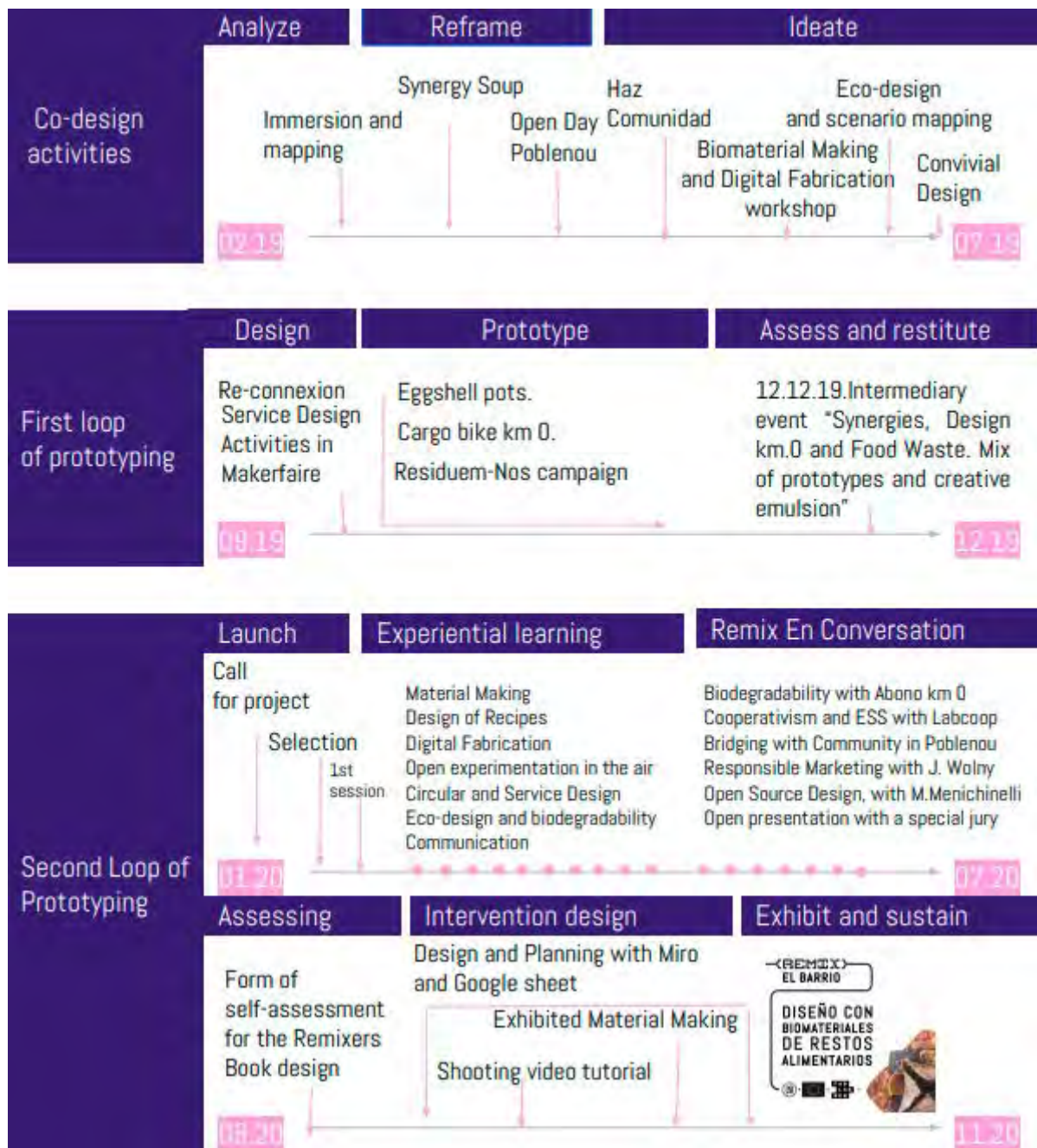


Fig 4.1.1: Timeline of IAAC|Fab Lab Barcelona's journey

##### 4.1.4.1 Analysis of the context

The first phase consisted of analysing the local context to obtain a better understanding of the existing instruments for circular economy, identifying the policies on food cycles at the different local scales and exploring the dynamism of the Poblenou neighbourhood and



Barcelona. This first phase was also crucial for understanding the team expertise and the research agenda within Fab Lab Barcelona that could support the pilot activities. For this phase, the team participated in 5 policy making events, conducted 35 informal interviews with 50 local actors in order to identify the current policies and resources that are playing a role in the local circular transition. Moreover, an effort has been made to develop a consistent mapping of current initiatives related to circular economy. The mapping phase focused on spreading awareness about ongoing activities and projects developed at IAAC|Fab Lab Barcelona that are related to co-creation activities and empowerment of citizens through sustainable and regenerative cities.

The main outputs in this phase were the creation of a timeline for the mapping process, a patchwork of the neighbourhood diversity and a stakeholder mapping of local food cycles based on different models of food value chains and food waste hierarchies.



Fig 4.1.2: Artefacts of the co-design activities (phase 1, 2, 3)

#### 4.1.4.2 Reframing of the problem.

The second phase consisted in shaping the set of data collected to better structure the future interventions with local stakeholders. The first co-creation workshop named “Synergy Soup” (“Sopa de Sinergias”) was proposed and destined to a core group of local stakeholders identified through the different interviews, events and participative observations that took place during the first phase. The event aimed at identifying synergies among the actors by matching local resources with the needs of each of the stakeholders. Local actors participated in creative activities while sharing a soup made from food collected in the local area by the organisers. During this Synergy Soup session, 58 needs, 36 resources and 31 ideas of projects were generated by participants. Afterwards, the team categorised them through a matrix grouping looking at the type of innovation presented versus the steps of the food cycle process. The matrix and project ideas were later exposed during an open exhibition of IAAC, in which the visitors could provide insights, feedback and suggestions about innovation interventions and food cycle improvements related to sustainability at the neighbourhood scale. As a result, five potential categories of ideas were selected: the development of a collective bank for vegetable seeds hosted by a Fab Yurt (a mini Fab Lab designed in and for

an urban garden), local collection and preparation of recovered food, design of bio-materials, library of things and collective composting.

#### 4.1.4.3 Envisioning of alternatives.

The third phase was composed of five 3-hour-events that took place between the 28th May and 28th June 2019, in which the participants were actively involved to foster ideation and participate in learning experiences:

1. **“¡Haz Comunidad!”** (28.05.19): A community ideation workshop which took place at an historic community place, “El Ateneu de la Flor de Maig”, where 5 concepts were challenged through a redesigned version of three tools: (1) 6Ws to define the ideal solution of each concept and cross the different visions, (2) a sort of back casting-value opportunity mapping challenge aimed at “how” to reach the solution, and identifying needs and opportunities in terms of materials, tools, resources and skills, among others, and (3) idea cards.
2. **Practicing making** (8.06. + 11.06.19): Two learning-by-doing experiences have been proposed and co-organised with local participants to raise awareness and respond to the identified need of making things together. Fab Textiles ran a workshop at IAAC for realising biomaterials and bio-composites from local waste collected in restaurants. Three techniques were explored by the participants: 3D extrusion, bioplastic sheets and bowls mould design. The second experience was facilitated by MACUS Cooperative based on digital fabrication tools and machine design.
3. **Eco-design and future narratives** (18.06.19): Together with three stakeholders (Taca d’Oli, Fab Textiles, Urbonera), a session of eco-design and scenario building has been proposed during a local event on circular economy which took place in Palo Alto, another historical place located in the neighbourhood.
4. Finally, **a convivial agora** (28.06.2019): This was organised with 40 students from the summer school of Degrowth run by ICTA to discuss the conviviality of the concepts through specific design tools and refine the solution to be prototyped.

As a result of the third phase, the participants have refined the single project proposals, created new learnings and established local synergies. Indeed, for 31 opportunities identified in phase 2, five concepts with independent communities have been built allowing the identification of 83 needs, 57 opportunities and 6 idea cards during the community events. The methodology applied was based on specific design tools adapted for the workshops in which the local actors could break down the challenges, recognise their essential components and make and understand connections with other proposals. A particular interest was noted for exploring the potential of material innovation from food waste. Additionally, an effort has been made to build a local symbiosis model – a sort of scenario of

solutions connecting the stakeholders and integrating all the different food waste project solutions at the neighbourhood scale. Beyond selecting and focusing on each specific solution, the core team opted to act on a more systemic level, designing a system of solutions that could involve the core stakeholders and identify key collective actions to ensure increased cooperation and mutualisation of means for local learning, design, production and logistics.

#### 4.1.4.4 Development and prototyping

**Design.** After a reflective summer break, the team started a process of designing the specific prototype solutions, exploring internal opportunities and participating actively in local events to reconnect with diverse stakeholders engaged in the first phase. The team wrote a paper for the ERSPC (European Round table for Sustainable Production and Consumption) conference happening in Barcelona and were invited to exhibit in a local market on responsible consumption as well as in the Maker Faire Barcelona. For this particular event, a specific service design tool was designed and tested to visualise the circular ecosystem for food waste and surplus transformation, inviting people to choose their food waste, their place of collection, and place and means of fabrication together with the type of application. Furthermore, the groups finally engaged with the initiative “Barris pel Clima” which aims at creating local activist groups showing alternatives during the international week of climate strike happening in September 2019. In this creative period, the team could engage in parallel discussions and informally identify new opportunities to restructure the governance of the project while launching the prototyping phase.

The prototyping phase consisted of two main loops, each one followed by a phase of evaluation and improvement of the prototypes. While the first loop consisted of a set of fuzzy explorative projects, the second loop focused on running a structured incubation programme for creating a real mix of materials, people and knowledge for crafting and micro-producing with food waste.

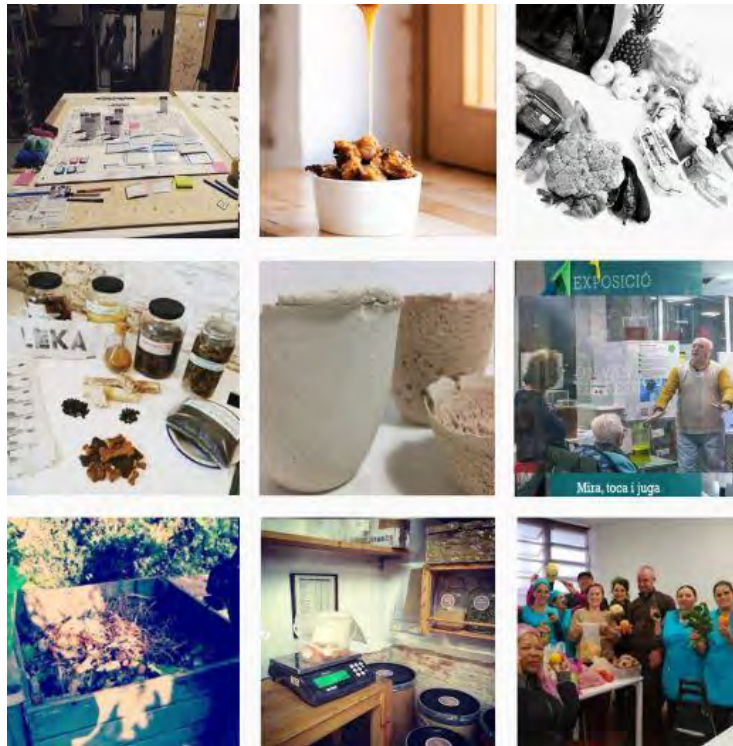


Fig 4.1.3: Main artefacts for the first loop of prototyping

**1st loop (10.19-12.20).** During this phase, three groups explored different aspects of the ecosystems developed in parallel. Each of the groups was autonomous and was asked to document the activities in detail and, as far as possible, to keep a diary to document the subjective parts of the exploration.

1. **Eggshell pots.** A first group explored the potential of eggshells for the production of ceramic-like products such as pots or plates. This was established in collaboration with one restaurant (El Little Fern Cafe), one local food cooperative (Cydonia) and Fab Textiles. It was estimated that one pot can be done from as little as 10 eggshells which promised a strong potential of scaling up considering the intense consumption of eggs in Spain (13.512 million annually). The complexity of production relies on the process, the additives and tools used to come up with a relevant result both in terms of usability and aesthetic. Lara Campos, the main researcher of the group, proposed two original recipes mixing eggshell powder, cellulose, alginate and tested different finishing techniques from pine resin, linseed oil, carnauba wax, paraffin, alginate and gum. She also highlighted the importance of organising a cooperative system for optimising the activities of collection, processing and preparation that are particularly time-consuming.
2. **Cargo bike km 0.** The second prototyping group designed a cargo bike to facilitate transport of logistics i.e. collection and redistribution of waste and materials between restaurants, fab labs and urban gardens. The proposals consisted of co-producing a bicycle trailer from reused or recycled materials that can be found in the neighbourhood. The project gathered various active stakeholders from an artisan-

maker cooperative (Macus Cooperative), a self-service bicycle workshop (Biciclot Cooperative) and the Future Learning Unit of IAAC|Fab Lab Barcelona together with two interns and the SISCODE team. It consisted of defining the specificities of such a bike, acquiring basic knowledge on bike mechanics, understanding the process of recovering a disused bicycle and adopting modular and circular design from the use of other local materials. Then, products for cleaning and conservation of oxidized iron for the trailers had to be found to build the base and lateral structures of the trailers, imagine new forms of easy-to-use containers, assemble all and test it on the streets of the district. While new connections have been established in a relatively easy way, strong difficulties have been faced to effectively find all parts and material needed locally and connect with some second-hand places not yet recognised legally and convince the internal purchase department to adopt new practices, particularly when local prices were higher than alternative solutions. A key challenge resulting from this process was the definition of a plan for effectively sharing the use of the bike collectively and transferring good practices of circular design to other projects in the ecosystem.

3. **Residuem-Nos.** An awareness and measurement campaign for the waste reduction week in Poblenou. This last group has worked on a collective action to raise awareness among neighbours and promote existing circular initiatives. It also retrieved quantitative data on avoided food waste in the neighborhood and developed a strategy on how to sustain a collective collection of surpluses and residues of local food in Poblenou. Diverse activities were designed and presented in local events such as a waste autopsy in existing businesses and a creative mapping to capture the subjective insights of citizens concerning local waste management and opportunities to improve it. The waste autopsy was co-created with 3 key stakeholders coming from the neighborhood association, a local cooperative and the fab lab serving as relays for connecting with other participants such as students, urban gardeners, cooperatives, restaurants and citizens involved in measurement activities and event organisation. In total, 195kg of waste food have been avoided during the 10 days of activities and more than 250 participants attended the various events.
4. **Intermediary event (12.12.19).** “Synergies, Design km.0 and Food Waste. Mix of prototypes and creative emulsion”. The event was created to gather all the knowledge produced in each of three projects, present the main insights to a wider audience and cross-analyse the feedback to identify future opportunities. It was organised in the Fab City Hub, a communitarian space managed by Fab Lab Barcelona, with a friendly co-creation atmosphere, surrounded by prototypes and original catering from local restaurants to allow participants to discover the topic. In the first part of the event, each project was presented followed by a short feedback session asking both the project developers and external participants to discuss the main contributions, difficulties and perspectives. In the second part, participants were asked to envision



the second loop of prototyping based on a proposal designed by the facilitation team. The generated project ideas have been pitched by a set of participants and the call for projects “Remix El Barrio” has been collectively launched.



Fig 4.1.4: Open Air Biomaterial workshop in the urban garden by and for Remix El Barrio

**2nd loop. (01.20-10.20): Remix El Barrio.** Remix El Barrio has been created with the ambition to propose a learning space for fostering and nesting new practices based on crafting with food waste. It launched with the intention of creating a “mix of materials, people and social experiences”.

Remix El Barrio started in December 2019 with an open call for participation that was sent to the stakeholders of previous activities and communicated on the social media of IAAC|Fab Lab Barcelona.

After one month, 16 project candidates had filled out the form of application and a process of selection was initiated with five members of the co-creation team, composed by local stakeholders from the neighbourhood. The process consisted of a first review of all applications, a collective discussion that allowed the definition of selection criteria and a first evaluation of projects following these criteria.

Among the criteria defined by the Remix El Barrio co-creation team, one main idea about what the incubation programme would focus on was:

*“The projects have to be aligned with the theme of circular economy and offer a concrete proposal of products generated from food waste in the neighbourhood. Projects must promote direct cooperation with the neighbourhood and demonstrate a potential for local*

*socio-economic development including actors. Reciprocity and collaboration between participants are key values. “*

From this selection process, 13 projects were invited to start the incubation programme. All of them individually signed an agreement specifying the expectations and rules of the programme defined internally with the various internal departments. IAAC|Fab Lab Barcelona offered a provision for materials (300€), a supervised access to the lab infrastructure (around 10 hours in total), dedicated online spaces for interaction (including a whatsapp group and a shared google drive), weekly collective activities and individual coaching both at technical level and for community engagement to each of the participating projects.

This programme was built based on previous experiences made during training courses offered in IAAC|Fab Lab Barcelona and adjusted during the process to the specific needs of participants and the internal and external constraints of the local ecosystem. The first skeleton of activities was designed before the beginning of the programme and adapted according to the developments, constraints and possibilities in an agile way by the project team members.

**From February to August 2020**, the participants were invited to take part in 7 face-to-face sessions at IAAC|Fab Lab Barcelona and Fab City Hub Barcelona, 2 external experiential workshops in the urban garden “Connect Hort” and 16 online meetings during the Covid-19 pandemic related lockdown with 4 live sessions with external stakeholders available on the social media of @circularbarris.

This period ends with the diffusion of a large form to collect the qualitative feedback of each participant on various aspects of the journey (individual projects, interaction, knowledge exchange, infrastructure) and on the future pathways they want to explore individually or collectively. All participants contributed and brought relevant suggestions for building the next steps of the project. All the knowledge has been collected in an online book (using the [gitbook](#)'s software) that tells about the wide narrative as well as transmit practical tips and tools.

**From September to October 2020**, the Remixers (Remix El Barrio participants) were supported to co-design a final intervention aiming at showcasing their projects and campaign in the barrio to activate new bonds and more awareness about food-waste-material making. Diverse activities were listed. Among them, a campaign-exhibition and video tutorial making have been selected to be the most impactful in such a short and complex period of time. To organise the activities, a Miro Board was shared, organised in 3 main parts: stakeholder's description frame, a timeline with a frame for each activity (from the result of evaluation, the advancement on the book, the campaign plan, the exhibition set-up and a list of external events) and a matrix to follow and co-build the involvement of the Remixers in each activity. The board has helped the team to connect the different dots and was used mainly as an internal dashboard for running this sprint of activity. This phase was dense in terms of

interaction with the internal SISCODE team, with other members of the labs (communication, coordination, lab managers) and the Remixers. A lot of energy has been spent to envision, negotiate and make real the interventions. Once the date was validated, the team switched from the use of the Miro board to a shared google sheet containing more than 50 tasks to coordinate, a list of attendees to complete and collective data to collect (e.g. scripts for the video, photo, written contents) in 15 days. The effort was distributed between the members in a transversal way as each participant had different availabilities and were situated in various localities. Oscillating between exhibition design, administrative and logistics management, making and communication activities, this period came with an extreme passion, a sense of accomplishment for people engaged in the process but also with many tensions and emotions partly due to the lack of time and anticipation, internal organisation issues and the pandemic constraints.

**The exhibition “Remix El Barrio - Co-design of biomaterials from food leftovers in Poblenou”** finally took place from 14.10.2019 to 23.10.2020 in the open source Restaurant LEKA<sup>14</sup>. The nine projects of the Remixers were exhibited, a bar of food waste sampled and natural dyes were as well as other artefacts of the co-creation journey - photos, ideation cards, map of the neighborhood, a manifesto for policy makers, and an infographic about biomaterial’s complexity. All the labels had been made in Fab Lab Barcelona with reused egg boxes transformed into posters and engraved with a laser machine. Textile products have been sewn in collaboration with a local collective of women, dyed and serigraphed with avocado pits recipes in the Remixers’s kitchens. The exhibition was launched during the Fab City Summit<sup>15</sup>, held during the Poblenou Urban District open day/night<sup>16</sup> and actively participated in the Foodture event<sup>17</sup> and the local FOOD SHIFT pilot kick-off<sup>18</sup> and has been a success despite the circumstances of the global pandemic. More than 400 people visited the exhibition following the barrier gestures and necessary restrictions imposed by Covid-19. A lot of discussions and connections with various types of stakeholders have been established, from newbies to gurus of design, from neighbours to policy makers.

#### 4.1.4.5 The role of policies and policy maker engagement

IAAC’s ecosystem is multi-layered and each member acts as a node to connect with the community and a diversity of stakeholders at the same time. Since its inception 17 years ago, IAAC has connected with a high number of policy makers from the fields of urbanisation, digital economy, culture and education. The Barcelona City Council is working closely with IAAC and Fab Lab Barcelona via many projects like Making Sense, DSI or Decode to foster new models of innovation, promoting the maker district as well as citizen sciences and

---

<sup>14</sup> <https://restauranteleka.com/>

<sup>15</sup> <https://fablabbcn.org/calendar/fabcitysummit2020>

<sup>16</sup> <https://www.poblenouurbandistrict.com/es/category/poblenou-urban-district/podn12h/>

<sup>17</sup> <http://www.foodture.barcelona/>

<sup>18</sup> <https://foodshift2030.eu/labs/food-tech-3-0-lab/>



supporting the Fab City initiative. In an evolving political context and a strong turnover within the institution, connections for future projects were established throughout the process, meaning also that no formalised strategies to approach policy makers were defined at the start of the SISCODE project. In other words, all contacts were informally kept by the strategic leaders from the lab using existing bonds to connect the new project team members with relevant stakeholders. Thus, those connections already existing with the core team of IAAC|Fab Lab Barcelona was fundamental. Within this context and the ambition of the SISCODE project, an important effort to connect with familiar and new policy makers has been made. We cannot say they participate actively in the decision making, the development and the implementation of the project, but they, rather, have been influencing it or facilitating some activities. The City Council's (used to run co-creation processes and participate in EU projects) lack of integration as a partner in the consortium made the engagement with the organisation quite evidently more challenging. It remained difficult for the SISCODE team to effectively involve them in the overall process as well as in individual co-design workshops. Facing those difficulties, we opted for more agile strategies to connect with policy makers, some of them are described in the following:

- *Running informal interviews with civil servants* to get to introduce the project and get to know the context: Four interviews were realised with people from the department of responsible consumption, from Barcelona Activa, the district of the Sant Marti, and BIT Habitat who is co-leading the urban plan of the district. They provided contextual information and key connections towards existing initiatives.
- *Participating in political events.* From the beginning, the team has participated in local policy events facilitated by policy makers on the relevant topics concerned by the project. The team was able to identify a strong knowledge of the co-creation culture in the local context. This permitted them to take part in the local ecosystem, to participate and reconnect with local policy design.
- *Exploiting direct contacts for logistics and communication:* a certain climate of trust and experience with certain stakeholders allowed to receive support for the organisation of some activities. In that sense, some stakeholders from the city innovation service, Barcelona Activa, proposed their help to promote events, while the neighbourhood association, the Taula Eix Pere IV, offered some logistical support like the sharing of infrastructures.
- *Co-hosting events led by the city.* The city regularly connects with IAAC|Fab Lab Barcelona to function as a co-host and service provider in some large-scale events. The SISCODE members seized this opportunity to take part in these event's organisation and propose co-creation and dissemination activities involving a wide public including the presence of policy makers. We set up two stands at the Open Nights of Poblenou, conducted three workshops on eco-design, biomaterial making and on service design with food waste during local events.

- *Applying for city funding and communication calls.* The last strategy has been to answer collectively to some official calls from the city regarding the topics of social innovation and climate change together with some stakeholders of the project. Three proposals have been co-written; one has been accepted with two others remaining under review. Additionally, the local actions for the week of waste reduction were synchronized with the local agency of waste allowing to establish a shared action “Residuemos” in the first loop of prototyping.

To finalise the pilot, the team has selected a format of policy brief as a manifesto to support the sustainability of the emergent collective. A draft of this document has been sent by email to our policy makers, has been integrated as an object of interaction during the exhibition and communicated via [Instagram](#). Among them, it was transmitted to the active groups on Food Sovereignty, Circular Economy, Responsible Consumption of the city, and was debated with one of the representatives of the Circular Hotspot Catalunya involving region authorities, the local centre for crafts and various stakeholders of the Food Shift project. It is now part of the exhibition catalogue that is disseminated as main outcomes of the journey.

## 4.1.5 Status of the solution

### 4.1.5.1 Concept

The solution consists of the development of learning ecosystems for the crafting and micro-fabrication with food waste at a neighbourhood scale. It elaborates on a variety of possibilities emerging from food waste and surplus, inspiring people with various techniques and tools to co-create, learn, collect, transport, pre-process and craft a series of materials and products to be applied by local users. From materials, products, services and platforms, nine proposals emerged from the Remix El Barrio’s collective, combining the interests, needs and synergies between participants and local stakeholders (see Fig 4.1.5).








 <b>REMIX EL BARRIO PROJECTS CHART</b>		 <b>Squeeze the Orange, Eadimoda</b> Biodegradable disruptive fashion with biomaterial made from orange peels, algae and wool.
 <b>Gos Leka, Arleny Ares</b> Nutritional Snack for animals from restaurant organic mix waste	 <b>ShellSkin, Dihue Miguens</b> Awareness campaign and manifestos for sustainable and circular actions in the circular barri	 <b>Re-Olivar, Naifactory</b> Enhancing the potential of olive seeds with a series of soft and rigid products from kidtoys to lamps.
 <b>Look Ma No Hands, Secil Asfar</b> A service of 3D printed cookies using organic peels and healthy recipes.	 <b>Dulce de la piel, Clara Davis</b> Soaps and soap making workshops made of used cooking oil.	 <b>Organic Matters, Laura Freixas</b> A platform to connect local producers, material designers and industries to create compostable and regenerative applications
 <b>Colores, Giorgia Filippelli</b> Empowering Natural dyeing by creating new experiences mixing food and colors	 <b>Organic Matters, Laura Freixas</b> A platform to connect local producers, material designers and industries to create compostable and regenerative applications	<b>En(de)Uso, Lara Campos</b> Eggshell ceramics and pine resin bio-composites for artistic artefacts

Fig 4.1.5.: Sample of Remix El Barrio Projects

Two projects created edible snacks from mixed food waste, thus keeping the use within the food industry, creating by-products such as snacks for pets and 3D printed cookies. The latter can also be combined with culinary experiences and B2B services of 3D printing food in local restaurants. The majority of projects decided to focus on the collection, processing and design from one specific type of food waste. The proposals ranged from furniture and interior design, biodegradable textiles for fashion elements, artistic objects, dyeing products, cosmetics, packaging and educational workshop proposals for raising awareness and knowledge-transfer. Two projects developed in the pilot are focusing on the creation of platforms and communication campaigns that seek to connect different stakeholders, further engage and expand the network of the “circular neighbourhood” and reassure the longevity of the project through the promotion of participation.

Beyond those individual projects, the Remixers have co-designed a set of new narratives and ideated an ideal service blueprint for a neighbourhood community focusing on waste collection, design of materials and products, knowledge exchange and development, and empowerment of a wider range of actors.

With Remix El Barrio, IAAC|Fab Lab Barcelona has created a set of communication and educational materials supporting the development of local ecosystems for co-creating, crafting and micro-producing food waste. The demonstrator described in D3.3 is composed of:

- *A catalogue of the exhibition “Remix El Barrio, co-design with biomaterials of food leftovers in Poblenou”* with an activism campaign kit and a policy brief to be replicated in different places;

- *A set of video tutorials* explaining the process of making biomaterials for emerging DIY makers and
- *A GitBook* (only in Spanish) for researchers and practitioners, containing a written mix of materials, interactions and services to endeavour the creation of local ecosystems for crafting and eco-innovating with food surplus and waste.

#### 4.1.5.2 Sustainability

Engaging with sustainability strategies from the early stage of the prototyping activities was crucial for the lab. It has been clear that it is also an iterative activity that needs to be adjusted all along the way, some of the key strategies adopted by the lab are detailed below:

*Research publications.* Two intermediary research publications have been written during the process to reflect on the journey, disseminating preliminary results and gathering feedback from specific academic communities. The first one was presented and edited in the proceeding of the ERSPC conference held in Barcelona, on the specific topic of sustainable production while the second one was integrated in the online Creative Food Cycle symposium and book on the theme “How FOOD CYCLES become a major field for social innovation?”

*Replication of the exhibition and enhancing the visibility of the projects.* The main short-term strategy consists of diffusing the catalogue of the exhibition and defining a plan for bringing the exhibition in different places, first in the neighbourhood, in the city of Barcelona, and beyond. Three places have already confirmed their interests among them, the Design Hub of Barcelona and the local Craft Center (Centre d’Artesania Catalunya). Moreover, the projects have been integrated in the FOODTURE Talent platform<sup>19</sup>, defined as a digital space open to all those artists, designers, startups, inventors, companies or brands that want to show their disruptive projects related to emerging disciplines of the food sector and want to be part of the FOODISM edible cultural movement.

*Integration of people and knowledge in the Fab ecosystems.* Discussions have been raised in an organic way to integrate all the knowledge created in SISCODE in the various branches of IAAC|Fab Lab Barcelona’s ecosystem. First, the SISCODE pilot serves as good practices for the circular community and the distributed design community; interventions in internal teams and specific EU projects have been done in this regard. The pilot was presented in the DDMP Barcelona meeting in February 2020 while two interventions have been realised for the Pop Machina Circular Makerspace Academy in June 2020. The pilot was also presented as a good practice to the participants of “Catalunya Emprèn”, a programme organised by the ‘Generalitat de Catalunya’ that promotes public and private actions of value to new entrepreneurs, to which it gives direct support. Secondly, the mentoring of Anastasia Pistofidou for the Remix El Barrio Collective have created close bonds with all the Fabricademy community, that also was enriched by the recipes and various learning materials created during the pilot. In that sense, the “Remix” recipes are planned to be

---

<sup>19</sup> <http://www.foodtureplatform.com/>

integrated into the distributed Materiom's platform<sup>20</sup>. With the creation of a collective, the Remixers have a new identity and are now considered as ambassadors able to promote and replicate the project further and in different contexts building their own path of development. They will be invited to be part of other local pilots such as FoodShift, Centrinno, and Shemakes, three new EU projects building upon the local strategy for more productive and inclusive cities.

Interesting exchanges have also happened internally on the topic of action research practices, community engagement, circular makerspaces and productive city management.

*Pushing for new activities to satisfy the 7 wishes of the Remixers for new public policies.* Many difficulties have been faced to sustain the development of circular ecosystems crafting and manufacturing with food leftovers. Internally, the main barriers have been related to the coordination among departments, the tensions between the intent to open access while protecting data of the created designs and the development of a sense of community while feeding individual aims and path of development (see Fig.4). For external barriers, a policy brief has been designed to elicit what needs are to be addressed and further explored in the following years to make the environment of implementation more accessible, plain and durable. It is mainly about bridging the gap between research and industry and democratising access to innovation by facilitating access and transformation of abandoned places, incentivising sustainable practices for restaurants and local communities and better framing the circular pilots by promoting co-creation and educational programmes.

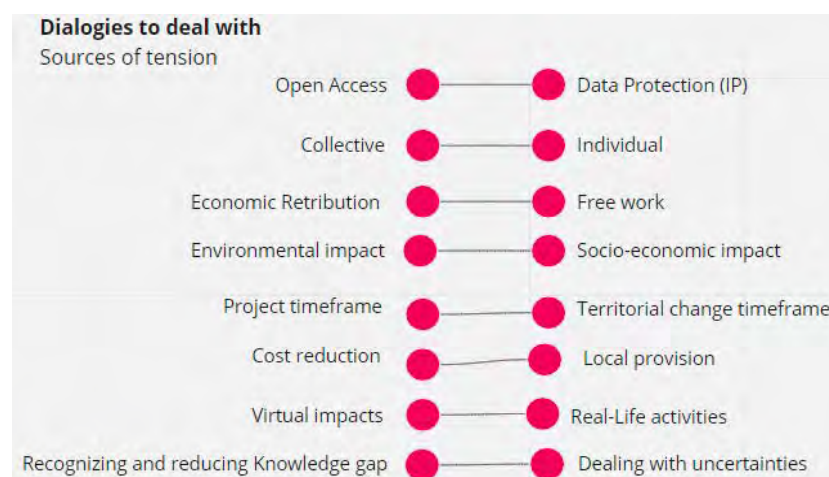


Fig 4.1.6. Co-creation Management's dialogic and source of tension

#### 4.1.6 Transformations triggered and outcomes

Remix El Barrio was born in a dense network of stakeholders bringing together various perspectives and cultures and has impulsed new collaborations, learnings and organisational transformations in and beyond the existing lab ecosystem. Using the terminology of

<sup>20</sup> [materiom.org](http://materiom.org)

Stakeholder Network Analysis (SNA), the stakeholder network is presented below as a set of system-nodes of people interacting with each other creating particular organisational dynamics.

Four types of system-nodes have been categorised consisting of the group of project participants (the 'Remixers'), the Fab Lab Barcelona team, the local active communities and the network of global platforms. Each node comes with a certain diversity of people, a story, a proper mode of governance and ways of interacting with other nodes.

*The collective of the Remixers.* The group of Remixers was initially formed by 13 projects where 18 participants engaged in the incubation programme. For each project, a collaboration between designers, local providers and associations was encouraged. All along the project, the participants from the different projects got to know each other working in their respective projects with their own partners and exchanging regularly with their peers in a common group. After six month of incubation, two projects were combined and three projects could not follow on with their initial ideas due to personal reasons. Thus, the Remixer's collective is currently composed of 9 projects with 12 active participants and 3 facilitators from the Fab Lab BCN team, living or working in the neighbourhood of Poblenou. The teams are composed by a majority of women (85%) and represent various origins and cultural profiles (from the fields of design, graphism, fashion, architecture, catering and management in the gastronomic sector).

*The Lab* interacted regularly with the other actors to synchronise the activities all along the project. They were the interface between the Remixers, the local stakeholders and other nodes of the overall ecosystem. The Fab Lab infrastructure offers rooms and access to machines, a service of material purchase, direct connections with other programmes and services of communications. The team was systematically negotiating with the other people of the lab, creating protocols and specific procedures, synchronising activities and ideas to put the programme in place by avoiding conflicts and delays as much as possible. As it involves many aspects of the organisation that underwent changes during an internal restructuring of Fab Lab Barcelona, the SISCODE pilot allowed to test the collaboration between units, revealing some tensions while supporting the creation of new dialogues and forms of collaboration between members.

*Local communities in Barcelona.* Remix El Barrio also engaged with a series of local stakeholders as a continuity from the first step of the SISCODE pilot. Five active stakeholders were integrated in a local co-creation team and have been engaged in Remix El Barrio either to co-define the criteria of selection, to connect with specific projects, or to participate in the cycle of open conversations. The following are some examples of interactions that occurred during the 8 months of activities:

- The restaurants, cafes and a local food cooperative of the previously engaged neighbourhood were invited to connect with the participants to interact about their food waste and co-design the solutions.

- Some workshops have been held in the urban garden “Connect Hort”. The local initiative “Abono Km 0” aiming at promoting worm composting in the neighborhood reflected with the group on the compostability of biomaterials.
- The ecosystem of cooperatives, LabCoop, provided a series of talks on social economy and cooperativism.
- A round table on circular neighbourhood has been organised with a cooperative of artisans (MACus), the citizen association of the neighbourhood (Taula Eix Pere IV), the local library of things of Sant Martí (Biblioteca de Les Coses) and a collective of new socio-ecological agents of the district (Taca d'Oli). It allows participants to get informed about the local context, start thinking collectively and envision new forms for being part of the collaborative local ecosystem.

*Global Design Platforms and International Partnerships.* The last system-node identified as relevant for the Remix El Barrio's stakeholder network consists of all the knowledge platforms and EU project partners allowing the participants to enhance their experience and knowledge during the project while connecting with a wider network of designers, experts and makers. This connection is facilitated by the local IAAC|Fab Lab Barcelona team. Remixers have connected with the ecosystems of Fab Textiles, Fabricademy and MDEF (Master of Design for Emergent Futures) which allowed open access to relevant knowledge for pre-identified areas. Some platforms of distributed design (Make.Works, Materiom, Wikifactory and Fablabs.io) have been shared to support the extension of knowledge and one event of dissemination was created with the project DDMP with the main scope of connecting people. Collaborations have been established with various EU projects, from other SISCODE's pilots or beyond (projects such as Material Designers (MA.DE), FOODSHIFT, REFLOW, Pop Machina). The pilot has been particularly impacted by the creation of a working group named “Circular Community” in which all researchers working internally on the topic have the opportunity to discuss together about their projects, problems, outcomes and motivations. This group helped to create bonds between EU projects and raised debates around methodologies of co-creation, community engagement and productive cities.



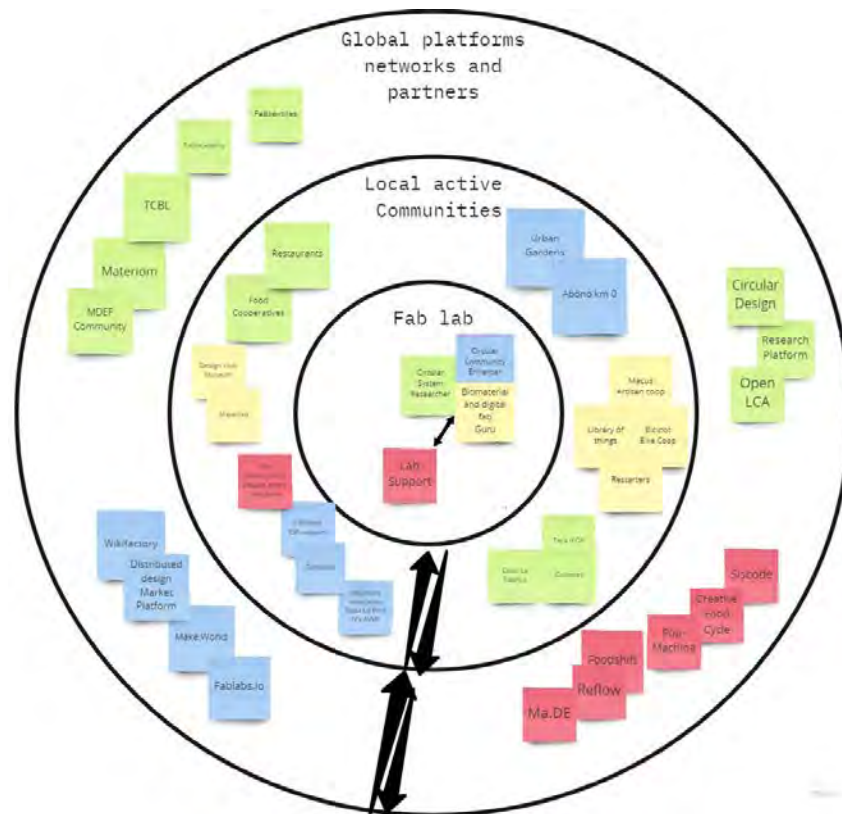


Fig 4.1.7: Stakeholders network dynamic for Remix El Barrio

This example of Remix El Barrio's stakeholder interaction shows a pattern of dynamism in the fab lab ecosystem. It highlights the importance of regular connectivity among different layers of community and building upon existing bonds to move forward instead of reinventing the wheel.

#### 4.1.7 Conclusive reflections

Describing the overall project Remix El Barrio while its incubated initiatives are still under development and defining some strategies for sustaining the diversity of proposals has allowed the team to capture the emerging practices and reflect on the different dimensions of co-creation processes. Four hot topics have been selected to feed this conclusion: raising the importance of cross-pollination of concepts and knowledge, solidarity, science communication and facilitation in the development of circular food ecosystems at the scale of the neighborhoods.

##### Co-creation and cross pollination of concepts and knowledge

The programme of incubation revealed that knowledge exchange occurred both intra and inter-groups of stakeholders, it was bi-directional and emphasized the cross-pollination of concepts in the Remix ecosystem. Even if large quantities of contents and information were provided by the Fab Lab team, each participant brought with him/her specific culture, skills, experiences and doubts that allowed others to obtain a new perspective on the process. Beginners interacted with other stakeholders to enhance their knowledge while more



experted people benefitted from being connected with beginners as it reinforced their capacity of teaching, gave them a role, utility and let them rethink their current practices. The hands-on activities and material-driven experiences have attracted much more participants using other approaches for discovering and learning empirically about materials. Materials, site of production and prototypes are objects and interfaces of design fostering debates, consolidating knowledge and taking inspiration. By playing with materials and making objects in parallel through the application of a variety of techniques and involving all senses led to the emergence of new forms of pollinations between participants and facilitators. By communicating the experience of the Remixers and integrating the results in wider ecosystems, other connections have appeared to support the activation and the empowerment of local communities in generating biomaterials using local resources, as well as the involvement of researchers and experts to rethink their role in the material production system. Using the word “cross pollination”, the terms of “knowledge exchange” or “knowledge sharing” can often be found in relation instead of using the word ‘knowledge transfer’ that could have a monodirectional connotation and could negatively affect the feeling of mutuality. With cross-pollination, the idea of commons is enhanced. This was demonstrated in this case precisely when the Remixers made the effort to connect their individual projects to common vision and activities for co-designing the exhibition. They realized that each individual project gained power and sense only when they were put all together under a common “journey”.

#### **Co-creation, science communication and co-ownership**

This project reinforced the fact that designers are constantly dealing with uncertainties while making decisions, even after decades of scientific experimentations, some phenomena remain hard to validate and the impact of designs remains complex to assess. Decisions are supposed to be made in an informed way using prototyping and research logics to develop a proof of concept. Through this project, it was identified that in young learning ecosystems like fab labs, the knowledge is still scattered, mainly tacit and rarely documented with scientific resources. Thus, intuitions and practices lead the process of design. With Remix el Barrio, participants were looking for evidence on their concepts and faced some difficulties at this stage to justify and find the appropriate tools to assess the environmental impacts, the compostability as well as the overall viability of their projects while a complete professional analysis is too expensive in such a context. Open source platforms are not sufficiently complete and do not integrate such local determinants or indications on how to adapt to contexts and circumstances. There are not enough certification machines in makerspaces or external labs supporting the testing of materials and products. Experts and technical centres in the field could support a better understanding and diffusion of tools. Their active participation in the conversation of Remix El Barrio creating dialogues on projects has been fruitful as they expanded the knowledge areas of participants and enhanced confrontation among them for collective reasoning and criticism. In the short term, it would be interesting to develop collaborations between makerspaces and scientific experts in the area of

environmental assessment and other key disciplines to guarantee an effective consideration of scientific knowledge when making design decisions, thus avoiding the propagation of fake news and greenwashing when communicating the projects. Media and cultural centres also have to be included in the process to find more relevant ways to inform citizens and future users about the effective quality and impacts of solutions provided. Moreover, interventions of experts in innovation and IP management could have been beneficial for evaluating the risk of sharing and reducing contradictions between the classic entrepreneurship and the cooperativism approach, i.e. the will of sharing and open source culture while guaranteeing data protection, copyright.

### Co-creation and solidarity

Both a core element and one of the most complex parts of co-creation, especially when transiting toward a circular neighbourhood, is the achievement of mutual aid and trust within the ecosystem. Testimonies from the local cooperatives in the Remix conversations highlighted that “everything started with a collective intent or a social struggle to fight together” and then it relied on ‘hacer xarxa’ intending on making network by learning how to interact with each other and find appropriate forms for vinculating ideas and projects. From Remix El Barrio, and the overall pilot in Barcelona for the SISCODE project, several examples of mutual aid could be identified. A shared system of values has been co-created from the beginning of the project with the Synergy Soup (see chap.4.2) bringing people together around principles of circularity and co-creation. Then, the involved stakeholders participated in the activities exploring jointly, without expliciting particular expectations or asking for direct benefits such as the short term reciprocity when offering a service like providing waste or mentoring for a project. The forms of collaboration have mutated all along the project, from the initial possibility to engage in co-creation activities to the opportunities of being part of the local co-creation team, actively participating in the programme, being retributed as service providers for expertise and coaching or bringing opportunities to the team. Another moment of solidarity occurred at the level of individual participants through peer-exchanges and collective support when doubts and difficulties occurred. Whether on the Whatsapp group or in open sessions, people were caring about each other, regularly sharing contents and thoughts dedicated to other participants' projects. A kind of motivation contamination was observed in those moments of sharing as if participants mainly got motivated as soon as other colleagues were showcasing or advancing with their projects.

But at the same time, some challenges arose regarding the cooperation and adhesion of participants in the project. Some participants had to deal with professional and economic constraints to contribute to the Remix programme. Indeed, the Remixers were not rewarded or remunerated and built their projects during their free time. This also led to difficulties in envisioning common scenarios for connecting the individual projects and establishing a formal collaboration between the members that could afford a continuation of the shared values, resources and goals developed after the conclusion of the incubation programme. This was a non-negligeable time investment driven by mixed intents to take part in a social

experience and contribute to a societal challenge locally while being trained within the Fab Lab ecosystem, learning about innovative sustainable circular material techniques and building new career paths aligned with these values.

### Facilitating co-creation in Labs

The management of co-creation initiatives includes the definition of how processes are governed, which competencies are required and who are the people involved. In the particular context of Remix El Barrio, the facilitation was led by members of IAAC|Fab Lab Barcelona team, who was the stakeholder commissioned by the European Union with funding to support the SISCODE pilot project. The following scheme illustrates the roles, skills and competences that emerged for facilitators of co-creation in the context of circular transitions:

- *Fab Lab “gurus”* are a group of experienced practitioners inspiring and expliciting tacit technical knowledge on fabrication techniques to participants. They are valuable especially during the co-creation process in the role of experts and mentors giving more tangibility to projects as well as confidence to beginners in the field.
- *Systemic designers* are seen as crucial interfaces between people, design artefacts and new policies. They activate change, visually capture concepts and disseminate new practices (Real et al, 2018). They act as architects of the unknown, activating the imagination of other actors to improve the design capacities in place, stimulating the interaction between imaginaries to bring out concrete concepts that break with collective fixation. "(Agogu  , 2012)
- *Community managers* are people strongly connected to the ecosystem of members that can manage the panel of stakeholders by building a rich picture of them by matching them with the needs and communicating adequately about the activities while fostering synergies between them.

Facilitation requires a variety of soft skills and an ability to manage complexity throughout the whole process. During the project, facilitators had to conduct various dialogues and to adjust their behaviour accordingly to fit the context. Their constant effort to propose contents and activities to foster sharing between participants reinforced the motivation and adhesion of the participants. They oscillated between short-term demands and long-term sustainability, ideas and constraints, between planning and emergence, between vertical and horizontal decisions, between theoretical knowledge and empirical studies, between atomisation of knowledge into disciplines and holistic design, between positive and negative emotions. Facilitation of co-creation is about creating safe and accessible learning spaces to ensure more autonomy to people whatever their profiles or levels of expertise are while connecting people, ideas and realities, proposing innovative forms of dialogues like done in co-creation workshops.

## 4.1.8 References

### The two publications

Real, M. and Calvo, M. (2019) “Boosting co-creation practices in makespaces to support the design of more empowering and circular food systems at a neighbourhood scale”. In Proceedings of the 19th European Roundtable for Sustainable Consumption and Production Circular. Spain. ISBN Volume 1: 978-84-09-16892-7, pp. 831-840.

Pistofidou, A., Real, M., & Juarez Calvo, M. (2020). Remix El Barrio: A Co-Creation Journey to Foster Innovative Ecosystems Crafting and Micro-Fabricating with Food Surplus and Waste. Creative Food Cycles-Book 1, 185-195.

### Main references cited

Agogu  , M., Le Masson, P., & Robinson, D. K. (2012). Orphan innovation, or when path-creation goes stale: a design framework to characterise path-dependence in real time. *Technology Analysis & Strategic Management*, 24(6), 603-616.

Camere, S. and Karana, E. (2018) “Fabricating materials from living organisms: An emerging design practice”. In: *Journal of Cleaner Production* 186, pp.570–584.

CHEMARTS. 2020. The CHEMARTS Cookbook. Available online at: [https://chemarts.aalto.fi/index.php/the\\_chemarts\\_cookbook/](https://chemarts.aalto.fi/index.php/the_chemarts_cookbook/). [Accessed 17.06.2020].

Diez, T. (2018) Fab City Whitepaper Locally productive, globally connected self-sufficient cities. Available online at: <https://fab.city/documents/whitepaper.pdf> [Accessed 28.06.2020].

Diymaterials.it. 2020. DIY Materials – The Materials Generation. Available online at: <http://www.diymaterials.it/>- [Accessed 18.06.2020].

Ecoplazo.mx. 2020. Inicio. Available online at: <https://ecoplazo.mx/>. [Accessed 16 June 2020].

Ellen MacArthur Foundation (2015) Growth Within: A Circular Economy Vision for a Competitive Europe. Cowes, UK: Ellen MacArthur Foundation. Available online at [https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation\\_Growth-Within\\_July15.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth-Within_July15.pdf). [Accessed 25 August 2020].

European Commission (2018) A sustainable Bioeconomy for Europe: strengthening the connection between economy, society and the environment. Brussel. Available online at: [https://ec.europa.eu/research/bioeconomy/pdf/ec\\_bioeconomy\\_strategy\\_2018.pdf](https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf). [Accessed 26.06.2020].

Fabtextiles.org. 2020. Bioplastic Cook Book | Fabtextiles. Available online at: <https://fabtextiles.org/bioplastic-cook-book/>. [Accessed 20.06.2020].

Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., & Meybeck, A. (2011). Global food losses and food waste. Global food losses and food waste – Extent, causes and prevention. Rome. Available online at: [https://www.madr.ro/docs/ind-alimentara/risipa\\_alimentara/presentation\\_food\\_waste.pdf](https://www.madr.ro/docs/ind-alimentara/risipa_alimentara/presentation_food_waste.pdf). [Accessed 25.08.2020]

Foodwasteexplorer.eu. 2020. Foodwaste Explorer. Available online at: <https://www.foodwasteexplorer.eu/>. [Accessed 17.06.2020].

Fruitleather Rotterdam. 2020. Home - Fruitleather Rotterdam. Available online at: <https://fruiteather.nl/>. [Accessed 18.06.2020].

Made-from-malai.com. 2020. Made From Malai – Malai Biomaterials. Available online at: <http://made-from-malai.com/>. [Accessed 10.06.2020].

Marcelino, J. R., & Castro, A. (2013) “Design Driven Innovation and Cross-Pollination”. In: SAE Technical Paper Series, pp 47-50.

Materiom.org. 2020. Materiom: Search. Available online at: <https://materiom.org/search>. [Accessed 19.06.2020].

Orange Fiber. 2020. Orange Fiber: Sustainable Fabrics From Citrus Fruits. Available online at: <http://orangefiber.it/en/>. [Accessed 20.06.2020].

Piñatex. 2020. Piñatex - Piñatex. Available online at: <https://www.ananas-anam.com/>. [Accessed 20.06.2020]

VEGEA. 2020. VEGEA: Innovative Biomaterials For Fashion & Design. Available online at: <https://www.vegeacompany.com/> [Accessed 18.06.2020].

Woods, M., Balestrini, M., Bejtullahu, S., Bocconi, S., Boerwinkel, G., Boonstra, M., ... & Fazey, I. (2018). Citizen sensing: a toolkit.

### Acknowledgement to the main stakeholders

#### *Remix El Barrio collective*

Anastasia Pistofidou	FAB LAB BCN	Material and Textile Director
Marion Real	FAB LAB BCN	Project Manager
Milena Juarez Calvo	FAB LAB BCN	Community Researcher
Lara Campos	@biomateriality	Endes(uso)
Clara Davis	@biotecamaterialarchive	Dulce de la piel
Laura Freixas	@_organicmatters	Organic Matters
Silvana Catazine y Josean Vilar	@naifactorylab	ReOlivar
Giorgia Filipellini	architect	Colores
Dihue Miguens	@dihuemiguens	Shellskin
Arleny Medina	Leka Restaurant	Circular Gos
Secil Asfar	@3d_printed_healthy_snacks	Look Ma No Hands
Elisenda Jacquemot	Eadimoda	Squeeze the Orange
Susana Jurado Gavino	Eadimoda	Squeeze the Orange
Nuria Bonet Roca	Eadimoda	Squeeze the Orange

IAAC|FabLabBarcelona: Circular Community teams (Alessandra, Xavi, Jessica, Pablo, Sally, Emily), Coordination and EU teams (Luciana, Guillem, Alessandra, Cristina, Vanessa), Communication (Kate, Paula, Manuela, Lina, Marcel), Fab Lab Infrastructure (Mikel, Josep, Julie, Santi), Interns (Avik, Arman)...

### Main Glocal community stakeholders

Doris Boira	Coop La Fabrica	Local association
Diego Waehner	Abono km 0	Social entrepreneur
Miki Royan	Abono km 0	Social entrepreneur
Adriana Sanz	Simbiosy	Consultant in CE
Daniel Florin	RestartBCN, Macus	Local association
Blanca, Rosie, Monique, ...	Taca d'Oli	Social organisation
Pere	Biciclot	Social organisation
Sílvia Casorrán	Superilla, BCN en Comu	Public Institution
Marika Charlier	AAVV Poblenou	Social organisation
Tiago Rocha	Market Cuina	Restaurant
Arleny, Ivan and all the team	Leka Restaurant	Restaurant
Judit Barra/ Jay and all the team	Little Fern	Restaurant
Jordi	Taula Eix Pere IV	Social organisation
Victoria	Macus / Biblioteca de Cosas	Social organisation
Daria Esteve	Cydonia cooperative	Social organisation
Guernica, Pere y Jordi	LABCOOP	Social organisation
Chiara Farinea	Creative Food Cycle	Design ecosystem
Zoe Powell & Pilar Bolumburu	Materiom	Design ecosystem
Robert Thompson	Materfad	Design ecosystem
Maite Machado Rivas	Circular Hotspots / Palo Alto	Public institution
Albert, Claudia	Poblenou Urban District	Design ecosystem

## 4.2. BodySound by Polifactory

*written by Carla Sadini, Laura Cipriani, Mirko Gelsomini, Stefano Maffei, Massimo Bianchini*



# BODY SOUND



## 4.2.1 Synthesis of the pilot's journey

### 4.2.1.1 The organisation

Polifactory ([polifactory.polimi.it](http://polifactory.polimi.it)) is the makerspace and fab lab of Politecnico di Milano. It was created and coordinated by the Department of Design in collaboration with the Departments of Mechanical Engineering and Electronics, as well as Information and Bioengineering. It is an interdisciplinary research lab and a KET Centre that explores the relationship between design and new production models and materializes interactive product-service solutions. Polifactory develops competitive and experimental research, consultancy projects for large companies and SMEs, experimental didactics initiatives, preincubation of talents and ideas for master degree students, PhD students, and fellowship researchers.

Polifactory staff (at the moment composed of eleven members) promotes, coordinates and manages the different makerspace's activities. It collaborates with a wider group of scholars, researchers, graduate and undergraduate students.

In the complex and wide realm of healthcare, the Polifactory team decided to take rare conditions into consideration. FightTheStroke (FTS), is the social promotion association selected to be the main collaborator and mediator of the co-creation journey since it works with and for families whose children have a Cerebral Palsy Childhood condition. The final solution, called BODY SOUND, was co-created in collaboration with a wide range of stakeholders: children, parents, therapists, policy makers, and experts.

### 4.2.1.2 The co-creation journey

Polifactory decided to work in the realm of healthcare and well-being, in particular concerning rare conditions. Polifactory's pilot project investigates the physical-motor needs of children diagnosed with cerebral palsy and explores them according to proprioception principles with a specific attention to the translation of movement into sound stimuli.

Polifactory addressed its challenge with a service design approach and aims to inspire policy making and discussion with a new platform, bottom-up approaches and the engagement of patient associations as key stakeholders to change policies.

The journey was composed of three main phases, during which co-creation activities in forms of workshops, labs and tests were carried out. After a phase of preliminary research and activities' planning, the three phases officially started in May 2019 and ended in November 2020.

It started with the involvement of parents and children to then involve therapists and policymakers as well.

The final solution is BODY SOUND, a system which proposes a new way of performing physical reactivation. It is based on choreutics (a combination of dance and music) and on the transformation of movement into sound.

## 4.2.2 Initial context

### 4.2.2.1 External context and ecosystem

Since 1997, Italy has opted for the decentralisation of the healthcare system, giving regions more autonomy shifting towards a “public-private” model. Lombardy is one of the most populated European regions and has one of the most advanced healthcare systems in Italy and Europe. In 2014, Lombardy Region published the White Paper on the development of the social and health system in Lombardy, followed by the issue of the law of reorganisation, “Evolution of the Lombardy socio-economic system” (August 2015).

Interviews with doctors carried out by the Polifactory team in previous research (MaketoCare) confirmed the precision of the data on self-diagnosis. Indeed, in many cases, when patients try to cure themselves, they tend to adjust the treatment without consulting the doctor first. This habit of independently facing one's own small health problems is not necessarily bad; experts speak of a process of “autonomy”, which is well evaluated by operators in health policy because it reduces public spending and allows doctors to focus on most serious pathologies. However, self-managed medicine is neither easy nor risk-free. This is why Assosalute, in 1997, created an Observatory on Responsible Self-medication<sup>21</sup>.

The Municipality of Milan is focusing on lines of action which have influenced the focus of the pilot<sup>22</sup>, such as the importance given to urban manufacturing, startups and knowledge intensive economy with particular attention to technological and economic development, social cohesion, and participation in the city.

In addition to that, at the regional level, Lombardy Region founded the Lombardy's Life Sciences Cluster, to better facilitate the progress of life sciences in Lombardy and the creation of new business opportunities among the members. In line with the cluster, Lombardy Region organizes the Research and Innovation Hub competition. The aim of the call is to strengthen the innovative capacity of the territory and the infrastructures of research and innovation, to ease the processes which go from ideas to implementation.

Within this realm, Italian and especially Milanese makerspaces and creative communities are particularly active in projects that deal with healthcare. Italian fablabs collaborate and operate on these issues together with patient associations, policy-makers and RRI experts in several European projects, such as FabCare and MakeToCare (Polifactory); Made4You, Hackability Milano (OpenDot); OpenCare (WeMake); and Ubora (Fab Lab Pisa), etc.

---

<sup>21</sup> <http://assosalute.federchimica.it/homepage-anifa/pubblicazioni/numeri-e-indici.aspx>

<sup>22</sup> [http://urbact.eu/sites/default/files/milan\\_iap\\_2018.pdf](http://urbact.eu/sites/default/files/milan_iap_2018.pdf)

Looking at future policies, they would be able to “enable or encourage more innovation effort investment by users at either the extensive (i.e. having more users engage in innovation or innovation diffusion) or intensive (i.e. enabling users that already innovate or diffuse innovations to invest greater efforts in doing so)” (Svensson and Hartmann, 2018: 279).

#### **4.2.2.2 Organisational background**

Polifactory can rely on a large and diverse network of contacts and collaborations which has been growing since its foundation. The network and the communication landscape of Polifactory are composed of several concentric levels, which are - from the smallest to the widest - the Department of Design, the School of Design and the Politecnico di Milano University. These levels characterise both the internal and the external network composition both because Polifactory is directly related to the other levels and also because it can rely on their larger community.

Over the last three years, Polifactory developed relationships and collaborations with more than 100 companies (from SMEs to global firms like Sanofi Genzyme and Vodafone), universities, and organisations like design associations and museums (e.g. ADI, and Triennale di Milano) and entrepreneurial associations (e.g. Confartigianato that represents SMEs). Where the relationship with public bodies and policymakers is specifically concerned, Polifactory is part of the Milanese circuit of collaborative spaces (more than 100 co-working and 10 makerspaces) and is involved in cultural and scientific initiatives organised by the Municipality of Milan. In fact, one of the statements of intervention from the Municipality of Milan is “New Craft & Urban Manufacturing” (identified as strategic sectors for creating new jobs, regenerating suburbs and promoting social cohesion) and implemented the policy programme “Manifattura Milano”. Polifactory co-designed and participated in networking initiatives like Manifattura Milano Camp and Manifatture Aperte Milano ([manifattura.milano.it](http://manifattura.milano.it)). These initiatives aim to involve all the stakeholders interested in developing an urban manufacturing ecosystem in Milan.

Lombardy region is another public body to which Polifactory is already connected. The project Next Design Innovation ([nextdesigninnovation.it](http://nextdesigninnovation.it)) was developed by Lombardy region in collaboration with the Design Department and under the coordination of Polifactory. The project was aimed at promoting the pre-incubation of young talents able to materialise product-service innovative systems that combine design and digital technologies, experimenting with new manufacturing processes.

As the international network is concerned, Polifactory is part of [fablabs.io](http://fablabs.io) global network, is member of Fab City Collective and is platform member of Distributed Design Market Platform (DDMP, [distributeddesign.eu](http://distributeddesign.eu)), a Creative Europe project that stimulate designers, makers and independent innovators to promote and distribute open source products that can be materialised in European FabLabs. In this project, Polifactory collaborates with international fab labs such as FabLab Barcelona and FabLab Amsterdam.

Further, the Polifactory team has carried out several research experiences both in health, manufacturing and policy making areas in an RRI perspective. For example:

- FABCARE ([distributeddesign.eu](http://distributeddesign.eu), Coordinated by IAAC; in collaboration with Centro Medico Santagostino);
- MAKETOCARE ([maketocare.it](http://maketocare.it), Coordinated by Polifactory; promoted by Fondazione Politecnico and Sanofi Genzyme);
- Mi-GENERATION LAB ([migeneration.it](http://migeneration.it), Coordinated the Municipality of Milan, in collaboration with 18 partners).

### 4.2.3 Challenge

Notwithstanding the fact that Italy ranked as the world's healthiest country and fourth in the health system efficiency rank, (Bloomberg, 2018), decreasing good health perception and trust in the medical system has been manifesting in the Italian population. 4 out of 10 Italians (23.6 million people) are affected by a chronic disease; while 1 in 4 among adult patients is affected by at least two chronic conditions.

The idea of focusing on a so-called rare condition was developed for a number of reasons:

- Often rare diseases and conditions are not sustained by the public welfare system;
- Informal caregivers are neither supported nor trained in the management of their relatives' problems;
- Rehabilitation and cure processes and environments are often unfriendly;
- Collaborations between makerspaces/fablabs and innovative users in the medical field are very important to avoid users 'drop out' of the innovation process before having realised a prototype because of lack of skills, budget, etc.

Even if Cerebral Palsy (CP) is not exactly a rare condition, it is often perceived and treated as such, even if it is one of the most common physical disabilities in childhood. CP is "an umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of development"(Mutch et al., 1992 in Rosenbaum, 2003: 326)<sup>23</sup>.

Looking at data on infantile CP, there are over 40 thousand children with Infantile Cerebral Palsy in Italy, with an incidence of 1 in 500; estimated to be 3 per 1000 in Milan.

Looking at the policy context, we can mainly refer to chronic patient conditions, which at a national level, is regulated by the "Piano Nazionale della Cronicità" (PNC) (National Plan for Chronicity), issued in 2016. Chronic pathologies and states require a strong integration between NHS and social services. There are several models of chronicity management that

---

<sup>23</sup> Mutch LW, Alberman E, Hagberg B, Kodama K, Velickovic MV. Cerebral palsy epidemiology: where are we now and where are we going? *Dev Med Child Neurol* 1992;34:547-55.  
Rosenbaum, P. (2003). Cerebral palsy: what parents and doctors want to know. *Bmj*, 326(7396), 970-974.

the Regions are adopting to implement the PNC. Where the Lombardy region is concerned, citizens with chronic diseases (once accepted by their territorial Health Protection Agency), choose the Manager<sup>24</sup> who will take care of their health needs developing an Individual Assistance Plan (PAI) valid for one year.

FightTheStroke was identified as the patients and caregiver association to initiate collaboration. It deals and operates with and for young stroke survivors with a disability of Infantile Cerebral Palsy, and their families; it was crucial to better know the issue and to contact families and therapists.

#### 4.2.4 The co-creation process of the envisioned solution

Our experimentation phase started in May 2019; since then, the following stages of work were carried out, which -as it is going to be discussed- were not conducted sequentially but in a recursive way:

- analysis: survey
- reframing: challenge definition
- ideation: co-design workshops
- prototype:
  - 1st loop: first development of BODY SOUND and tests
  - 2nd loop: development of recording platform and tests
  - 3rd loop: development of demo web platform and tests
- policy makers: meetings and workshop

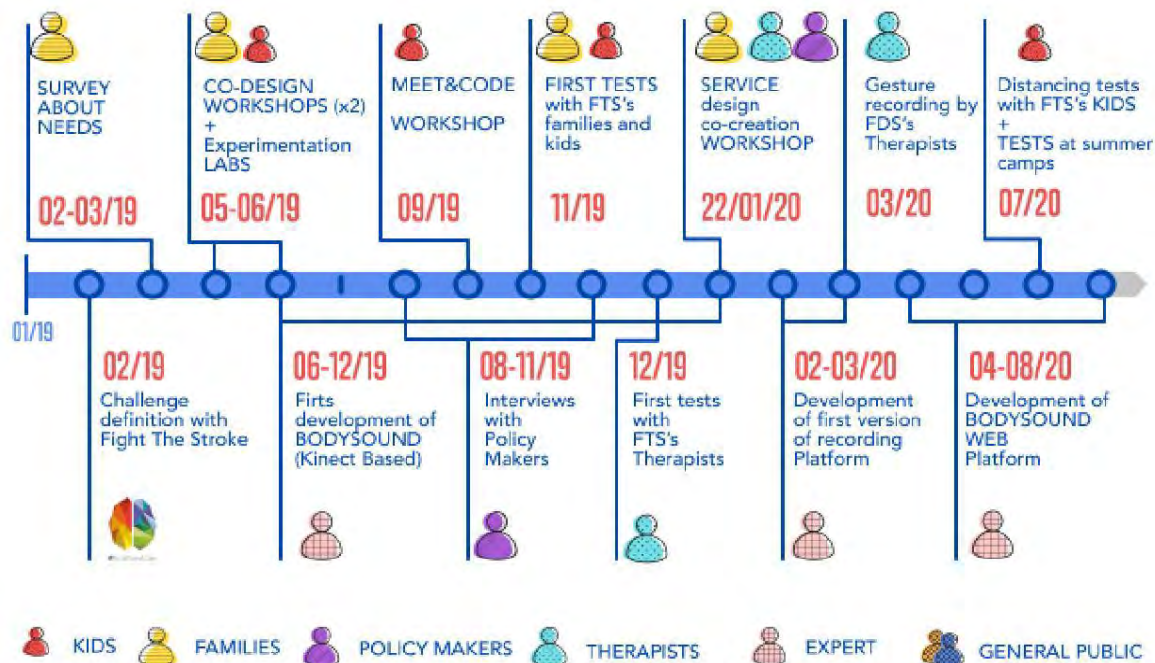


Fig 4.2.1: BODY SOUND co-creation process

<sup>24</sup> The manager is not a single doctor, but it is a public or private health facility or an association or a cooperative of general practitioners or pediatricians, which the Region has previously screened and assessed as suitable for treating one or more chronic diseases.

#### 4.2.4.1 Analysis of the context

Both desk and field analysis were conducted. In general, the team carried out a documentation on the Cerebral Palsy condition and treatments with particular attention to inspirational case studies.

As the field research is concerned, first of all, a survey with parents/caregivers of families was realised where (at least) one case was present as well as a preliminary conversation with the president of FTS association. This process was useful to better frame the challenge, identify inspirational projects and understand the role of music (through the involvement of a sound design expert).

Talking with the president of the association and thanks to a survey carried out with parents of children affected with CP, the main challenge was finally defined: addressing the physical-motor needs of children diagnosed with CP, exploring them according to proprioception principles with a specific attention to the translation of movement into sound stimuli.

#### 4.2.4.2 Reframing of the problem

After the initial desk and field research, the Polifactory team decided to orientate the actions for improving CP conditions by focusing on the well-being of patients (children). They particularly focused their work on sports and play, in particular on music. This choice was influenced by the survey answers which stressed low levels of pleasurability of cure and rehabilitation spaces and the importance of sport and recreational activities besides the rehabilitation ones.

In addition to that, the International Classification of Functioning, Disability and Health (ICF) from the World Health Organization, states that “a true and effective global takeover of the child must give importance to a series of factors, described through six simple words, the so-called 6 F-Words: function, family, fitness, fun, friends, and future. Nowadays, we promote the idea of the best life possible being the best medicine for people with cerebral palsy”<sup>25</sup>.

#### 4.2.4.3 Ideation

During this stage, a variety of experimental workshops have been conducted to validate some intuitions, refine the needs and better identify the effective problems of the various stakeholder groups, as it is going to be discussed in the following pages.

##### Co-design with ‘Fight The Stroke’

11 members of the association FTS, including both caregivers and a patient, participated in the first half-day workshop facilitated by designers from the Polifactory team.

---

<sup>25</sup><https://worldcpday.org/our-campaign/medical-therapeutic/dr-peter-rosenbaum-the-best-life-is-the-best-medicine-for-people-with-cerebral-palsy/>

After a brief introduction, needs and design opportunities were identified starting from the initial questionnaire and personal stories of the participants to then get into the exploration of technology's potential to meet those needs using tools like idea cards and scenarios.

### Experimentation lab with children

An experimentation lab was designed for children consisting of 4 different activities based on four main technological and musical tools to develop simple tests to experiment with children: the Kinect technology, the Theremin, the Makey Makey, and SoundMoovz bracelets (Fig. 2).

8 children participated in the experimentation lab and the following main evidences have been collected both through direct observation and the collection of cultural probes:

1. Shakeshake (using SoundMoovz bracelets): the parents liked them because they are “portable”, can be used everywhere, and are easy to use;
2. Teremì (using the Theremin): easy to use; and the children like the sound produced;
3. Gimmi5 (based on Makey Makey technology): easy to use also by younger children;
4. Kinny (based on Kinect technology): not very intuitive and easy to use, but when they understand how to do it, they like it; Kinect has difficulties in detecting children on wheelchairs.



Fig 4.2.2: BODY SOUND experimentation lab with children

Between the first and the second set of co-design sessions, the internal team conducted several moments of debriefing.

The proposed ideas were verified to be original to then clusterize them according to:



Table 4.2.1: Criteria of clustering

Design areas
The physical component of sound (haptic feedback)
The body in space (body / space interaction)
The body as a musical instrument (transducer)
Design dimensions
The inclusive dimension of the solution (designed for FTS children but usable and appreciated by all)
The non-performative dimension of the solution (a different approach to the discipline: music / dance)
Characteristics
Make music through a bilateral movement (since children with cerebral palsy diagnosis tend to move only and preferably the side of their body which was not compromised)
Experience music through the body (wearables) thanks to haptic feedbacks
Use of the body to play music

### Co-design with caregivers

4 caregivers participated in the 2-hour-workshop with the scope to verify the outputs from the first co-design workshop and experimentation lab. The ideas that had emerged from the debrief activity were presented in order to verify and refine it; they were asked to collectively imagine a possible user journey of BODY SOUND product (Fig. 3). In particular, they appreciated the systematisation of several ideas together and they were able to discuss barriers and opportunities of the solution. The facilitators asked them to focus mainly on the device and on the guide for the movement. Where the device is concerned, they suggested that it should be integrated in a piece of cloth or it should be an accessory which the child was able to wear by him/herself. As the guide to the movement is concerned, participants identified Motion Graphic as the preferable solution; however, different opinions about the abstraction of the visualisation emerged mainly according to the age and the physical and mental conditions of children.

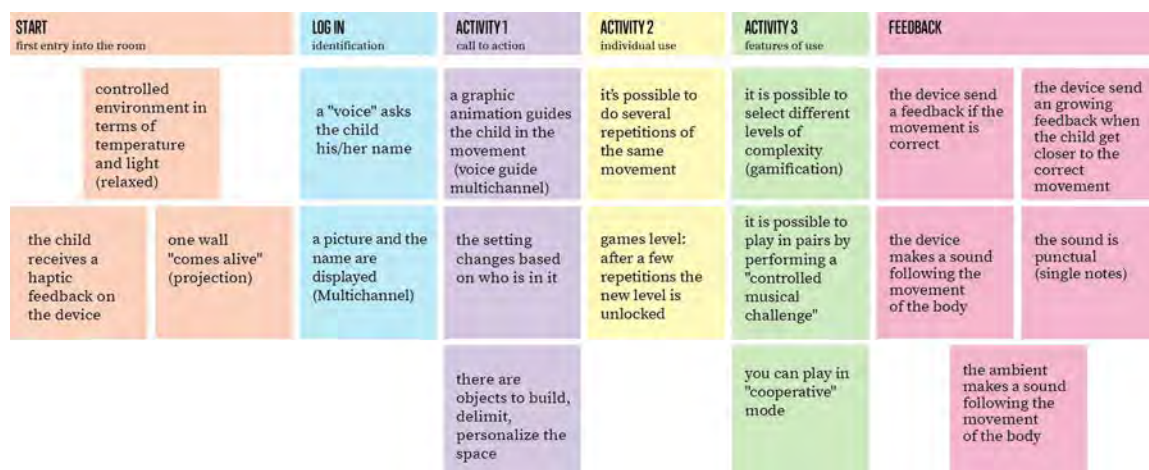


Fig 4.2.3: User journey as an outcome of the workshop

### Second experimentation lab with children

For the second round of experimentation lab with children, Polifactory participated, in collaboration with FightTheStroke, in the Meet and Code days, on the occasion of the EU Code Week (October 2019).

BODY SOUND' Experimentation Lab was developed around the theme "Technology and Inclusive Music" and it was hosted on Facebook, in their Milanese headquarter. About 20 children participated in the Lab and the group was equally composed both by children affected by cerebral palsy and children without the pathology.

- As for the previous experimentation lab, the process of involvement of children was based on designing and prototyping a series of tangible experiences, based on sound manipulation with the children playing three main roles:
- Deejays: in pairs, they could interact with knobs, levers, rudders designed in connection with the synth version of littleBits. They activated the interfaces with both hands, interacting with two notes simultaneously to generate the most varied consonances and dissonances.
- Choreographers: in pairs, they could choose among different simple movements to guide the "dance" of the other children.
- Dancers: the rest of the children executed simple movements guided by the two choreographers and on the notes produced by the two deejays.

The result of this second round was the idea of a virtual system where gamification elements help the motor stimulation and – possibly - reactivation of the limbs by encouraging the children/users to use and move the plegic part through the execution of a series of choreographies.

#### 4.2.4.4 Development and prototyping

BODY SOUND prototyping followed a quick and dirt development approach, which is very useful to anticipate results and review them during the early stages of work. The basic idea was that, guided by the visual interface of the game, the child can perceive the movement performed and the position in the playing space through its own reflection in the monitor in the form of an avatar. BODY SOUND can detect gestures through a simplified system of motion capture and return in real-time one or more sound feedbacks, producing a melody when performing the correct movement. The system uses a touchless technology (Microsoft Azure Kinect) for body tracking based on the space coordinates and the angles between nodes of the human body. This device was integrated with an audio-video system in combination with a software developed by the internal team.

Three main iteration stages were organised according to testing and co-designing activities. These stages were mainly focused on software development. Several versions ready to be tested were released, even if not completed. The solution was then readjusted according to tests feedback and co-design results. The three main loops were based on:

- 1st loop: first development of BODY SOUND and tests + co-design of the service (offline)
- 2nd loop: development of recording platform and tests (online)
- 3rd loop: development of demo web platform and tests (offline and online)

### Co-design with policy makers, therapists and families

The workshop involved 18 participants represented by policymakers, therapists and families from the FTS association divided in two working groups. First of all, they filled in an opportunities map (Fig. 4a), reasoning on different possible contexts of implementation, purposes and additional users who could be involved. Each participant was invited to generate some rough ideas starting from the opportunities discussed in the previous collective session (Fig. 4b). After a plenary voting of the ideas, the two most popular were selected and each group had to work on one of them, trying to hypothesise the provider of the service, specific software functions and goals. The first idea was focused on a school environment, and the second was on a sports center environment.

In the afternoon, the participants elaborated on these ideas according to three different moments: what would “happen” before, during and after the use.

As for the first co-design workshop, the debrief phase was crucial in order to identify strengths and weaknesses and be able to merge the most promising features in one unique idea.

Fig 4.2.4.a: Opportunity map, b. Idea generation sheet

### Testing

Multiple testing phases have been carried both offline and online (due to the COVID-19 situation), involving several actors: the designers/developers, the therapists and the children (see D3.3).

#### 4.2.4.5 The role of policies and policy maker engagement

Working in the field of health and therapy, the involvement of policy makers throughout the process was crucial. The Polifactory team understood that personal meetings might be preferable in order to start a conversation. The team selected a list of 21 experts and policy makers to contact and ask for a private meeting.

Policy makers have been both from the Municipality of Milan and the Lombardy Region and other experts from private Foundations.

The interview/conversation guide was based on the «Policy Context» SISCODE tool. 9 policy makers were interviewed. A synthesis of the results has been developed dividing the context between barriers, driver's location and policy context (See Fig. 5).

All the interviewees were willing to participate in future consultations and developments.

They declared to be available to participate in the project through:

- the implementation of the prototype n. 1 at a city level (Council for Participation, Active Citizenship and Open Data)
- the advisory on RRI (Scientific and Technological Area Director, Fondazione Cariplo/Cariplo Factory)
- the participation in one specific event or conference (Head of Welfare Secretariat at the Lombardy Region)



Fig 4.2.5: Synthesis of the interviews with policy makers

#### 4.2.4.6 Covid-19 Situation

BODY SOUND journey was influenced by the COVID-19 pandemic and the core team had to review the journey according to the unlikelihood of being in the same place at the same time. Continuing the prototyping activities remotely was possible, but in order to maintain the involvement of the users, the team had to change the supporting technologies. Indeed, they decided to substitute the Kinect with an ordinary webcam in order to share BODY SOUND with the children who were able to test it (and use it) from their homes. Before starting this new testing phase, therapists who participated in the journey were invited to register the training gestures on an ad hoc platform that was developed. The original idea was not abandoned but it was decided to develop BODY SOUND web first, a more pervasive and accessible solution at the expense of accuracy, and then BODY SOUND pro.

This shift was possible thanks to the advanced development of Artificial Intelligence methods requiring low performances. In particular, Google has invested a lot in the last years in developing and fostering adoption of machine learning tools working directly on the web browser (e.g. Google Chrome, Mozilla Firefox, ...) by building TensorFlow<sup>26</sup>. In March 2020, based on TensorFlow, Google updated and improved features of Human Pose detection with the name "PoseNet" v2<sup>27</sup>. PoseNet can be used to estimate either a single pose or multiple poses, meaning there is a version of the algorithm that can detect only one person in an image/video and one version that can detect multiple persons in an image/video.

Therefore, it was finally decided to integrate both the PoseNet + webcam solution and the Kinect one which lead to the development of BODY SOUND web and BODY SOUND pro.

### 4.2.5 Status of the solution

#### 4.2.5.1 Concept

BODY SOUND System proposes a new way of performing physical reactivation. It is based on choreutics (dance + music) through the transformation of movement into sound.

Within this system, children can perform a choreography and transform it into a melody. The system is able to detect the child's movement and send a digital trace through a wearable device. Moreover, this wearable device will enable haptic feedback to guide the child in executing the movement correctly. Two types of solutions have been designed: BODY SOUND web and BODY SOUND pro.

---

<sup>26</sup> TensorFlow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks.

<sup>27</sup> PoseNet is a machine learning model that allows for Real-time Human Pose Estimation on the web by making use of regular web browsers and a webcam (integrated or plugged).

**First solution - *BODYSOUND web* (Fig 4.2.6):**

This solution is addressed to both patients and caregivers. It is developed for home training and can be used on any device with an internet connection equipped with a webcam (PC or tablet). It does not require installation but only the registration of a user profile. This version is released with a finite number of exercises which may vary due to the software updates.

**Second solution - *BODYSOUND pro* (Fig 4.2. 7):**

The solution is addressed to specialists in the medical, health and sports field. It is tailored for training sessions to be carried out at schools or sport centres. The system integrates everything necessary (computer, kinect, projector) to set up a space dedicated to the activity to make it accessible to more users simultaneously. This configuration allows the user to load custom movement sequences which are converted into exercise / game models.

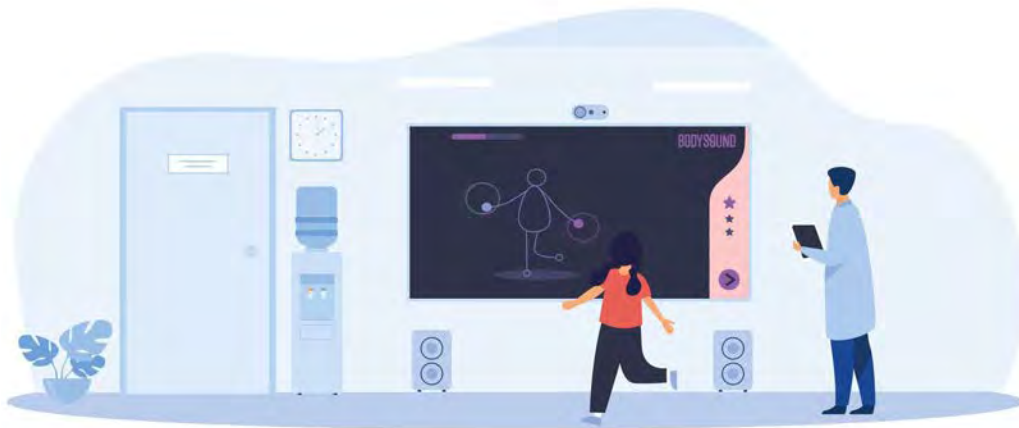


Fig 4.2.6: BODYSOUND pro



Fig 4.2.7: BODYSOUND web



### Brief technical aspects

The BODY SOUND web application was developed using web languages such as HTML5, JavaScript and CSS3 and is offered online through any internet browser (Google Chrome, Mozilla Firefox, Microsoft Edge, etc...). The application starts by loading all layout contents needed for the graphical representation and all the scripts needed for controlling the flow. The flow is provided as a list of subsequent states starting from an "INIT" phase in which all parameters of the application are instantiated.

A "WELCOME" (Fig.8a) phase provides visitors with the initial information of the project and asks them to enable the webcam. Only by enabling the webcam, a pre-trained model is downloaded to detect human poses from the webcam video stream. This part is based on ml5.js, an open source, user-friendly high level interface to TensorFlow.js, a library for handling GPU-accelerated mathematical operations and memory management for machine learning algorithms (see more <https://www.tensorflow.org/>, <https://ml5js.org/>).

A "REGISTRATION" phase asks the user to input his/her name and choose his/her preferences (e.g. which body part to enable, avatar colour). At the end of the registration, instructions are given asking the user to move out from the screen, enable the audio (in case it was not activated) and start.

A "TEST" (Fig.8b) phase enables the system to calibrate the difficulty of the game based on the user body specificities and motor capabilities. The user is asked to form a T shape with his/her body as a test and a functional map is created based on the formed shape, calculating the user's specifics (trunk, limbs and arm's length, height, centre of gravity) and capabilities (easiest to most difficult positions w.r.t its specifics). In case one side (eventually the one affected by the stroke) shows less capability than the other side, the weaker one will be considered as a baseline function and the second as the target position function.

As soon as the system stores the functional map, the game starts. A metronome given the music tempo is played. The user has to catch as many virtual balls as he/she can by touching them with hands or feet. The virtual balls are launched one after another and depict a musical instrument belonging to the music played in the background. Each ball has also a colour which corresponds to the same colour attributed to one of the limbs. Once the user collects the instruments, they start playing and join the main melody. The more balls are caught, the more instruments are inserted, and the musical track turns complete step by step.

When the music finishes, the user is provided with the final score (relatively based on the instruments caught and on the duration of the music). The entire session (such as user's positions, movements, gestures, times, features, capabilities, etc.) is stored as a json formatted file to be processed by statistical software.

"HAPTIC FEEDBACK" (to be developed): the BODY SOUND device communicates with the application and enables the transmission of haptic feedback directly to the user's wrist or ankle. The device is made of a set of components needed to enable specific features: a micro-

controller receives and sends low latency signals to the app by making use of an integrated Wi-Fi module connected with the main application. A vibration module is activated when it is the right time to interact with the suggested hand or foot.



Fig 4.2.8a “WELCOME” phase of BODY SOUND WEB

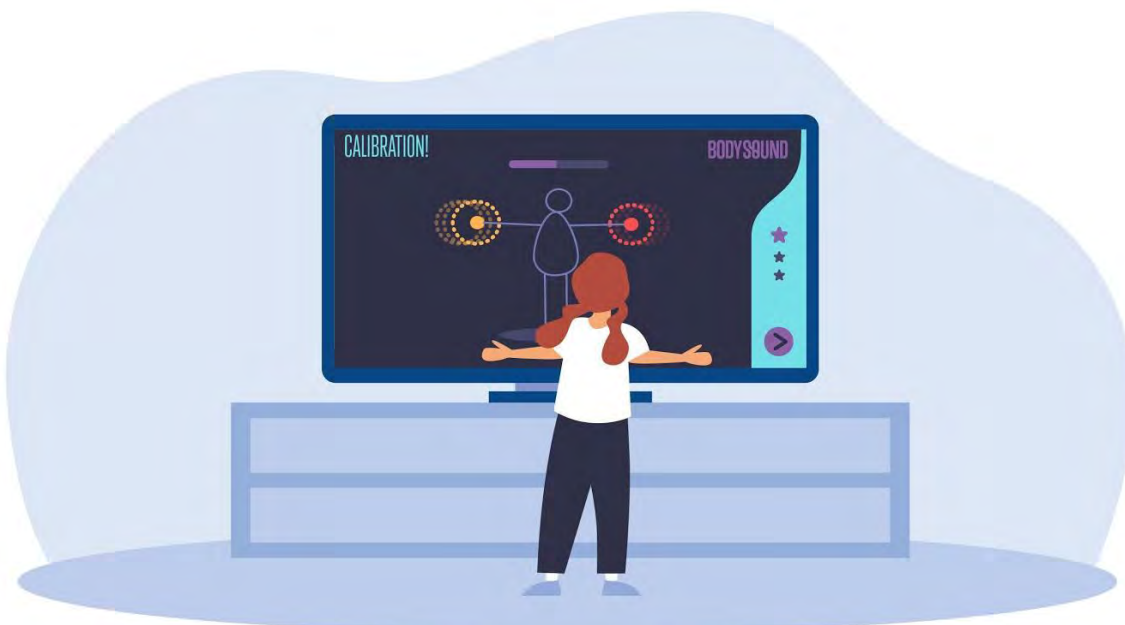


Fig 4.2.8b: “TEST” phase of BODY SOUND WEB

## 5.2 Sustainability strategy

Polifactory is already planning to continue the development and the implementation of BODY SOUND looking at occasions for synergies and financing possibilities. In particular, the team is evaluating the possibility to develop the BODY SOUND project in terms of IP

protection (aligning it to the Consortium's IP regulation): building a connection with the Technology Transfer Office (TTO) of the University (Politecnico di Milano) in order to understand the possibilities for a patent submission.

The moment of crisis due to the pandemic forced the team to find a solution that actually is already scaling the possibilities of enlarging the internal base of users. Indeed, the BODY SOUND web version that has developed from this extraordinary situation, will be free for use by everybody who owns a private computer with a camera.

BODY SOUND web was already successfully tested in schools. This web version has great potential to be scaled all over the country while the simple translation into other languages e.g. English would allow an international scaling. The team is evaluating the possibility of running a hackathon to improve both the solutions and explore national and international (European) calls that might allow to finance the following development phases.

## **4.2.6 Transformations triggered and outcomes**

### **4.2.6.1 Organisational transformation**

Thanks to the SISCODE experience, Polifactory improved its capacity to work in multidisciplinary teams and with a multidisciplinary approach, since IT and sociology became part of the process of analysis and development. In addition to this, extended capacities to communicate and collaborate with different stakeholders were acquired. Furthermore, special attention has been dedicated to children as the main target. Polifactory had never worked with children before and this was a very important experience and opportunity to acquire competences in engaging with specific groups of stakeholders for the members of the team.

Co-creation has already been something closely linked to the culture at Politecnico di Milano. Nevertheless, thanks to SISCODE, Polifactory improved its experience in application and deepened its knowledge on co-creation practices.

The introduction of this new knowledge also enlarged the stakeholder network of Polifactory establishing new and improving existing relationships with policy makers and patients' associations. This opened new possibilities and pathways towards the ideation and development of new experimentation research projects.

The Covid-19 pandemic forced the entire lab to collaborate at distance not only within the working team but especially with their stakeholders. Therefore, Polifactory gained additional competences in exploiting the possibilities that online tools can provide.

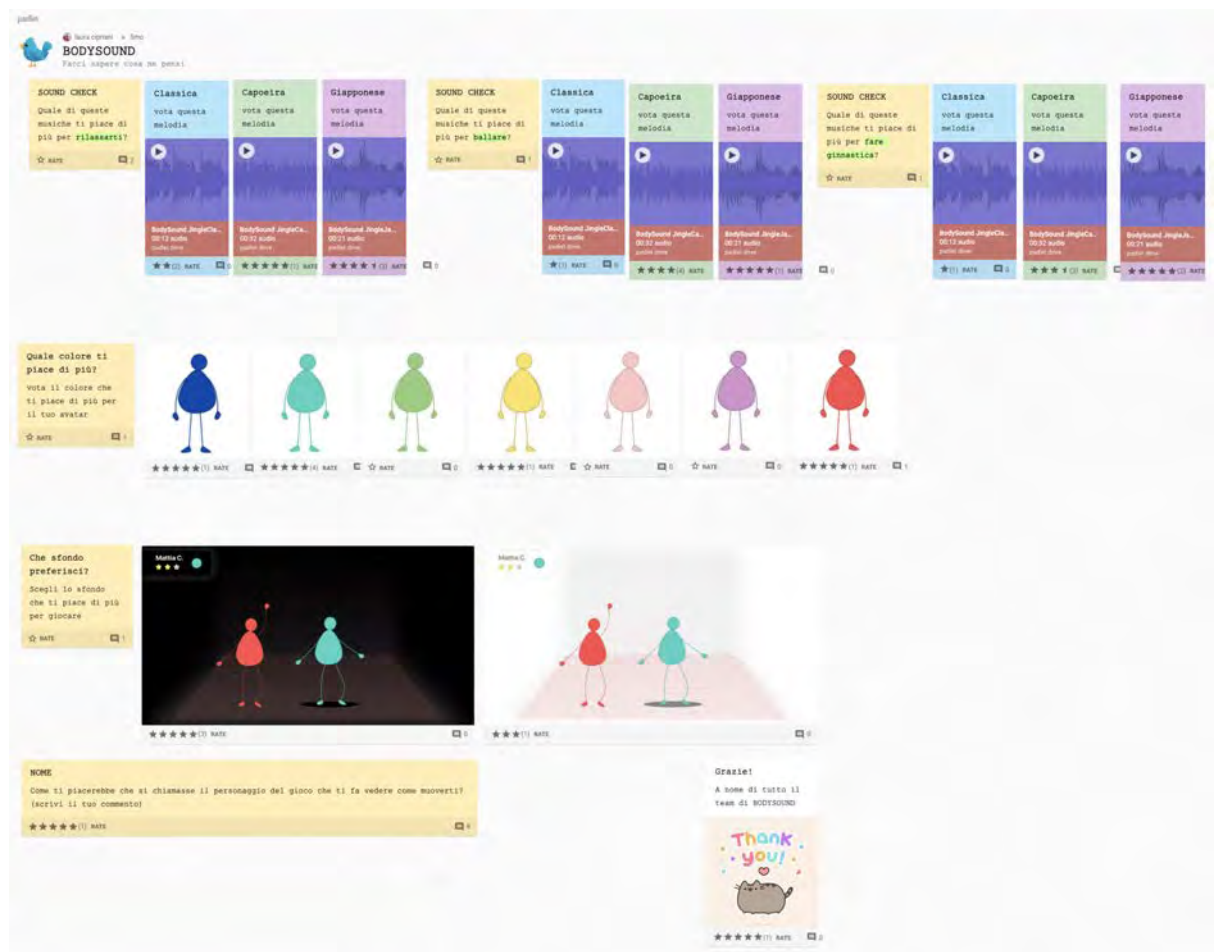


Fig 4.2.9: Padlet platform for users' evaluation

Fig 4.2.10: Recording platform for co-design with therapists  
[www.bodysound.org/edutest](http://www.bodysound.org/edutest)

#### **4.2.6.2 Transformations in the ecosystem**

Polifactory, as previously discussed, already had some experiences in conducting co-creation activities and carried out some research on healthcare issues as well. However, the SISCODE project gave the possibility to experiment with this know-how and to acquire additional knowledge on co-creation in the specific field of healthcare and well-being. This support to consolidate experiences and reputation and to gain new pieces of knowledge like designing and co-designing with children, developing an intangible solution (software development), managing the involvement of a multi-composed group of stakeholders. In addition to this, Polifactory shared this experience with an extended community at Politecnico di Milano.

In the following months, Polifactory wants to improve the BODY SOUND web demo in order to fix some technical problems and complete the BODY SOUND pro registration platform for therapists. In addition to this, the team is planning to realise promotional videos to disseminate the idea and prototype. Specific attention will be drawn to the sustainability and the dissemination of the project. Before the Covid-19 emergency, Polifactory were invited by the Municipality of Milan to have a final dissemination event at Palazzo Marino (headquarter of the Milanese Municipality) and were also invited to test the demo in some public schools. The pandemic made it impossible to realize those events or take part in similar ones but did not reduce the interest to exploit these opportunities in the future.

It is important to look at small changes in the whole ecosystem and especially on the accumulative improvements that a pilot project such as BODY SOUND can have in stating the relevance of co-creation in healthcare and well-being and the special and crucial role that makerspace and fab labs can play in facilitating these processes. Some of the policy makers involved had never participated in activities like these before and positive feedback were collected from them. At the same time, the capacity of creating a “safe room” for users with specific needs, in particular vulnerable groups, to encounter other stakeholders like policy makers in leading positions was for sure a very relevant and trigger point.

The Covid-19 situation stressed the importance of taking care of people with disabilities also from a distance and especially when it is impossible to attend rehabilitation and sports activities.

#### **4.2.7 Conclusive reflections**

Thanks to the experience gathered during the pilot project, Polifactory understood and verified that co-creation processes are highly dependent on the issues faced and their context; co-designing with vulnerable users' needs a different approach than more conventional users' co-creation processes.

The team decided to initially meet their stakeholders in separate and private moments because of the delicate and intimate issue to then organise a collective moment with all the stakeholders involved building trust among all the participants. As researchers, they identified the importance of the role of the mediator between different groups. However, an

additional mediator facilitating the relationship between the research group and the main users (parents and children) was crucial. (in this specific case, the collaborating patient association). Concerning the process of building trust, it is very important to share knowledge from both sides, which means that - avoiding biases - researchers have to inform participants and keep them informed throughout the whole co-creation journey regardless of their rank or role outside of the project. Unfortunately, the Covid-19 emergency diminished the possibility of having face-to-face moments of interaction that were identified to be very relevant. Apart from participating in operative workshops, informal moments of conversation have been found necessary to share opinions, build trust, and be able to observe how interaction dynamics are performed. Therefore, the space of interaction is very relevant as well. Also, relaxing moments (such as lunches or coffee breaks) need to be organised and managed to facilitate interactions and keep up the safe space created during the activities.

Talking about the co-creation workshops is possible to say that they were all organized according to three main activities:

- share information, knowledge, and experiences
- hands and minds on: through the use of co-design tools imagine possible scenarios
- reflect (and share again): collectively analyze the solution identified and select

Last but not least, respect is one of the most relevant factors to pay attention to. Stakeholders have their own commitments, and time is one of the most precious resources. For this reason, it is very important to give value to the time that is required from them.

To sum-up, from Polifactory co-creation journey, it was understood and verified that co-creation:

- is an accumulative and iterative process
- needs to pay attention to time and space issues
- needs the researcher to be a mediator
- has to keep stakeholders informed throughout the whole process.

## 4.2.8 References and Acknowledgement

### References

Federchimica Assosalute (2020). Numbers and Indices on automedication

<http://assosalute.federchimica.it/homepage-anifa/pubblicazioni/numeri-e-indici.aspx>

Urbact (2018) Innovation & Inclusion. Milan's periphery as a laboratory for Social and Economic Innovation



[http://urbact.eu/sites/default/files/milan\\_iap\\_2018.pdf](http://urbact.eu/sites/default/files/milan_iap_2018.pdf)

Mutch LW, Alberman E, Hagberg B, Kodama K, Velickovic MV. Cerebral palsy epidemiology: where are we now and where are we going? Dev Med Child Neurol 1992;34:547-55.

Rosenbaum, P. (2003). Cerebral palsy: what parents and doctors want to know. Bmj, 326(7396), 970-974.

Rosenbaum, P., The best life is the best medicine for people with cerebral palsy  
<https://worldcpday.org/our-campaign/medical-therapeutic/dr-peter-rosenbaum-the-best-life-is-the-best-medicine-for-people-with-cerebral-palsy/>

### Interview partners

FightTheStroke:

- Founding President

Municipality of Milan:

- Chairman of the commission advising social policies, health services and volunteering
- Councillor for Participation, Active Citizenship and Open Data
- Councillor for Education
- President of the Milano City Council

Lombardy Region:

- Head of Welfare Secretariat at the Lombardy Region

Milan Chamber of Commerce:

- Programme Manager- Inclusive Growth

Foundations:

Scientific Director, Fondazione Bassetti

Project Manager, Fondazione Filarete

Scientific and Technological Area Director, Fondazione Cariplo / Cariplo Factor

### 4.3. Plastic In Plastic Out (PIPO), by Maker / Viadukten

written by Asger Nørregård Rasmussen and Malte Hertz Janzen

# PIPO



# maker

### **4.3.1 Synthesis of the pilot's journey**

#### **4.3.1.1 The organisation**

Maker is a non-profit association established in March 2015 in Copenhagen (Denmark), with the core objective to foster professionalisation and spread of the maker-ecosystem and to support physical entrepreneurship in Denmark.

Maker works to build and secure a strong network between makers, private companies and the public sphere in Denmark and the Northern countries. The association is led by a board and managed by a secretariat.

The mission and role is to mediate formal and informal relations and connections between makers, the civil society, organisations and policy makers. Maker therefore nurture, promote and engage the Danish ecosystem of stakeholders working with co-creation of sustainable solutions, capacity building, and tools regarding design thinking, prototyping and new digital fabrication technologies. Maker addresses challenges in relation to the Fab City Initiative in order to experiment, develop support and promote local production, circular economy, democratisation of tools and knowledge in Copenhagen, as well as in the rest of Denmark.

#### **4.3.1.2 The co-creation journey**

The heightened acceleration of the world's resources consumption is creating enormous challenges. In Denmark and Copenhagen, the amount of resources being disposed per capita is twice important compared to the EU average. The new Resource and Waste Management Plan 24 in Copenhagen (Rap 24), highlights the needs to change the mindset about waste and resources, ensure better sorting systems, change consumer behaviour in a more circular direction, foster better sharing and swap models, propose higher requirements on recycling plants, and inspire more recycling of concrete and other materials from the built environment (Rap24, p. 5).

Meanwhile, we experience a rise of grassroots initiatives and citizen driven projects that pushes the boundaries of alternative models of production and consumption promoting the R principles (repair, recycle and reuse), and thereby the transition from a traditional linear to a more circular production and consumption model (Rap 24, p. 6 & Fab City Whitepaper, p. 9).

The pilot of Maker developed during the SISCODE project addresses the needs for more sustainable solutions and circular alternatives to traditional (linear) production and looks for fostering collaboration that enables new recycling models, methods and systems. With a strong starting point in the local maker and fab lab communities, the journey focuses on co-creating an ecosystemic and community driven approach to the circular economy. In this way, the approach is aligned with the Fab City agenda.

The process lasted 21 months in total and consisted of four phases of activities from context analysis to co-design and prototyping leading to the development of our ecosystem 'Plastic

In, Plastic Out' (PIPO). Mapping and analysing the local systems, existing and possible solutions, best practices in infrastructure management, production models, legislations and regulations in hardware production, allowed the Maker team to build a shared base of knowledge that led to the elaboration of a new generator-processor-producer ecosystem model for the city of Copenhagen.

This model has then been extended to fit with the wider ecosystem of stakeholders involved in the local value-chain of recycled plastic sheets and products. By implementing, prototyping and testing the model through several iterations, the Maker team has facilitated the development of the PIPO system, a solution combining the reduction, reuse and recycling of plastic in manufacturing, production and consumption applying a locally anchored, systemic approach.

### **4.3.2 Initial context**

#### **4.3.2.1 External context and ecosystem**

Danish legislation makes it difficult to directly reuse and source materials from resource centres, since it is illegal to source materials from these places. However, many resource centres have already set up shops for discarded objects. The downside here is that those shops do not offer materials, but are proposing more final products, such as old furniture and toys destined for direct reuse. Until recently, procurement policies did not incorporate or promote the exchange of reused or recycled materials and were not proactive enough to promote neither circular nor sustainable practices. Denmark has established well-functioning waste management plans, but still struggles to give value to waste from private households. Denmark in general has a lower recycling rate than the average within the European Union (Rap24, p. 5). Recently, the technical and environmental mayor of Copenhagen, Ninna Hedeager Olsen, has introduced that collaboration, cross-sector partnerships and socio-cultural change is needed for a circular transition in Copenhagen. The new solutions rely on a combination of new technical solutions and innovations, and on the understanding of complex contexts and ecosystems (Rap24, p. 5-6). The last resource and management plan in Copenhagen have fostered better waste fractioning and private sorting while the recycling percentage has grown from 27% in 2010 to 45% in 2018 (Rap24, p. 6). Denmark is the country in Europe that burns most waste, which can be changed via better and more thorough waste sorting and management.

The Resource and Waste Plan for the city of Copenhagen (RAP24) highlights 3 concrete goals: 70% recycling of household waste, 59.000 tons CO2 reduction, tripling of reuse via municipal sharing and reuse facilities. Consequently, the City of Copenhagen started an ambitious effort for promoting circular initiatives. One of the key actions is the development of the new Sydhavn Genbrugscenter (Sydhavn Resource Centre) (Rap24, p. 8). While the political landscape is opening activities and projects working with this scope, regulations, certifications and material transparency are still issues when working with recycled

materials and products. The city of Copenhagen highlights three core elements that are important when embedding influencing policies and changing citizen and industry behaviour: 1) physical conditions, 2) motivation, and 3) knowledge (Rap24, p. 17).

Extended responsibility of producers, but also on procurement within municipalities and companies are some of the main goals for future policies toward a more local circular economy. It is essential to co-imagine a new certification system for local and circular products as well as new opportunities for experimenting with better quality and better access to materials/fractions from recycling stations and centres. Those new policies need to enable better collaboration between municipal stakeholders, companies and innovation environments such as makerspaces/fab labs and production facilities. It is about piloting new collaborations to ensure better models for recycling, designing and producing high quality and small to medium scale productions (products and services). The political landscape is changing and reports also show how procurement agreements benefit from the circular economy and more sustainable choices (Prisen for cirkulære indkøb, MST, 2020). The future for a more circular Copenhagen and Denmark is moving in the right direction, with the new resource and management plan, national plans, European plans and legislations promoting the circular economy.

#### 4.3.2.2 Organisational background

Employees at Maker are trained in cross-sector collaboration, co-design methods and hands on prototyping. Maker is, most of all, a practical research association supporting and promoting physical entrepreneurship (designers, makers, entrepreneurs), open source methodologies and circular economy initiatives.

The core team from Maker working on SISCODE consists of Asger Nørregård Rasmussen who is the community and lab manager, Malte Hertz Jansen who is the managing director, Frederik Kragh Brandt who is a plastic specialist and design engineer. Stine Broen Christensen has been part of the core team until she left on maternity leave. The core stakeholder group during the co-creation journey consists of designers, circular economy specialists and practitioners, small scale plastic recyclers and SMEs. In the ecosystem model these embeds in the processor, producer, and end-user groups. The members group in Maker's shared workshop and co-working space (Viadukten<sup>28</sup>) counts architects, industrial designers, engineers, interaction designers, product designers, jewellery designers, hobbyists, and can be grouped as physical entrepreneurs or makers.

Throughout the co-creation journey and as part of policy maker engagement 6 civil servants from both Copenhagen Municipality and Helsingør Municipality have been engaged in workshop, meeting and event activities. On an informative level the cultural and leisure mayor of Copenhagen have been engaged. Engagement of both students and a professor from

---

<sup>28</sup> Formerly called 'Underbroen'

Aalborg University Copenhagen have been engaged in developing life cycle assessment, stakeholder engagement and framing the PIPO project. On an industry level, the old Danish plastic recycling company, Aage Vestergaard Larsen and Rockwool have been engaged in analysing the context and reframing problems and solutions. Lendager architects have been engaged on an inspirational level during events, but also as technical inspiration. Maker has been working with the maker movement and Fab Lab network experimenting with its related design methods in cross-sectoral collaborations since 2015. The association has experiences in organising and facilitating innovation and development sprints, and hackathons with companies, citizens and members internally and externally.

The co-creation activities throughout the project have played an important role in all collaborative processes. The role of co-creation in relation to prototyping has undertaken an approach that relates both to validation and exploration, focusing mainly on community workshops, learning activities and prototyping. Within Maker's organisation, co-creation is a process that can happen as facilitated (formal) and/or spontaneous (informal), and most of the time (when done properly) in iterations and with a tangible-tactile-hands on starting point, where tools such as hackathons, pretotyping and prototyping are part of the initial phases, and is often used as a tool as part of the ideation phase (and ongoing), to complement traditional brainstorming and post-it exercises.

This so-called "maker mindset" is the main strength of Fab Labs and especially important for Maker when collaborating with a broad network of stakeholders from various sectors. By including and implementing knowledge from all relevant stakeholders in the lab, the distance between ideation and implementation is often delimited, as cross-sectorial and trans-disciplinary knowledge and experience is taken into account from the initial stage. The implementation and experimentation of "a maker mindset" (design thinking, prototyping and iterative design methods), mostly affects all stakeholders positively, as it provides a tactile common ground and co-creational design tools facilitate working on concrete challenges.

### 4.3.3 Challenge

The political landscape in Denmark and in particular, Copenhagen, are undergoing a transition towards and raised awareness and focus on the circular economy, better resource management and optimisation.

Maker's pilot has started with the wish to incubate the Fab City agenda<sup>29</sup> in the city of Copenhagen. It envisioned the development of circular systems by adopting an ecosystemic approach for small scale systems of designers and producers, and by paying attention to effective technical solutions with a high potential of scaling.

---

<sup>29</sup> <https://fab.city/#fabcity-challenge>



With the SISCODE pilot, the community building capacity and the creation of a new dynamic for developing the small scale ecosystemic model for local production and circular economy has become the focal point for co-designing and prototyping.

#### **A focus on local plastic recycling systems**

The key objective was to meet the local need for inquiring locally produced recycled plastic sheets. This need was established due to a growing interest in designing and producing with recycled plastics. Desk research in the beginning of the co-creation journey showed that no Danish companies, communities, or other produced recycled plastic sheets in high quality for product design etc. At the same time, a growing number of designers and makers in Maker's community were buying plastic sheets from the UK company SMILE plastics.

Maker's local challenge addresses the lack of local and economically accessible facilities, technologies to, as well as incitement and know-how on, local recycling of plastic waste in Copenhagen. The challenge meets a need for circular systemic innovation and holistic production models for recycling plastics that take the whole model chain - from local generators of waste plastic to end-buyers of locally produced goods - into consideration in a way that is economically viable and scalable.

### **4.3.4 The co-creation process of the envisioned solution**

#### **4.3.4.1 Analyse the context**

Maker has been analysing the context of relevant themes: the circular economy; plastic industry; plastic recycling; community driven solutions to the circular economy; fab city initiative; national and municipal legislations, development plans, and strategies.

This work has been conducted as desk research, literature reviews, case studies, mapping exercises, informal conversations and meetings with the core stakeholder community, field visits, workshops and interviews. During this phase, 9 external stakeholders from the industry and innovation community have been engaged.

Involved stakeholders have been placed within the following ecosystem model (see Fig. 3.1). This model has then been continuously updated by the feedback coming from design activities until it reaches the relevant constellation of stakeholders involved in the local value-chain of plastic recycling.

## DRAFT ON A LOCAL CRADLE-TO-CRADLE SYSTEM MODEL

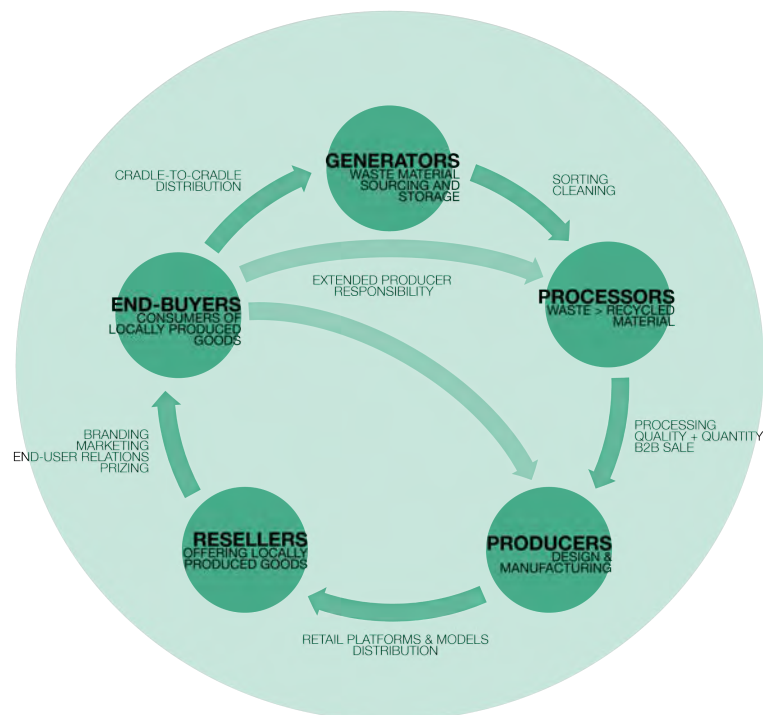


Fig 4.3.1: Initial Draft of ecosystem model. By Stine Broen Christensen

Idea Card Analysis - SISCODE			
Challenges	Costs of materials (getting the for free)	Idea	Upcycling old floors to wood sheets
	Locally sourced materials (max 5 kilometres)		Upcycling scrapp wood
Needs	Business model	Achievements	Educating people in how to upcycle and recycle
	Processing and production location		Crowd funding
	Logistics		Agile legislation regarding recycled production
	Man power (long processing time)		Deposit on products
	Efficient processing methods (cleaning, sorting etc.)		
Solutions	Collection of "waste materials"	How	Creating a closed loop where we only need to supply man-power and energy
	Processing of "waste materials"		
	Producing		
	Consuming		
	Financing		
	Design skills		
	Machine development + build		
	Plastic Workshop in Underbroen		Education
	Material workshop in Underbroen		Designing machines
			Software development

Fig 4.3.2: Co-design workshop. Tools: idea card, mapping, problem definition

The stakeholder mapping and ecosystem model described the first interactions between the key identified stakeholders and helped to organise a broad group of stakeholders into categories.

Meanwhile, desk research, field visits, workshops, literature reviews, informal interviews and conversations have helped to understand the scope and relevant theories within the research field, and therefore influenced how the local challenge and solution have been framed. This common base of theoretical and methodological researches have been updated all along the project development.

#### 4.3.4.2 Reframing of the problem

The challenge and problem have been reframed through three iterations emphasizing the 3 following dimensions:

1. Theoretical aspects from the fab city initiative - i.e. creating more liveable cities and community focused descriptions.
2. Direct feedback on the effective scaling opportunities, industry collaborations and technical solutions.
3. A shared intent to focus more on empowerment, community building, open access to knowledge and learnings.

As part of reframing the challenge, Maker has worked with a student group from Aalborg University Copenhagen on life cycle assessment (Fig 4.3.3), stakeholder mapping, value chain understanding and challenge identification (Fig 4.3.4).

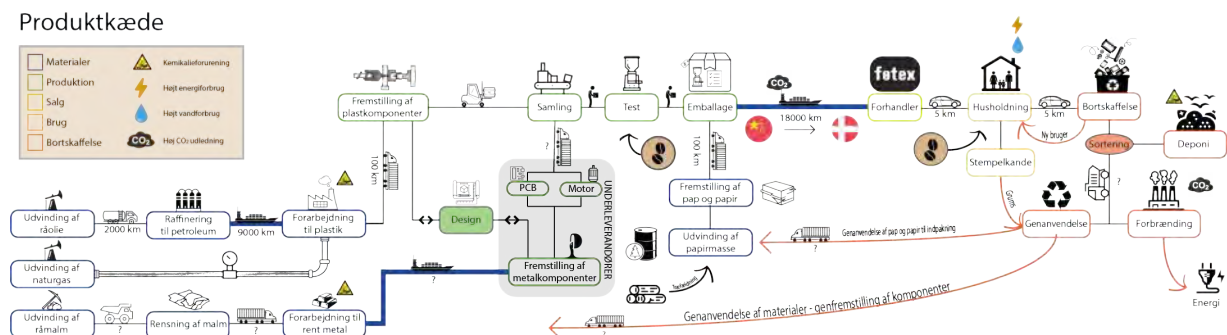


Fig 4.3.3: LCA & Infographic in collaboration with Mikkel Barfod Boll and Félix Elkær Nicot, AAU)

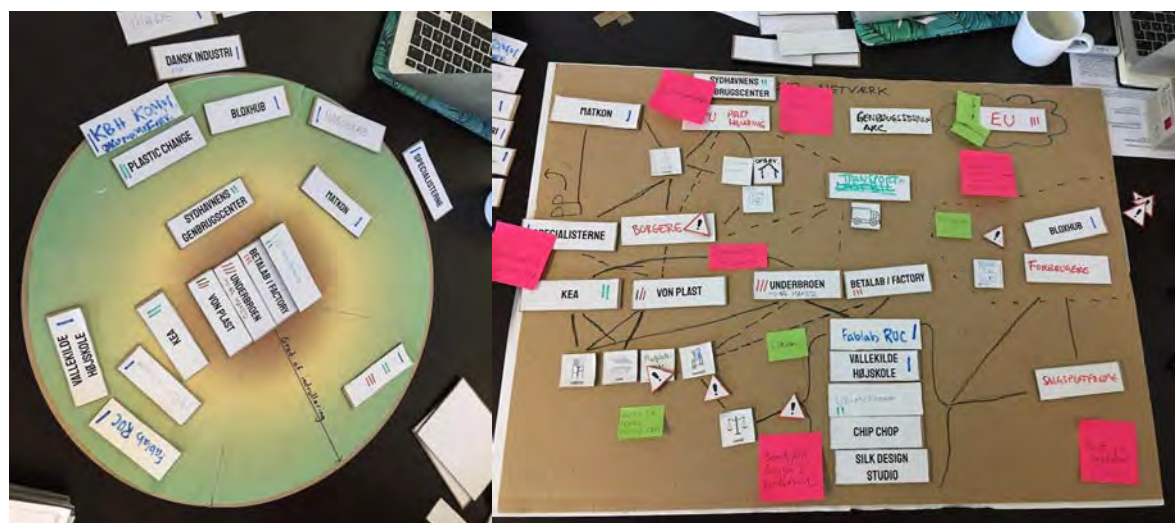


Fig 4.3.4: Game and stakeholder mapping by AAU students & Maker, workshop

The student group from Aalborg University Copenhagen counted 5 students. Interactions and later formal connections to their professor, Michael Søgaard Jørgensen, was also realised. Interactions and collaborations with industrial and public stakeholders have also been made as part of this phase to understand the challenge from an industry perspective and the potential for scaling the concept, some interviews, visits and informal conversations have been conducted. For instance, the Maker team organised a field visit to Aage Vestergaard Larsen, a large Danish plastic recycling company, and set up an interview with their Business developer and Marketing manager Gitte Buk Larsen. For reaching public stakeholders, informing and engaging activities to existing relations and contacts within the municipality have been done via email and informal meetings.

#### 4.3.4.3 Envisioning of alternatives

The ideation phase has started with several internal prototyping activities on general plastic recycling and circular product design built on top of findings and knowledge generated from the co-design workshops and presentations from the student group from Aalborg University Copenhagen. The objectives were to refine the concepts and to plan the development and prototyping phase and finding compromises. Outputs of the session were compiled, and the team decided to focus their attention on only one type of wasted materials, plastic by creating solutions for plastic recycling especially the co-development of recycled plastic sheets and local cases.

With this new focus in mind, solutions have been envisioned via several co-design workshops:

##### ***A Maker Meet Up and Open Lab Day in May 2019.***

The co-design workshop engaged 27 participants, two civil servants from the municipality, 11 participants from the scientific and research community, 6 from the industry and innovation community, 1 from NGO and civil society organisations, and 5 from the general public.



Fig 4.3.5: Maker Meet Up and Open Lab Day in May 2019

##### ***C40 Live like Tomorrow event in October 2019.***

The co-design workshop engaged 44 participants: a civil servant from the technical and environmental department, 8 participants from the scientific and research community, 18



from industry and innovation community, 5 from non-governmental and civil society organisations, and 10 from the general public. Tools applied counts: local ecosystem mapping, idea cards and inspirational specialist presentations. During the C40 PIPO event, Maker invited Kate Armstrong from Fab Lab Barcelona and the Fab City Network to inspire and meet civil servants - as well as the audience - about the political agenda of Fab City.



Fig 4.3.6: Maker Meet Up and Open Lab Day in May 2019

Outputs and inputs from those workshops have been used to narrow down the scope and to understand how the ecosystem PIPO can interact in the best way with other community-driven initiatives, municipal projects and lead to that Maker was invited to become part of a circular economy network in Copenhagen with a focus on envisioning circular collaborations and initiatives, capacity building and networking between various stakeholders.

#### *Circular Design Brief at Vallekilde Højskole.*

Maker did a brief for the students at Design and Maker course from Vallekilde Højskole. The facilitator of the discussion integrated information of circular product development showcased various prototypes to 18 students and 2 teachers.

#### **4.3.4.4 Development and prototyping**

Developing and prototyping the PIPO concept have gone through several iterations. On the physical prototype scale the core team from Maker have worked closely with the industry and innovation community to prototype the recycled plastic sheets and local cases. This work has matured nine case-solutions and run educational activities for the community to engage in plastic recycling and ensure knowledge transfer. Methods used counts co-design workshops with the public as well as maker community, prototyping activities and introduction courses with makers and designers. It engaged more than 150 participants.

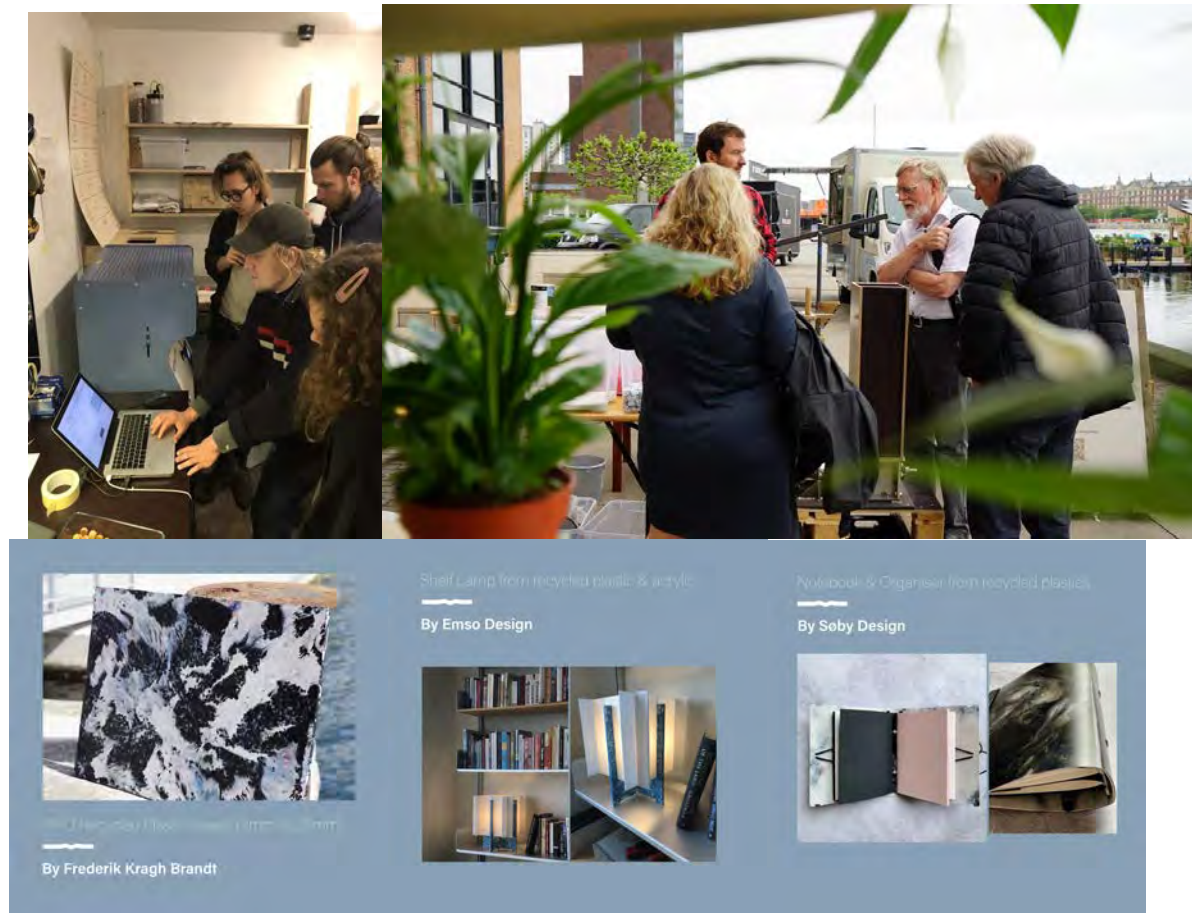


Fig 4.3.7: Moments and Cases for prototypes.

The core PIPO team from Maker have been co-creating physical prototypes and products with 9 different makers, designers and companies. The final outputs of those cases were disseminated as a digital exhibition on Maker's social media channels as well as on the SISCODE website. A selection of three of these cases were also exhibited as part of 'Reflow - Plast Arkiv' at Spinderihallerne in Vejle<sup>30</sup>.

The 9 case designers have been asked to fill out a questionnaire about the sheet prototypes (materials) in order to get feedback on the core prototype (PIPO sheets) regarding quality, functionality and price, as well as ensuring high quality picture documentation of the cases. The overall feedback has been positive on all parameters, and the goal of reaching a tolerance of +/- 1mm was reached.

#### 4.3.4.5 The role of policies and policy maker engagement

The role of policy makers has to most extend been on an informing and engaging level as part of disseminating activities and informing meetings - C40 Maker Meetup, Design for Circular Economy Maker Meetup. The engagement of civil servants and policy makers have helped to scope the challenge and connect PIPO to local initiatives and agendas. Martin Tilsted from

<sup>30</sup> <https://www.spinderihallerne.dk/find-arrangement/udstilling-reflow-plast-arkiv/>



the Technical and Environmental Administration, Øystein Leonardsen from Områdefornyelse Sydhavn and Culture and Leisure Mayor Franciska Rosenkilde have been engaged on various levels. However, engaging policy makers and politicians have been challenging due to availability and culture of policy engagement. Therefore, the main policy maker focus has been on civil servants.

From this engagement with policy makers and civil servants, the challenge changed into focusing more on community building within the scope of circular economy. The outputs from policy engagement have identified challenges with the scaling of the technical solution since applying maker-methodologies and small-scale local production to an industry level is difficult. Working with civil servants has highlighted the need for both large scale industrial and municipal solutions, but also on community-driven bottom up initiatives. Therefore, the community-focus of PIPO has become the focal point.

#### **4.3.4.6. Covid-19 Situation**

With the situation regarding Covid-19, gathering people for physical meetings, workshops and events have been close to impossible. From March 2020 until August 2020 most of Denmark's places were closed. The situation changed during the summer holiday with a soft opening during the summer. However, due to increasing numbers of infections after summer, a semi-lock down was applied again during fall and the coming winter. Decisions and approval to postpone, cancel and change expected activities have been made. Some challenges that have been faced are due to the acceptance of different national guidelines and restrictions by the stakeholders. For instance, municipal employees were required to mostly work from home and are not able to attend physical meetings and workshops.

### **4.3.5 Status of the solution**

#### **4.3.5.1 Concept**

PIPO stands for 'Plastic In, Plastic Out'. PIPO is continuously establishing itself as a community-built ecosystem model for local circular initiatives working with and promoting relevant local actors within the field of small-scale circular economy. PIPO is also including a prototype gallery and case exhibition that serves to inspire, co-design and develop circular products and materials locally in Copenhagen. The overall focus for PIPO is to connect circular initiatives to municipal agendas, and to promote the fab city initiative in Copenhagen. Furthermore, PIPO is an initial methodological and practice-oriented toolkit for co-creating the circular economy in Copenhagen.

Via co-creation methods and multiple stakeholder engagement, PIPO works towards scaling and promoting a local circular ecosystem of plastic recyclers, designers and makers. Working with an ecosystemic mindset enables a decentralised model for recycling and re-circulating

plastic in Copenhagen and empowers local designers and makers to work with the circular economy.

The initial desired outcomes have been presented in Deliverable 3.1. Throughout the co-creation journey, Maker and the PIPO ecosystem have achieved most of the outcomes.

Table 4.3.1: Evolution of the outcomes for Maker's journey

Initial Desired Outcomes	Delivered Outcomes
5-10 community concepts/prototypes/cases	9 cases/prototypes
3 PIPO prototypes	more than 3 different sheet prototypes (sheets, moulds/cassettes, products (conference table, sheets, tray))
Collaborative Blueprint - ecosystem	PIPO Ecosystem
Infrastructural prototype	Yes, but mostly on 3 stakeholder groups (Generators, Processors, Producers)

#### 4.3.5.2 Sustainability strategy

##### About scaling

###### *Scaling the ecosystem model*

The core idea behind our sustainability strategy is focused on developing and working with a community of local plastic recyclers to push forward a local circular model and ecosystem for small to medium size entrepreneurs and makers working with the circular economy in Copenhagen. The community and ecosystem model is called PIPO - 'Plastic In, Plastic Out', and targets the environmental crisis regarding plastic waste on a national and global level.

PIPO connects directly to the overall vision and approach from the Fab City agenda - where we move from a "Products in, Trash Out"-model to a "Data In, Data Out"-model. PIPO initially concludes how solutions that combine a desire to reduce, reuse and recycle in design, fabrication and consumption is achieved through a locally anchored systemic approach bridging local stakeholders, utilizing existing knowledge, capacities and technical solutions to prototype and scale a small to medium size circular system for producing new materials and product cases from recycled plastics.

As part of the sustainability strategy, Maker will utilise knowledge, cases and learnings from SISCODE to help local physical entrepreneurs to develop and test new forms of circular and emerging business models. The goal is to continuously grow and develop the PIPO ecosystem ensuring a societal and local relevance in municipal strategies.

###### *Scaling up the technical solution*

Scaling up the sheet sizes and production via collaborations. Currently, Maker is exploring various possibilities and potential solutions to scaling up the solution.

### About foreseeing strategies

Maker ambitions to empower the community via events, open access blueprints and solutions, engaging further with existing initiatives, both on a municipal and citizen level. In order to re-develop the PIPO-project from a practice oriented academic approach learnings, models and knowledge from PIPO will be utilised in other European projects (Reflow, CIRCuiT) and future proposals. SISCODE and PIPO have pushed the objective of Maker in a circular economy direction, which is now part of the core activities in the association.

The strategy for the technical aspects of scaling the solution will be secondary to the work with scaling up and re-developing the community and ecosystem model. This decision is backed up by core policy maker stakeholders, due to difficulties of scaling up 'maker-solutions' on an industry level. However, Maker has identified relevant potential partners for scaling up the technical solutions and developing a larger sheet press machine. The potential partners in this concern are Circular Design Studio, Rockwool Innovation, Lendager Architects, and in Spain, FOS /Esferica. This choice is founded in the local demand for and interest in recycled plastic sheets as a commercial material.

## 4.3.6 Transformations triggered and outcomes

### 4.3.6.1 Organisational transformations

The organisational transformation that Maker has gone through via the SISCODE project holds a large impact on a strategic level for Maker. Maker has been working with cross-sector collaborations and co-creation prior to SISCODE, but this effort has been methodologically strengthened as part of SISCODE due to the theoretical and practical framework given SISCODE. The co-creation toolkit internally has fostered an internal professionalisation of co-creation methods and cases.

Future proposals and projects are now focusing more on community building via co-creation methods. During the course of SISCODE, Maker has been redeveloping the strategy with a core focus on community-based co-creation to foster and strengthen a circular economy local agenda.

In a situation like the Covid-19 pandemic, co-creation initiatives have to great extent been challenged, since co-creation in the realm of Maker's work often requires people to meet and work in a physical setting. During the course of the co-creation journey, which has been, and still is, affected by the Covid-19 situation, the consortium has worked to find digital and virtual alternatives to co-creation methodologies - as Miro and other online tools. However, the experience that Maker has had shown how chaotic and challenging online co-creation can be - especially in the realm of physical prototyping and open innovation. Since prototyping activities and co-creation activities had to be done within this period, Maker experienced challenges with the physical prototyping and workshops. However, all prototyping activities were conducted by doing smaller scale gatherings and focusing more on internal community stakeholders in order not to extend the interactions to new relations.

#### 4.3.6.2 Transformations in the ecosystem

During the work of PIPO and work with local stakeholders, the ecosystem has been growing with more actors and cases. The interest and potential of working with recycled plastic sheets has been positively increasing within the core stakeholder group. One example is how Von Plast and Circular Design Studio started prototyping and producing sheet materials as well. As part of the lab activity and promotion of PIPO and SISCODE other European potential partners are interested in collaborating on a scaled open access sheet press and solution.

Company collaborations and relations have been informally established between Maker and Rockwool Innovation, which will focus on testing and developing alternatives and more circular materials. This potential collaboration will be formulated, and common projects identified.

Working with an ecosystem in a situation like Covid-19 is difficult, since co-design and co-prototyping initially works best in a physical environment. However, working on a more decentralised model (like the PIPO ecosystem) enables greater flexibility to cope with the challenges. On the other hand, working with multiple stakeholders from various sectors in this context requires an understanding of different work regulations and guidelines, which can make it difficult to connect all partners physically.

#### 4.3.7 Conclusive reflections

During the co-creation journey, co-creating the cases (demonstrators/prototypes), co-creating the challenge and blueprint for the ecosystem have predominantly gone straightforward and positive.

Focusing on mapping tools, ideation cards, stakeholder mapping, the SISCODE toolkit have been beneficial for leading this work. Co-creating the prototypes has been more loosely guided, since the core aspect here has been to utilise the specialist knowledge created via SISCODE to help the local community (nine cases) to realise and prototype with recycled plastic. Co-creation within PIPO has generated a growing interest in the circular economy within the community, due to introduction courses, maker meetups and other activities that help communicating, co-developing and inspire the community.

Maker has identified barriers when connecting the lab community (designers, makers) to policy engagement with civil servants. One reason could be that the stakeholders work on different levels. Ensuring good access to policy makers has been challenging. However, engagement at an informal, relational and contextual level was successful. Working with the policy makers has helped framing the project in a municipal context and to establish a closer relationship to civil servants and other stakeholders attached to circular economy in Copenhagen.

Co-creation in labs is in many ways a natural way of working with stakeholders, since this already often happens in labs. However, working more theoretically and methodologically with co-creation has strengthened Maker's approach to co-creation.

### 4.3.8 References

#### Documents cited:

Københavns Kommune (2019) "Cirkulær København: Resource- og Affaldsplan 2024"

[https://kk.sites.itera.dk/apps/kk\\_pub2/index.asp?mode=detalje&id=1990](https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1990)

Tomas Diez et al. (2018) "Fab City Whitepaper: Locally productive, globally connected self-sufficient cities". <https://fab.city/uploads/whitepaper.pdf>

Miljøstyrelsen MST (2011) "Danmark Uden Affald: genanvend mere - forbrænd mindre".

[https://mst.dk/media/mst/Attachments/MST\\_Faktaark\\_1\\_WEB.pdf](https://mst.dk/media/mst/Attachments/MST_Faktaark_1_WEB.pdf)

Københavns Kommune (2012) "KBH 2025 Klimaplanen"

[https://kk.sites.itera.dk/apps/kk\\_pub2/index.asp?mode=detalje&id=1035](https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1035)

PIPO Cases (Booklet). <https://siscodproject.eu/maker>

#### Main interview partners

Gitte Buk Larsen, Business developer and Marketing manager at Aage Vestergaard Larsen

Andreas Zacho, Founder of and Plastic Recycler at Circular Design Studio and Von Plast



#### 4.4.LET'S TALK ABOUT THE AIR by KRAKOW TECHNOLOGY PARK (KTP)

written by Agnieszka Włodarczyk, Monika Machowska, Aleksandra Gabriel





## **4.4.1 Synthesis of the pilot's journey**

### **4.4.1.1 The organisation**

Krakow Technology Park, based in Kraków, Poland is a business support organisation (BSO) which together with entrepreneurs, the academia, and the territorial authorities develops the ecosystem for the development of the Małopolska economy. The main mission of the KTP is to help companies to develop faster.

KTP manages the Polish Investment Zone, authorising tax exemptions, and inspiring enterprises to new investments and promotes what the Małopolska region has to offer in terms of economy. It also helps local and regional authorities to be ready for contacts with investors. KTP also runs incubation and acceleration programmes, a digital innovation hub and is also one of just two certified living labs in Poland. It cooperates closely not only with business, but also with administration and regional stakeholders in elaboration of regional development strategies.

Co-creation as a methodology, is used very often by KTP experts in their work with stakeholders. KTP team is continuously extending their knowledge and experience in the field of design thinking and co-creation methodology and offers such support for companies and administrations.

### **4.4.1.2 The co-creation journey**

The co-creation journey, which is a part of SISCODE project, can be seen as a natural consequence of the priorities and activities run by Krakow Technology Park. In frame of the project, the KTP team undertook a very important and current issue for the region, which involves all stakeholders in the KTP ecosystem and is very significant for the inhabitants of the region. The idea of KTP was to support the preparation of the regional legislative document "Air Protection Programme for Malopolska", with a specific focus on the involvement of all interested stakeholders at every stage of this process. The key idea was to lead an open and transparent process of preparation of the document, define the needs and expectations of the stakeholders and actively involve them in the creation of possible solutions. The process lasted more than 1,5 years and created a catalogue of interesting ideas. Some of them were incorporated in the Air Protection Programme. Moreover, one of the challenges "the monitoring of industrial pollution" was further developed. During the workshops and discussions, the conclusion was made that not only private sources of heating or cars cause air pollution. Significant pollutants are transmitted by factories, small service stations etc. Moreover, these incidents are not monitored and inhabitants do not have knowledge about them, so it is necessary to create a monitoring system, available both - for the administration who can control the most dangerous venues, and for people, who can

react and intervene, if they notice suspicious incidents. This is why this challenge has been used as one of the main themes of a hackathon co-organised by KTP in December 2019. The best solution has been granted with a special implementation award and a pilot implementation process has been conducted in one of Małopolska counties. This pilot was also a part of KTP's co-creation journey.

The main outputs of the process were two-dimensional: on one hand the Air Protection Programme for the Małopolska region has been approved and ratified, as the first such document in Poland, on the other hand: a tool for the monitoring of industrial pollution has been designed, tested and approved for further development.

#### **4.4.2 Initial context**

The aim of the National Air Protection Program (NAPP) is to improve air quality in the country of Poland. The NAPP applies to the areas with high concentrations of air pollutants and areas with high population density. The coordinated action on improvement of air quality has to be undertaken immediately and Poland is obliged to make much more decisive efforts to fight air pollution, in accordance to the requirements of European Union legislation, transposed into the Polish legal system, in order to meet the goals set by the World Health Organization by 2030.

##### **4.4.2.1 External context and ecosystem**

On a regional level, each region has to create its own Air Protection Plan taking local socio-cultural and business conditions into consideration.

The Regional Air Protection Programme (APP) also called air quality plan is a regional strategic act owned by the Marshal Office of Małopolska region to improve the quality of air in the region by 2023. Małopolska is the first region in Poland to have initiated and finished the work on their regional APP, which lays the foundation for the strategy of activities aimed at air quality improvement. The programme includes the description of short- and long-term remedial actions, including for example the introduction of an alarm for air pollution levels, registration and stocktaking of emission sources, and introduction of control tools and instruments addressed to monitor individual and industrial air pollution.

The Krakow Technology Park has joined the process of creating a new Air Protection Programme at the early stage of the work, in January 2019, supporting the Marshal Office of the Małopolska region in conducting public consultations. In the consultation process, KTP involved a broad range of stakeholders including representatives of NGOs, experts, scientists, civil servants and employees of units responsible for environmental protection and transport policy, representatives of the technological sector, and citizens.

The main goal of the programme is to improve air quality in the shortest time range possible. According to the judgment of the Court of Justice of the EU, issued due to exceeding the air quality standards in Poland, these measures must be adequate to lower the level of pollution

to achieve permissible levels as soon as possible. The amount of harmful substances in the air continues to exceed the permissible levels throughout the voivodeship. The amount of harmful substances in the air continues to exceed the permissible levels throughout the voivodeship. To tackle this situation, Marshal's Office of Małopolska Region undertook a series of defined activities and initiatives financed both from national and regional level, for example as the Clean Air Programme or Life-IP Małopolska project. The Clean Air Programme is the first national programme with such an immense scope in the history of Poland geared towards the improvement of air quality, which provides subsidies for thermal modernisation of single-family homes, as well as replacement of old heating sources. Thanks to the Life-IP Małopolska project, inhabitants of Małopolska region can count on professional support from nearly 70 eco-managers employed under the project. Among other things, eco-advisers help in the preparation of grant applications, conduct educational activities, conduct inspections and professional tests with a thermal imaging camera, and organise meetings and workshops for children and adults.

As a result of the actions undertaken so far by the Marshal's Office of the Małopolska region, a significant improvement in air quality in Kraków and Małopolska is already visible, especially during the heating season, from October to March. The average concentration of PM10 dust between the winter season 2014-2015 and the last season 2019-2020 decreased in Małopolska alone by 30%, while in Kraków by as much as 45%.

The achieved effects are the result of a consistent environmental policy, including the implemented anti-smog resolutions.

On September 28, 2020, the Council of Małopolska region adopted a new Air Protection Programme after almost 11 months developing an ambitious programme. Many people and a variety of entities were involved in this work. The public consultation alone lasted over seven months and nearly one thousand participants representing administration, business, academia, NGO and citizens took part in the consultation workshops and meetings to represent their interests, opinions and propose solutions that can be applied in a specific field to improve air quality. It has been the first time that such extensive, wide and open community consultations in the creation of strategic regional documents were organized. Several thousand comments of various kinds were submitted. KTP's role in the process was to support policy makers in developing a programme with a wide involvement of varied groups of stakeholders in order to meet their needs and expectations and ensure the creation of an evidence-based document with a high level of feasibility, measurability and scalability.

#### **4.4.2.2 Organisational background**

As a business environment institution, together with regional administration, entrepreneurs, academia, and the territorial authorities, KTP works on developing suitable ecosystems for the increasing competitiveness in the Małopolska economy. It covers the participation and initiation of co-creation processes and the consultation of strategic documents and acts, as

well as the application of financial instruments and incentives offered to companies both on national and regional levels. KTP acts as the orchestrator involved in initiation and leading the open dialogue and exchange of know-how, views and opinions among citizens and politics. It stays in line with the paradigm of the quadruple helix and open innovation, as well as Public Engagement (PE) and Responsible Research and Innovation (RRI). KTP is one of the key actors in co-creating and implementing the Regional Innovation Strategy promoting smart specialisation and user-driven innovation approaches in the region. KTP collaborates actively with regional and local governments, universities, NGO's, businesses and local communities when straight conversation and new approaches are needed to stimulate economic development and implement innovations. As a regional enabler and facilitator, KTP is an ambassador of an innovative driven approach for smart cities developing innovative user-centered and sustainable new public services. In doing so, KTP contributes to increasing the quality of life and well-being within different domains (people, living, mobility, e-governance, economy, environment) targeting different user groups applying experience, know-how and infrastructure of stakeholders.

KTP possesses unique know-how and wide experience in project coordination and implementation. There are over 70 specialists and project managers with deep knowledge on incubation and acceleration in the area of game sector, Industry 4.0 and smart city present in the company. Apart from training, coaching and mentoring KTP provides access to hardware, software, and network infrastructure to businesses.

#### **4.4.3 Challenge**

KTP got involved in the creation of a new Air Protection Programme for Małopolska region to support policy makers in developing this programme involving a wide variety of stakeholders in order to meet their needs and expectations and to ensure an evidence-based document as an outcome with a high level of feasibility, measurability and scalability.

Alongside the APP, KTP got involved in the implementation of a solution selected during the Smogathon, which was monitoring industrial air pollution.

The decision to tackle this specific challenge was preceded by a series of consultation meetings with the public administration both at the municipal- and the regional level, relevant city-based public institutions responsible for transport and mobility, NGOs and activists. Furthermore, a desk research has been carried out to identify the most important common challenge for the region. Among many others, representatives of Department of Air Quality of City of Kraków, Plenipotentiary for Air Quality Management, the Metropolitan Association of Kraków; Public Transport Entity, the Smogathon Initiative, and Kraków Smog Alert have been involved in defining of joint challenge.

#### **4.4.4 The co-creation process of the envisioned solution**

KTP has undergone a process of co-creating together with a broad range of stakeholders, policy makers and citizens to obtain two main outputs: on one hand, the new Air Protection Programme of the Małopolska region has been developed - an official document containing regulations and goals for public, privates and industries to take concrete actions for lowering the air pollution in the region. On the other hand, during a Smogathon, a specific hackathon against air pollution, a platform for the monitoring of industrial pollution has been ideated and further developed in the following months.

##### **4.4.4.1 Analysis of the context**

In order to specify the challenge and identify the basic needs, this phase consisted in an analysis of the current situation and policy context as well as a series of consultation meetings to identify the participating stakeholders gathering their needs and opinions.

At first, an analysis of existing documents like national and regional reports, legal acts and academic analysis allowed the definition of the current status and precise context of the challenge. The challenge has then been discussed during numerous meetings with the Marshal Office of the Małopolska region, the Department of Environment; the City of Kraków, the Plenipotentiary for Air Quality Management; the Department of Air Quality; The Metropolitan Association of Kraków; the Entity for Public Transport, The Smogathon Initiative and Krakow Smog Alert.

The opening meeting to start the consultation process on the new Air Protection Programme for Małopolska region has been hosted at KTP and co-organised by the Marshal Office. The conference was attended by approximately 220 participants representing different stakeholders, the agenda was filled with experts' presentations on the different aspects of air pollution, best practices from districts of the region, key activities and challenges. Moreover, moderated discussions and Q&A sessions were held in order to listen to the opinions of all participants.

This phase was implemented according to the foreseen schedule. Numerous internal meetings and consultations with regional authorities helped to identify the final objectives of the journey and specify the challenge. The opening meeting was also a chance to raise interest from the public.

##### **4.4.4.2 Reframing of the problem**

After the opening meeting and the analysis of the existing material, and in-person discussions with representatives of the Marshal Office regarding the planning and structure of future workshops followed. It has been a very profound and structured process where different approaches and suggestions were gathered and analysed. It was agreed that the first workshop should be aimed at the definition of stakeholder needs in terms of air quality with an initial prioritisation of these needs as an outcome.

With the clear objectives for the workshops defined, the KTP team worked on the selection of suitable design thinking methods like personas or empathy maps preparing canvases for their application.

It was very important to gather representatives of varied stakeholders to ensure the presence of all interested groups. The first workshop held on the 4<sup>th</sup> of March 2019 was attended by 43 persons, representing administration from the local and regional level, academia, civic society organisations and inhabitants. The discussions were held in 5 groups, each moderated by a facilitator from the KTP team. All the participants could share their ideas and the workshop was concluded with a cluster of interesting insights and classification of needs.

However, the team identified insufficient involvement of the inhabitants probably due to the venue and timing of the workshops. Being crucial for the success of the initiative, KTP decided to organise two more workshop meetings in two counties of the region (Lusina & Zabierzów) where the inhabitants could share their views in order to have a clear and valuable voice of the inhabitants in terms of their needs and expectations towards the Air Protection Programme. They were attended by 20 participants and many interesting conclusions have been issued. These additional workshops were a derivation of the original plan of KTP, but it was found necessary and the results were precious for the further development of the process, as more information from inhabitants were received and citizens got involved in the process.

#### **4.4.4.3 Envisioning of alternatives**

The ideation phase has been initiated during the two above mentioned local workshops, as it was decided to open the discussion and ask the participants not only about their expectations and needs, but also for concrete proposals and particular solutions. A special, dedicated canvas was prepared to structure the process, participants were asked to identify what has been done in their surroundings in the last years, what are the main gaps, barriers and challenges, and what could be done as the next steps to improve the air quality. The participants were not given any limitations in terms of resources, capacity etc., what opened the discussion and generated a bunch of interesting thoughts. This was a very open process, producing a number of interesting ideas in the creative process. The process was well structured and tailored to the specificity of the subject as well as technical conditions, mainly time constraints and the multiplicity and controversy of the proposed solutions. It also responded to the expectations of participants and organisers. The ideation- and envisioning workshops were based on selection of design thinking methods, personalised persons reflecting the challenge and dedicated customised canvases (map of empathy, idea selection) to reflect on the complexity and multidimensional perspective of the challenge.

Based on the materials from the first workshops and meetings with local communities the ideas on how to improve the air quality in the region were sorted and categorised.

On this base, another set of workshops was organised with 46 participants representing the quadruple helix organisations (administration, business, academia and inhabitants and



NGOs). They were divided in 3 thematic groups: Transport and mobility; Effective information/ consultation and Monitoring and controlling systems. The participants worked with an adapted project lean canvas developing a set of long- and short-term recommendations for the APP including a series of proposed activities which should be considered during the elaboration of the new programme. The workshop concluded with 8 initial project proposals which should be further developed in the process of the preparation of the new APP.

The report with recommendations was prepared by the KTP team, consulted with participants and delivered to the Marshal Office for Małopolska. Moreover, the initial projects were disseminated among experts and NGOs as an inspiration and starting point for further development.

Some of them became also priorities for the hackathon co-organised by KTP in December 2020.

#### **4.4.4.4 Development and prototyping**

The development and prototyping phase had two main dimensions which should be described separately: the APP and the platform for monitoring industrial pollution.

##### **1. Air Protection Programme (APP)**

The APP is the result of the extensive process of consultation and co-creation mentioned above. The text was prepared by a team of experts; however, the content was the result of discussions and workshops described above. The first version of the APP was published in January 2020 including a set of rules and restrictions but also proposals for activities which should be implemented in the region to improve the quality of air.

The prototype, so the first version of the APP has been disseminated in public, so that all interested stakeholders could analyse it and provide their feedback. Moreover, besides the online consultation process a set of official consultation meetings has been organised throughout the region. During these meetings, the APP draft was presented by the authorities followed by an open discussion. These meetings provided a set of comments, suggestions but also doubts regarding the impact and possibility of implementation of restrictions. These conclusions were extremely significant for the further development of the prototype, as they provided a complex and holistic vision of how different stakeholders and groups of interest approach the document, where they find the possibilities and strengths and which elements need to be still improved and developed.

After the first round of consultations in January 2020, the draft of the APP has been revised, the recommendations were analysed and incorporated in the second version of the prototype. The second version of the APP was published in June 2020 and again the stakeholders had a chance to provide their feedback and comments. Due to the Covid-19 pandemic, this time the process was conducted online (July 2020).

The final version of the document was published in September 2020 and has been ratified by the Regional Authorities.

## **2. Platform for Monitoring of Industrial Pollutions**

On the base of the results coming from the phases of context analysis and problem framing, during the hackathon organised in December 2019, the Jury selected one from numerous interesting project proposals, and granted a special implementation award. The winning solution, presented by the Qubit team, was an online platform aimed at recording and gathering of the data concerning the emissions of pollutants by enterprises on the one hand and informing and presenting the data and alerts to the inhabitants on the other.

The selected proposal has been designed, implemented and tested in one of the Małopolska counties between January and October 2020.

The process of implementing the solution was managed collectively by Qubit and KTP. It included a long process of consultations and discussions with public authorities and institutions responsible for monitoring the air quality in the region. In order to provide an effective tool, used by enterprises, administration and inhabitants, it was necessary not only to create an appealing, interesting design, but also to follow the difficult and complicated, but mandatory information flow relating to bureaucracy and administrations.

The first version of the platform was tested internally with members of the KTP team not directly involved in the SISCODE project and representatives of administrations. On the basis of their recommendations the platform was updated and distributed for a second round of tests with 20 inhabitants of the Skawina county and 5 enterprises from this region taking part. These tests were conducted carrying out interviews with the testers, conducted online or via phone, since it was not possible to meet personally due to Covid-19 pandemic. Moreover, an open survey was published on social media and on the Marshal office's website. The feedback received was deeply analysed and discussed among the teams of KTP and Qubit. Recommendations which were found most important and within the possibilities of the implementation plan in the project time frame were incorporated. Moreover, a detailed report including all recommendations was prepared for the Marshal Office. The prototype platform will be still active until the end of December, after this time the Marshal Office will take over the full responsibility for it.

Taking the complexity of the proposed prototypes and the two-dimensional character (preparation and testing of two prototypes - one being a policy and the second a product) of the journey into consideration, it was recognised that the process was very challenging. Nevertheless, it concluded as a success, as two important prototypes have been prepared. The first one - a policy instrument - is a pioneer legislative document, prepared applying co-creation methodologies and consulting all relevant stakeholders in such an open and transparent way. It represents a chance to succeed in the short-term implementation as well as to remain a point of reference in the following years responding to the needs and expectations of a variety of stakeholder groups.

The platform for monitoring industrial pollution is a totally different kind of a necessary and significant tool, which can facilitate the process of data collection and the distribution of information, it will also ease the process for the enterprises themselves to obtain permissions and inserting data, a procedure that is up-to-date, quite complex.

The overall process of getting to the point of two final prototypes lasted almost two years and one of the main learnings has been the effort needed to keep stakeholders engaged and attentive for such a long duration. To put this in practice, it was crucial to keep them constantly informed about the progress and involving them at every stage of the journey.

#### **4.4.4.5 The role of policies and policy maker engagement**

The entire co-creation journey has been conducted in close cooperation with authorities, especially the Marshal Office for Malopolska, who is directly responsible for the preparation of the new Air Protection Programme. The most important in the process was to involve the representatives of policy makers from the very beginning and discuss with them every stage of the journey.

The KTP team have conducted numerous internal meetings discussing every part of the co-creation journey in order to meet expectations of all sides.

It was the first time that the Marshal Office decided to open the consultation processes beyond the formal way and gave KTP the possibility to conduct this journey. Their final opinion is very positive, and they are very satisfied with the recommendations which were delivered after the concluding phase of the journey.

Also, the involvement of the regional authorities in the preparation of the platform was very significant. It was designed according to the needs and expectations of the Marshal Office from the beginning conducting numerous bi- and trilateral meetings and discussions on the structure and profile. Moreover, the involvement of other public institutions and the county authorities was necessary to support the process and help the creation of a comprehensive, practical and effective instrument. It also ensures its sustainability responding directly to the needs and expectations of the various stakeholders and having its functionality verified with them beforehand.

#### **4.4.4.6. Covid-19 Situation**

The Covid-19 situation brought up some challenges and obstacles in attracting and bringing policy makers and citizens together in face to face consultation meetings. A few meetings that were initially planned as physical events, had to be moved to online activities due to the high risk of infection. When meetings were held in a traditional way, the special safety restrictions were introduced limiting the number of participants gathered in one place. Additional participants were invited to take part on-line as the consultation meetings were streamed as well encouraging them to actively participate asking questions on-line or send them to the relevant department of Marshal Office responsible for APP consultation.

Apart from the physical meetings, the Covid-19 situation also caused severe limitations related to prototyping activities in some cases, especially in scope of testing the platform with end users. The interviews with Skawina based citizens and industries planned to validate the platform for the monitoring of industrial pollution were transferred to remote teleconferences and activities. Moreover, the process of getting access to data on industrial pollution was much more complex and time consuming. It occurred also that policy makers were less available for activities and consultation meetings having different priorities due to coronavirus.

Overall, it can be said that KTP succeeded in overcoming these obstacles thanks to determination of all stakeholders involved and some minor extensions of the initial deadlines.

## **4.4.5 Status of the solution**

### **4.4.5.1 Concept**

As a result of the entire process, we have elaborated two final solutions based on the two prototypes described in the previous chapter.

#### **1. Air Protection Programme for Małopolska region**

The Air Protection Programme is a strategic, legislative document which has been approved and ratified by the Regional Authorities.

It structures the main rules, restrictions, instruments and actions which should be undertaken in the region in the next 7 years to improve the quality of air in the region (Fig 4.4.1).

The spectrum of the activities contained is a direct result of the extensive co-creation process, it involves a variety of the ideas and proposals that came up during the workshops and the entire document has been revised and updated according to the recommendations collected during the consultation meetings.

All relevant stakeholders were involved in the creation of this solution, from administration, experts, academic researchers, activists, business and citizens. It is necessary to underline that their opinions, needs and expectations were gathered, organised and evaluated to directly feed the drafting of a complex document consisting of a set of rules and activities, that can be effectively implemented in the following years.

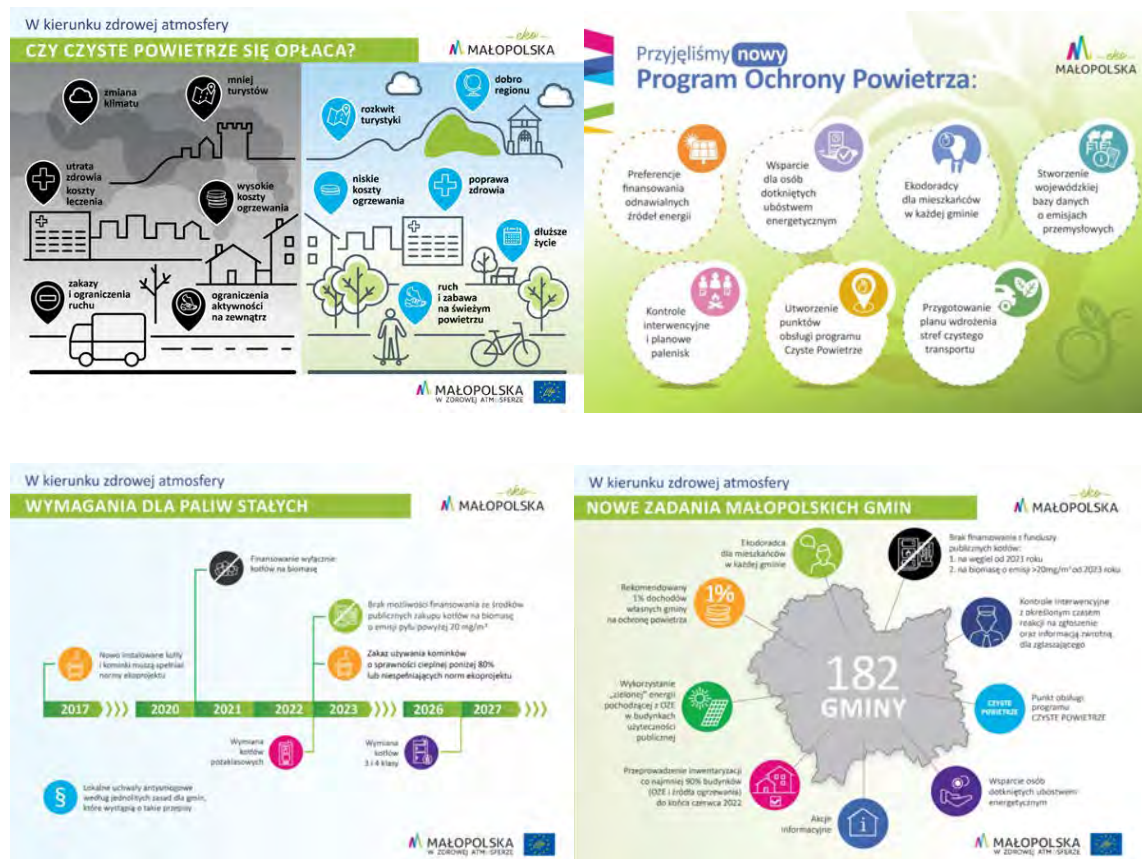


Fig 4.4.1: Slides presenting main goals and assumptions of the Air Protection Programme

## 2. Platform for Monitoring of Industrial Pollutions

This innovative tool (Fig 4.4.2) can be used by companies to evidence and inform about levels and specific incidents regarding emission as well as by administrations and citizens to monitor and obtain information on industrial pollution in specific areas.

The created platform was a response to the need of the regional authorities to have one comprehensive tool for the data entry and monitoring the industrial pollutants. Up to date, the procedures of evidencing, recording and informing about emissions is very complex and involves a variety of institutions to be informed, different templates to be filled and similar. The developed platform can be a universal, coherent instrument facilitating the flow of data and information. The main value of the co-creation process applied in the development of this tool was its testing in a small community of the Skawina county to eliminate the mistakes and inconsistencies and improve usability. Having a closer look and analysing the structures and details of the data needed as well as the complexity of the existing procedures allowed the development of a holistic platform.

At the same time, an official application for inhabitants has been launched from the Marshal Office allowing the notification on incidents regarding industrial pollutants in the region of Ekointerwencja in connection to the platform.



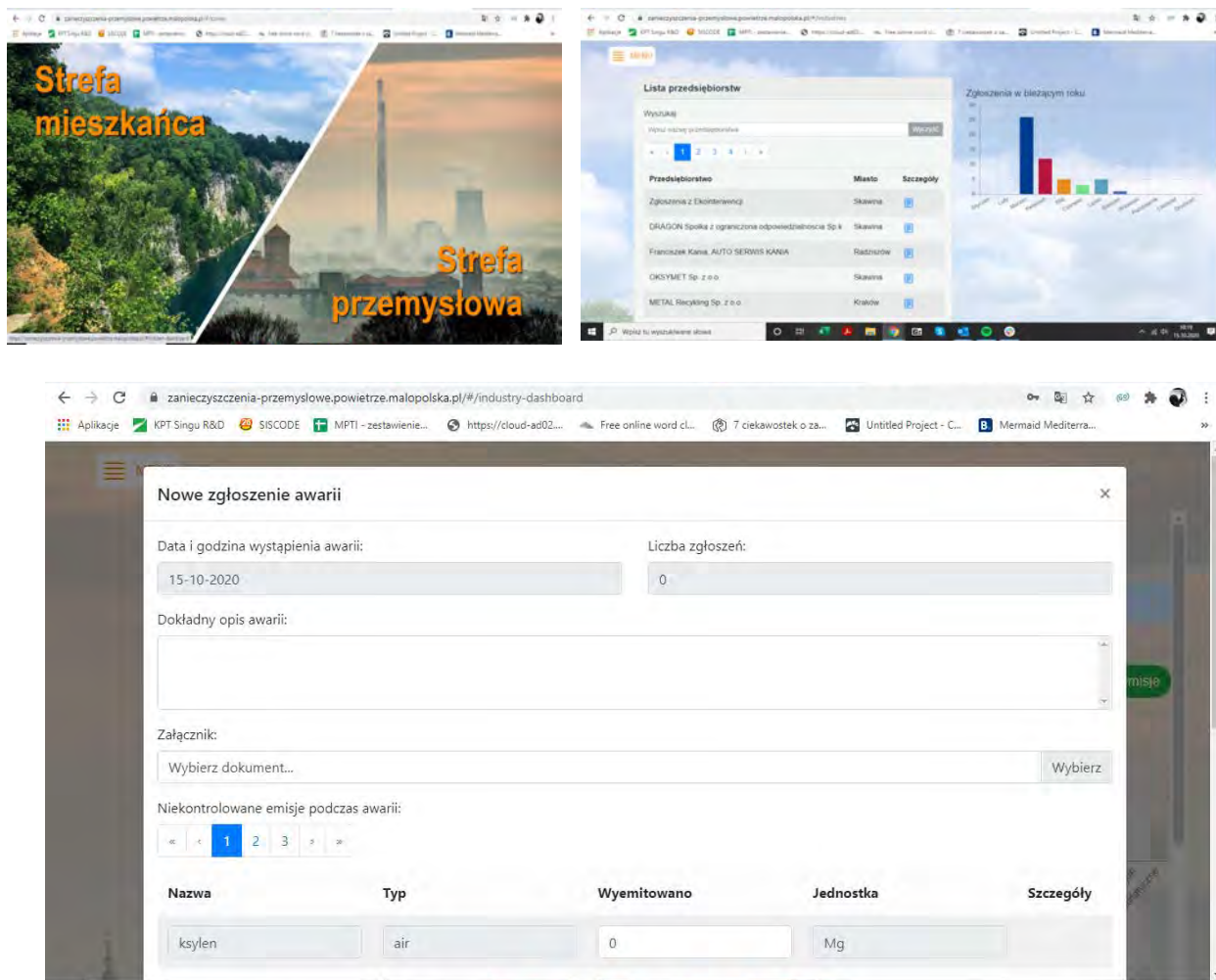


Fig 4.4.2: Presentation of the Platform for Monitoring of Industrial Pollutions

#### 4.4.5.2 Sustainability strategy

The Air Protection Programme is an official legislative document, which will be implemented in the next 7 years, guaranteeing its sustainability through regular monitoring and evaluation. Its results and impact will be analysed and revised on a regular basis and KTP will be taking part in its evaluation together with regional authorities.

The digital platform as the second solution developed will be finalised and introduced on a wider range by the Marshal Office. The results and recommendations coming from the testing phase evidence a clear need for such a tool, available at the regional level, as it has an informing and educating role at the same time. Also the Qubit team, the developers of the original idea during the Smogathon, elaborated a business plan to expand this tool to other regions. The interest encountered during the process shows the relevance of such kind of instruments to all stakeholders.

Regarding the sustainability of the methodology and process, it is necessary to underline that thanks to such open and extensive consultations it has been possible to prove the positive impact of this bottom-up approach on the entire development process including the perspective of academia, experts circles, businesses and NGOs giving them the possibility to



have real impact on creation of strategic documents. During the consultation process, a wide group of participants was involved in different stages of the co-creation process openly presenting their perspective, opinions and proposed solutions that could be applied in a specific field to improve air quality. It has been the first time that such extensive, wide and open community consultations were organised for the creation of a strategic regional document. There are plans to enhance and exploit this experience gained in collaboration with the Marshal Office of Małopolska region to the development of other strategic documents at a regional level.

#### **4.4.6 Transformations triggered and outcomes**

KTP has got involved in the consultation process of the APP from its very beginning at the end of 2018. As a mature, trustful and well-recognised business support organisation, Krakow Technology Park played a significant role in the process of open debate on how the APP should look like to meet expectations and requirements of the EU regulations on one side but on the other hand be adjusted to regional acts and specific cultural and financial circumstances.

##### **4.4.6.1 Organisational transformations**

In the scope of the co-creation journey, KTP has proven his leading position as a BSO in supporting policy makers in co-creation and implementation of regional binding acts as the Air Protection Programme.

As a mature technology park, KTP has a catalogue of varied methods, tools and techniques that are applied to drive the process of supporting companies and administrations. To strengthen the co-creation process, a dedicated team responsible for co-creation was established. The team is now officially introduced to KTP's structure and recognised as the main team dealing with design thinking. The team is constantly increasing its competences, expanding its offer to address varied needs and expectations of the local ecosystem. Within the implementation of the SISCODE project, KTP has confirmed his leading position as one of two living labs in Poland playing an important role in stimulating the local economy by supporting companies and administration in areas of their responsibility. Thanks to experience collected during the SISCODE project and inspiration gathered from other project partners, including remaining 9 living labs, KTP increased the scope and number of living lab activities which become a meaningful part of KTP strategy for coming years.

##### **4.4.6.2 Transformations in the ecosystem**

During the co-creation work led by KTP, it appeared that despite the fact of widely known and strongly presented open debates on air pollution there is still a large knowledge gap on this topic present in society. There is a need to organise knowledge and adapt it for the understanding and comprehension of the citizens of Małopolska. The concept to run an open process of dialogue and exchange of views and experiences between representatives of

various social and professional groups with no exclusion and marginalisation proved to be a successful approach to enhance this learning process. Giving citizens the right and space to exchange their views and present their opinions, visions and concepts of fighting smog, sometimes controversial, were a strategic win-win also for authorities rising awareness on the topic among the inhabitants to initiate the needed behavioural change.

The co-creation process implemented by KTP proved that the development of legislation with the direct and active involvement of residents is extremely important both for the citizens themselves as well as for the public administration. It gives them the opportunity to adopt the point of view of residents as direct stakeholders addressing it to the legislative processes ensuring that the proposed solutions and improvements will take the real expectations and needs of citizens into account while giving them a sense of influence and agency. Moreover, involving residents in the process from the very beginning leads to increased understanding and acceptance of the proposed changes. Such an approach does not question the rationality of the activities carried out so far at the legislative or financial level, but shows that there is a lot to be done in terms of communication, education, accessibility and coherence of existing and proposed activities.

To limit the impact of the coronavirus restrictions, dedicated meetings with the KTP Board, the Heads of the Environmental Department of Małopolska region, representatives of Skawina City Office and Qubit team have been organised to verify the milestones and prepare a contingency management plan (CMP) to adjust activities to the current coronavirus situation. The CMP with an updated timeline has been discussed and agreed by all involved participants of the project. Instead of the scheduled in person meetings, regular teleconferences to monitor the prototyping and implementation phase on the APP and the platform for monitoring industrial pollution have been introduced by KTP. It was agreed to exploit the online creative tools and techniques to activate and engage a varied group of stakeholders requiring an extension of the catalogue of tools and techniques to adjust them to new circumstances. The new modalities also requested much more time for the preparation of activities and making other stakeholders familiar and comfortable with new techniques and ways of working.

#### **4.4.7 Conclusive reflections**

The co-creation process undertaken by KTP, related to the APP and the digital platform for monitoring industrial pollution was conducted so widely and transparently for the first time and proved to be a great success. It was possible thanks to the long-established relation with public administrations as well as the trustful and respectful connection of KTP to the business ecosystem of Małopolska, academia and NGOs.

However, opening the process of co-creating regional policy so widely resulted in some constraints and obstacles as well. The divergent interests between regional authorities and some business groups like, for example farmers or coal furnace producers were noted. The

situation regarding the pollution required a transition period to introduce a total ban for coal heating and special financial instruments to support this business transformation of the affected stakeholders. The process also brought to light that even local authorities cannot fully implement new regulations due to insufficient financing and a series of related acts that cannot be changed as they are based on the national legislation.

All those challenges and even the coronavirus situation can be considered minor obstacles, since the co-creation journey undertaken by KTP proved that the process of creating legislation with the direct and active involvement of residents is both functional and important for the administration. It gives the administration the opportunity to understand the different perspectives of academia, businesses and citizens and results in a sense of community based on common identity, culture and real challenges tackled together. The proper timing and general importance of the air pollution problem, as well as getting familiar with expectations and needs of residents and businesses strongly supported the process of introducing the new regional APP.

#### 4.4.8 References

The platform developed

<https://zanieczyszczenia-przemyslowe.powietrze.malopolska.pl/>

The Malopolska region. The Air protection program <https://powietrze.malopolska.pl/program-ochrony-powietrza/>

The Malopolska region. (2020) The adoption of the new Air Protection Programme <https://powietrze.malopolska.pl/aktualnosci/sejmik-województwa-malopolskiego-przyjal-nowy-program-ochrony-powietrza/>

KTP (2020) KTP Academy. Report on co-creation workshops carried out under the project 'Society in Innovation and Science through CODEsign. SISCODE "financed from Horizon 2020 as part of research and innovation projects.

<https://www.kpt.krakow.pl/en/about/akademia-kpt/>

KTP (2020) Summary report on co-creation workshops

<https://www.kpt.krakow.pl/en/6752-2/>

#### 4.5. ICT for Agricultural schools by PA4ALL

written by Isidora Stojacic



### 4.5.1 Synthesis of PA4ALL's journey

PA4ALL is an abbreviation for Precision Agriculture for All, which is also the main scope of the Living Lab, introducing all the actors along the agriculture production chain to precision agriculture tools. The host organisation of PA4ALL is BioSense Institute, an institute for research and development of information technology in biosystems. Research and innovation at BioSense Institute is developed in close interaction with farmers and the agrifood sector, government bodies, entrepreneurs and business community, international researchers, and citizens. PA4ALL is working together to create a new generation of open innovation which will be readily used and lead to benefits along the entire value-chain. As a meeting place for all relevant stakeholders, PA4ALL has established the Living Lab for precision agriculture. This is the first living laboratory in Serbia and the first one in Europe to focus on precision agriculture. PA4ALL takes full advantage of inter-sectoral cross-fertilisation of ideas and offers possibilities to test ideas and prototypes in a real-world setting.

PA4ALL is located in Novi Sad, Serbia and is the only institution in the region focused on the topic of ICT in the agri-food sector. BioSense advances and integrates all the advantages that ICT can offer today – nanomaterials, low-cost miniature sensors, satellite imaging, robotics, big data analytics – to provide as much information and support as possible to the agricultural sector. The final goal of BioSense is to incorporate all efforts and results of various research groups into a unique BioSense integrated system for agricultural monitoring. This system is aimed at providing necessary data sets and creating breakthroughs in the agrifood sector, not only in terms of increased efficiency, reduced pollution and monetary savings, but also in the way in which farming is perceived and performed, making agriculture an attractive career choice for younger generations.

Co-creation and its tools represent a crucial opportunity for PA4ALL, since the Lab is in need of constant communication, exchange and feedback from and with the actors in the industry in order to facilitate the adoption of ICT in agriculture. Therefore, PA4ALL has its own ecosystem of farmers, SMEs operating in the field of agriculture, policy makers, schools specialised in agriculture to enable efficient interaction through co-creation.

The case study of PA4ALL in the SISCOODE project gathers the aforementioned in one scope. After conducting the interviews with the relevant actors, the working group understood that the curriculum in high schools specialised in agriculture does not support the subjects related to ICT in general, nor do the school facilities and infrastructures support the implementation of ICT. Also, despite recent increase in the number of young people engaged in agriculture, Serbia still lags other countries in Europe. In the European Union, young farmers account for 8% of the total number of agricultural producers. In the Czech Republic and Poland, this percentage is even higher. In Serbia, however, less than 5% of young people are engaged in agriculture. By implementing precision agriculture tools into high school mandatory curriculum, PA4ALL together with BioSense wants to achieve its long-term goal of increasing

this percentage. Therefore, it can be said that the best solution to follow in SISCODE was the introduction of ICT subjects in agriculture-related courses, by inclusion of ICT in schools specialised in agriculture, to increase the awareness of the relationship between technology and agriculture. Since a change in the educational system in the Republic of Serbia takes a lot of time and the consent of various policy makers in the Ministry of Education, the main goal for this experimentation has been to initiate this process of change to then develop a long-term strategy to reach the final goal.

## **4.5.2 Initial context**

### **4.5.2.1 External context and ecosystem**

The political context in Serbia in the past decades had brought a lot of turbulence to the society followed by frequent changes in relevant governmental institutions. Furthermore, being a society in transition, Serbia is facing the challenge of keeping up with the global challenges lacking the necessary technology and industry that would enable and support this process. However, the previous socialist legacy provided Serbia with high-quality education in engineering professions, primarily electronics and mechanical engineering. It is exactly these fields that have become the pioneers of change in recent years influencing both policies and the labour market making ICT one of the core elements of Serbia's export potential, talent pool and educational opportunities. A recent study conducted by the German-Serbian Chamber of commerce confirms that ICT is the fastest growing sector in the Serbian economy.

Given these developments, the local policy context has also been changing. Traditionally, the lack of democratic institutions has led to a lack of bottom-up initiatives and little understanding for the co-creation process when talking about new initiatives and changes in the system. However, the growing potential of the ICT sector has led to the development of organisations and institutions with the common goal of working towards changing the institutional framework to increase the potential of the sector. ICT Clusters are representing a group of companies, SMEs or start-ups formed in cities such as Novi Sad, Subotica, Nis, Belgrade and many others. The Digital Serbia Initiative brings together banks, media companies, ICT companies and phone operators and acts in their best interest working on necessary policy changes.

In agriculture, more traditional approaches to policy are deployed. Most farmers form cooperatives and use these structures to influence crop prices, gain greater bargaining power when negotiating with the state, influence subventions, etc. In this field, compared to ICT, serious co-creation and bottom-up policy initiatives have not yet been introduced.

As PA4ALL works at the intersection of the two respective fields, the assessment of the policy context through initial desk research as well as previous presence in the community directed the lab towards working more on applying the approach of the ICT community. Capitalising



on the current digital strategies, bottom-up initiatives and potential of ICT for Serbia's development, the pilot focused its policy efforts in that domain.

#### 4.5.2.2 Organisational background

BioSense Institute is involved in multidisciplinary research performed in the fields of micro- and nanoelectronics, communications, signal processing, remote sensing, big data, robotics and biosystems. PA4ALL consulted research groups on what kind of help can be provided to high schools specialised in agriculture in order to prepare the students for the labour market. Remote sensing and GIS group provided an excellent reference on what kind of equipment should be provided to schools in order to support their students in learning more about the popular concept of Big Data analysis, which could be applied to agriculture as well. Since this group bases its research on processing, storage and retrieval of data acquired from multimodal sensors, as well as the integration of large amounts of multimodal data acquired from different sources, the idea of organising specific training in high schools was born. The activities of the group include the development of systems for instant access to relevant data presented in ways that are the most informative for end-users, such as GIS databases, which could be interesting for future professionals in agriculture.

#### 4.5.3 Challenge

*How is the agriculture sector rapidly changing? And how can we respond to new needs which arise in the agricultural sector? What could be our main strategy?*

Those are just some of many questions which come to mind when defining the main challenge to be tackled in the SISCODE project. Farmers can no longer rely on timeworn coping strategies when all of their familiar benchmarks for making agricultural decisions are turning increasingly less reliable. This raises the need for additional means such as ICT technologies applied in the field of agriculture. Many ways of applying ICT in agriculture or digital agriculture interventions have been developed and tested around the world to help agriculturists improve their livelihoods through increased agricultural productivity and income or risk reduction for damages and crop failure.

PA4ALL focuses on connecting citizens and policy makers in order to incorporate the whole co-creation process. As PA4ALL works at the intersection of two fields, ICT and agriculture, the assessment of the policy context through initial desk research as well as previous presence in the community led towards an intensified interaction with some ICT community bodies using co-creation tools. Through the PA4ALL project initiative, the application of co-creation leads to both direct and indirect benefits on a policy level. Indirectly, due to the existing governmental strategies which are addressing the existing policies that incentivise the implementation of ICT in education in Serbia (Digital Agenda) a more innovative mindset and starting changes on a society level were expected. Directly, the co-creation activities functioned as positive examples to be presented to the policy makers on how the curriculum

in schools could be improved and how the society reacts to educational system reforms. This has been done during workshops, events, presentations, fair exhibitions and other events prepared for the local, regional and national policy makers addressed in the project. Therefore, this triggered a variety of reflections as indirect benefits such as digitalisation on a larger scale, not only in agriculture.

## **4.5.4 The co-creation process of the envisioned solution**

### **4.5.4.1 Analysing context.**

The Desk Research was undertaken in order to identify the crucial aspects lacking in the educational systems of Serbia related to ICT and agriculture. As aforementioned, firstly, materials used for this research were documents on Digital Strategy of Serbia and Strategy of development of information society in 2020. Furthermore, desk research uncovered existing initiatives promoting IT education in schools and helped to develop the next steps for conducting interviews.

Secondly, one school was selected as a reference point. Interviews were conducted with the teacher Branislav Jovanovic and his students at a high school specialised in agriculture in Futog. The main questions addressed were related to their professional specialisation, additional workshops and seminars, training on ICT in agriculture and new equipment. After further analysing the needs emerging from these interviews, PA4ALL was able to confirm the urgency of implementing ICT in the educational system of Serbia.

Finally, PA4ALL reached out to its network of innovators (farmers, SMEs, entrepreneurs) and asked them to provide their professional opinions on how schools specialised in agriculture could better address the current needs of the market and create better professionals in the field.

### **4.5.4.2 Reframe the problem.**

The analysed data has helped in determining what are the crucial needs of schools to develop their curriculum activities and introduce new aspects in agricultural education.

The first established contact with schools around Serbia was during the Science Festival at the University of Novi Sad. The aim was to welcome the students attending schools specialised in agriculture to gather their ideas on new prototypes which could be developed, and which would help in solving some of the issues related to agriculture. After the ideas were presented at the science festival, which took place from the 18th to the 19th May 2019, the best idea was selected and awarded with equipment which will bring ICT closer to students. The idea selected was the “SPRAYCONDI - a digital advisor for the reduction of errors in the application of pesticides” by the high school specialised in agriculture from Futog (suburbs of Novi Sad). “SPRAYCONDI” would help the farmer make the right decision regarding the reduction of drift and more efficient pesticide application together with the measurement of meteorological data at the site where the pesticide application is performed.

The digitised data would also be transmitted via mobile network to a cloud or computer where a model for the impact of the pesticide application on biomass and the final yield will be generated. This data was supposed to be obtained at the meteorological stations on a regional level, which is why PA4ALL decided to provide the meteostations to schools in this project, so they could obtain the data locally from their own sources.

#### **4.5.4.3 Ideate.**

The farmers' community around BioSense provided information on activities which are necessary in order to improve the ICT-based knowledge inside the farmers community in Serbia in general. During the Annual ANTARES Workshop which was held from the 3rd to 5th April 2019, AgroSense, the BioSense platform, was presented to farmers together with the main services it can provide. The opportunity has been taken to consult the farmers as final users and other stakeholders illustrating the plans for the SISCODE project and the idea of improving the educational system in agricultural specialised schools was strongly supported. The farmers directly provided advice on how to structure the basic idea regarding the needed equipment, how to address the students in this field and they pointed out how important it is for young professionals in the agricultural sector to use novel technologies such as the AgroSense platform, Big Data from meteostations, and others.

An additional source of information related to the needed activities in schools which would improve the education of future professionals in the AgTech industry was the existing BioSense network, which comprises SMEs and start-ups. Since most of the entrepreneurs belonging to the network have a background in agriculture and ICT related sciences, they were an excellent reference point to suggest relevant changes and develop new ideas in relation to the educational system. The main reference point from this network was Milan Dobrota, the founder of Agremo, an AgTech start-up specialised in agricultural sensing and drone analysis platform for drone operators, growers, and agronomists, which provides actionable insights that lead to sustainable production, higher yields, and lower production costs. Milan Dobrota PhD is an entrepreneur with a background in electrical engineering, who started his own start-up a few years ago and he backed the idea of using co-creation to develop and integrate such an idea with great enthusiasm.

Since BIOS Institute is involved in multidisciplinary research performed in the fields of micro- and nanoelectronics, communications, signal processing, remote sensing, big data, robotics and biosystems the research groups have been consulted on what kind of help can be provided specifically to high schools specialised in agriculture in order to prepare its students for the future labour market to develop a detailed educational module based on these insights.

#### **4.5.4.4 Prototype.**

In order to prototype the educational model designed by PA4ALL (BioSense Institute), a meteostation was installed on a piece of land in Futog in the suburban area of Novi Sad, the

city where PA4ALL (BioSense Institute) is located. The meteostation is now part of the agriculture equipment in the high school specialised in agriculture in Futog which enables the teachers and students to use precision agriculture tools themselves. Apart from installing the meteostation, PA4ALL provided additional equipment such as laptops, video projectors or printers in order to help the school to collect and manipulate meteorological data directly from the meteostations. PA4ALL also provided credentials to this high school specialised in agriculture for the digital platform AgroSense, to give the school the possibility to follow the data such as precipitation, air and soil temperature, humidity, wind etc. Finally, Vladan Minić, a researcher from PA4ALL explained to the teachers how to use AgroSense and demonstrated its benefits for agriculture production. The teachers and students showed deep interest in the new technologies and in this educational model since they became aware of the necessity to improve the curriculum in schools by introducing precision agriculture as a new subject. They also realised that traditional agriculture production might not be adequate for today's production and work profiles anymore and that to move towards the agriculture production of the future, it is necessary to rely on precision agriculture to complement the traditional methods.

#### **4.5.4.5 Policy Maker Engagement**

During the SISCODE project, one of the main outputs to be considered is the acquired ability to initiate and conserve the change of this high school curriculum which will be only improving in the future and that was also presented to the policy makers when PA4ALL visited the Ministry of Education in the beginning of the project. The policy officials underlined the main issue with this specific focus group, which is the fact that agriculture is not an interesting field for young people and ICT can change the perception they have about the main sector of any economy. Therefore, the benefits of co-creation tools have been exploited in order to gather feedback on how to raise their interest in the initiative. Policy makers and representatives of the governmental and civil society have been engaged in conversations on the importance of equipping young students in high schools specialised in agriculture with the necessary ICT skills. Now, an active dialogue is ongoing with the aim of paving the way for the necessary changes in the educational system to reach the final goal of improving the high school curriculum.

#### **4.5.4.6 Covid-19 situation**

As for most of the cases described in this document, the situation with Covid-19 slowed down and generally impacted on the progress of the project. Due to the direct involvement with high schools and their closing due to the pandemic, the planned activities and workshops in schools were postponed from March to September 2020. The second loop of feedback gathering took place on the 24th September 2020 using the ZOOM platform due to the restrictions on in-person meetings. The teachers and some of the students from the high school specialised in agriculture were invited to join and listen to the detailed description and guide of the AgroSense platform, which is the core tool of the case study. The researcher

Oskar Marko, a member of PA4ALL, conducted the presentation, explaining in detail the main performances of the platform and Momir Alvirovic, his fellow researcher, provided an introduction of drone technology and other precision agriculture technologies (Fig 5 1). The feedback gathered was, as the team had hoped, full of positive thoughts but also some important questions were raised. The questions mostly addressed the needed information which is required by the agriculture producers and can be provided by the platform. The students knew what could be beneficial since they already have some experience in their family agriculture production. After the feedback collection session which was conducted through the chat section of the platform, it has been decided to apply slight changes to the platform based on the collected feedback. They were mostly related to technical functionalities as spectral imaging of the field and mapping of the grounds and parcels where the screening is taking place.

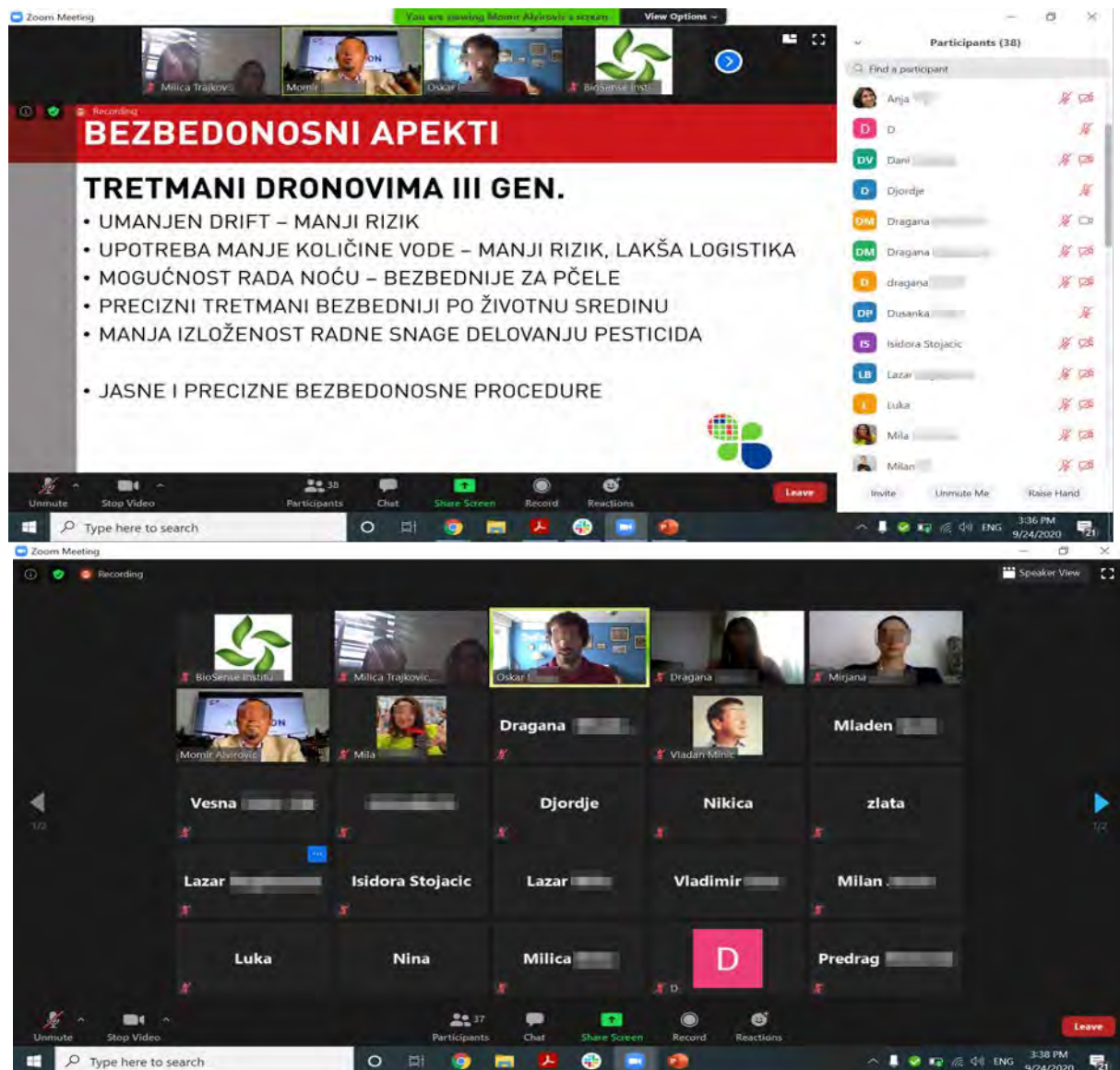


Fig 5.1: The feedback session conducted on ZOOM

## 4.5.5 Status of the solution

### 4.5.5.1 Concept

The main solution developed during the SISCODE project is the design of a new educational module which could be implemented within the high school curriculum on a national level and therefore would be applicable in any school around Serbia. When making considerations on the best solution, it was necessary to explore what would have the highest impact on children's education today. The resulting answer has been related to Biosene's main field of expertise, precision agriculture, therefore it has been decided to take this direction for the development of the final solution. The idea resulted in a great understanding and very positive feedback from the actors in the ecosystem and involved policy makers that supported the project vigorously. After choosing the school for the testing of the prototype, PA4ALL decided to start with equipping the school with the following gear: meteostations, computer, printers, solar energy panel and other supporting material. Furthermore, PA4ALL provided supporting training sessions on how to use the meteostations, the AgroSense platform as well as giving personalised access to AgroSense. The services of AgroSense are promising for schools since students are able to see how such a technology looks and works in real life. AgroSense includes an option of mapping the various parameters of the farmed area, with an option to place the images from the drones (RGB, NDVI etc.) on the desired production plot, the maps of the conductivity of the soil obtained by the electro-magnetic probe, the yield maps of the combine and any other georeferenced images.

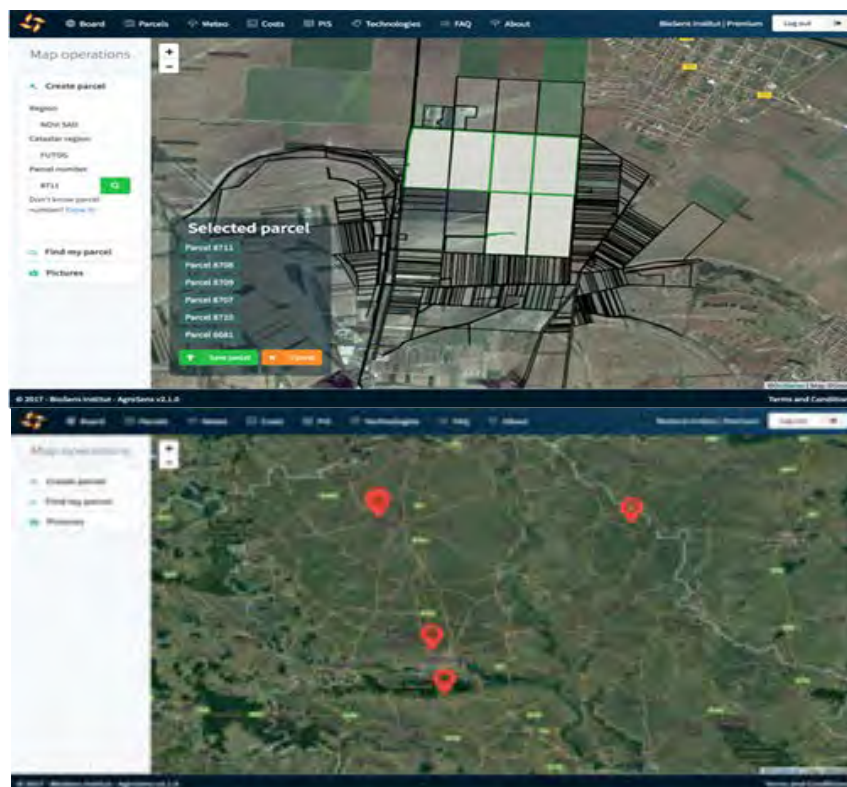






Fig 5.2. The AgroSense platform and the equipment installed in the schools

When it comes to direct policy maker involvement, it is important to mention that the formal and semi-formal bodies who focus on lobbying for advancement in ICT have been formed in recent years (i.e. ICT Clusters in cities around Serbia and Digital Serbia Initiative, with which PA4ALL (BioSense) is in constant collaboration). A successful programme of introducing ICT in primary schools through an online platform has been implemented by Petlja paving the way for similar efforts in other fields such as agriculture, and the case is one of PA4ALL main benchmarks to follow. This development of the context will also be of support in ensuring the sustainability of the project in the long run, since Serbia is heading towards a more digitised economy.

#### 4.5.5.2 Sustainability

Co-creation tools were used during face-to-face meetings with the school directors and during the meeting organised annually by the Ministry of Education to discuss current issues and potential collaborations between schools. PA4ALL attended last year's (2019) meeting when first presenting the project initiative and the final goal. The project idea came to be a source of appreciation from the school directors' side towards the organisation which made the team proud and considered the next steps to follow. In the context of ensuring the project sustainability, it led to the idea to look for additional, national funds, which would help to supply other schools, not only the one where the solution was prototyped, with additional meteostations. Finally succeeding in this activity, the ongoing focus lays on the implementation of the initial idea to install the new meteostations in other 8 schools around Serbia. Additionally, the initiative caught attention from other projects, both national and international. One of those which contacted PA4ALL for further collaboration was the H2020 project Data Dragon. Data Dragon aims at educating interested parties (scientific and other communities) on smart agriculture and therefore, they wanted to expand their interest group

to high school children as well and collaborate with PA4ALL to exchange experiences and knowledge.

## **4.5.6 Transformations triggered and outcomes**

### **4.5.6.1 Organisational changes**

The PA4ALL team learned that co-creation applied in science can lead to long-term positive results. Co-creation has been identified as a means to explore and exploit the future potential of agriculture in Serbia, simply by interconnecting different important stakeholders. On an individual level, co-creating can facilitate scientific research by providing precise directions and insights on a specific topic from an individual or organisation who is already involved in it. The flow of information is facilitated, lack of experience is not seen as a threat but rather a different and relevant point of view. On an organisational level, co-creating brings synergy, better organisational structure and deep engagement of the actors and stakeholders. PA4ALL understood that co-creating can bring together stakeholders from different levels of administration to improve policies on the level of cities, regions and entire countries.

### **4.5.6.2 Ecosystem's transformations**

Since the beginning of the project, the network of partners of SISCODE provided information, explanations of specific tasks and the support was helpful for PA4ALL. Even for the purpose of writing this case study, the partners' insights and feedback were a valuable asset since it was possible to compare results and challenges which arose along the way. There were some barriers identified during the process, such as the constant engagement of actors (students and government officials) but at the time of the conclusion of the co-creation journey all of them could be overcome.

Recently, because of the Covid-19 situation, PA4ALL strives to engage the students using social media and online communication platforms such as Zoom or GoToMeeting. However, since the schools were completely closed, a reorganisation of the project structure and adaptation of the changed conditions and possibilities was needed.

## **4.5.7 Conclusive reflections**

PA4ALL detected that agriculture is significantly dropping in terms of numbers of people employed, especially in Serbia. Also, when compared to other high schools, those specialised in agriculture attract only 6% of yearly applicants, while gymnasium school's enrolment is reaching percentages of 26%, IT schools' around 11% and economic/law high schools' enrolment around 13%. This is why PA4ALL strives to make agriculture a sector more appealing for the youth of Serbia. These activities have directly demonstrated how precision agriculture tools can be used in the field and by promoting the use of advanced ICT solutions to high school children, it is possible to spread their adoption by embedding them from the very early phases of training to then be brought into work life.

As aforementioned, other planned activities are other workshops with students and teachers, which will be an extra activity aimed at making the project sustainable over time. The second loop of feedback gathering was also set up as a workshop on precision agriculture, in collaboration with another project DATADRAGON (<https://datadragon.eu/>), where high school children from all around Serbia will be able to learn more and try to use other precision agriculture tools such as robotic platforms, etc. Since the Covid19 situation is in place at the moment, there are some difficulties in organizing the events, but it was possible to make the first steps towards the future. Datadragon organises hackathons and events where people around the world come to learn more about Big Data in Agriculture and Precision Agriculture tools on a large scale.

Finally, when speaking about sustainability, it can be said that one of the main achievements was receiving funds from a national project which will fund the meteostations being supplied to various schools around Serbia, which is already being activated as this case is developed. As a result, other schools, not just the one in Futog, will be able to use the model and the curriculum designed. More importantly, it will be possible to influence more students to adopt precision agriculture tools to be then brought into industry together with them.

## 4.5.8 References

Living Laboratories Division (2020). Living Laboratories Initiative

<https://www.agr.gc.ca/eng/scientific-collaboration-and-research-in-agriculture/living-laboratories-initiative/?id=1551383721157>

Real, M. et al. (2019) SISCODE deliverable 3.2 Envisioning of solutions and policies.

<https://siscodeproject.eu/resources/>

Agrosense platform <https://www.agrosens.rs/#/app-h/welcome>

### **Main contributors of PA4ALL journey:**

School children, teachers, directors

Government officials

Ecosystem actors: SMEs, farmers, agriculture producers, agri food businesses

#### 4.6. Partners of Experience by Thess-AHALL|AUTH

*written by Evdokimos Konstantinidis, Despoina Mantziari, Despoina Petsani, Panos Bamidis*



## 4.6.1 Synthesis of the pilot's journey

### 4.6.1.1 The organisation

The Thessaloniki Active & Healthy Aging Living Lab (Thess-AHALL) has been operating since 2014, governed by the Medical Physics Laboratory, School of Medicine of the Aristotle University of Thessaloniki (AUTH), Greece. It fosters research initiatives, encouraging regional development and sustainability of novel technologies in the Active & Healthy Ageing (AHA) domain. Thess-AHALL is actively pursuing co-creation and co-design of technological and other non-pharmaceutical solutions to improve the physical/mental/social health & care of older adults and other vulnerable populations, like patients with chronic diseases in order to facilitate independent living.

The lab has a broad experience in the field of research and innovation, as partner or coordinator in plenty of national, European-funded programmes, while running several self-funded initiatives. Its multidisciplinary personnel are experienced in designing, evaluating and implementing co-creation practices. Researchers regularly collect and share users' feedback and findings from systematic observation, monitoring and user-behaviour analysis in real-life context, applying the Agile Development Methodology. In order to maintain user engagement over time, Thess-AHALL has established a set of methodologies and principles, creating its own co-creators community of older adults, healthcare professionals, formal/informal caregivers, the so-called, "Collaboration & Research Community for Independent Living", currently comprised of over 100 active members. Furthermore, Thess-AHALL has designed and implemented its own "loyalty point" system to motivate participation and engagement together with a panel management tool to facilitate the logistics, keep track of ethics and create an archive of participatory activities carried out.

### 4.6.1.2 The co-creation journey

Thess-AHALL aims to enhance active citizenship and tackle the risks going along with ageism in the elderly community and chronic patients, introducing the "Partners of Experience" life-long learning programme for early-stage researchers over 65 years old.

Thess-AHALL's extensive experience in collaborating with the targeted groups of society has shown that they often feel socially marginalised facing the cultural stigma of losing their mental and physical abilities due to health problems or ageing. At the same time, although science has a high impact for societies, the scientific community is still seen as a "close elite", not addressing citizens' real needs. Taking these into account, *Thess-AHALL's "Partners of Experience" programme opens academia to the society and embraces older adults as an alternative research group to co-create solutions for everyday living challenges (Fig 4.6.1).*





Fig 4.6.1: Concept of 'Partners of Experience'

The challenge of this initiative is proving that a more accessible scientific community with a high involvement of citizens in participatory research and decision-making could become the solid ground for targeted populations to tackle potential stigmatisation while addressing effectively key societal problems in collaboration with citizens and experts. In this framework, a total number of 44 older adult early-stage researchers attended the “Partners of Experience” programme for a whole academic year (from September 2019 until June 2020), applying scientific research methodologies, first in-person and later virtually due to the Covid-19 pandemic. Subdivided in three smaller research groups and guided by mentors from Thess-AHALL, participants addressed societal challenges, related to the topics of Environment, Health & Social Welfare and Active Citizenship with the final aim to make the city of Thessaloniki healthier and more accessible to peers. Fig 4.6.2 summarizes the structure of the programme’s activities, described in details in the following sections. A concrete model of the proposed experiential educational approach has been the main outcome of the process with the objective to be applied in similar and different contexts to be developed further in the future.

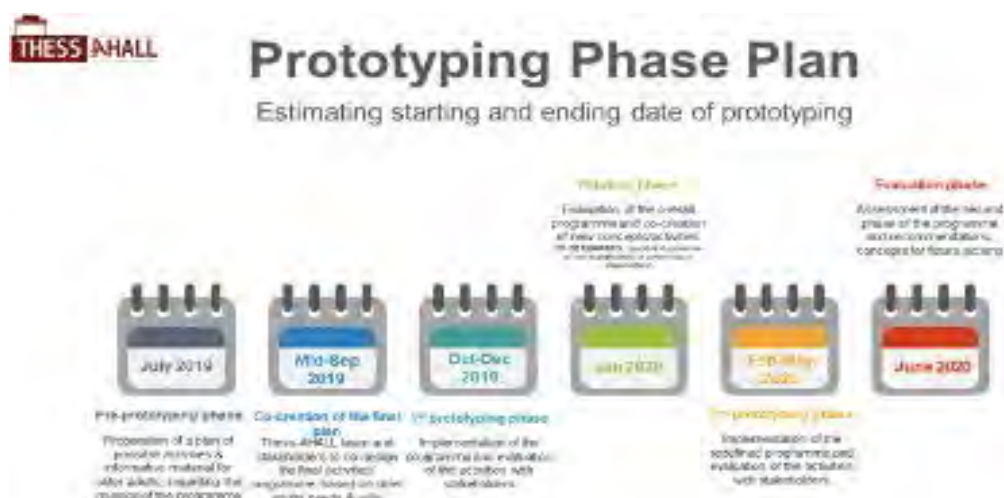


Fig 4.6.2: Structure of the Partners for Experience program



## 4.6.2 Initial context

### 4.6.2.1 External context and ecosystem

Concerning both the local and the national context, there has not been a universal social policy or a Ministry/authority responsible in Greece related to the risk of social isolation of older adults and patients with chronic diseases, yet. There are a number of established policies at the national level addressing the provision of primary and secondary healthcare as well as social welfare support to older adults and patients with chronic diseases together with the provision of insurance allowances aligned to the related EU policies. Nevertheless, there is a lack of policies regarding the topics of active ageing and the elimination of social discrimination and the cultural stigma in relation to ageing and chronic diseases at a national level.

On the other hand, there are remarkable initiatives, undertaken by individual organisations or regional authorities and policymaking actors at the local level: e.g. municipalities, local chapters of the National Health Districts, Patients' associations, universities, etc. More specifically, the implementation of social inclusion policies for older adults and patients with chronic diseases is at the discretion of the municipal authorities operating the local day care and activity centres. Furthermore, they provide activity programmes, like sports, entertainment or educational seminars for older adults. A remarkable example of social policy in this context is the one of the Greek Intermunicipal initiative for Health Promotion (EDYPPY), which has established (2015) some general guidelines on the Active & Healthy Ageing of citizens, including educational programmes for older adults (e.g. teaching computers skills, foreign languages etc.), as well as entertaining and cultural activities, ageing tourism, etc. Similar activities are organised also by local patient associations like dancing and painting classes offered by the Parkinson's Association in Thessaloniki or under Corporate Social Responsibility initiatives of private actors like the computer training programmes for older adults by SKAI TV and the programmes for the employment of people over 55 years old by the national Manpower Employment Organisation. Lastly, but also worthy to be mentioned, are individual initiatives, also run under scientific research programmes, like the AUTH Medical Physics Laboratory's LongLasting Memories Care physical and cognitive training platform and the CAPTAIN eCoach system. Both of them started as research initiatives rapidly gaining local acceptance that led to their commercial exploitation as complete assistive solutions in the local silver market fostering collaborations with nursing homes, municipalities, day care centers and private actors.

The absence of a national framework against ageism has led to unequal access to the benefits of social inclusion activities for the target population across the country. This is a challenge that should be effectively addressed cultivating the grounds for such a nationwide framework across all the currently fragmented initiatives for the establishment of a concrete national policy aligned to the EU priorities for an active ageing population with improved Quality of Life enhancing competences and skills.

#### 4.6.2.2 Organisational background

Thess-AHALL has wide experiences in R&D activities in the field of Active and Healthy Aging (AHA), as well as in technologies for Assisted Living for older adults and other vulnerable groups. It is the only active Well-Being & Health Living Lab in Northern Greece and the Balkan region. It has matured an extensive experience in user-driven innovation and evidence-based research in the AHA domain over the years, manifested in more than 7,500 piloting hours with more than 2,500 end-users.

Thess-AHALL is a dynamic community composed of researchers with a rich variety of scientific backgrounds (doctors, psychologists, engineers, social scientists, data analysts, etc.), who are working as pioneers in their research receiving national/international recognition and funding for their work and excellence. The lab's staff is experienced in co-creation and social innovation methodologies while also being specifically trained and certified to work with vulnerable populations.

The actual strength of Thess-AHALL lies in the created synergies and strong bonds with local and European communities. It preserves a wide network of end users and partnerships with stakeholders from the Quadruple Helix model always supporting the active involvement of all the interested parties in every step of the development of a new solution or initiative. Thess-AHALL is an adherent member of the European Network of Living Labs (ENoLL) and leader of the networks Health & Well-Being Task Force. Furthermore, it is categorized as a 2-starred Reference Site of the European Innovation Partnership on Active and Healthy Ageing (EIPonAHA) and acts as coordinator of the Thessaloniki “Mental Health & Well Being” Lead City of the European Commission DG JRC/RTD “City Science Initiative”.

Either as part of its Corporate Social Responsibility action plan or its research activity, Thess-AHALL often runs social innovation actions like the Play4/Participate4 common cause campaigns (parent-ideas of the SISCODE Challenge), awareness raising events, open science initiatives like open courses & lectures to the public, co-creation & experiential research activities, etc., in a way to promote the openness of the scientific community to the society and the close collaboration of policymakers, experts and citizens to develop and support new policy frameworks and solutions to societal key challenges in the field of Health and Well-Being.

#### 4.6.3 Challenge

Thess-AHALL aims to fight ageism and the risk of social marginalisation while increasing social inclusion and active citizenship in older adults and chronically ill patients by introducing the “Partners of Experience” programme: a series of life-long learning & co-creation research activities for early-stage older adult researchers exploiting co-creation, citizen science and open science principles as its means.

More specifically, the lab's empirical knowledge of working with older adults and patients with chronic diseases or residential care receivers has shown that the targeted population

often feels marginalized and an inactive part of society due to their retirement or experiencing the cultural stigma of losing their mental and physical abilities. Although there's not a lot of data available for the local Greek context, the desk research confirms Thess-AHALL's experience providing valuable insights on ageism and the risk of marginalisation of the targeted population showing an interconnection of those two issues with similar risks of social isolation and possible serious mental damage accompanied by the experience of potential stigmatization (avoidance or rejection) (Cantarella et al., 2017; Kaushansky et al. 2016; Maffoni et al. 2017). Both, the UN and WHO have raised concern and awareness on the topic of active ageing by setting policy frameworks and action plans since 2002. Moreover, preliminary interviews with experts and policymakers and focus group sessions with end-users also confirmed the Thess-AHALL assumption, leading to the drafting of the lab's challenge.

Within the SISCODE context, Thess-AHALL's challenge was to welcome chronic disease outpatients and older adults back to the community, re-introducing them as an alternative research group that collaborates with the University and Lab's researchers, applying step-by-step scientific & co-creation research methodologies to contribute with their own solutions to research questions related to their own health and well-being issues. This approach has a two-fold objective: on the one hand, to change the established perception that the Academia often operates as a "close elite" detached from the society and its needs, by opening "University's doors" to the citizens highlighting the value of citizens' science and its impact on people's lives and the entire society. On the other hand, the aim is to bridge the gap among citizens, researchers and policymakers by implementing some of the proposed solutions proving the value and effectiveness of active involvement of all interested parts of the society to establish new policies and tackle key societal challenges.

#### **4.6.4 The co-creation process of the envisioned solution**

##### **4.6.4.1 Analysis of the context**

To enhance the empirical knowledge and identify solid ground for the research hypothesis, in the beginning of its co-creation journey, Thess-AHALL conducted an in-depth research to collect both quantitative and qualitative data. Using both keyword bibliometrics like desk research on ageism, social exclusion, the cultural stigma and the "openness of the Academia") and "interest group discussions" as focus groups with professional stakeholders from the healthcare sector lead to a broad spectrum of data to be enriched with direct interviews and questionnaires conducted with the main target group: older adults and patients with chronic diseases.

As previously mentioned, the desk research provided valuable data on the impact of ageism and the cultural stigma on the social & mental health of the targeted population. Interest focus group discussions and interviews with healthcare professionals, (psychologists, doctors, nursing home staff, physiotherapists) confirmed the findings of the desk research

on ageism and the cultural stigma also in relation to the local context, emphasizing the need for inclusive activities for these populations and their active involvement in society. Furthermore, the interviews with patients with chronic diseases (the Parkinson's Association of Northern Greece) and older adults (members of the Collaboration & Research Community for Independent Living) showed that inclusive/participatory activities with researchers of the Living Lab would make them feel not only socially included and accepted, but would also have the potential to significantly enrich research by giving them space to share their thoughts and needs and actively contribute to the design of new solutions. The collected feedback from the interviews strengthened the lab's vision to apply participatory research and co-creation as the means to tackle the risk of ageism and enhance end-user's active citizenship during the project.

#### **4.6.4.2 Reframing of the problem**

Thess-AHALL's first approach for the SISCODE challenge was to break the social exclusion walls and welcome institutionalised and chronic disease outpatients, as well as older adults, back to the community, introducing the "Participate 4" campaigns. Within the "Participate 4" context, older adults, patients with chronic diseases and people from other vulnerable groups would be motivated to participate in social awareness campaigns and co-creation research activities "with" and "for" people who experience social exclusion because of being institutionalised patients or older adults receiving residential care. The participation of Thess-AHALL's community would be gamified and participants would donate their time and effort in co-creation and common cause actions with the vulnerable populations, who would not just be spectators, like in other donation campaigns, but active participants, who would feel socially included again. Additionally, the participation would be turned into points that would be translated to a symbolic donation for the joint, predetermined cause. To explore the value of this initial solution, Thess-AHALL conducted a round of discussions with the SISCODE consortium, a series of focus groups with experts from the healthcare sector (6 psychologists, 4 doctors, 2 physiotherapists, 2 nurses), interviews with outpatients who had a previous similar experience, co-organising such events with the Thess-AHALL (Parkinson's Association of Northern Greece), as well as some in-person discussions with organisations and private bodies (PAOK F.C., Telloglion Fine Arts Foundation), who would possibly donate the symbolic gifts for the campaigns, presenting the entire idea.

Indeed, the "Participate4" idea received positive remarks by both experts and potential end-users, regarding its innovative approach to raise awareness and engage different stakeholder groups under a common cause. However, the interviews/group discussions highlighted experts' concerns on the possible temporary benefit for beneficiaries through their occasional participation in such actions and the need of a more concrete solution, focused on even more specific needs of older adults, to meet their "what is in it for me?" expectations. To this end, Thess-AHALL decided to pivot the initial idea, preserving the "Participate4" activities as a "tool" within the wider context of an experiential learning process for the

targeted population, emphasizing on the potential value of “learning by doing” actions and the active involvement of older citizens in research and implementation of solutions for “them” and also for “their society”.

#### 4.6.4.3 Envisioning of alternatives

The Thess-AHALL researchers used the collected data and stakeholders’ feedback from the first two phases of the co-creation journey, to reframe the initial proposed solution. They promoted multiple alternative ideas to address the SISCODE challenge, trying this time to include all the emerging concerns and aspects, related to the impact and methodology to be used. Everything now led to the design of an inclusive, alternative life-long learning programme for older adults and patients with chronic diseases, that would be used to meet end-users’ specific needs for active citizenship and risk of ageism.

Living Lab researchers created a database of potentially inclusive and life-long learning activities, based on the exploitation of the “principles to opportunities” and “concept scenarios” design tools. The main concern now was that a traditional adult education model would not fit the specific characteristics of the older adult population (e.g. variations on the previous educational level and skills, low digital literacy, limitations due to age and health problems, need for strong motivation to participate). As a more interactive solution was sought, based on the principles of co-creation and responsible research and innovation (RRI), a new research question was raised: *“What if instead of an older adult student group, there was an older adult early-stage research group?”* End-users would have the opportunity to learn and enhance their participation in the society by experientially applying scientific research methodologies or in other words by “being in Thess-AHALL researchers’ shoes”, working for a whole academic year as mutual collaborators, “Partners of Experience”, of the Living Lab, not just attendees, to solve everyday living problems of their interest.

The final idea was refined and drafted as a concrete plan by Thess-AHALL and entered a two-stage phase of development and validation with the active participation of older adults, healthcare/research experts and policymakers.

#### 4.6.4.4 Development and prototyping

The proposed idea of the “Partners of Experience” programme was officially launched in the framework of a public deliberation, held by Thess-AHALL in September 2019, during the OpenLivingLabDays Conference by ENoLL (co-hosted by Thess-AHALL in Thessaloniki, Greece). A total number of 74 attendees, policymakers, healthcare professionals, researchers, co-creation experts and end-users, participated in enlightening talks and panel discussions expressing their insights, thoughts and previous experiences in co-creation activities and how could citizens’ science initiatives could help societies and their people address societal challenges, and specifically health & well-being issues, improving everyday living. Participants, and especially older adults, embraced the idea of an alternative, early-stage researchers’ group with their active involvement, calling themselves “ambassadors” of

Lab's "Collaboration & Research Community for Independent Living" and of the SISCODE challenge. The prototype phase of the "Partners of Experience" programme followed.

For a 9-month period, a total number of 44 older adult researchers split in three research groups, Thess-AHALL researchers, with the close collaboration of local policymakers and healthcare professionals. We worked together applying scientific research methodology and implementing solutions to make Thessaloniki a "healthier" and more accessible city to the elderly population. A various set of inclusive activities and tools were exploited. From its very first activities, the programme received the positive comments of stakeholders, regarding social participation and acceptance and achieved high engagement for primary end-users, who asked for its replication in different contexts.

#### **4.6.4.5 The role of policies and policy maker engagement**

The involvement of local political authority representatives was not as active in the first steps of the challenge, as it was during the prototyping, primarily due to the successive elections (local, European and now early national elections) in Greece in 2019, and the respective pre-election periods that made the engagement of local policymakers a hard mission for Thess-AHALL researchers. However, during that period, the Lab exploited some existing policies on older adults, patients with chronic diseases and social research in previous activities, examining the potential incorporation of some of them in its challenge (like the Greek Inter-Municipal Network of Healthy Cities, promoting good practices in public health and well-being). After the elections and on the onset of its prototype phase, Thess-AHALL conducted a series of bilateral in-person discussions with the Head of the Directorate of Innovation & Entrepreneurship Support of the Region of Central Macedonia and the Municipality of Thessaloniki, responsible for the activity programmes of the older adult day care centres in the city. The two authorities welcomed the initiative, participating in the public deliberation for the launching of the "Partners of Experience" programme, while their representatives, along with academia representatives and related to the topic NGOs, participated in the policymaking "coaching" workshops with older adults at the final phase of 1<sup>st</sup> prototyping loop, providing mentoring and tools to early-stage older adult researchers. One step further, policymakers have been committed to the implementation of older adult solutions for the city and the further exploitation of the programme, when the Covid-19 situation allows it.

#### **4.6.4.6 Covid-19 Situation**

The Covid-19 pandemic affected the second half of the prototyping phase (2<sup>nd</sup> loop), when Greece imposed a general lockdown. The two-month home restriction (March-May 2020) was followed by strict recommendations for social distancing, especially for older adults and vulnerable populations. Face-to-Face and group meetups were prohibited during that time and Thess-AHALL had to find alternatives, so as to effectively deal with two emerging challenges in its prototyping phase: one the one hand, to fulfil its commitments towards the project completing its journey and reaching some tangible outcomes for the challenge and its community; on the other hand to keep stakeholders engaged, especially older adults who



have been the most vulnerable ones during the Covid-19 situation, meeting their expectations for the “Partners of Experience” programme and avoiding its abrupt interruption. The solution to continue prototyping, by exploiting virtual means, was not suitable for this specific journey, as many of the experiential learning actions included outdoor activities, but also primarily, because of the low digital skills of older adults and their limited access to smartphones/tablets/computers. Finally, the activities of the programme were not postponed, but they were pivoted to a series of phone group calls (via Skype to their home/mobile phones) and viber group calls, the so-called “e-coffee” sessions, during which older adults participated, tightening team’s bonds, and were assigned with some homework to continue their research.

## 4.6.5 Status of the solution

### 4.6.5.1 Concept

The “Partners of Experience” solution was introduced as a life-long, experiential research programme to address everyday living challenges of older adult early-stage researchers and their society. The 44 older adult researchers were equally split to three smaller research groups, which worked for a whole academic year, under the mentoring of Thess-AHALL researchers in providing solutions for three main Health & Well-Being societal issues of their interest, as they emerged by voting among participants and are reflected in the following schemes:

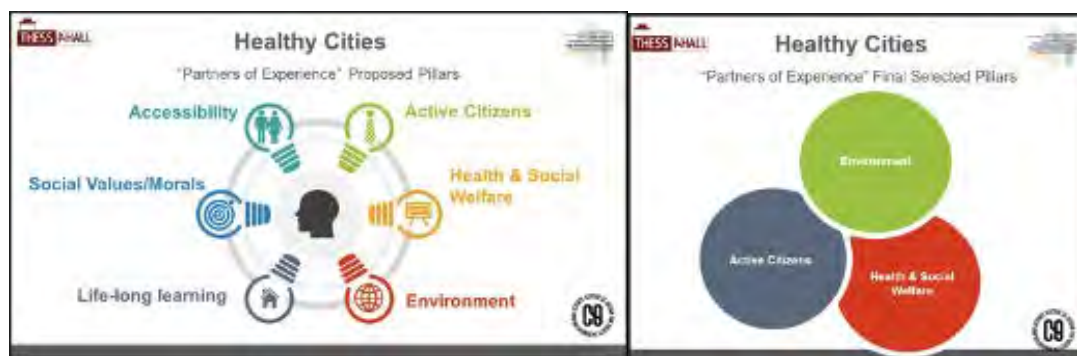


Fig 4.6.3: Pillars selection for Partner Experience

The three thematic research groups agreed on a proposed plan of research activities by Thess-AHALL, adjusted to a more experiential and user-driven approach, however, including all the core activities of the scientific research methodology. In the 9-month duration of the prototyping, older adult researchers tested and evaluated the proposed methodology, which is summarized in five main steps, as following:



Fig 4.6.4: Methodology evaluated by the participant of the programme

In the current case of the “Partners of Experience” prototyping, the three older adult research groups followed, step-by-step the above-mentioned promoted methodology working on their selected thematic areas: Environment-Active, Citizens-Health & Social Welfare, reaching practical solutions on the achievement of their common goal to make Thessaloniki “healthier”:



Fig 4.6.5: Description of the three thematic groups

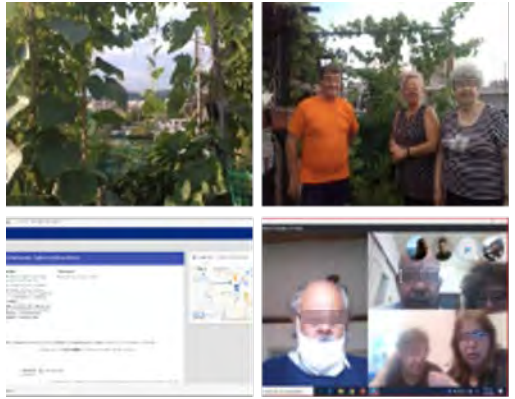

Older adult participants completed the “Partners of Experience” life-long learning programme, attending a series of 12 activities: 8 of them were conducted as face-to-face sessions from September 2019 to February 2020, including field visits and intergeneration sessions with medicine students, policymaking workshops, etc. While the rest of the activities went virtually, via Skype/viber and phone group calls, due to the Covid-19 situation. The face-to-face events included the 1<sup>st</sup> loop of the prototyping, the activities related to the three first steps of the methodology and part of the fourth, while the virtual sessions, included the 2<sup>nd</sup> loop and consequently the final stage of solutions’ implementation, the dissemination and final evaluation of the programme.

Table 4.6.1: Summary of the activities of the Partners of Experience programme

<b>Research Problem Definition</b>		<b>“Partners of Experience” official launching:</b>  Public deliberation & Panel sessions  (OPEN LIVING LAB DAYS – THESSALONIKI CONCERT HALL, SEPT 2019)
		<b>Preliminary Design Thinking Session:</b>  Selection of Thematic Research Areas/ Split in Groups: Environment-Health & Social Welfare-Active Citizens  (SCHOOL OF MEDICINE, ARISTOTLE UNIVERSITY OF THESSALONIKI, SEPT 2019)
<b>Specific Research Assumptions</b>		<b>Exploring the Research Problem:</b>  Co-creation session, ideation session  (MoMus-MUSEUM OF PHOTOGRAPHY, THESSALONIKI, OCT 2019)  + assignment of research work to AUTH school of medicine students (NOV 2019)



		<p><b>Desk Research:</b></p> <p>Hands-on Workshop in online and bibliographic resources</p> <p>(LIBRARY &amp; INFORMATION CENTRE, ARISTOTLE UNIVERSITY OF THESSALONIKI, DEC 2019)</p>
<p><b>Solution Ideation &amp; Work Assignment</b></p>		<p><b>Presentation of proposed co-designed solutions by students:</b></p> <p>based on the requirements and research work of older adults' groups</p> <p>(SCHOOL OF MEDICINE, ARISTOTLE UNIVERSITY OF THESSALONIKI, DEC 2019)</p>
<p><b>Solution Ideation &amp; Work Assignment</b></p>		<p><b>Policymaking workshops:</b></p> <p>Coaching sessions with Experts and policymakers, representing the three research topics (Municipality of Thessaloniki, Municipal Day Care Centers for Older Adults, Open Knowledge Foundation Greece, International Forestry Students' Association-Thessaloniki Chapter)</p> <p>(DAIOS HOTEL THESSALONIKI, in the framework of the annual xMas gathering of Thess-AHALL's community -DEC 2019)</p>
		<p><b>Field Visit &amp; Solution Brainstorming:</b></p> <p>Environment Research Group on how to transform abandoned spaces in the neighborhoods into "wallet" parks for the public</p> <p>(THESSALONIKI WATER PARK – FEB 2020)</p>

<p><b>Solutions Implementation</b></p>		<p><b>Homework assignments and implementation of the proposed solutions for the three research groups:</b></p> <ul style="list-style-type: none"> <li>• <b>Environment:</b> pivot to terrace and balcony gardening, during social distancing</li> <li>• <b>Health &amp; Social Welfare:</b> pivot to co-creation of a guide on Covid-19 and self-management of older adults at home</li> <li>• <b>Active Citizens:</b> (the same as before Covid-19) providing input for the “Improve my City” open access platform of the Municipality of Thessaloniki, reporting problems in neighborhoods.</li> </ul> <p>(Covid-19 mitigation measures, skype/viber/phone calls -APR-JUN 2020)</p>
<p><b>Assessment &amp; Dissemination of Outcomes</b></p>		<p><b>Final Evaluation of the programme &amp; eCoffee sessions:</b></p> <p>Tightening bonds, exchange of knowledge/experiences among groups</p> <p>(Covid-19 mitigation measures, skype/viber/phone calls -APR-JUN 2020)</p>

#### 4.6.5.2 Sustainability strategy

Thess-AHALL aims to replicate and exploit further the “Partners of Experience” programme, both at the local/national and the EU level (scaling up). It has already discussed opportunities to run the programme again, addressing new societal challenges in cooperation with the Municipality of Thessaloniki Day Care Centers for Older Adults, after the Covid-19 situation. Similar to the SISCO prototype phase, Thess-AHALL aspires to co-organise and co-validate its proposed solution in cooperation with stakeholders (older adults and chronic patients) educational organisations inside Greece and abroad, collaborating with European Living Labs and institutions, running participatory research activities in different cultural and policy contexts (scaling out). “Archangelos Michail” Nursing Home in Cyprus has officially expressed its interest to incorporate the “Partners of Experience” programme in the activity calendar for its beneficiaries. Labs or entities, interested in other kind of citizens marginalisation, like ex-prisoners, refugees, homosexuals, uneducated people, etc., target

groups that are on Thess-AHALL's research interest, could also implement the prototype, adjusted to their stakeholders' needs, in order to monitor and evaluate its potential impact on social inclusion (scaling deep).

## **4.6.6 Transformations triggered and outcomes**

### **4.6.6.1 Organisational transformation**

As previously mentioned, Thess-AHALL has many years' experience in co-creation methodologies and research. Its staff is well-trained in fostering social innovation and participatory research activities and the Living Lab has a great capacity in exploiting and developing co-created solutions and tools. However, the SISCODE journey equipped Thess-AHALL with new knowledge and skills for the systematisation of its co-creation activities. The exploitation of the SISCODE toolbox in every phase of the co-creation journey and the prototype of the "Partners of Experience" life-long learning programme, are indicative of the transformation achieved within the organisation. Moreover, the project's challenge highlighted the importance of maintaining stakeholders' engagement in a more concrete way. Before SISCODE, the Thess-AHALL developed a wide network of stakeholders across Greece and beyond, mainly based on personal contacts, previous collaborations and mutual trust. However, as its network has remarkably been expanded in recent years, there has been the emerging need of an established framework on community's sustainability. It was the SISCODE project which led Thess-AHALL to develop and implement their own "panel management" tool to keep the logistics, track participation and ethics of its stakeholders. Furthermore, regarding the involvement of policymakers, the Lab adopted new approaches of addressing and engaging policymakers from different levels in different stages of the co-creation process. Last, but not least, the Covid-19 situation emerged the need for alternative means of communication, engagement and collaboration with stakeholders, especially older adults, who are low digitally skilled and cannot use virtual means.

### **4.6.6.2 Transformations in the ecosystem**

The local ecosystem has been remarkably affected by the Thess-AHALL SISCODE challenge. Lab's aim to tackle ageism and the risk of social marginalisation of chronic patients, using co-creation and social innovation research as its means, has changed established practices. Specifically, the "Partners of Experience" life-long learning programme "opened the doors" of the scientific community of the city, changing the belief that the academia is an inaccessible and "close" community to the public, which runs "research only for research" and not to meet the real needs of a society. Meanwhile, the research community recognised that the experiential knowledge of citizens is a valuable resource for science, to avoid the development of solutions that do not fit with the community needs. Moreover, the close collaboration between end-users, researchers and policymakers aimed to slightly bridge the gap between the City and its citizens, highlighting the importance of collaboration of all the interested parts within a society for solving key societal needs. Additionally, the proposed



solution raised the awareness of the general public towards the needs of the older population and patients with chronic diseases, as well as informed people about the risk of ageism in older adults' social and mental health. Furthermore, the intergenerational activities included in the programme, transformed the older adults' perception that young people -either students or researchers-could not be interested in the real problems/concerns of the older population.

#### **4.6.7 Conclusive reflections**

In conclusion, within the SISCODE context, Thess-AHALL has chosen to fight the key societal challenge, related to social, mental health & well-being of older adults and chronic outpatients being at risk of ageism and cultural stigma. The barriers identified during the 1<sup>st</sup> prototype were carefully considered during the pivoting phase and resulted in an updated plan. The co-creation process and the continuous communication with the community of stakeholders enabled the programme to continue and form the final prototype presented above. Thess-AHALL has already investigated future directions for exploiting the programme in other institutions and especially, discussions have been made with the Municipality of Thessaloniki and "Archangelos Michail" nursing home in Nicosia, Cyprus for implementation of the programme in the upcoming years. However, the Covid-19 pandemic has delayed the procedures.

Thess-AHALL would like to stress out the importance of co-creation and user involvement in the field of research for older adult's health and well-being. Older people usually are left out of the research developments, enhancing the ageism conception and are at risk of social exclusion. At Thess-AHALL, the core team believes that their participation in the research can assist in the development of more concrete and user-friendly solutions and additionally be beneficial for their own social life and well-being.

#### 4.7. Caiaques as rio by CIENCIA VIVA, *written by Gonalo Praa and Joo Marques*



##### Descrião

Um projecto social do Nutico Clube Boa Esperana apoiado pelo FabLab Lisboa e que resultou na produo de 70 kaiakes. As peas foram re-desenhadas para a fresadora do FabLab Lisboa e o desenho de corte optimizado por forma a evitar desperdícios de material. Os desenhos vectoriais foram feitos em Autocad e utilizamos

o Artcam 2018 para calcular os percursos e parmetros de corte para a mquina. No corte foi utilizada uma fresa com 6mm de dimetro e inclinao da lmina  esquerda, que empurra o material para baixo, permitindo um corte mais limpo. Os parmetros usados foram calculados a partir das referncias de fbrica e optimizados pela experincia de corte.

### 4.7.1 Synthesis of the pilot's journey

Ciência Viva (CVIVA), the Portuguese agency of scientific and technological culture, is a non-profit private association, funded by the Portuguese government, European projects, contributions of its associates (mostly, public partners from universities across the country) and commercial activities (tickets, etc.) CVIVA is also a network of science centres and museums. One of these centres, Pavilion of Knowledge, in Lisbon, is one of the co-creation labs of SISCODE.

From its birth, CVIVA has developed knowledge and resources that directly inspired its work in SISCODE. Specifically, CVIVA is part of (and helped to build) extensive partnerships related to ocean research and governance, uses of the ocean, ocean advocacy, and ocean education. Although relatively inexperienced in terms of development of full co-creation processes, CVIVA has been involved in the organisation of participatory processes with the school community, researchers, the public, policymakers, NGOs, business, and artists (in the field of ocean literacy, among others).

For SISCODE, CVIVA wanted to address a challenge it has identified for a long time: marine leisure activities that put people in direct contact with water are proven ways to increase engagement of the public with the ocean. But to have any real impact, marine leisure activities must be widely practiced, which does not happen in Portugal.

CVIVA's journey involved residents and "users" of the river in Lisbon, policymakers (from the Municipality and neighbourhood council; ministries of education, the sea), school communities, scouts, NGOs, water sports clubs, researchers, staff from other parts of CVIVA).

Ultimately, this effort translated into a solution: an engaging festival with practical year long activities that could show that Tejo, the river in Lisbon (but, potentially, similar contexts across the country) is interesting, safe and accessible. Specifically, and among various activities, the lab's prototype is a service to support the co-design and co-development of an annual festival devoted to the DIY design, customisation and/or construction of real size kayaks that can be used in rivers or similar conditions.

### 4.7.2 Initial context

#### 4.7.2.1 External context and ecosystem

Portugal is a coastal country with mild weather along the year and is an international beach tourist destination. The sea plays a central role in its history and its national mythologies and culture. Lisbon shares all these characteristics, while the Tejo estuary, which borders the city, is the largest wetland in Portugal and one of the largest estuaries in Western Europe.

But compared to other countries and cities with similar geographies, marine leisure activities are not common here. The river in Lisbon is mostly a space of contemplation, not interaction.

Public access to the water surface for recreational purposes is almost non-existent; current infrastructure and equipment is paid-only and located in too few locations.

There is public demand for access to Tejo. Proposals for open swimming pools in the river and other marine infrastructures and services are regularly submitted to municipal participatory budgets. Researchers, companies working in tourism development and policy makers speak of “giving back the river to the city”. Recent work in urban planning also has called for the development of recreational water-based activities as a drive for urban regeneration, in particular, in the neighbourhood surrounding Pavilion of Knowledge, Parque das Nações.

During the timeframe of the pilot, Lisbon Municipality and/or the government supported several large-scale initiatives that explicitly addressed these ideas, or at least reflected a cultural “mood” related to them. These initiatives range from A Rua é Sua! (“The Street is Yours!”), a monthly festival promoting outdoor activities, sustainable mobility and smart urbanism, with editions devoted to activities in the river/sea; to the World Youth Day, a Catholic international festival for which a large unkempt section of the riverfront would be recovered; to the European Green Capital Award - 2020, under which many organisations, including CVIVA, committed to take actions at a local scale to address environmental challenges; to the UN Ocean Conference, which would have included a public awareness and ocean literacy programme organised in part by CVIVA.<sup>31</sup>

#### 4.7.2.2 Organisational background

As an agency for the promotion of scientific culture, CVIVA has been involved in EU and national projects related with rivers and the sea, usually under the umbrella concept of “ocean literacy”, i.e. raising awareness of the mutual influence of the ocean and human lives.

Most of these projects, usually directed to young participants, rest on top-down public engagement methodologies and goals: informal education, with limited dialogue and interaction between the public and experts, basic consultation devices and occasional hands on activities, perhaps showing experiments with citizen science and maker activities.

A pertinent example: considering its expertise and network of contacts in this domain, CVIVA was a partner in the mentioned above Oceans UN Conference. Its initial role was in line with what is expected from traditional public engagement: it should host talks, documentary screenings and debates with researchers, a few ready-made scientific experiments for kids, guided tours of temporary exhibitions, etc. (A pilot of the lab's solution was planned for the

---

<sup>31</sup> See, respectively, <https://www.lisboa.pt/atualidade/noticias/detalhe/a-rua-e-sua-voltou-a-encher-a-avenida-da-liberdade-1>; <https://rr.sapo.pt/2019/01/27/religiao/veja-o-local-onde-vai-acontecer-a-jornada-mundial-da-juventude-2022-em-lisboa/noticia/138867/>; <https://lisboagreencapital2020.com/en/>; and <https://www.un.org/en/conferences/ocean2020>. Most of these activities, that should take place from 2020 to 2022, however, have been cancelled, postponed or moved online.

event; it was accepted as an innovative activity that should introduce more dynamic engagement examples.)

### 4.7.3 Challenge

Marine leisure activities are relatively uncommon in Portugal – and in the city of Lisbon – compared to other leisure activities, and other countries and cities with similar geographies, or even less favourable conditions. Traditionally, activities in the ocean or in a big river like Tejo, in Lisbon, tended to be seen as either elitist, accessible to the rich; or as dangerous, deadly and connoted with poor, uneducated people.

More recently, the idea of nurturing a “marine culture” has permeated policy agendas at the national, city and neighbourhood level, for urban sustainability in terms of leisure, mobility and spatial planning, development of tourism market. In Lisbon, for instance, access to the river is historically ruled by the Port Authority (a publicly owned limited company); but a new regulation is coming into force that transfers some of the ruling power to the Municipality, or even to the neighbourhood pursuing the agenda of “giving the river back to the people”. This has the stated goals of getting more people in the water, as a way of increasing sports practice and improving public health; of raising environmental awareness; of fostering civic care for public space.

This tension has been noted in several EU projects for engagement of the public and “ocean literacy” in which CVIVA is involved. Marine sports and activities for recreation, fun, instruction, tourism, etc. are crucial to increase “ocean literacy”, i.e. the awareness of the mutual influence of the ocean and human health and well-being. But to have any meaningful impact in public engagement with ocean literacy, marine leisure activities must be widely and regularly practised, and not limited by external factors (e.g. weather, specific events or cultural stereotypes).

Members of CVIVA team wanted to address this gap, and the co-lab set itself a challenge that resonates with these ideas: devising interesting, mobilising, safe and accessible experiences in the river Tagus, especially in the section of the river in the vicinity of Pavilion of Knowledge, CVIVA's headquarters.

### 4.7.4 The co-creation process of the envisioned solution

#### 4.7.4.1 Analysis of the context

The analysis of the context was based on fieldwork and desk research. The literature review focused on the considerable body of research and “grey” literature on recreational boating and water-based sports in Portugal and in the Lisbon area: statistics, reports, dissertations, papers, etc. mainly from researchers in geography and urban planning; tourism; economy and innovation; cultural heritage; and sports. In the field, key stakeholders have been interviewed after they were identified in the literature or by “snowballing” with other interviewees (~15 people). There were also informal conversations within the personal and



professional networks of the team, or with random people familiar with the aquatic activities in the Lisbon area, in Portugal and elsewhere. Field research included the observation and documentation of the de facto “design” of the river and its uses, in Lisbon and the neighbourhood, with photos, short videos and field notes. Then, activities to address problems pertinent to the initial challenge were observed or joined by the working team (e.g. a technical tour to assess the physical conditions of a dock near Pavilion of Knowledge; a parade in the river to show the results of a city programme to engage secondary students in water sports; a Catholic procession by boat, focused on the importance of the river heritage). These materials were organised with basic qualitative coding techniques, looking for themes and trends, mapping stakeholders, comparing and merging different SWOT analysis.

#### 4.7.4.2 Reframing of the problem

Research started by untangling the nature of the problem underlying the initial (“How could we get more people in the water?”). Interrogating prospective stakeholders and literature helped to get a sense of how people are not using the river/sea, to understand the nature of this problem. Themes that emerged in this phase revealed two major dimensions of the problem: limited physical access to water; and a hazy yet meaningful “cultural” resistance to water-based activities. Two main tools have been used to synthesize this information: 1) provisional SWOT analysis of leisure water activities in Portugal, in Lisbon and in the neighbourhood, looking at dimensions of the problem that the co-lab should and could address in any meaningful way; and 2) more elaborate stakeholder mapping, with a clearer idea of the interests, needs, skills and relationships between current and potential stakeholders. This helped to reframe the initial challenge to make it more workable and related to specific people.

The synthesis tools mentioned above (SWOT, stakeholder map) and the “Checking your challenge” template guided a workshop with four core stakeholders and two internal team members to reframe the initial challenge. The challenge that resulted from this meeting was: “How can we show that the river in this part of the city is interesting, accessible and safe – but that it needs attention from authorities for its fruition?”.

Finally, the internal team further refined this challenge, which was presented to the participants of an idea generation workshop, for evaluation. The challenge that eventually guided the idea generation was: “What interesting, mobilising, safe and accessible experiences could the co-lab create in the river in this part of the city?”

Reframing the problem, in short, meant turning it from a general concern for the promotion of “ocean literacy” into something that should consider the specific needs and aspirations identified in fieldwork. At this stage, there was a reasonably clear idea of CV’s ambition: to show that the river is there, and it should be used, even if measures are needed; to invite people to literally get themselves immersed in the water; and to deploy engaging examples, instead of repeating worn-out publicity campaigns.



#### 4.7.4.3 Envisioning of alternatives

Stakeholders and internal team members envisioned alternative solutions from the very start of the project, either by telling what should be the main subject to work on, or offering insights that triggered the development of solutions, inspiring internal discussions that lead to other ideas. Some of these ideas would later resurface during more formal ideation sessions.

The first of these was initially focused on reframing the problem, with core stakeholders; and idea generation was a by-product of problem reframing: it seemed to be natural to think of a problem by thinking of solutions. In the second workshop 13 participants were invited to write ideas on cards answering the question: “What interesting, mobilising, safe and accessible experiences could the co-lab [with such and such skills, interests, considering such and such local opportunities/weaknesses, etc.] create in the river in this part of the city?” Solution cards were framed in a matrix with quadrants representing the challenge (access to sea/river; mobilisation; safety; interest); the ideas were discussed and categorised collectively. A trend started to emerge, most ideas being placed in the “interest” and/or “mobilisation” quadrants. A consensus was reached on what group of ideas offered more value, i.e., those that involved actual experience of the river as it is now, without any major and expensive intervention.

This has been interpreted as an invitation to develop a solution that should address the need to make the river interesting and, importantly, to show that the river is interesting. This is through different activities in the river capable of mobilising diverse publics, using whatever infrastructure and equipment are available, while at the same time drawing the attention of authorities for the improvement of this equipment and infrastructure.

Another ideation activity took place during the open lab day and integrated in an event organised by one stakeholder, an NGO working with the promotion of sailing for senior women. The ideation activity involved families and practitioners of sports in the river (~150 participants), who were asked to imagine what a CVIVA event in the river would look like. This resulted in more than 30 sketched ideas for contents of such an event (with varying degrees of plausibility), and about 20 written suggestions answering the questions “Why would I want to attend an event in the river? What would it move me?”

The internal team, with colleagues from CVIVA, then considered those concepts that were more noticeable and more frequent in the ideation activities to synthesize a provisional solution, which was formulated thus: a yearlong workshop for the construction of life-sized, usable water crafts that should feed an annual event, with some sort of exhibition of the boats in the water, contextualised by a multidisciplinary festival devoted to the river/sea.

#### 4.7.4.4 Development and prototyping

Just as the solution was being formulated, the team came across an interesting, but barely known project, Abraçar o Vento (“Embracing the wind”). The project stems from a partnership with Marquesa de Alorna, a lower secondary school in Lisbon, the nautical club Boa-Esperança, and GIRA, a non-profit association for the rehabilitation of adult mental disease patients.<sup>32</sup> Abraçar o Vento aims at fostering peer-to-peer, informal learning, to raise awareness about water sports and environmental protection, and promote social inclusion – all this around a DIY kayak workshop hosted by the school, in which students, adult patients, a carpenter and a “mentor” build complete kayaks based on a free template obtained from a friendly project across the world.

This encounter deeply shaped and redirected the solution. Indeed, development and prototyping phases were devoted to understanding how to generalise, expand and innovate from this learning experiment in an own workshop-with-festival. Initially, the solution was more focused on the designing of a festival that should populate the river with real size, usable kayaks, built by teams according to a well-tried template. The contact with the school, and subsequent discussions with other partners, led to a much stronger emphasis on peer-to-peer learning processes that should result in the co-design and construction of real kayaks – or not that real, as described below –, and incorporate the design of contents of the festival itself.

At this stage, discussions involved the following partners and stakeholders, some of them new to the lab:

- The municipality (mid-level officers from Sports and Environment departments);
- Associations related with both “amateur” boat building and nautical leisure activities;
- Teachers and makers;
- SPI (in calls for WP6), which was crucial to reinforce the learning dimension of the solution;
- Staff from CVIVA not involved in SISCOE, but working in fields important for the prototype: education, exhibitions and events, maker space;
- And a video producer working in social innovation documentary projects that got interested in this project.

---

<sup>32</sup> Abraçar o Vento: [bit.ly/2CNEZFM](https://bit.ly/2CNEZFM). Marquesa de Alorna School: [agmarquesadealorna.wixsite.com/marquesadealorna](https://agmarquesadealorna.wixsite.com/marquesadealorna). Nautical club Boa-Esperança: [www.ncbe.pt/index.html](http://www.ncbe.pt/index.html). GIRA: [www.gira.org.pt/](http://www.gira.org.pt/).

These dimensions have been addressed in prototyping sessions based on the kayak construction workshop running for the (interrupted) school year of 2019-2020. In practice, developing and prototyping included partial immersion in key moments of kayak construction, with students and adult patients, in a real setting; this also involved stakeholders in one workshop, and during later incursions to the school.

The group deliberately looked for simple visual tools, accessible both to the internal team, stakeholders, and other staff from CVIVA to develop the solution: mind maps, storyboards, user journey maps, and in later stages of prototyping, digital mock-ups, and service blueprint templates. To work on the tools and discussions of emerging results material and virtual feedback walls have been used, organised around clear dimensions: like/would like/issues & doubts/suggestions, needs/requirements, goals, etc.

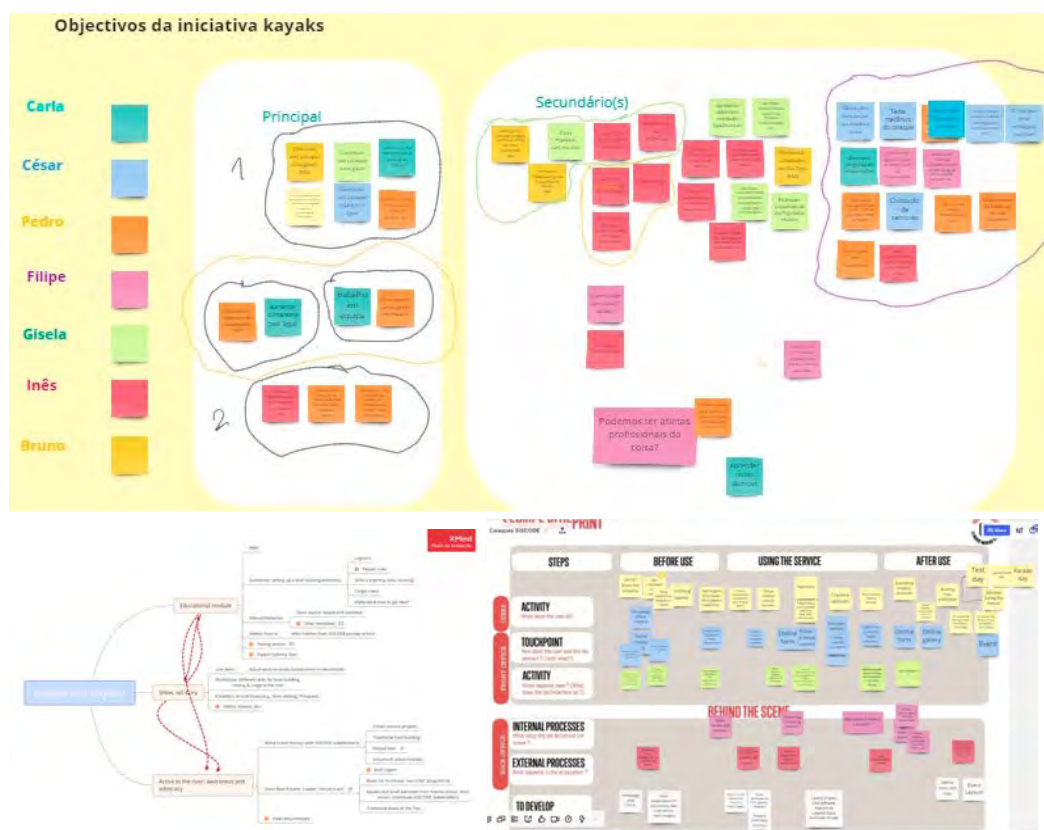


Fig 4.7.1: Artefacts of co-creation - Ciencia Viva Journey

Developing and prototyping was mostly about trying to make decisions on aspects of the learning module, especially four main topics:

- How can we motivate students, the schools, other stakeholders, to participate in the initiative?
- What needs to be in place from CVIVA's side to facilitate a creative peer to peer learning and engagement environment? Contents, support, materials, contacts and network?

- “Authority” and transmission of knowledge of kayak building: are open source resources (tools, templates, tutorials) enough? Will participants need live training?
- How much creative freedom should we give participants? Should we offer them a single, mandatory template for the kayaks? Different templates? Should we allow them to use their own templates?

This concept emerges from a combination of ideas from stakeholders; there were no formal moments of decision (e.g. voting), but rather validation in simple group discussions and individual interviews with key stakeholders – a few of them can be considered “end users”.

The main prototyping and testing workshops that would be organized with teachers, students, and the general public were cancelled due to Covid-19. The settings in which other live prototyping sessions were planned – the partner school and nautical club workshops, Pavilion of Knowledge itself –, as well as prospective participants in these sessions, also became unavailable. During the lockdown, the team tried to organize online prototyping sessions with key stakeholders; but this was possible only with staff from CVIVA (not previously involved in SISCODE). Assuming the lockdown measures will be eased over the summer, but with no clear ideas about the functioning of schools during this period, a limited live prototyping testing was prepared with at least adult stakeholders and users.

Still, confronting stakeholders and colleagues with versions of the solution proved to be invaluable to consolidate insights gathered in earlier stages, and to understand the added value that the solution can bring. All these insights were reflected in “directives” coming out of this prototyping round: allow for and stimulate peer to peer-learning, learning by doing with others; use peer to peer-engagement, i.e., showing, motivating, changing attitudes by example; and trying and failing – instead of the successful reproduction of existing safe models!

Mid October 2020, during an Open Weekend for Teachers at the Pavilion of Knowledge, a series of workshops/events have been organized to validate the solution. These activities focused on two dimensions: assessment of the engagement potential of the initiative; and scoping its weak points, “what could wrong”. Working with colleagues from CVIVA not exposed to SISCODE but experienced in comparable activities involving the school community; with key stakeholders of the co-lab; with teachers; with the public. Participants were invited to discuss the model of the developed “service”, in 2 workshops, and/or to interact with a partial rendition of a kayak DIY workshop and showcase.

The workshops provided a new view on the expectations of specific end users – teachers – regarding the solution: importantly, it was clear that they would be interested in participation in a festival like the one in planning, and involving their schools, but not necessarily by working in design and construction of kayaks. Instead, they want to bring their ideas to such an event. This could include kayaks, e.g., as an “anchor” for other activities; but would include other creative work.

Views on "what could go wrong" focused on dangers and limitations of the solution, some of them not clearly anticipated in the plan: safety of a water event with kids; need for funding and of partnerships; bureaucracy and regulations specific to each school; lack of time and staff, especially considering the pandemic. A crucial challenge was mentioned in the workshops and during the live demo, which has also been hovering around the solution from its first versions: how to ensure the transfer of technical skills to students? It seems consensual that the online learning module should be just an "anchor" for other real-life learning environments, based on trial and error and exchange between people with different skills.



Fig 4.7.2: Photo of the workshop of validation in the Pavilion of Knowledge. Despite the small scale of the event (due to Covid-19 constraints), it also gave a good grasp on how the public may interact with this kind of activity. Contrary to the expectations, people seemed to be more interested in the narrative side of the show – e.g. live and video presentations about the motivations behind the kayak project at the partner school: social inclusion, integration of migrant communities, attending special education needs, etc. The public, as well as staff from CVIVA, also enjoyed the display of "artistic" kayaks. The kayak building in action, however, attracted less attention than expected.

This was also a small test of requirements and potentials in terms of space, equipment, human resources, etc. of a "real" event that may be developed from that point on. In this

regard, there were no problems of note, and the event was very well-regarded by the Pavilion of Knowledge staff that helped with the organisation.

#### **4.7.4.5 The role of policies and policy maker engagement**

Initially, the lab was connected with policymakers at two local levels, the Municipality and the neighbourhood council. Approaching them was straightforward, in part due to the history of collaboration and personal networks between local policymakers and the Pavilion of Knowledge. From the start, policy makers were open to meetings (in their offices), expressed interest in collaborating, gave insightful information, and offered to help in activities like dissemination in the neighbourhood.

It helped that the initial challenge and, later, the solution, fit the agendas of different departments of the Municipality (Environment, Sports, Sea economy), as well as the neighbourhood's, for agreeing the regulation "giving back the river to the people". Local policymakers consider CVIVA a well-regarded influencer and expressed their trust in it to help to raise the public interest in these activities, and on occasions also to lobby for improving public access to the river. Once the solution became clearer, it was possible to raise the interest of a team of the Municipality and national government (ministries of Education, Sea) involved in the organization a major event in Lisbon: The UN Ocean Conference that would take place along other related initiatives within the time frame of the pilot, as the European Green Capital.

With the pandemic, these initiatives were cancelled or moved online, but there was the opportunity to start discussing with them if the solution could fit into the programme of these kinds of events, and start considering how it might be part of a national agenda for ocean literacy. Contacts in this regard are planned.

Getting policymakers into actual co-creation was more complicated. Those invited didn't attend early workshops, for instance; and it has been found they could be more supportive when having definite ideas, with concrete initiatives – even if this means they didn't participate in the design of these ideas. On the other hand, they were important to validate initial stages of the prototype, in one workshop and in individual interviews: when addressing the solution, policymakers from the city and the neighbourhood offered important suggestions to make it more realistic, considering very specific financial and organisational constraints that they know well.

A specific challenge related with policymakers was ensuring a "safe", comfortable place for them during the journey. The fields of water leisure activities and ocean literacy are small, with not that many players who have a history of collaboration (or lack of) of their own, and past and present issues to address. All these dimensions came to light in contacts with policymakers, and in meetings with them and other stakeholders.

#### **4.7.5 Status of the solution**



#### 4.7.5.1 Concept

CVIVA proposes to develop an annual festival devoted to the DIY design, adaptation and/or construction of real size kayaks that can be used in rivers or similar conditions. The initiative starts with a call directed to the school community in Greater Lisbon, in particular those schools already involved with CVIVA, including through the CVIVA's School clubs ([clubes.cienciaviva.pt/](http://clubes.cienciaviva.pt/)), and the Government programme of Blue Schools ([escolaazul.pt/en](http://escolaazul.pt/en)). This call is three-folded: participants are invited to contribute for public engagement with the river; by working together creating kayaks that should feed a public event in the river; and by documenting this work to develop an open knowledge repository devoted to DIY kayaks.

Looking at this concept as a “service”, it encompasses:

- An online learning and engagement module focused on boat design, building and co-creation skills, dissemination;
- Show and tell, “make happen” activities: demos and workshops for the general public about DIY boat building and related skills;
- And awareness and advocacy initiatives for engagement in creative citizenship in the river.

The learning module should be used – and developed – along the school year, while the festival would be an annual event before the summer break.

An important value of CVIVA's solution is embedding the ideals of co-creation deeply within the participants' experience; they will be challenged to create and develop contents for all the components of the initiative – learning processes, documenting and dissemination and engagement.

Participants thus will be encouraged to work in multi-stakeholders' teams, exploring diversity in gender, age, skills, etc., and recruited in their schools and their creative ecosystem (e.g. local Fab labs, makerspaces, associations, etc.). They will be invited to add as many creative “layers” as they wish, developing the concept of their kayaks in terms of design, materials, artistic dimensions, uses (touring, games, sports, science, etc.), and activities for the festival.

This work should be fully documented and made available in the project's site – including “making of”, things that didn't work, etc. Ultimately, participants will be encouraged to develop, complement or revise contents of the documentation offered in the site (e.g., manuals, tutorials), with their ideas and creative work; this will feed the learning module itself, much in the spirit of recent open DIY innovation platforms like [wikifactory.com](http://wikifactory.com) or [www.scopesdf.org](http://www.scopesdf.org).

The technical core of the solution is the online peer to peer learning & engagement module, which for now is also the best “material” illustration of the concept. The module will have five main sections:

- **Caiaques ao Rio!**

Presenting the initiative; how to participate; steps of the creative process; submitting proposals; rules; calendar.

- **Mission**

A “manifesto” for the active and creative citizenship in the river, and how it translates into the participant’s missions: design, transform, build your own kayak, and co-create the final event.

- **Resources**

Set of resources to help designing, building and transforming kayaks, including specific tools for (remote) creative work. Continuously updated by participants, a wiki for DIY kayak construction.

- **Galleries**

Photos and videos of/by participants, about their creative journeys.

- **Help**

Ongoing FAQ, fed by issues raised by participants. Contacts, including contacts for “mentors” selected from relevant stakeholders of the lab.

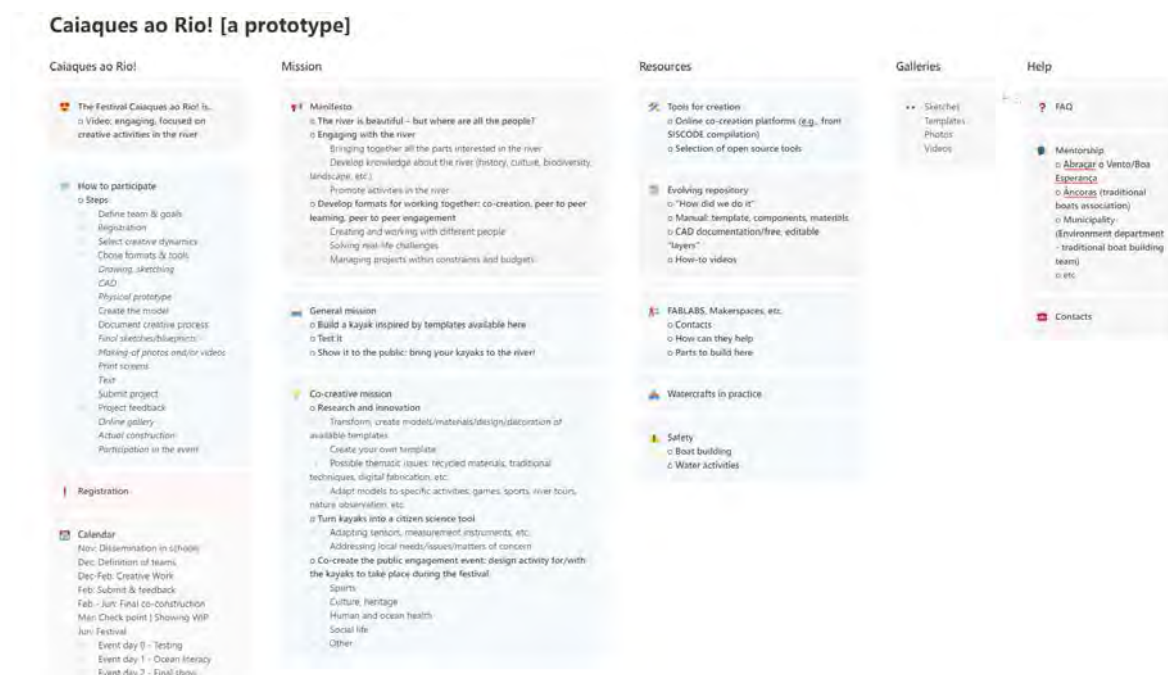


Fig 4.7.3: Caiaques ao Rio! [a prototype]

Reflecting on it, the online module should guide a typical creative journey along these lines:

1) participants get familiar and interested in the initiative, 2) they form teams and define specific goals reflecting the values stated in the initiative’s manifesto, and get inspired by examples offered in the site, 3) they choose formats, materials and tools, from resources available in the site, or elsewhere, to present a summary that should include their idea and the team, and 4) they then develop their proposals – in sketches, CAD, to scale or real-size physical prototypes, etc. – with resources (tools, tutorials, templates, etc.) available, if needed be in contact with “mentors” selected by a pool of the lab’s stakeholders. Participants

will document the development of their proposals; this work will feed both an ongoing wiki for DIY kayak construction and the multimedia galleries showing the creative journeys. Proposals are submitted and reviewed by lab's stakeholders, who will offer relevant feedback (about the creative process, conceptual, technical, artistic, etc.). Participants then work on their final models of the kayaks, with two , not mutually exclusive scenarios: 1) the models, and related activities designed by the participants will feed a weekend event in the river; or, worst-case, pandemic scenario 2) the models and related documentation will feed an online event.

#### **4.7.5.2 Sustainability strategy**

Plans to make the lab's prototype sustainable were based on four possible steps:

- 1) A version of the main component of the solution – the kayak construction workshop – is already well developed and tested by two local partners (the school Marquesa de Alorna and Clube Náutico Boa Esperança). The next step for CVIVA would be to establish a larger partnership through some kind of agreement or protocol with at least CVIVA and the two entities developing the boat building workshop, for the development and “ownership” of the whole package, i.e., the module/challenge for kayak construction and the festival;
- 2) Enrolling expertise and support of local and national policy makers for integration of the module/challenge in extra-curricular activities (for instance, involving schools participant in the “Blue Schools” initiative, of the Ministry of the Sea; or schools in Lisbon participating in the municipal programme for sailing/rowing training, of Clubes do Mar). The contacts for this were established by the lab, or by other CVIVA's team.
- 3) Completing the online module and testing it in secondary schools and informal learning settings in Lisbon or near similar river contexts. These can include stakeholders interested and/or already involved in the similar projects (e.g. the director of a CVIVA centre in Constância, a town up the river; the director of a private school near Pavilhão do Conhecimento who organises a contest for boats made of recycled materials).
- 4) This should lead to some sort of pilot event in Pavilhão do Conhecimento. Assuming this would take place during Covid-19 times, the event would include small-scale workshops for boat construction/adaption, exhibition of boats, and live demonstration of a limited number of boats in safe river settings near Pavilhão, focused on possible activities with the boats.

New information and ideas that emerged towards the end of CVIVA's journey, as well as implications of Covid-19, made the team work on another step. One of the main findings from the prototyping and testing workshops was that the online module (and the initiative in general) could be open to other learning and creative experiments, not just about kayak construction, even if this should remain the anchor activity.

Another crucial finding was that “learning” for kayak construction cannot depend on online training alone. The online module should work more as an engagement and reference tool. Consequently, some sort of “live” platform is needed for the exchange of technical skills that, according to the involved stakeholders, can be very difficult to occur online only.

Considering this, and also the constraints created by the pandemic – organising even small meetings in schools, let alone workshops, is now impossible – the plan is to make CVIVA and the Pavilhão do Conhecimento more active partners in the development of the initiative, perhaps more than anticipated. This implies that both organisations would not just be the brokers, but actual organisers and providers of the educational contents and activities for wide-range of participants, and this includes providing physical space for the activities, all necessary building equipment and know-how on boat construction.

For this end, it was discussed internally how to include the package in the agenda of Pavilhão do Conhecimento. A possible context for this would be the “DÓING” maker space located within Pavilhão do Conhecimento, and its series of workshops (<https://www.pavconhecimento.pt/tinkering/>), which are running despite the pandemic, thanks to a “Clean and Safe” certification.

#### 4.7.6 Transformations triggered and outcomes

It is still premature to speak of permanent transformations within the own organisation fed by the spirit of co-creation; but it is fair to say that CVIVA started developing explicit, deliberate, reflexive co-creation processes thanks to SISCODE, assuming that before this project co-creation was more an ideal that some of its staff were more or less familiar with: selected aspects, not complete processes, were invoked or used, e.g. in tasks of several RRI projects.

The idea of co-creation journey, methodologies and tools developed in SISCODE (and occasionally, actual templates from SISCODE toolkit) were presented and shared with staff members external to SISCODE in more or less informal environments (including team presentations, and the two WP3 workshops organised with Cube). These methodologies and tools were deployed in projects like:

- Training workshop using co-creation journey metaphor, and selection of canvases from SISCODE toolkit: co-creation for science centres and museums (by a member of the board of CVIVA; October 2019<sup>33</sup>; the same member of the board later used the same materials and ideas as the core of a semester course in the MSc degree in science communication at Universidade Nova de Lisboa;
- Day-long meeting(s) of CVIVA’s Outreach unit (~15 people) for mapping priority areas, challenges, and idea generation for 2020 programme; session co-organised by

---

<sup>33</sup>[namesnetwork.org/Attachment/Attachment/FCKFiles/files/Final\\_Program\\_EMME2019\(2\).pdf](https://namesnetwork.org/Attachment/Attachment/FCKFiles/files/Final_Program_EMME2019(2).pdf)

SISCODE lab members and using selected SISCODE toolkit templates (November 2019);

- Trial co-creation session with CVIVA's Outreach and Education units (~15 people): adapted SISCODE tools for idea generation and user journey for possible engagement of a science centre with “hot topics”, as rehearsal for:
- Co-creation session: designing strategies for communicating hot topics in science centres (-100 participants), during [encontroservicoseducativos.pt/](https://encontroservicoseducativos.pt/);
- Ideation session using board games, sketches, gadgets: co-creating a science communication event (-100 participants), during [encontroservicoseducativos.pt/](https://encontroservicoseducativos.pt/);
- Adapted SISCODE canvases for problem definition and idea generation and user journey, working with teachers across the country for the development of a programme for a national event of CVIVA (first trimester of 2020; the event itself was cancelled due to Covid-19)

Covid-19 severely limited the development of new capabilities triggered by the lab, as it put an end to group activities. On the other hand, during the lockdown, members of CVIVA staff external to the lab were able to join a couple of online SISCODE workshops; for some of them, this was the first contact with co-creation methodologies. Most CVIVA's participants in the activities mentioned here expressed their wish of developing these skills with some sort of more formal training and agreed that this should be provided by the organisation.

#### 4.7.7 Conclusive reflections

Reflecting on the uptake on co-creation in the final stages of the SISCODE journey the concept of “hermeneutic circle” is one keyword that came up. It describes the idea of continually moving from smaller component parts to a larger, whole unit, and back, in order to understand the meaning of both, the individual parts and the system as a whole.<sup>34</sup> The single components and phases of the journey have no “meaning” in themselves; the sense of the journey does not derive from adding up phases one after the other; rather, the importance of the journey and of the individual phases from a learning point of view derive from the complete process. In one way, the project members feel like starting all over now with the new knowledge gained. In another way, CVIVA staff (even some not necessarily involved in SISCODE) seems to be way more aware of the specific skills and knowledge that should still be developed to design and carry out co-creation processes in future projects.

The concept of the hermeneutic circle recalls the iterative nature of co-creation; it also says a lot about the specific experiment of CVIVA. For instance, the team only understood the generative power of prototyping – i.e., how engaging with actual things can accelerate new ideas and new connections between different people – late in the journey; but to understand

---

<sup>34</sup> See [https://www.youtube.com/watch?v=zIEzc\\_\\_BBxs](https://www.youtube.com/watch?v=zIEzc__BBxs).

this it was necessary to deal with more abstract discussions. Also, it is only now that issues and ideas that emerged early in the journey can be really taken into account. These are some of the comments collected in relation: "The best way to teach someone how to swim is throwing them to the water, pardon my French, but if you want to engage people with the river that's the only way to do it"; or this: "We shouldn't waste our time with more campaigns, we have to put the public to use to show other people how this is fun" (an activist of green mobility in the city); or: "We should all go to the river, a big parade, then people outside would see us, 'Ah, that looks fun, I want to do it!'". These ideas were stated in the first co-creation sessions; but it is only after several trial and error phases that they can be fully understood by the project partners and make justice to the aspirations they contain.

CVIVA thus decided to work on something that actually brings people closer to the river, engaging them actively, even though a boat created by themselves; something that could work as a showcase to attract more people to "populate" the river. This means that co-creation should actually be applied not just during the lab's journey; it should be embedded in the solution itself making it inherently collective: The solution itself is about gathering people together, experimenting with tools and materials.

Considering this, Covid-19 was, and will likely remain, a tremendous challenge both to CVIVA's journey and to the development of the solution. It limited the occasions for active engagement of people that could be brought together for trying and validating the solutions; and it is not known when organizations like CVIVA, schools, or even groups of citizens, will be able to assemble large numbers of participants in activities that are based on physical contact. On the other hand, we think that these characteristics can be just what will make sense for a post-pandemic recovery.

## 4.7.8 Acknowledgement

### Ciencia Viva stakeholders

Type	Function	Name
Urban activists	Organizers of initiatives in the neighbourhood related with our subjects	João Bernardino; Gonçalo Peres
Local associations	Representatives of Resident and businesses association of Parque das Nações	António Neves and other*
	Director of Association of users of the Parque das Nações Marina	Paulo Andrade
Parish councils	"mayor" of Parque das Nações council	Mário Patrício



	Director of Environment department of Olivais (neighbourhood in the vicinity of Parque das Nações)	Cátia Rosas
Lisbon Municipality	Director of Sea task group (within the Economy and Innovation department)	Abílio Ferreira
	Staff of mobility department	Filipa Bernardino and other*
	Staff of Environment department (with responsibilities for activities in the river)	Eduardo Lopes; João Diogo
	Director and staff of Sports & Youth department	Miguel Pacheco; Eduardo Reis
Municipal company	President of Marina Parque das Nações	André Fernandes
IPMA (Portuguese Institute for Meteorological and Maritime Sciences)	Researchers working in maritime citizen science	4 junior researchers*
NGOs in the field	Directors of Vela+/SeaWoman (engaging senior women in water sports)	Maria Ramires; Natália Santos; other*
	Representative of the Bloom Movement (Environmental NGO, focused on education in nature)	Margarida Pedrosa
	Member of Novos Decisores Ciências, a social innovation/inclusion project working in neighbourhood near the river; also researcher in citizen science	João Cão
Maritime scouts	Members of the "board" of group in the neighbourhood	Margarida Gil; Pedro Joyce; Vasco Lampreia
Local newspaper	Director of "Notícias do Parque das Nações"	Miguel Meneses
Local school community	Colégio Pedro Arrupe (a "Blue School", school with curricula focused on ocean literacy & activities)	Ana Mira Vaz
Marquesa de Alorna School	School psychologist	Carlos Simões
	School social worker	Rita
	Carpenter/tutor	Pedro
Nautical organizations	Member of the board of Clube Náutico Boa Esperança	Carlos Caetano

	Member of the board of Ancoras (association for traditional boating)	Carlos Alpedrinha
Independent researchers	Sociologist	Luísa Franco (deceased)
	Sociologist	João Nogueira
	Science communicator	José Vítor Malheiros
Ciência Viva	Staff of Ciência Viva not involved in SISCODE	Pedro Coimbra; Gisela Oliveira; Vanessa Baptista; César Marques; Filipe Carmo; Ana Alves; Pedro Domingues; Inês Oliveira; Bruno Gomes
	Director of Ciência Viva Center of Constância	Máximo Ferreira
Help Images	Director & producer	Raquel Martins, Ricardo Nogueira
ETIC (School of Innovation and Creation Technologies)	Academic director	Cátia Salgueiro
Gulbenkian Foundation	Senior Program Manager   Gulbenkian Sustainability Program (at the time of the interview; now Director of Conservation and Policy, WWF)	Catarina Grilo
Different schools	Teachers (Basic and Secondary)	12*

\* The full name of these individuals was stored in notes in Ciência Viva's servers that are inaccessible for the moment, due to a recent ransomware attack currently being addressed.

#### 4.8. The Co-design canvas by CUBE DESIGN MUSEUM

*written by Anja Köppchen and Gene Bertrand*



## 4.8.1 Synthesis of the pilot's journey

### 4.8.1.1 The organisation

Cube design museum is the first museum in the Netherlands that is entirely dedicated to design and the design process. Cube is part of Stichting Museumplein Limburg, a foundation in Kerkrade (NL) that also includes Continium discovery center and Columbus earth center. Together these three venues tell the story of the earth, sustainability, science and technology, and design in the context of mankind, industry and education. The foundation is partly funded by the Province of Limburg (regional government), project grants, sponsoring and commercial activities.

Since its opening in 2015, Cube has developed into a museum that features prestigious and future-focused exhibitions, where design for human needs and ambitions takes centre stage. Moreover, Cube provides a creative, multidisciplinary, and international space where different stakeholders meet, inspire, and co-create: the Cube design labs. Here, students and designers co-create with the public and other stakeholders to tackle current and future societal challenges, based on design thinking and human centered design. In this position, Cube focuses on education, business, and the creative industries.

In the design labs, museum visitors are encouraged to participate in the co-creation process as end users. The challenges vary from more product oriented questions like the need for sustainable packaging or affordable and attractive hearing protection for young people, to more behaviour and system oriented challenges such as how to make people aware of the urgency to register your choice regarding organ donation or how to evoke debate about eternal life and death. Some of these challenges are directly linked to Cube's exhibitions, which provide the context for the general public and thus contribute to the engagement and co-creation processes.

### 4.8.1.2 The co-creation journey

Cube's co-creation journey started at the beginning of 2019, in the context of the Netherlands' increasing political focus on citizen participation and Limburg's social challenges in terms of ageing and shrinking population. The initial challenge aimed to increase the quality of life of people living and growing up in an ageing society like the South Limburg region. By first exploring this challenge as an open-ended process with museum visitors, designers, students and researchers, Cube gradually started to re-frame the challenge together with the municipality of Voerendaal and citizens of the village of Ransdaal. The focus shifted towards citizen participation and public engagement as being preconditions for a future proof society and quality of life for all citizens. While the municipality wants to give citizens more space and opportunities to take responsibility for their own environment, they struggle with questions of how to actually empower citizens within the boundaries of their legal and political responsibilities. The re-framed aim of Cube's co-creation journey therefore became to stimulate and facilitate new, participatory ways of policy making, that drives citizen



engagement and bottom-up initiatives. The village of Ransdaal served as a pilot in this case to design a tool that helps citizens (initiatives) and policy makers to better collaborate, plan, evaluate and coordinate co-creation and co-design processes. This resulted in the development of the Co-Design Canvas: a conversation tool that can facilitate an open and transparent dialogue about stakeholders' experiences and interests, managing expectations, being empathic, and talking about knowledge, power and shared responsibilities in both planning, conducting and assessing a co-design process. Throughout the journey, Cube conducted several rounds of workshops and reflective talks with a variety of stakeholders and involved several design, design thinking and participation experts to support the process. In particular, empathic co-design expert Wina Smeenck has had a crucial role in the co-design and testing of the Co-Design Canvas. The Co-Design Canvas will be made available for download under a Creative Commons Licence through the SISCODE project website.

### 4.8.2 Initial context

#### 4.8.2.1 External context and ecosystem



Fig 4.8.1: Overview of the territory

Cube design museum is located in Kerkrade, a former coal mining town in the south of the Limburg region, next to the German border. Limburg is the south-eastern periphery of the Netherlands. At the same time, it is at the center of Euregio Meuse-Rhine, which covers a

geographical area of 11000 km<sup>2</sup> around the city corridor of Aachen (D) - Maastricht (NL) - Hasselt (B) - Liège (B), and is home to about four million inhabitants (Zambon, 2018).

Limburg has been going through several economic and demographic transitions since the shutdown of the mining industry in the 1960s and 1970s, including the development of the chemical industry, smart services and leisure industry. One of the main challenges of the region is its demographic development, which involves a population that is both shrinking and ageing. Population ageing comes with a wide range of policy challenges, also on the EU level, as it puts pressure on several public services (e.g. Kotzeva et al, 2015). Local, regional and national governments are looking for new approaches to deal with these challenges.

Even though the concept has already been introduced in 1974 by the Netherlands Institute for Social Research (Van Houwelingen, Boele & Dekker, 2014: 17) and whereas the national government has addressed it several times throughout the twenty-first century, it is especially since the King's Speech of 2013 (Government of the Netherlands, 2013), that the Netherlands is aiming to make a transition from a welfare state to a participation society. Citizens are expected to take responsibility for their own lives and the environment. Although there is not one clear and all-encompassing definition, terms like participation, public engagement and citizen involvement are now widely used in both national and local policy programmes. This is both a result of cuts in government spending and of a gradually changing perspective on how a healthy and sustainably society should function:

*“The Participation Society has followed from the restructuring of the welfare state and austerity measures, which have required and advocated more active citizen participation. Transferring the responsibility for their living environment, and therefore service provision, to citizens has led to a discussion on role change where (local) governments relinquish responsibilities and citizens attain more influence” (De Haan et al., 2018: 313).*

The Netherlands' increasing political focus on citizen participation and the regional challenges in terms of ageing and shrinking provide the initial context of Cube's co-creation journey.

#### **4.8.2.2 Organisational background**

Cube design museum is one of three venues that belong to the Museumplein Limburg foundation. This foundation shares similar characteristics with a network organisation. It is a dynamic and flexible organisational environment, where many different types of activities are developed and executed with a wide range of partners and stakeholders. Whereas the diversity and frequency of exhibitions, activities and events comes with some risks regarding employees' workload as well as time and financial pressures, it also makes the organisation used to adapt to changing circumstances and the drive to make things happen.

Engaging the public - whether it is in science and technology, design or sustainability - is at the core of Continium, Cube and Columbus. The organisation is also strongly embedded in the (EU)region through networks and co-operations in the field of culture, science, sustainability and design and there is a close connection with local and regional policy



makers. Museumplein Limburg strongly believes in the connection and co-operation between the institution and local or regional society and governments. However, despite the organisation's strong connection with both citizens and politics, to stimulate and facilitate dialogue and exchange between these stakeholders is a different ballgame. Participating in SISCODE is an opportunity for Cube to increase its knowledge and competencies and explore its potential role in this regard.

Continium and Cube have extensive experience in the management of complex projects, in particular developing and designing new venues/museums, and creating (travelling) interactive exhibitions around topics such as science, design, innovation and sustainability. This includes developing activities and events in which visitor participation is the central aim. Especially the evolution of Continium from museum to science center has contributed to the organisation's knowledge and expertise about (interactive) exhibition design and science communication and education. Furthermore, the design labs of Cube develop and coordinate design challenges in which design thinking and co-creation tools and methodologies are implemented to engage museum visitors and other stakeholders in the process. The labs also provide rapid prototyping facilities, including 3D printers, a large format printer, a plotter, laser cutters and basic tools and materials. In addition, Continium has a workshop with equipment for woodworking and metalworking. Both for implementation and for continuous development of the design thinking and co-creation methodologies, the design labs of Cube work together with a team of experienced coaches in the fields of design thinking, research, graphic design and product design (cf. Stompff, 2018).



Fig 4.8.2: a)Museumplein Limburg (c)Shift, b) Ransdaal village

### 4.8.3 The challenge

Due to increasing welfare and a continuously rising life expectancy, European population is ageing (e.g. Kotzeva et al., 2015). This demographic change brings about great socio-

economic challenges on different policy levels. In the Netherlands, population ageing is an issue in particular in those (often peripheral) regions where the population is not only ageing but also shrinking. Parkstad – a network of municipalities in the South Limburg region – is among the fastest shrinking areas of the Province of Limburg (Meuwissen, Severijns & Gardeniers, 2017). While there are European policies to address health and care challenges to promote ‘active ageing’ (e.g. UNECE/European Commission, 2019), in the context of Parkstad/South Limburg, there seem to be a number of social challenges that require a different approach to envision future societies. These challenges include and are related to an increasing number of single-person households, a more individualist but also a more culturally diverse society (due to migration), questions of (regional) identity, and an increasing feeling (or fear) of loneliness. Partly based on exploratory discussions with Cube visitors (most of them citizens from the region), the Cube team intended to address the social challenges related to the ageing society of the Parkstad region:

How might we increase the quality of life of people living and growing up in an ageing society like Parkstad (South Limburg region) and more specifically fight loneliness?

As will be explained in the next chapter, the co-creation process involved a lot of framing and re-framing of the initial challenge with different stakeholders. This process led to frequent adjustments and eventually a re-defined challenge that is on the one hand more broad, as it does no longer focus on loneliness per se, while on the other hand it is more tailored towards a specific context in a specific village (with significant potential to scale to different contexts later on).

Through Cube’s network, more specifically through contacts at Neimed - an independent socio-economic knowledge institute and a joint venture of the Open University, Zuyd University of Applied Sciences and Maastricht University, which aims to enhance socio-economic resilience of Limburg in a demographic transition (Neimed, n.d.) - Cube established a connection with the municipality of Voerendaal. This small town (approx. 12,500 inhabitants) is part of the Parkstad region and consists of five smaller villages: Voerendaal, Klimmen, Kunrade, Ubachsberg and Ransdaal. Both the municipality and the villages involved represent cases of more widespread challenges throughout the region: the pressure on public services due to population ageing and shrinkage, as well as an increasing need for more participatory ways of policy making and governance - all related to the quality of life of all citizens. In working together with the municipality of Voerendaal and citizens of Ransdaal, the aim and focus of this pilot gradually moved towards stimulating and facilitating citizen initiatives in co-creation with policy makers. The evolution of the challenge can be summarised as follows:

*How might we help citizens and policy makers to improve the quality of life of their village now and in the future, by encouraging and facilitating citizens to design the future of their village themselves in co-creation with policy makers and by realizing participatory projects/initiatives within and for the community?*



*How might we design a sustainable infrastructure (in Ransdaal) to stimulate and facilitate dialogue and bottom-up initiatives?*



*How might we design new methodologies and ways of working to stimulate and facilitate citizen initiatives (in Ransdaal), based on co-creation between different stakeholders?*



*How might we design and implement a clear co-design process, in which everyone (in Ransdaal) can participate and which facilitates decision making processes as well as defines preconditions?*



*How might we design a tool that helps to enter into dialogue in order to facilitate citizen initiatives (in Ransdaal) to collaborate, plan, evaluate and coordinate their co-design processes?*

Throughout the journey, the challenge has thus become more concrete as it became more clear what the desired outcome should be. From the start, both the municipality of Voerendaal and the citizens of Ransdaal have committed themselves to improve the quality of life of all citizens and to achieve long-term liveability in Ransdaal. The shared ambition is a liveable and future-proof village. Ransdaal is a village where many bottom-up initiatives arise; inhabitants live a good life, and they want to keep it that way in the future. The municipality wants to give citizens more space to take matters into their own hands. The question is how we might strengthen and support both stakeholders in their endeavours. Both municipality and citizens (initiatives) feel the need to improve their collaboration and coordination of initiatives. Furthermore, they are looking for ways to increase engagement of all inhabitants, aiming for a larger support base for community initiatives. There are many ideas, but not enough time and not enough active people involved. There is thus also the need for more focus and to prioritise among citizen initiatives and ideas for the community. The aim of this pilot is therefore to design a tool that helps citizens (initiatives) and policy makers to better collaborate, plan, evaluate and coordinate co-creation and co-design processes.

#### 4.8.4 The co-creation process of the envisioned solution

Before explaining and illustrating the co-creation process step by step, it is important to understand the complexity and non-linearity of the process. Understanding of the context increases when new alternatives are being envisioned and the challenge is being re-framed repeatedly throughout the entire journey (see above - The Challenge). Even during prototyping the challenge is being continuously reflected on and adapted when necessary. This means that the description below might not fully capture the actual messy and iterative process that led to the envisioned solution for the challenge. It illustrates however the phases that were considered when planning for this journey, and it should be read as an attempt to structure the actual process afterwards for the sake of comparison and analysis.

##### 4.8.4.1 Explore



Fig 4.8.3: Visitors' workshops: a) poster, b) live session

The initial challenge focused on the broad context of quality of life in an ageing society, which is why the co-creation process started with a broad exploration of the context (diverging). There is no all-encompassing definition of 'quality of life' and ageing relates to many different types of challenges for different types of stakeholders. Furthermore, the (geographical) scope of the challenge was not defined from the start.

To explore the context of social challenges related to an ageing society, the team collected and analysed several research and policy reports and demographic statistics about ageing and loneliness ranging from the local, to national, EU and global level (e.g. Kasper, 2018; RIVM, 2018; Svendsen, 2017; Te Riele et al., 2019; Van der Zwet & Van de Maat, 2016). The insights gained from these sources have been structured as key facts, ready to be used when relevant. Parallel to collecting and analysing existing data, Cube organised informal workshops with approximately 25 citizens visiting the museum to explore (social) challenges and needs related to ageing and possible solution ideas, to further re-frame and contextualize the challenge. The format of these workshops followed a simplified co-design process, defining challenges, imagining personas in a future context, and envision solutions. Also in

parallel, Cube contacted (potential) stakeholders, including policy makers, researchers, designers, and entrepreneurial citizens. The team had several exploratory talks with them to both further frame the challenge and to explore the possibilities of participating in the co-creation journey. These conversations are therefore not only important for context analysis, but even more so for stakeholder engagement. Cube also organised a pilot workshop with students from Maastricht University (Maastricht Disrupt and Faculty of Arts and Social Sciences) to test the methodology of using Frameboards as a tool for this pilot and to further gather insights for reframing the challenge. After having established contact with the local policy makers of the municipality of Voerendaal, the team did some preliminary observations at some neighbourhood support points, where the city's aldermen hold 'open office hours' for citizens and social activities for citizens are being organised.

The first phase of the co-creation journey was thus dedicated to gain insights on challenges and needs, as well as to make connections and engage (potential) stakeholders. This phase has been a highly exploratory one, rather than a structured analysis. In theory - like in the initial plan - the process is based on a clear research plan, using different methods and triangulation in a step-by-step manner for a rigorous analysis. In practice it was (and often is) a very open and exploratory process, in which many (unexpected) things happen that drive the process in different directions. This is partly the consequence of a lack of time - in an ideal world the team might have executed the research as planned. However, the question remains whether that would have led to a better solution and a better process. Considering the complexity of the initial challenge, the process might have benefited from this more flexible and open-ended approach.

#### **4.8.4.2 Reframe**

As has been emphasized before, framing and re-framing is an ongoing process as every new insight, idea, or test can lead to a better and more comprehensive understanding of the challenge and its underlying factors. At the Cube design labs, the use of Frameboards (Stompff, 2018) is a well-established practice for turning re-framing into a conscious process. The Frameboard Canvas is used to capture and re-frame both the challenge and possible solution spaces and ideas. Within the SISCODE journey, this canvas has been used with different stakeholders. First, eight local policy makers from the municipality of Voerendaal have worked with the Frameboards to explore their perspectives on the challenge within the context of the village of Ransdaal. In addition to the Frameboards, the Stakeholder Profile Canvas helped workshop participants to define and understand their users, in this case the citizens of Ransdaal. The next step in re-framing the challenge has been taken in conversations with a citizen cooperative called 'Ransdaal voor Elkaar', which consists of a group of enthusiastic and active citizens who initiate projects to improve the quality of life of their community. Building on and combining the insights gained from the policy makers and citizens of the village, Cube also organised a framing workshop with ten trainees of the Province of Limburg, who represent the future generation of local and regional policy



makers, to further re-frame and contextualise the challenge. In addition to these workshops, several discussions and reflections on the results with Cube's partner researchers and designers have contributed to the re-framing process in a more convergent manner. The most significant re-framing for Cube's co-design process has been the shift from ageing and loneliness as the main focus to the question of citizen participation as a way to support quality of life in a broader and more future oriented sense.



Fig 4.8.4: Framing workshop trainees Province of Limburg

#### 4.8.4.3 Envision



a)



b)

Fig 4.8.5: a) Ideation session at Cube, b) illustration Future Citizens Lab\_ (c) Tejo Haas



Due to the highly iterative and explorative nature of the process, ideation in a way already started from the very beginning: by ideating one also re-frames the problem and explores the context. This combined process of ideation and re-framing is very much facilitated by the use of the Frameboard Canvas. Design thinking expert Guido Stompff calls this part of the process 'learning by creating' (Stompff, 2018). In this way, every workshop and talk or discussion in the first three phases of the process contributed to generating ideas. There are thus no 'sharp' borders between the different phases.

Most of the ideas that emerged throughout the process were very specific and focused on only a small part of the challenge, based on personal needs and perceptions. It turned out difficult for especially citizens to see and comprehend the bigger picture of quality of life, beyond their own front yard. Cube organised creative reflections and brainstorming with their partners, including Neimed, Studio Hyperspace, Studio Kernland, and internal staff, to synthesize the findings and ideas of all the workshops and research in previous phases, into an all-encompassing concept, that was still open for different ways of concrete implementation. The working title for this concept was 'Future Citizens Lab', which focused on designing a sustainable infrastructure (in Ransdaal) to stimulate and facilitate dialogue and bottom-up initiatives. How such a lab or infrastructure should look like was still open for discussion, which means that the next phase of prototyping would also include a considerable amount of ideation. The envisioned solution was thus a realisation of a more concrete aim or definition of the desired impact, rather than a concrete solution. Based on the re-framed challenge, Cube also organised short co-design workshops with citizens who visited the museum, to receive first feedback and reflections on how to create a more participatory and productive relationship between citizens and policy makers in regards to increasing the quality of life of all citizens in an ageing society. To facilitate these workshops and enable further communication and engagement, Cube involved a professional illustrator to visualise the idea of a 'Future Citizens Lab'.

#### 4.8.4.4 Prototype and experiment

As has been explained in the previous section, the envisioned solution of a Future Citizens Lab was more a realisation of a concrete aim or definition of the desired impact, rather than a concrete solution. To actually develop a prototype that could be tested together with the citizens and policy makers of Ransdaal and Voerendaal, Cube needed to start a new cycle of development and go back to the needs and challenges of the local community. As a result, Cube first organized two co-design workshops in November 2019 and engaged local policy makers from the municipality of Voerendaal (including one alderman, civil servants, city councilors and city committee members) and active citizens and entrepreneurs from Ransdaal and other villages in Voerendaal. To help prepare and facilitate the workshops Cube also involved engagement marketing expert Linda Frints (<https://www.neimed.nl/nl/neimed-team>) and participation expert Bart Pastoor (<https://www.barticipatie.com/>). Not all the workshop participants had been involved in the

co-creation journey before. This means that Cube also needed to devote some time and effort to introduce and explain the principles and values of design thinking and co-design methods. It takes time to establish trust and commitment and Cube used different tools to negotiate on shared questions and values, as well as address questions of ownership and different roles for various stakeholders (from only being informed, to actually co-designing). More specifically, customer journeys and stakeholder maps helped to reflect on desires, needs, challenges, roles and expectations of the different stakeholders involved. Furthermore, creative moodboards were made to envision possible and desired futures for Ransdaal and participants engaged in a critical yet constructive dialogue about what is important and what priorities of the community are.

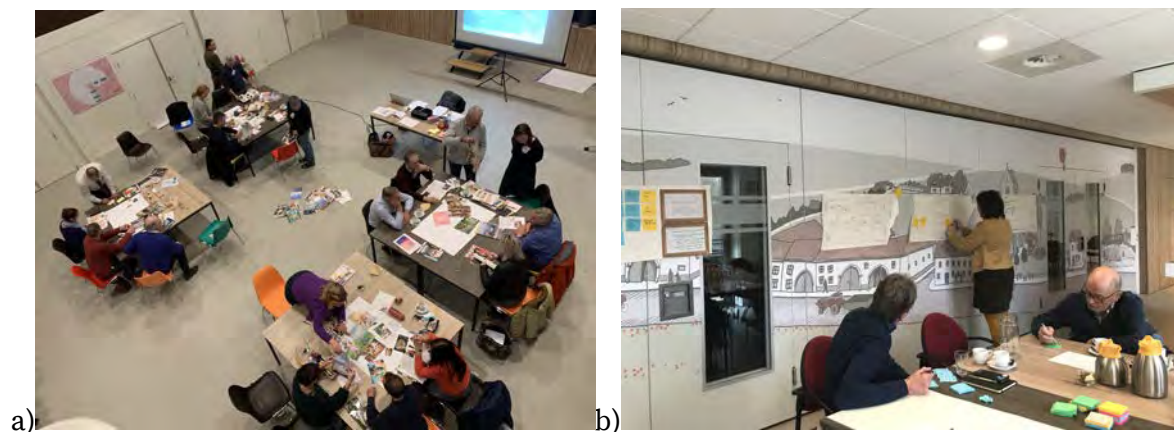


Fig 4.8.6: Co-Design Workshops a) November 2019, b) March 2020

The workshops can be considered a success in the sense that they facilitated an open and constructive dialogue between all stakeholders and provided great insights on the interests and challenges within Ransdaal/Voerendaal. However, the workshops also caused frustration and scepticism among some participants (both citizens and policy makers) because of the lack of concrete solutions. It turned out challenging to get all participants into the flow of design thinking, without expecting immediate results. Cube learned that it is extremely important to manage expectations (change takes time), as the experience of the workshops caused some drop-outs in the follow-up of the journey, due to the length of the process and the feeling of it being too abstract.

After the workshop Cube arranged separate reflection meetings with the citizen cooperative ‘Ransdaal voor Elkaar’ and with the municipality of Voerendaal in order to define and agree on mutual aims for the follow-up the co-creation journey. The team learned that the cooperative is looking for new ways to become relevant for the community, to increase their support base in the village, and to improve the collaboration with the municipality. The municipality on the other hand (which in this case is represented by an alderman and a civil servant from the department of social development) would like to provide more opportunities for citizen initiatives and participatory ways of policy making, but lack the time and resources to address and support the large number of citizen initiatives from the village. The municipality therefore needs a tool that helps to facilitate citizen participation.

Both citizens and policy makers indicated that they need more guidance in how to actually co-design a new way of working. Cube therefore involved empathic co-design expert Wina Smeenk (<https://www.wien-s.nl/>) to organise and facilitate the next workshops and to help the team to co-design a concrete prototype and connect the different needs of all stakeholders involved. This resulted in two co-design workshops in March 2020 and in which tools and methods of the design thinking game 'Shake it!' were used (Willenborg & Smeenk, 2017). Compared to the workshops in November 2019, now only a small, but very dedicated and committed group of citizens were participating, who are willing to make a change and devote time and effort to develop, test and reflect on the prototype together. The main conclusion of the first workshop was that especially the citizens of Ransdaal need a clear co-design process for their citizen initiatives and that the process needs to be made tangible for testing. The first concrete step towards a prototype for a co-design tool was then made during the second workshop on the 13th March 2020 with a group of 4 dedicated citizens. Initiated by Wina Smeenk the tool is inspired by the design choices framework of Lee et al. (2018) and is called the Co-Design Canvas.

The Co-Design Canvas will be explained in more detail in the following chapter. But to understand the development process of this prototype it is important to take into account that after the workshop on the 13th March, the Covid-19 pandemic suddenly made on-site meetings impossible and many stakeholders suddenly had to deal with new challenges and new priorities. While Cube's team could and did continue designing the first prototype together with Wina Smeenk, new ways for testing it with the community were needed. Covid-19 forced the team to meet, test, and reflect in a virtual environment. Fortunately, by using Microsoft Teams for the online conversation, Miro for the actual testing, and Padlet for reflection Cube managed to present, explain and even test both the first and the second version of the Co-Design Canvas online. These online meetings (in June and July 2020 for the first iteration and October 2020 for the second iteration) went rather well, but only because the relatively small group of highly motivated citizens and policy makers was already engaged from the very beginning of the process. The virtual conversations and tests cannot, however, completely replace the intended physical meetings, in which citizens and policy makers should work together by themselves, without Cube or another facilitator orchestrating the entire conversation. What is also missing in these virtual meetings are the opportunities to have informal talks with individuals in-between workshop activities, which also makes the test less elaborate. Furthermore, it caused a few dropouts of older adults, who felt less comfortable participating in the online testing.

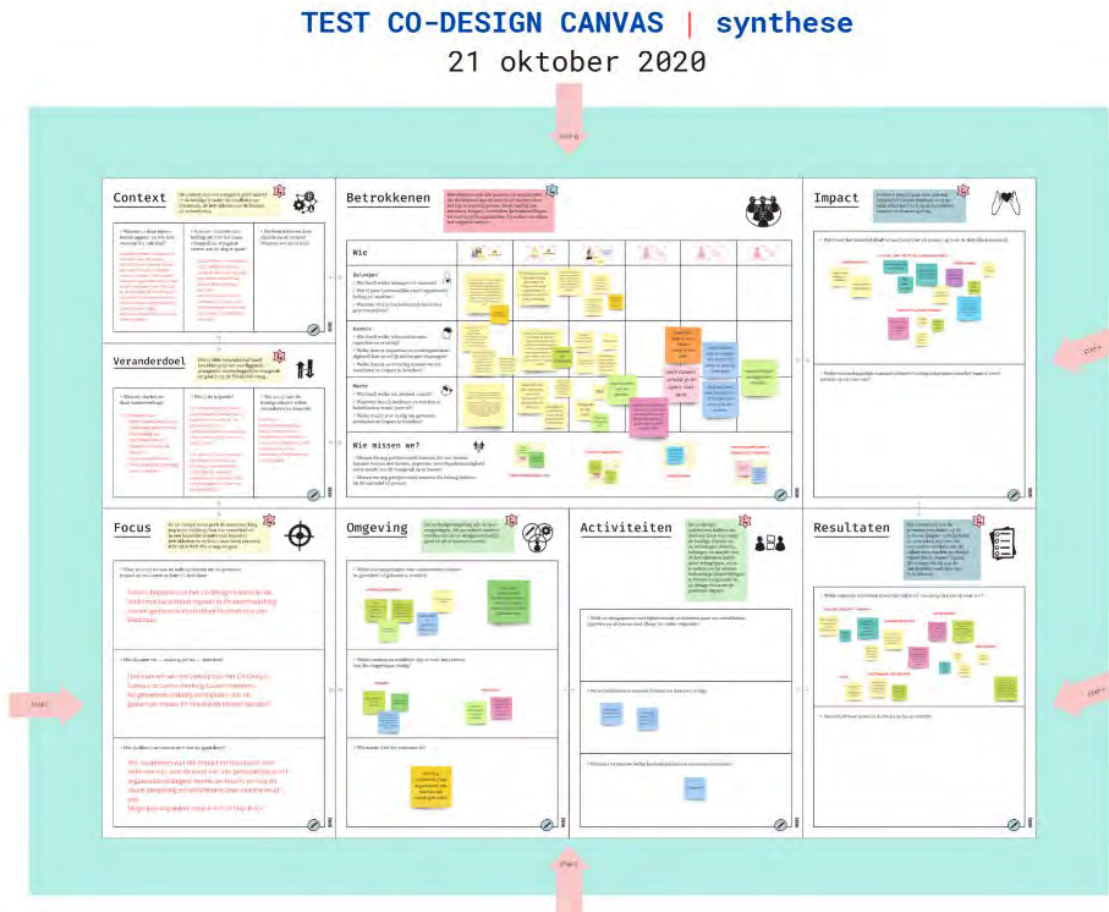


Fig 4.8.7: Online Co-design workshop with the canvas (october 2020)

In conclusion, even though throughout the journey there has been produced a variety of tangible and visual outcomes such as customer journeys, mood boards, mind maps, frameboards and rapid prototypes, it took a while to actually develop a first testable prototype. But once this prototype was there, it very much helped in keeping stakeholders engaged, because they could better grasp the potential value of the intended solution. At the time of writing this report (November 2020), there is no concrete strategy yet to implement the solution, but both members of the municipality of Voerendaal and citizens of Ransdaal have more than once expressed their enthusiasm and motivation to use the Co-Design Canvas in future citizen initiatives and participation strategies. More reflections on the challenges and opportunities of implementation are provided in chapter 4.

#### 4.8.4.5 The role of policies and policy maker engagement

The development of Cube's co-creation challenge from improving the quality of life to designing a tool for citizen participation and engagement has been a joint effort of Cube's team, citizens of Ransdaal and policy makers of the municipality of Voerendaal. Especially the municipality's policies and ambitions to provide for liveable and future-proof villages and to engage in new participatory ways of policy making provided clear motivations for the local policy makers to engage in Cube's co-creation journey. In other words, Cube and the

municipality were able to find a common ground, because there was already a certain level of awareness regarding the value of citizen participation.

However, even though the local policy makers' ambitions and motivations are clearly aimed at facilitating and stimulating citizen participation and engagement, it doesn't mean that actually designing and developing a process that works for everyone is an easy task. Cube's team quickly learned as being an 'outsider' to the village, that such a co-creation journey cannot start with a blank canvas. Frustrating or disappointing past experiences regarding the relations between citizens and policy makers can become real obstacles to make a change. Actually, changing relations and expectations and creating trust takes time and a certain openness to change (or to re-frame). One way to get out of existing frames has been trying to break open the black boxes of 'the municipality' and 'the citizens'. The municipality consists of different layers and different departments with different responsibilities, knowledge and power. But citizens often tend to perceive 'the municipality' as one powerful stakeholder, who becomes the enemy if a project proposal is declined. Similarly, policy makers tend to talk about citizens as if they were a homogenous group too, whereas citizens of course also have different professions and backgrounds.

Unequal power relations were sensed frequently during different workshops, but it was only in the later phases of the journey when the prototype of the co-design canvas was being tested, that these power relations were openly and explicitly addressed. This open dialogue resulted in an increased awareness among policy makers about their power and what this means for the perception of citizens - all stakeholders (policy makers, citizens, Cube) learned that they sometimes speak different languages and that empathy is an important learning process.

To invite and engage policy makers in the development and testing of the prototype went relatively well and while testing the prototype, both citizens and policy makers were very enthusiastic about the way the tool helps them to gain insights and to share and reflect on the interrelated elements of the co-design process. But the prototype is just a tool - to make a change towards more participatory ways of policy making requires implementing different ways of working throughout the several levels of the municipality. The canvas itself is not the solution, it is just a tool. In particular, the participating civil servants were aware of this need to change and they argued that they might need help or guidance in terms of capacity building. However, to structurally implement a different way of working among the municipality also requires some decision making, which needs more time as this is partly also a political decision. Thus, changing ways of thinking and working requires a longer process of change management, which could not be provided by Cube within this pilot. Furthermore, in this pilot only a small number of policy makers from the municipality were directly involved in the development and testing of the co-design canvas. To implement the canvas in new ways of working takes more time and effort to engage other departments

within the municipality (who might have different political agendas), including for instance the department of spatial planning.

In conclusion, it has been extremely important to actively engage local policy makers in every phase of Cube's co-creation journey, because its aim is to develop and implement new ways of participatory policy making. One of the main challenges in engaging policy makers is related to the notion of power. Power often has negative connotations – both among citizens and policy makers. The result of these negative connotations is that power relations are often not explicitly addressed – many things and feelings are left unspoken, thus, resulting in frustration. Engaging policy makers therefore requires constant management of expectations, but also facilitating an open and transparent dialogue about each other's interests, values, power relations, and shared responsibilities, to create awareness and empathy among all stakeholders.

## 4.8.5 Status of the solution

### 4.8.5.1 The Co-Design Canvas

As explained in chapter 4, both the citizens of Ransdaal and the policy makers of the municipality of Voerendaal, needed a tool or an instrument, in combination with a clear and well-defined co-creation process, to support them in developing and implementing new participatory ways of policy making. Initiated by empathic co-design expert Wina Smeenk, inspired by and based on the *Design Choices Framework for Co-creation Projects* by Lee et al. (2018), and co-designed and tested in two rounds of iterations, Cube developed the *Co-Design Canvas* - a one page tool for social change. The Co-Design Canvas aims to connect people on a deeper level, by utilising their collective wisdom to act together. It is first and foremost a conversation tool that can help by facilitating an open and transparent dialogue about each other's experiences and interests, managing expectations, being empathic, and talking about knowledge, power and shared responsibilities in both planning, conducting and assessing a co-design process. The canvas does so by making the process and the different elements that affect the process more explicit for all stakeholders involved. It can thus be a tool for policy makers who want to engage citizens and other stakeholders or the other way around, by providing a shared language and clear starting point.

The Co-Design Canvas is initially designed as a physical conversation tool, consisting of eight cards that represent eight variables influencing the co-design process: the context, the (initial) purpose of change, the stakeholders, the results, the impact, the co-design focus, and the co-design settings and activities. These variables do not only affect the process as such, but are also interconnected. The stakeholders, for instance, decide on the co-design focus, and the focus in return determines which stakeholders need to be involved. And then who is involved affects which results and impact are desired and viable, etc.



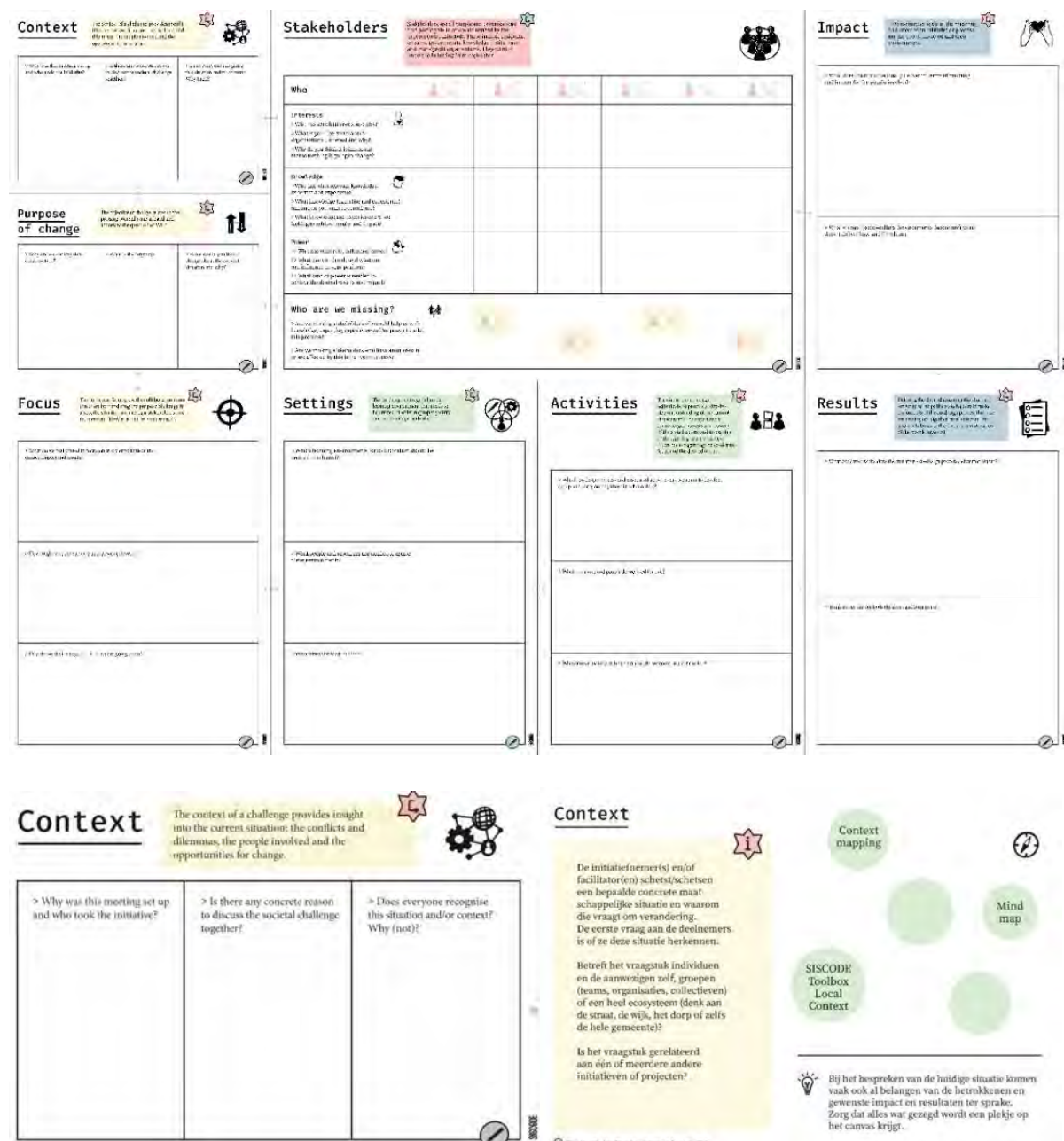


Fig 4.8.8: Overview of the Co-design canvas and cards

The design of the canvas aims to provide a flexible and accessible tool, that can be used in different ways depending on the context and the needs within different stages of the process. The cards can be discussed separately, in different orders, to not overwhelm participants with the complexity of the entire process. The filled cards can then be put together into one canvas, to understand the bigger picture and address the relations between the different variables. On the front side of each card, guiding questions help to stimulate the discussion. There is room to write or draw or put sticky notes on the cards. The back sides of the cards explain the variables, give tips and tricks, and suggest additional tools from the SISCODE toolbox, and other design thinking and social innovation methods.

In short, the Co-Design Canvas aims to connect all the variables that define and affect a co-design process and it can guide and facilitate an open conversation between multiple

stakeholders. This requires shaping the conditions of having a conversation in the first place. Once different stakeholders are willing to start a conversation, the canvas can help them by providing a shared language, to better understand each other, and to align expectations and thus to literally get everyone on the same page.

#### **4.8.5.2 Sustainability strategy**

A tool is just a tool and it has no value until it is being successfully used. The Co-Design Canvas is a synthesis of existing tools and knowledge, combined with insights based on the experiences within this co-creation journey and adjusted to the needs of the stakeholders involved in this pilot. It is thus not a commercial or technological invention, but a tool for society to be used in different contexts.

It is therefore important to make the Co-Design Canvas (freely) accessible and easy to use. The cards are designed in such a way that they can be printed on any standard A4-printer. It will be provided as a downloadable pdf-file via the SISCODE project website, under a Creative Commons licence. The participants of the co-design process during the experimentation phase will receive a high quality printed version of the canvas.

Furthermore, new tools need practice or instructions on how to use them and in what kind of context. During the development and experimentation phase of Cube's co-creation journey, policy makers and citizens suggested that the successful use of the canvas requires a skilled facilitator or otherwise at least instructions or training on how to actually use and apply the canvas in practice. Cube is therefore working on a guideline that helps people to prepare for such facilitation and to make the use of the canvas as intuitive as possible by design. The guidelines will be accompanied by a couple of storyboards to visualize the tool's use in different contexts.

Cube cannot decide for municipalities or other stakeholders to actually implement the use of the canvas, but the organisation can help by offering training or workshops for capacity building. At the time of writing it is still an open question if and when such workshops would be needed and how they could be offered for different groups of stakeholders. Yet the positive reactions of policy makers during the experimentation phase, as well as the positive response of participants of the third workshop of the second cycle of workshops for the CoRRI Forum, demonstrate a high potential for further stimulating the Co-Design Canvas' implementation by providing training sessions and/or workshops. Cube also presented the first prototype of the Co-Design Canvas during a meeting about quality of life for Voerendaal's city councillors and committee members, which again received much positive response. Furthermore, to explore and disseminate the value of the Co-Design Canvas in other contexts, Cube is organising a workshop for students, educators, and professionals and makers in the fields of arts and sciences as part of the IGNITE Autumn School 2020 (IGNITE is an EU-funded initiative that unites academic institutions and creative industry partners from three countries to create an open-source, online course about design thinking and making).

## 4.8.6 Transformations triggered and outcomes

### 4.8.6.1 Organisational transformation

Design thinking and co-creation has been used within the dedicated Cube design labs for almost five years. In these five years, more than fifty co-creation projects were executed, mostly in the fields of product or service design. The SISCODE project was the first, major social design project that took place in the design labs. It challenged Cube's developed methodologies and provided new insights in the structures and processes of design thinking and co-creation. It offered the team of Cube new experiences and insights in the role of the different stakeholders and participants in a co-creation or co-design process. The focus was on the awareness of working with people with their own responsibilities, ideas, experiences, roles, etc. Empathy, the different roles of stakeholders, and the management of expectations was more pronounced than in most of the previous projects that Cube had been involved in.

The current Covid-19 crisis has forced the organisation to change its strategy and developments for the future. The current concept, consisting of three different venues (Cube, Continium, Columbus), will be transformed into a new integrated organisation. This means that the organisation will still address the same topics but in a different environment and without separate venues. This implicates that organisation has to focus even more on visitor programs and activities. All projects will be assessed on the role they play for visitors or the general public. In the light of these developments the Cube design labs will be closed in 2021, but the organisation will not abandon its methodologies and programs. The new organisation focuses on a kind of "pop-up" approach and will use design thinking and co-creation in different projects and different locations within Museumplein Limburg. At the time of writing, the organisation is in the middle of the transformation and developing this new approach. Many questions are still unanswered. The conversation with artists, designers, policy makers, scientists and citizens is still at the centre of the organisation's attention. The aim is and continues to be to invite visitors to bring their own experiences, questions, resources and unique perspectives. The organisation wants to create spaces for conversation, participation and co-creation and thus strongly believes that the tools, learnings and developed methodologies from the SISCODE project will play an important role in reaching these goals.

### 4.8.6.2 Transformations in the ecosystem

It is difficult to assess the impact of Cube design lab's activities within the context of this co-creation journey on the ecosystem. The initial context of the journey still holds true and the development of the Co-Design Canvas fits perfectly within that context: The Netherlands' increasing political focus on citizen participation and regional challenges in terms of ageing and shrinking. It is too soon to assess whether this journey actually triggered a transformation within the municipality of Voerendaal. However, the process seems to have increased awareness about the value and opportunities and challenges of co-creation in

policy making. It is still an open question though to what extent co-creation can and will be actually implemented in the municipality's future strategies.

A current development that might speed-up the implementation of new participatory ways of policy making is the prospective implementation of a new Environmental Act by the Dutch government in 2022. The essence of this Act is first to combine all existing laws and regulations relating to the living environment into one law and second to create more space for bottom-up and local initiatives by providing a new division of responsibilities based on trust between government and society. In other words: citizen participation will become part of the Dutch law on the living environment. The Environmental Act does not, however, determine how participation should be implemented - here it provides a lot of space and opportunities for local and regional governments to develop their own ways of working that fit the local contexts. The municipality of Voerendaal has already mentioned that the Co-Design Canvas could be a valuable tool in translating the new Environmental Act into their local environmental policies. The new Act might thus be a trigger to use new methods and tools, such as the canvas.

The Covid-19 pandemic is an additional complicating factor in this regard, because it makes physical public meetings difficult or even impossible. Yet in order to create a safe space for addressing (unequal) power relations within such complex societal challenges and co-design processes, meeting and talking in person is very much desired.

#### **4.8.7 Conclusive reflections**

The co-creation journey has started as a very open-ended process without a well-defined destination. Some people love it, because they flourish when the sky is the limit and they feel comfortable in chaos and ambiguity. For others it can feel like a never-ending story in which they get lost and unmotivated, because the end goal is not visible. Looking back and reflecting on the journey as a learning process, a few insights might be worth sharing for future projects.

First of all, exactly because it started as such an open-ended process, nobody at Cube could have imagined delivering a solution that serves as a valuable tool not only for the local community that it was designed for, but also for Cube's own, organisational context. The co-created prototype can be applied and adjusted in a variety of contexts. This means that the eventual value and potential impact of the solution is something that could not be measured or validated in the earlier stages of the process. And that makes it sometimes difficult to engage other stakeholders to join the journey. But as Henry Ford once said: "If I had asked people what they wanted; they would have said faster horses". So how to engage policy makers and other stakeholders in an open-ended journey? This will always be a challenge, because innovation always takes time and involves taking risks and accepting failure. Showcasing best practices might help to overcome such 'entry' barriers, to which the outputs of the SISCODE project could certainly contribute.

Throughout the first three phases of this co-creation journey, also no one could have imagined that there would be a time of working in a society where 'social distancing' has become a worldwide rule and human interaction is mostly limited to the virtual world. Who would have thought that co-design workshops would be conducted online and that as a result the physical lab space would lose some of its relevance? The Covid-19 pandemic has forced the team to learn that the virtual world has a lot more to offer than expected and known. However, it remains to be seen to what extent virtual interaction can actually replace human interaction in real life. If it would be necessary to set up a co-creation journey in a virtual setting from the start, could the end result be as rich and multi-faceted? It might be required to develop more digital competencies first, not just within the organisation, but within society as a whole. What does this mean for future co-creation journeys?

This co-creation journey has been an immense learning experience for the team, especially in terms of stakeholder engagement. To really achieve equal involvement of all stakeholders requires trust, to share responsibilities and to have an openness towards change. The role of empathy and changing power relations cannot be overestimated in this regard. The team learned the hard way that managing expectations is crucial to keep stakeholders involved, especially when you work with an unpredictable and highly iterative co-design process.

Due to the iterative nature of the process, it is also important to understand (for all stakeholders involved) that tools and methods should be applied and adjusted flexibly, according to the needs of the stakeholders and the process. There are many tools and methods available that in essence have similar aims. Yet which exact tool or method works when and how, is highly context dependent. The mindset and attitude of the stakeholders might be much more relevant than the selection of tools. After all, a tool is just a tool. You can select the right tools, tested methods or creative procedures, but these are of no use if there is a lack of respect, empathy and equality.

## 4.8.8 References and Acknowledgements

### References

De Haan, E., S. Meier, T. Haartsen & D. Strijker (2018), "Defining 'Success' of Local Citizens' Initiatives in Maintaining Public Services in Rural Areas: A Professional's Perspective", in *Sociologia Ruralis*, 58, pp. 312-330. doi:10.1111/soru.12173

Government of the Netherlands (2013), Troonrede 2013 [King's speech 17 September 2013]. Accessed online: <https://www.rijksoverheid.nl/documenten/toespraken/2013/09/17/troonrede-2013>

Kasper, H.J.D.P. (2018), *Perspectief hebben. Zicht op het welzijn van oudere consumenten* [academic farewell speech], Maastricht: Maastricht University, School of Business and Economics, 7 September 2018.

Kotzeva, M., V. Corsini, A. Gereöffy, G. Lanzieri, G. Senchea Badea, D. Thorogood & F. Zampogna (2015), *People in the EU: who are we and how do we live?*, Luxembourg: Publications Office of the European Union.

Lee, J.-J. et al. (2018), 'Design Choices Framework for Co-Creation Projects', *International Journal of Design*, 12(2), 15-31. Accessed online:

[https://www.researchgate.net/publication/327338557\\_Design\\_Choices\\_Framework\\_for\\_Co-creation\\_Projects](https://www.researchgate.net/publication/327338557_Design_Choices_Framework_for_Co-creation_Projects)

Meuwissen, J., B. Severijns & J. Gardeniers (2017), Begeleidende notitie bij de resultaten van Progneff, Maastricht: Etil research group.

Neimed (n.d.), About Neimed [website]. <https://www.neimed.nl/en>

RIVM (2018), Volksgezondheid Toekomst Verkenning 2018 - Een gezond vooruitzicht: Synthese, The Hague.

Stompff, G. (2018), Design Thinking. Radicaal veranderen in kleine stappen, Amsterdam: Boom uitgevers.

Svendsen, L. (2017), A Philosophy of Loneliness, London: Reaktion Books.

Te Riele, S. et al. (2019), PBL/CBS Regionale bevolkings- en huishoudensprognose 2019-2050, The Hague: Statistics Netherlands.

UNECE/European Commission (2019), Active Ageing Index in the European Union and its evolution 2010-2018: Results Report, prepared by Y. González Rábago & A. Domínguez Rodríguez of the University of the Basque Country (Bilbao), under contract with the United Nations Economic Commission for Europe (Geneva), co-funded by the European Commission's Directorate General for Employment, Social Affairs and Inclusion (Brussels).

Van der Zwet, R. & J. W. Van de Maat (2016), Wat werkt bij de aanpak van eenzaamheid, Movisie commissioned by the Ministry of Health, Welfare and Sport.

Van Houwelingen, P., A. Boele & P. Dekker (2014), Burgermacht op eigen kracht? Een brede verkenning van ontwikkelingen in burgerparticipatie, The Hague: Netherlands Institute for Social Research (SCP).

Willenborg, A. & Smeenk, W. (2017), Shake It! Een design thinking-spel voor innovatie en transformatie, Amsterdam: Boom Uitgevers.

Zambon, F. (2018), Regions for Health Network - Catalogue of Regions 2019, Copenhagen: WHO Regional Office for Europe. Accessed online: [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0010/373555/20190619-h1350-RHN-regions-web-2.pdf](https://www.euro.who.int/__data/assets/pdf_file/0010/373555/20190619-h1350-RHN-regions-web-2.pdf).

## Acknowledgments

**Cube's team** responsible for the content of journey's process and outputs

<b>Gène Bertrand</b>	Museumplein Limburg (programme & development)	<i>research/ development, network</i>
<b>Anja Köppchen</b>	Cube design museum (coordinator Cube design labs)	<i>research/ development, coordination, facilitation</i>
<b>Ambre Reijntjens</b>	Vista College (graphic design student)	<i>illustrations</i>
<b>Wina Smeenk</b>	Wien's Ontwerperschap (empathic co-design expert)	<i>facilitation, research, design</i>
<b>Nadine Vroomen</b>	Museumplein Limburg (graphic designer)	<i>graphic design</i>



### The journey's main co-contributors involved in different phases of the journey

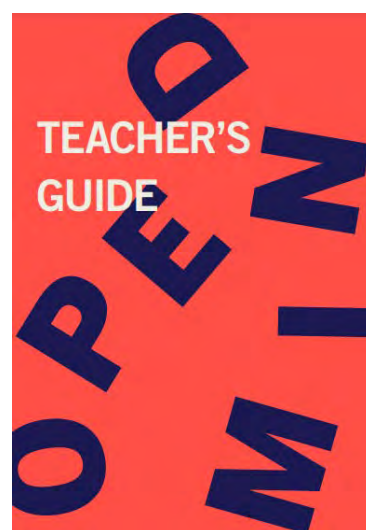
<b>Linda Frints</b>	Neimed (Knowledge Institute to enhance socio-economic resilience of Limburg in a demographic transition)	<i>research, network</i>
<b>Toon Hezemans</b>	Tejohaas Cartoons and Art	<i>illustrations</i>
<b>Hans Kasper</b>	Silverbrains (platform aimed at exchanging (international)	<i>research</i>
<b>Isa Laurent</b>	Maastricht University (liberal arts and sciences student)	<i>research</i>
<b>Mariya Molotnikova</b>	Maastricht Academy of Fine Arts and Design (social design student)	<i>research</i>
<b>Bart Pastoor</b>	Barticipatie (participation expert)	<i>facilitation</i>
<b>Theo Ploeg</b>	Studio Hyperspace (media and design sociology studio)	<i>research</i>
<b>Nina Simons</b>	Studio Kernland (exhibition design, storytelling settings)	<i>research</i>
<b>Guido Stompff</b>	InHolland University of Applied Sciences (design thinking PhD)	<i>research</i>
<b>Dagny Vogely</b>	Maastricht Academy of Media Design and Technology (graphic design student)	<i>graphic design</i>

### The local community participating as a pilot in the journey

Many thanks and appreciation go to the citizens of Ransdaal and Voerendaal, who devoted time, effort and enthusiasm to the entire process, in order to co-design new, participatory ways of policy making and development for the future quality of life of the village. Some citizens participated on a personal basis, others did so from their role within the citizens cooperative called Ransdaal voor Elkaar (<https://www.ransdaalvoorelkaar.nl/>). Furthermore, equal thankful recognition goes to the Municipality of Voerendaal (<https://www.voerendaal.nl/>), in particular the policy makers and civil servants of the Social Domain. Their ambitions to stimulate and facilitate citizen participation provided a fertile ground to experiment with new tools and methods for participatory policy making. Cube is very much open for further discussing and exploring possibilities to provide support to both citizens and policy makers to continue their endeavours to co-design for the community's future quality of life.

#### 4.9.OPEN MIND by SCIENCE GALLERY DUBLIN

written by Grace D'Arcy



## **4.9.1 Synthesis of the pilot's journey**

### **4.9.1.1. Science Gallery Dublin's organisation**

Science Gallery Dublin (SGD) at Trinity College Dublin (IE), is a public engagement space that delivers unique, transdisciplinary exhibitions, events and educational programmes with an emphasis on the intersection of art and science as a means to empower young people. Science Gallery Dublin brings together artists and makers as well as researchers from across disciplines and provides a platform for the development and exhibition of new transdisciplinary work in response to broad themes that engage young people in connective, participative, and surprising ways. It offers our target audience of 15-25 year olds a social space to develop ideas, imagine the future, and realise dreams.

Science Gallery Dublin was pioneered at Trinity College Dublin and its success led to the establishment of an international network of university-linked art-science cultural spaces. At the time of writing, leading universities in London, Melbourne, Bengaluru, Venice, Detroit, Rotterdam, Atlanta and Berlin are members of the Science Gallery Network.

Informal learning programmes engage young people through programmes which combine the arts with science and technology (Moore, Roche, Bell, & Neenan, 2020), and which places a focus on the development of key competences such as critical thinking, communication, collaboration and creativity.

While Science Gallery Dublin frequently uses participatory processes to develop programmes, including an Open Call process for exhibition development, the SISCODE project provided an opportunity to engage in best practices for co-creation, and to apply these in an iterative, long-term process.

### **4.9.1.2 Our co-creation journey**

Co-creation is understood as a collaborative methodology that involves, engages and learns from various stakeholders about a specific challenge to develop a solution.

At the beginning of the co-creation journey Science Gallery Dublin set out to connect with young people and others and involve them in the creation of solutions for an issue of importance to them. The broad challenge of 'mental health and well-being management' was chosen in collaboration with youth advisors, the Science Gallery Dublin programming team and after a research review of issues impacting young people in Ireland. Science Gallery Dublin created an open call for people to get involved in the journey to dream up potential solutions to mental health and well-being challenges faced by young people, and to take one idea onto realisation. This cultivated a diverse gathering of 31 young people, mental health professionals, teachers, parents, mental health charities and researchers, who committed to coming together in Science Gallery Dublin for three workshops for 16 hours

The SISCODE project team facilitated a series of design thinking workshops specifically for this group to introduce them to the SISCODE approach to collaboration, and to support them

through stages of idea generation, idea refinement and prototyping. Together, the group generated a plethora of creative ideas and refined the challenge. With a world of potential solutions, from festivals to apps or activism, the group identified education as a key avenue to support well-being management in young people. This seemed especially relevant since education is often a contributor to the stresses and worries of young people. The group deliberated to collectively refine and prototype an educational module to be delivered in second-level schools aiming to develop students' understanding of mental health and to equip them with tools to manage their well-being, with a focus on the importance of personal hobbies and interests. Over 18 months, the stakeholder group prototyped the student learning experience, set the agenda on what mental health topics to address, crafted interactive activities to deepen student's understanding and develop content.

The outputs of the co-creation journey are multi-dimensional. The educational module was co-created and piloted in schools nationally, with the content co-developed by youth participants and mental health experts. Iterative testing refined the module content and delivery in collaboration with students and teachers. The co-creation journey also led to a shift in approach and application of co-creation best practices within the Science Gallery Dublin team.

## 4.9.2 Initial context

### 4.9.2.1 External context and ecosystem

Science Gallery Dublin chose to tackle mental health and well-being believing it to be one of the biggest problems facing Ireland today. Ireland has one of the highest rates of mental health illness in Europe, [ranking joint third out of 36 countries surveyed](#).<sup>35</sup> We are focusing on young people as they have been shown to be the most vulnerable group in Irish society in relation to mental health, and because Science Gallery Dublin has a particular target audience demographic of 15 to 25-year olds. Within young people (aged 15-19), Ireland had the 7th highest rate of suicide across the 33 countries. A national study profiling mental health in nearly 15,000 young people across the country found that mental health difficulties emerge in early adolescence and peak in the late teens and early 20s.<sup>36</sup> This peak in mental health difficulties, in general, was coupled with a decrease in factors that protect positive mental health such as self-esteem, optimism and positive coping strategies. Historically, people with mental health problems have lacked a voice. Co-creation is a critically important approach in tackling mental health, as there is a direct link between patient empowerment and improved mental health. “Empowerment” is a core concept of WHO’s vision of health

---

<sup>35</sup> Health at a Glance: State of Health in the EU Cycle. Europe, 2018

<sup>36</sup> My World Survey. 2012 National Study of Youth Mental Health. Barbara Dooley, Amanda Fitzgerald, UCD School of Psychology

promotion. “People should be empowered to promote their own health, interact effectively with health services and be active partners in managing disease”.<sup>37</sup>

Better Outcomes, *Brighter Futures: The National Policy Framework for Children and Young People 2014-2020 (DCYA)*, sets out the Irish Government’s agenda and priorities in relation to children and young people under the age of 25 and provides the overarching framework for developing and implementing policy and services during this timeframe. Fundamental to all outcome areas is that children and young people have a voice in decisions that affect their lives.<sup>38</sup>

Mental health management is a priority for Irish people. The 2019 National Budget made a commitment to allocate €55M for new developments in mental health. This increase to funding was supported by a large majority of the population.<sup>39</sup> In terms of mental health policy in Ireland, ‘A Healthy Ireland’: A Framework for Improved Health and Well-being 2013 – 2025’ outlined a vision where everyone can enjoy physical and mental health and well-being to their full potential, where well-being is valued and supported at every level of society and is everyone’s responsibility.<sup>40</sup>

The Irish government is in favour of including young people in policy making processes. In 2015, the Irish government published a report on ‘National Strategy on Children and Young People’s Participation in Decision-Making 2015-2020’. A major objective set out in this strategy was that children and young people should have a voice in decisions that affect their health and well-being, including on the health and social services delivered to them. This strategy sets a strong precedent for using co-creation methodologies to co-develop mental health and well-being management with young people in Ireland.<sup>41</sup>

#### 4.9.2.2 Organisational background

Science Gallery Dublin chose to focus particularly on 15-25 year olds, as this stage in a young person’s life is a particularly vulnerable period. 15-25 year olds are the target audience for Science Gallery Dublin exhibitions, events and education programmes, and have established channels to reach out to young people to engage them on this co-creation journey such as through our education programmes.

---

<sup>37</sup> User empowerment in mental health – a statement by the World Health Organization. Regional Office for Europe, 2010

<sup>38</sup> Better Outcomes, Brighter Futures: The National Policy Framework for Children and Young People 2014-2020. Department of Children, Equality, Disability, Integration and Youth.

<sup>39</sup> Mental Health Reform, Pre-Budget Submission Report 2019.

<sup>40</sup> A Healthy Ireland’: A Framework for Improved Health and Wellbeing 2013 – 2025’

<sup>41</sup> National Strategy on Children and Young People’s Participation in Decision-Making 2015-2020. 2015

As part of Trinity College Dublin - the top ranked university in Ireland Science Gallery Dublin has access to a wide network of researchers and professionals who are working in the area of our chosen challenge. The challenge “to develop mental health and well-being management with young people” overlaps with previous and upcoming exhibition themes, so we can build on existing relationships with academics, as well as foster new ones. Science Gallery Dublin has a strong multidisciplinary team with in-house artists, designers, virologists, astronomers and neuroscientists, while our exhibitions bring together a wider group of external artists, engineers, designers and scientists to address a particular theme. Science Gallery Dublin possesses a unique know-how in developing and executing creative experiential formats for public engagement with science, alongside wide experience in project coordination and implementation.

Since opening in 2008, themes for upcoming Science Gallery Dublin exhibitions have been conceptualised in collaboration with a group of advisors entitled the Leonardo group: a ‘brain trust’ of exceptional people from science, technology, the arts, media, education and business. The Young Leos are the youth branch of Science Gallery Dublin's advisory board. Hailing from across Ireland, they act as youth ambassadors and advisors to the gallery, programming their own events and helping to inform Science Gallery Dublin's approach to several aspects of our activity, including social media, marketing, exhibition themes, and broader education initiatives. This collaborative structure utilised some co-design methodologies but lacked a formalised process and accountability. The SISCODE project provided an opportunity to reflect and analyse best practice in co-creation and apply these in an iterative long-term process in our unique social and cultural context.

### 4.9.3 Challenge

The broad challenge Science Gallery Dublin chose to tackle was ‘mental health and well-being management in young people’ believing that this is one of the biggest problems facing Ireland's youth today.

This broad challenge became more defined through a series of desk research, focus groups and stakeholder interviews in the research phase. The SISCODE team gathered a diverse stakeholder group made up of young people, mental health professionals, teachers, parents, mental health charities and researchers. These stakeholders had diverse interests and backgrounds, but all exchanged similar experiences of struggling with mental health in a school setting. Gaps were identified in the Irish education experience of well-being management.

Through a series of stakeholder sessions of idea generation, idea refining and idea prototyping the group focused the challenge around ‘Co-creating mental health resources with young people to use in a school setting’. The stakeholder group wanted to develop a resource that would develop students' understanding of mental health and to equip young



people with tools to manage their well-being, with a focus on the importance of personal hobbies and interests.

To contextualise the policy background of this defined challenge, from 2016 the National Council Curriculum and Assessment undertook an ongoing review of education in Ireland and identified well-being as a key theme to improve and support. This review sets a strong justification for co-development of resources for health and well-being management with young people.

#### **4.9.4 The co-creation process of the envisioned solution**

Science Gallery Dublin has undergone a co-creation process together with a broad range of stakeholders, policy makers and citizens which led to one main output, and one main outcome. The output was a co-created educational module on mental health and well-being management was piloted and refined over several iterations in schools nationally to produce a strong youth centred resource tackling mental health and well-being management in the classroom. The outcome was that co-creation journey also led to a shift in approach and application of co-creation best practices within the Science Gallery Dublin team.

##### **4.9.4.1 Analysis of the context**

In order to define the challenge and identify needs, the Science Gallery Dublin SISCODE project team performed an analysis of the landscape of mental health for young people in Ireland. 34 experts were interviewed in the field of mental health and well-being such as researchers and clinicians, and charities working in the area. A study of the current Irish and EU policies was carried out, along with a partial literature review. Questionnaires and focus groups were utilised to collect perspectives from parents and teachers.

In order to collect insights directly from young people about problems they identify in relation to the topic, Science Gallery Dublin facilitated three education programmes for 15-17-year olds, focused on the theme of youth mental health. These week-long programmes included hands-on workshops, a design thinking sprint and prototyping of solutions, and reflective practice. Sixty students participated in this programme across three weeks. This directly shaped an understanding of youth perspectives on mental health challenges. This also promoted a strong relationship and trust between youth participants and Science Gallery Dublin facilitators and encouraged interest in the SISCODE project. Several participants returned to engage in the stakeholder sessions.

The insights collected from the context analysis were used to generate data visualisations and “proto-personas”: prompt cards depicting visual descriptions of users across the mental health landscape in Ireland. These insights were presented to participants at the first stakeholder session to inform the process.

##### **4.9.4.2 Reframing of the problem**

After analysis of the landscape around mental health and well-being management in Ireland, the planning of stakeholder workshops followed. These were structured over three sessions, to take participants through key stages of idea generation, idea refinement and idea prototyping.

With the clear objectives for each workshop defined, the team worked on the selection of design thinking methods, personas, idea mapping canvas and priority sorting tools. These tools were introduced to the team by project partner CUBE, who supported the process.

The first workshop held on 12th April 2019 was attended by 31 stakeholders representing young people, mental health professionals, teachers, parents, mental health charities and researchers. The stakeholders were split into 6 groups, to encourage discussion and promote the opportunity to speak. Each group was moderated by a facilitator from the Science Gallery Dublin team to guide the idea generation process. The workshop was concluded with a presentation of ideas generated to an expert panel. The ideas generated covered three key themes: nature as a tool to protect mental health, promotion of creative expression, and well-being challenges in relation to academic stress in a school environment and exam systems. Each idea had a strong focus around education to promote positive mental health. The challenge was reframed to focus on education around mental health within a formal education setting.

Stakeholders identified a particular year in Irish post primary education as a major opportunity in the solution. ‘Transition Year’ is an optional year-long programme for Irish students that marks their transition from junior cycle post-primary education (usually for 12-15-year olds) to senior cycle post-primary education (usually 16-18 year olds). The overall purpose of the Transition Year programme is to give 15-16-year-old participants an educational experience that encourages self-directed and independent learning.<sup>42</sup> It is especially significant as there is no comparable programme in other education systems around the world.<sup>43</sup>

A key aspect of the Transition Year programme is that while guidelines are provided by the Government through the Department of Education and Skills, each school has the freedom to design its own programme.

#### **4.9.4.3 Envisioning of alternatives**

The ideas that were generated in the first workshop were analysed and categorised by theme. The Science Gallery Dublin presented the ideas generated to experts and a youth advisory panel representing schools across Dublin for their insights. This helped shape an analysis of the strengths, weaknesses, opportunities and threats (SWOT) of ideas generated.

---

<sup>42</sup> Perkins, R., Cosgrove, J., Moran, G., & Shiel, G. (2012). PISA 2009: Results for Ireland and changes since 2000. Dublin: Educational Research Centre.

<sup>43</sup> A Time Profile of Mathematics in a "Gap Year" in Irish Secondary Schools. Prendergast, Mark; O'Meara, Niamh European Journal of Science and Mathematics Education, v4 n3 p293-304 2016

During a second stakeholder workshop on the 26th April 2019, the stakeholders were presented with the SWOT analysis of the ideas and insights. Ideas were grouped together by theme covering nature, creative expression, and school systems. The stakeholders worked in three groups, each working on a specific theme and reflected on the strengths and weaknesses of each idea. The stakeholders were challenged to identify complementary concepts and combine them to form a solution. Each group presented back their solutions to the wider group. This generated two key ideas: a creative festival for schools nationally to promote well-being, and the formation of extracurricular clubs to promote student-teacher relationships. A second iteration of concept synthesis was carried out with stakeholders to combine these ideas into one key solution.

#### **4.9.4.4 Development and prototyping**

On the 26th May 2019, the stakeholders were invited back to prototype the idea. Using concept synthesis tools, the group established a central solution that synthesised elements of key concepts previously discussed, focusing on hobbies as a strategy to promote positive well-being. The group created an early conceptualisation of a mental health programme to implement in schools called OPEN MIND. The programme would have in-class sessions to develop students' understanding of mental health and a concluding challenge to co-create an extracurricular hobby club to mentor younger students in the school, creating a more inclusive school environment. The participants hoped that this framework would empower young people's choices and interests. By focusing on hobbies, OPEN MIND creates opportunities to foster positive mental health, encourages peer relations and diverse leisure activities. Additionally, students who may not have access to extracurricular activities outside of school would be included. Stakeholders split into groups to accomplish specific tasks. One group focused on outlining and developing the in-class content that teachers would deliver to students. The second group generated a roadmap of the solution planning how the programme would be implemented in phases. The groups then presented this work back to each other to ensure consensus.

The Science Gallery Dublin team used this roadmap to develop the prototype further over the following two months. Key stakeholders were identified to generate video content for the in-class modules. Before launching the pilot programme, a strategy session was held with participants for their feedback and insights on the 13th August 2019.

The first phase of piloting was launched in September 2019, with four schools committed to running the pilot programme. Schools were primarily identified through youth representative links. This allowed youth representatives to see the solution realised in their community. The modules were delivered over the course of a 9-week programme that involved hands-on learning activities, class and group discussion and reflection. Themes of the sessions encompassed diversity and inclusion, the importance of hobbies, and mental health and well-being management strategies. In particular, there was an emphasis on social media use and time management. Discussion in the ideation phase also highlighted that there

is a link between spending time daily on creative goals and well-being. For this reason, a journal with activities, reflection questions and drawing prompts was prototyped to be used alongside the programme in and outside of the classroom.

The Science Gallery Dublin team facilitated the sessions in two of the four schools to capture insights on the activities developed and for rich student and teacher feedback. The other two schools ran the content independently. This close oversight allowed tweaking of content during the pilot. Focus group feedback sessions were organised with students in each participating school group and with teachers to reflect on the programme and to capture insights. These insights were analysed and visualised and used to inform the next steps.

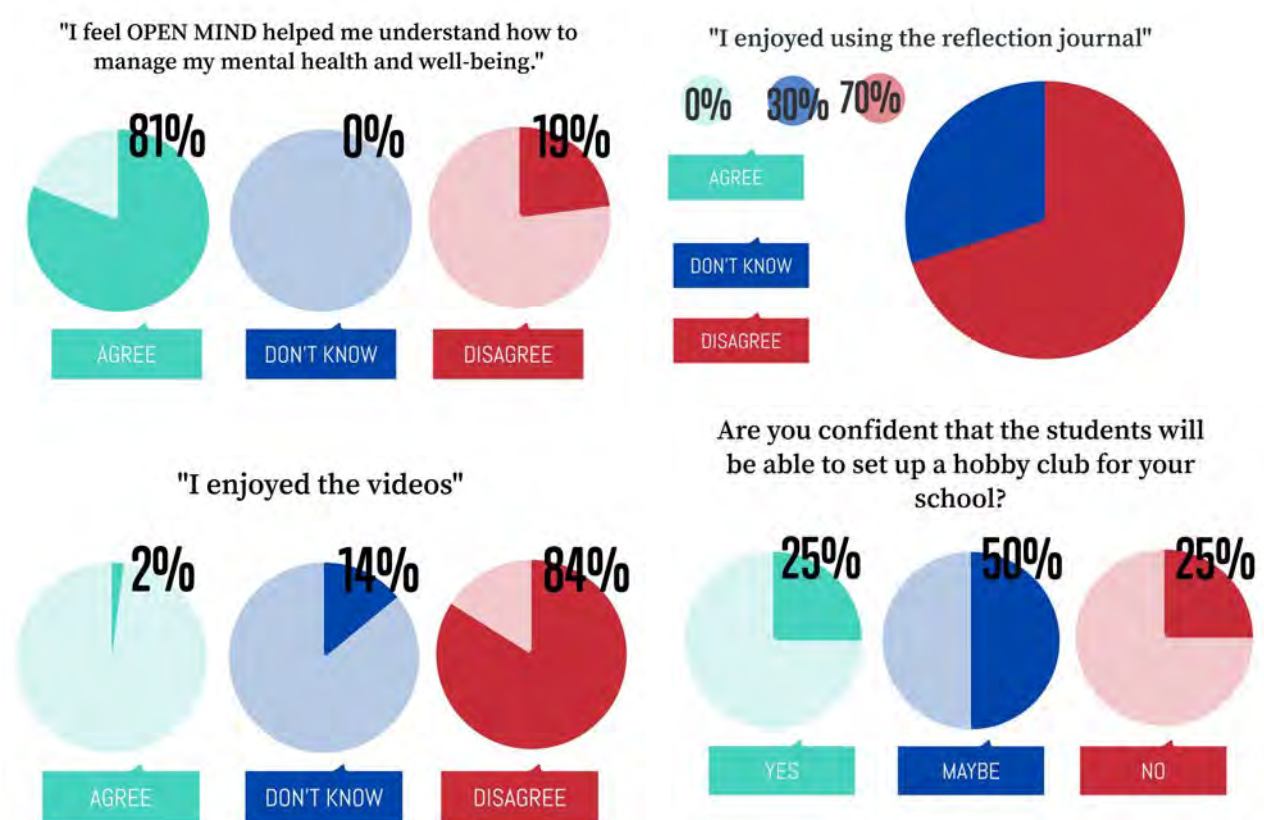


Fig 4.9.1: Main insights after the first loop of Open Mind

After this first iteration, in December 2019, the SISCODE team gathered our stakeholders, participating schools and a number of relevant policy makers to evaluate the programmes delivery and goals, and plan the adjustments needed. The visualisations of student and teacher feedback focused the agenda, and during a 2- hour session, this extended group dived back into the content and worked together to refine the activities and content that young people wanted to see emphasized.

### What needed to change?

Teacher feedback focused on organisational barriers to implementing hobby clubs in schools and provided insights that the burden of work would fall to teachers instead of being student-led. Additionally, outside the lifetime of the SISCODE project student's hobby clubs would not be resourced which posed a barrier to the sustainability of the programme. These insights led stakeholders to reframe the aim of the programme away from mandating an extracurricular component of a hobby club and instead using the in-class sessions to build students confidence and empower them to make changes in the school in areas that interest them.

Student feedback shaped changes in the content, and delivery. Student participants identified that the videos developed by expert stakeholders for the programme discussing mental health management were delivered in formal language causing students to disengage. A solution to address this shortcoming was to co-develop a series of animations to cover the information in a more engaging way, with youth participants co-writing the script along with mental health professionals. The use of the journal in the programme was also pivoted to ensure the sustainability of the programme outside the SISCODE project. The stakeholders were keen to promote reflective practice during the OPEN MIND programme, and so instead of printing bespoke journals to distribute to participating schools, the stakeholders opted to develop a journal challenge worksheet that teachers could use throughout the programme, and for each student to have a dedicated copy book to use for reflection during the OPEN MIND sessions.

### OPEN MIND Prototype Timeline

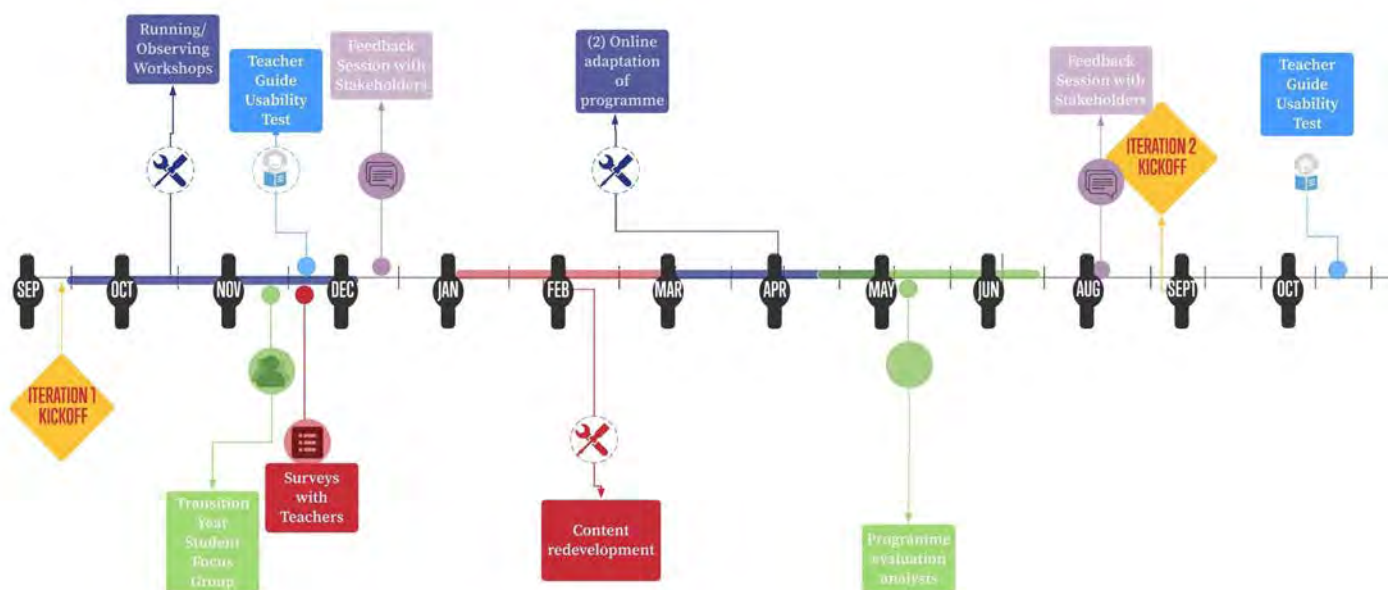


Fig 4.9.2: OPEN MIND Prototype Timeline

### **Evaluation of the programme**

To measure the impact of the programme, Science Gallery Dublin collaborated with the School of Psychology, Trinity College Dublin to collect pre- and post- surveys of the students' mental health and well-being.

#### **4.9.4.5 The role of policies and policy maker engagement**

The Science Gallery Dublin team engaged with policy makers through every stage of the co-creation journey, from interviews with a broad cohort during the research phase, to targeting specific relevant policy makers as the prototype became more defined.

During the research stage of the journey, the team hosted an event with the Minister for Mental Health, Jim Daly with researchers and students to discuss issues around mental health in higher education.

During the idea generation stage, the Policy and Research Officer for Mental Health Reform sat on the panel of experts to inform the process. During the prototyping session representatives from the Department of Health - Policy, Strategy and Integration Unit attended, expressing strong interest in learning about the process.

As the prototype became focused around Education, the team met with the Department of Education to present education programming at Science Gallery Dublin and the use of co-creation to create a mental health module. The team also held several consultations with the National Council for Curriculum and Assessment within the Department of Education to discuss and plan the uptake of the OPEN MIND in schools nationally.

More broadly, the team met with TCD Law Prof Rachel Walsh to discuss formats for Citizens' Assembly in Ireland and to understand how topics and participants for that are chosen. Our co-creation journey also caught the attention of the Queen of Sweden, who has a strong interest in youth mental health issues and wanted to learn about how co-creation could be used to develop solutions during a visit to Ireland in May 2019. To facilitate this, we gathered several strongly engaged stakeholders, and designed a workshop to demonstrate the process to the Queen.

#### **4.9.4.6. Covid-19 Situation**

The Covid-19 pandemic interrupted the running of the hobby clubs from students who participated in Phase 1 with the closure of schools nationally. It also disrupted the second iteration of the programme in additional schools in Spring 2020-. Phase 2 iteration was rescheduled to September 2020.

The Covid-19 pandemic also brought the importance of mental health and well-being management into fresh focus. Bereavement, isolation, loss of income and fear are triggering



mental health conditions or exacerbating existing ones. Globally many people are facing increased levels of alcohol and drug use, insomnia, and anxiety.<sup>44</sup>

Government restrictions limited the opportunity to meet friends. The Science Gallery Dublin team adapted the OPEN MIND programme to create an online mental health resource. This was distributed to all participating schools in the pilot programme, and to a large network of schools who engage with Science Gallery Dublin. This was also disseminated periodically over social media over several months of governmental restrictions.

## 4.9.5 Status of solution

### 4.9.5.1 Concept

The defined OPEN MIND programme is a co-created educational module for teachers to implement in school. The programme aims to develop students' understanding of mental health and to equip young people with tools to manage their well-being, with a focus on the importance of personal hobbies and interests. The module combats the current gap of mental health resources available to senior cycle students, and to equip students with tools as they embark into a stressful academic period. The content developed includes free activity plans for teachers including slides, posters, worksheets, and video content.

Throughout the programme, the modules cover four key learning outcomes:

- empathy and inclusion skills
- mental health literacy
- well-being management tools
- teamwork and co-creation skills

This pilot programme aims to empower students in the class and school community by embedding co-creation into the ethos of the OPEN MIND programme. The OPEN MIND programme looks at each participating school as a place to activate a community, and build co-creation practices over time, developing a culture of positive well-being, resilience, and student participation in decision making. The OPEN MIND sessions act as a tool to equip participating teachers, students and schools to identify ways to greater involve young people

---

<sup>44</sup> The impact of COVID-19 on mental, neurological and substance use services: results of a rapid assessment. World Health Organization, 2020.

in the school environment such as in their existing extra-curricular programme. Inclusion, teamwork and co-creation sessions act as a guide to promote collaboration between students and teachers on any existing school activities and initialise co-created activities.

#### **4.9.5.2 Sustainability strategy**

The OPEN MIND programme has undergone several steps of iteration, each pilot step aimed to achieve the optimal independent use of the resource in the classroom without need for direct involvement of Science Gallery Dublin staff. During Phase 1 of the pilot Science Gallery Dublin facilitated the sessions in two of four participating schools to capture insights on the activities and content when delivered in the classroom. Student and teacher feedback shaped changes for optimal uptake in the classroom.

The second phase placed emphasis on the teacher guide as a tool to support teachers delivering the module in the classroom independently. During Phase 2 iteration Science Gallery Dublin held calls with teachers to train them briefly in the materials and program goals and handed over the resources to deliver themselves. Feedback on its use in the classroom was collected for final revision of the resources. The revised resources will be made available on Scoilnet, the official education portal of the Department of Education in Ireland, for teachers use. The Science Gallery Dublin team is also working with a youth stakeholder from the SISCODE journey, who has taken up a role in the Irish Second-Level Students' Union with a specific focus on youth mental health. This will be part of the exploitation strategy for the programme to carry on the initiative beyond the lifetime of the project.

### **4.9.6 Transformations triggered and outcomes**

#### **4.9.6.1 Organisational transformation**

In addition to the production of a refined mental health resource for schools and teachers, the Science Gallery Dublin co-creation journey also led to a shift in approach and application of co-creation best practices within the Science Gallery Dublin programme.

##### **Role of youth voice**

Before the SISCODE project commenced, an advisory board called the 'Leonardos' - a group of experts in science, technology and the arts - influenced themes to explore in Science Gallery Dublin programming. The Young Leos were the youth branch of Science Gallery Dublin's advisory board. They acted as youth ambassadors and advisors to the gallery, programming their own events and helping to inform Science Gallery Dublin's approach to several aspects of our activity, including social media, marketing, exhibition themes, and broader education initiatives. This collaborative structure inadvertently utilised some co-design methodologies but lacked a formalised process and accountability. Throughout the experimentation in the SISCODE project, the Science Gallery Dublin team underwent a change in mindset towards the role and value of a youth voice, and gained skills in the amplification of youth insights.

### **Co-creation as a central strategy to achieve diversity, equity and inclusion (DEI) goals and community-focused objectives**

During a two-week team-wide strategy session called REBOOT from the 17th February 2020 to 28th February 2020, Science Gallery Dublin opened up workshops and discussions in the gallery space with the public and multiple stakeholders to ask our community where to go next. Through youth and equity workshops the team came to a shared agreement on co-creation as a pathway to realising core values of diversity, equity and inclusion (DEI). The co-creation approach is being connected to ongoing DEI workshops. The 2021 programme will explore the theme of BIAS, with co-creation embedded as a central methodology through phases of incubation and activation across the year.

The Science Gallery Dublin team has integrated co-creation into a new programme to re-engage with the gallery's core community: our youth advisors, mediator team and early-stage artists and researchers. Using learnings from the SISCODE project, the team built a framework to work with these three groups: youth aged 15-18, into one cohesive structure, with co-creation a central methodology.

#### **4.9.6.2 Transformations in the ecosystem**

##### **Use of toolkit as a valuable resource for multi-stakeholder engagement**

The SISCODE toolkit has been utilised in multiple projects that Science Gallery Dublin has been involved in, including SySTEM 2020, a Horizon 2020 project (2018-2021) examining and mapping science education outside the classroom - it was used at a national event for educators from formal and informal sectors at a networking and training event entitled "Confluence" on the 10th October 2019 to promote co-creation as a powerful tool for transdisciplinary education. The SISCODE toolkit was also used in the national touring of a Science Gallery Dublin exhibition entitled PLASTIC, as a tool to facilitate the co-creation of new artworks in three rural areas of Ireland in response to the themes of sustainability and climate action.

The toolkit has also been central to supporting Open Science Hub, a Horizon 2020 project aiming to engage schools and local stakeholders in research and innovation as a tool for sustainable community development, in which Science Gallery Dublin lead two Work Packages. Open Science Hub will inspire, empower and engage citizens - from school children to senior citizens - in STEAM learning and research opportunities, grounded in collaborating with the local community and other stakeholders. During the Covid-19 pandemic the Science Gallery Dublin team adapted the SISCODE toolkit for online use to support Open Science Hub partners structure their co-creation journeys with their local communities. Online adaptations of the toolkit were also used in collaboration with FIT4FOOD 2030, a Horizon 2020 project aiming to create sustainable food network systems. Expertise gained during the SISCODE project positions Science Gallery Dublin strongly nationally as a facilitator of multi-stakeholder engagement.

The toolkit has been disseminated and used across the Science Gallery Network with our partner organisations in London, Melbourne, Bengaluru, Venice, Detroit, and Rotterdam. On 19th July 2019 Science Gallery Dublin ran a co-creation workshop to demonstrate the toolkit at the Science Gallery Youth Symposium in Science Gallery at Kings' College London. Additionally in April 2020, Science Gallery Dublin ran online training sessions on 'Creating Co-creation Sessions' for staff and youth advisors across the Network.

#### **Embedding co-creation ethos into OPEN MIND prototype**

The OPEN MIND programme aims to empower the participating students within their class and school community. The OPEN MIND programme looks at each participating school as a place to activate a community, and build co-creation practices over time, developing a culture of positive well-being, resilience, and student participation in decision making.

### **4.9.7 Conclusive reflections**

The Science Gallery Dublin co-creation journey within the SISCODE project has been a great opportunity to tackle a youth centred issue.

It was unexpected to the Science Gallery Dublin team that our stakeholders focused solutions for use within formal learning institutions - schools. The school organisational structure and environment can be a barrier to the co-creation process, lacking the agility or flexibility when the end-goal is undefined. Informal learning institutions could offer an alternative pathway to the embedding of co-creation within education, with co-creation becoming increasingly popular among museums, science centres and other cultural organisations.<sup>45</sup>

A strong organisational learning from the SISCODE project was developing the facilitation skills to amplify youth voices in multi-stakeholder projects. We noticed a shift in participation dynamics of stakeholders throughout the process. In the beginning the adults in the room were typically first to speak, and several youth participants expressed hesitancy in speaking out. Over time, and through careful facilitation and relationship building, the experts in the room ended turning to youth participants for the say in decisions.

"I became more confident in talking to people that are older than me. At first, you think 'oh they're older than me - I have to be respectful', but there's also a point where they have to respect you. Everybody involved learned how to interact with people of different backgrounds and different careers" - Youth representative, Roisin Cork, age 17.

The SGD co-creation journey emphasised the role of the facilitator as a gatekeeper to mediate the process. As a cultural institution it is interesting to reflect on how the position of that facilitating organisation, whether it is a cultural institution, a university, or a business may impact on the co-creation process. Within the field of cultural institutes, organisations may be university linked or independent. There can be advantages and disadvantages to both - in organisations that are university linked there are wide networks of researchers and

---

<sup>45</sup> The Creative Museum - Analysis of selected best practices from Europe, 2016.

academics that can be involved, but there also may be more institutional bureaucracy which impacts the ability to be agile.

Within art organisations, outputs of a community co-creation initiative may challenge the self-image of the institute, depending on the aesthetic or finish of the output. Relinquishing institutional ego before commencing the co-creation process is central to the collaborative process.

#### 4.9.8 References

Health at a Glance: State of Health in the EU Cycle. Europe, 2018.

My World Survey. 2012 National Study of Youth Mental Health. Barbara Dooley, Amanda Fitzgerald, UCD School of Psychology

User empowerment in mental health – a statement by the World Health Organization. Regional Office for Europe, 2010

Better Outcomes, Brighter Futures: The National Policy Framework for Children and

Young People 2014-2020. Department of Children, Equality, Disability, Integration and Youth.

Mental Health Reform, Pre-Budget Submission Report 2019.

A Healthy Ireland': A Framework for Improved Health and Wellbeing 2013 – 2025'

National Strategy on Children and Young People's Participation in Decision-Making 2015-2020. 2015

Perkins, R., Cosgrove, J., Moran, G., & Shiel, G. (2012). PISA 2009: Results for Ireland and changes since 2000. Dublin: Educational Research Centre.

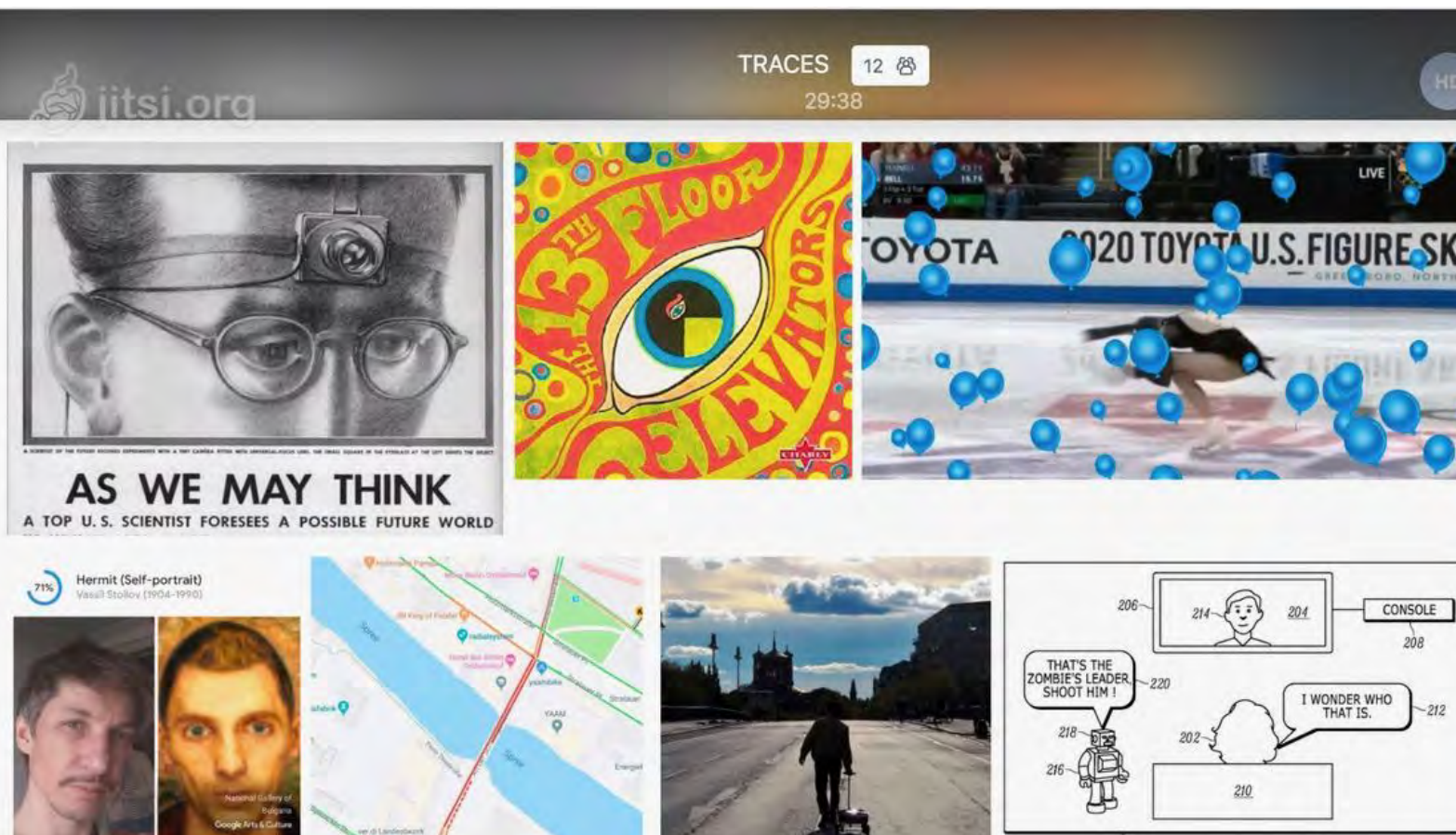
A Time Profile of Mathematics in a "Gap Year" in Irish Secondary Schools. Prendergast, Mark; O'Meara, Niamh European Journal of Science and Mathematics Education, v4 n3 p293-304 2016

The impact of COVID-19 on mental, neurological and substance use services: results of a rapid assessment. World Health Organization, 2020.

The Creative Museum - Analysis of selected best practices from Europe, 2016.

#### 4.10 AI as co-spectators by TRACES

written by Aude Ghilbert and Matteo Merzagora



In 2030, will AI visit Museums?



## 4.10.1 Synthesis of the pilot's journey

### 4.10.1.1 The organisation

TRACES is a not for profit association acting at the crossroad between participatory science engagement and social inclusion. TRACES runs the activities of Espace des Sciences Pierre-Gilles de Gennes, the science-culture venue of ESPCI Paris and PSL Research University, a leading French research university covering a wide academic field, well-connected to national research bodies and with a strong innovation-oriented research policy. As a platform between the academic, associative and private spheres and in collaboration with diverse partners, Traces aims to create living lab spaces in which to reflect, experiment and innovate in the fields of science in society, science education and public communication of science.

TRACES' team is made of 12 people, including science facilitators, trainers and experts in social inclusion projects. Its core competences rely on innovative methods for science engagement and social inclusion, facilitation of discussion games on socially relevant science and technology issues, collaborative training in RRI and science in society.

In the last 3 years, the team has initiated several projects in frugal science using living lab approaches, bringing together the science community and other actors from the arts, international cooperation, education, etc. Our knowledge and experience of co-creation methods is not brand new but needs to be further developed.

So far our approach of co-creation is based on the concept of developing public activities within the “grey zone”, where the frontier between knowledge production and knowledge dissemination is not well defined. That is, activities that satisfy at the same time the needs of the general public and the needs of the research and innovation community. The living lab approach is particularly suited for this idea. Our aim is to combine dialogue approaches of science engagement and living lab methodology and open innovation approach to provide meaningful explorations of science based, socially relevant issues. Traces is adapting the usual criteria of living labs (involving end users in the design/ testing) in the classical process of co-creation, exploration, experimentation and evaluation, to events in which the general audience with a cultural interest / involvement in the issue can participate.

### 4.10.1.2 The co-creation journey

TRACES' journey addresses the issue of our “right to be informed” in automated decision processes using artificial intelligence in everyday life. How can the presence of AI-based support to professional or everyday life decisions become noticeable and readable for end users / citizens so they can make informed choices in crucial aspects of their lives? This ever-growing need related to the right to be informed is important because there is more and more pressure on the public for knowing what is done with their data. This is a central issue in our societies, for the public to know and understand how our decisions are influenced. The RGPD law enforced on European level in 2017 obliges companies and administrations to be accountable for that.

More specifically, TRACES as a science museum identified a real need of including discussions on the topic in contexts and situations easily accessible by general audiences, such as in educational or cultural activities.

An overview of TRACES co-creation journey is presented in the following sketch. This led to the development of a prototype which is a protocole bringing people and AI together as co-spectators of a live cultural event.

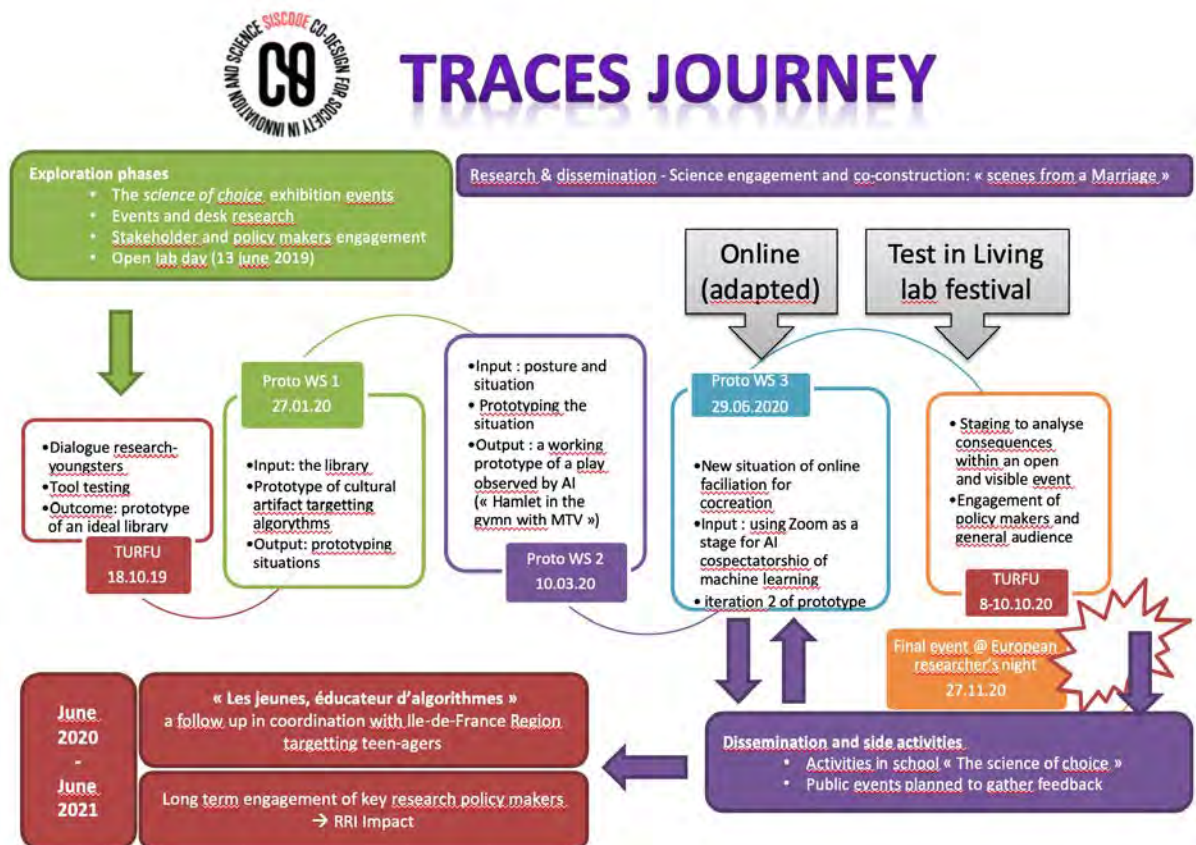


Fig 4.10.1: TRACES' journey sketch

## 4.10.2 Initial context

### 4.10.2.1 External context and ecosystem

#### National and local specificities

CNIL (Commission nationale de l'informatique et des libertés) is a national body set up in France to defend people's rights in the protection of their private data and has been active since. Nonetheless, national policies seem to be out mastered by international organisations like Google, Apple, Facebook, Amazon (GAFA)s, who define and stir people's uses of new technologies via the ever-growing dependence on digital technologies and social media to keep connected, both at societal, professional and private levels, and more recently through artificial intelligence applications. This trend is well illustrated and subject to debate in relation to privacy, democracy, citizen empowerment, etc.

The RGPD law was enforced at European level, and several legislations are in place to protect citizens' rights. However, until the values underpinning them will become shared and embedded in the general culture, they will not produce the desired effect and will remain out of control for the lay citizen.

In the meantime, deep learning research is advancing at tremendous speed. Many valuable educational activities are being proposed to follow those advancements, mainly focusing on equipping the public with basic knowledge about algorithms and artificial intelligence: this is necessary, but not sufficient. In fact, it neglects the issue of how we make AI visible and recognisable and how we represent it: we believe that these are essential dimensions if we want to preserve a capacity to operate informed choices about AI.

We set up an exhibition in 2019 entitled "[The science of choice](#)" - with a series of [live events](#) to engage with audiences - which emerged from the need of exploring how the presence of artificial intelligence supporting personal and professional activities is influencing our way of making choices. This approach proved very fertile, and called for a deeper analysis of our relationship with artificial intelligence, through a co-creation approach: in fact, many different groups with different agendas are interested in the same topic: an ideal situation for a co-creation exploration.

The extreme relevance of the topic, which will without any doubt dominate the landscape of sociotechnical controversies in the next decade, ensures the interest of policy makers in a diversity of approaches. This is why the journey focuses not on developing one specific solution, but on enlarging opportunities for multiple, mutually enriching solutions.

#### 4.10.2.2 Organisational background

TRACES has a long and widely recognised experience in co-creation in several fields.

- Linking education, people with disabilities and fab-labs for the co-design and prototyping of practical solutions for handicapped persons involving marginalised students (more than 60 prototypes realised since 3 years and design of a new training scheme: project [www.efabrik.fr](http://www.efabrik.fr))
- Including participation of citizens and other stakeholders in the co-creation of science-society exhibitions (project [www.qsec2.fr](http://www.qsec2.fr); exhibition « Science & humour »; exhibition [Science frugale](#); [exhibition](#) and [events](#) "The science of choice")
- Running discussion-based activities and multi-stakeholder dialogue activities, including living-lab approaches (for example the Citizen science project "[Citique](#)", or EU projects such as PILOTS, FUND, NANO2ALL, KICKS, Nanopinion, Improfood,...).

Within SISCODE, the team chose to go beyond the existing approaches, and move one step forward, keeping as a core objective fostering Responsible Research and Innovation in socially relevant techno-scientific advancement. Algorithmic decision making was selected as the most relevant topic, since it is a cutting-edge research and innovation field very close

to citizen concerns: an ideal playground to cross social innovation and RRI, and a high stake for policy making.

Although participatory procedure and co-creation are at the core of all Traces activities, they have never been explored as a topic in themselves. SISCODE represents for Traces an opportunity to enrich our knowledge on existing tools, and to increase our level of reflexivity on co-creation and co-design.

### **4.10.3 The general approach and the specific challenge**

The SISCODE project “[IA SPECTATRICES](#)” was driven by a general approach, that started as a fuzzy and approximate intuition, and was progressively enriched through discussions within the consortium and comparisons with other labs, to end-up in a general vision that is interesting for SISCODE’s general objectives.

This general approach is briefly developed in section 3.1, as well as in the general conclusion in section 7. In fact, for Traces, the clarification of this general approach is one of their main achievements during the SISCODE journey.

#### **4.10.3.1 The general approach**

For Traces, one of the most interesting aspects of co-creation is the possibility to satisfy at the same time independent agendas.

This is different from aligning different agendas, typical of a more classical form of collaboration. In this case, it means that we seek to collaboratively set up a situation that will potentially serve the needs of various participants in many, potentially very different ways. In other words, rather than aligning the objectives of different stakeholders toward a common objective, and thus having the prototype as an end-point, there is a true interest in conceiving the prototype as a starting-point offering opportunities to different stakeholders to better satisfy their own objectives. This is shown in the scheme below.

As a working hypothesis, it was proposed to identify these two modes as “collaborative” and “generative”.

In the “collaborative mode”, used in several SISCODE case studies, co-creation mainly consists in a process of alignment of different stakeholders toward a common goal, in order to collectively achieve a solution. Prototype is essentially a “solving prototype”.

In the “generative mode”, co-creation is intended as a collectively generated opportunity to help different stakeholders to achieve autonomous goals. Prototype is essentially an “exploratory prototype”.

In the “generative mode”, the prototype is not a solution in itself, but an opportunity and a facilitator for several independent solutions. It is thus clearly a radically prototype-driven approach.

The indicators and values that can be used to assess these two modes of prototyping are obviously very different. In the case of “generative mode”, the attention is focused on the change in the participants/stakeholders, while in the “collaborative mode” the focus lies on the capacity of the prototype to provide a solution to a specific problem.

Seen from the participants/stakeholders point of view, by overstressing a bit the famous proverb “give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime”, the “collaborative mode” provides shared fish (solution to a specific problem), the “generative mode” provides shared learning on how to fish (collective opportunities that produce change).

The Lab considers the “generative mode” to be a mature, challenging, and rewarding form of co-design, and seeks further interactions with experts in the field to bring it forward. In particular, Traces proposes the hypothesis that it is the more appropriate approach in the context of social innovation and Responsible Research and Innovation, the area of exploration of SISCODE.

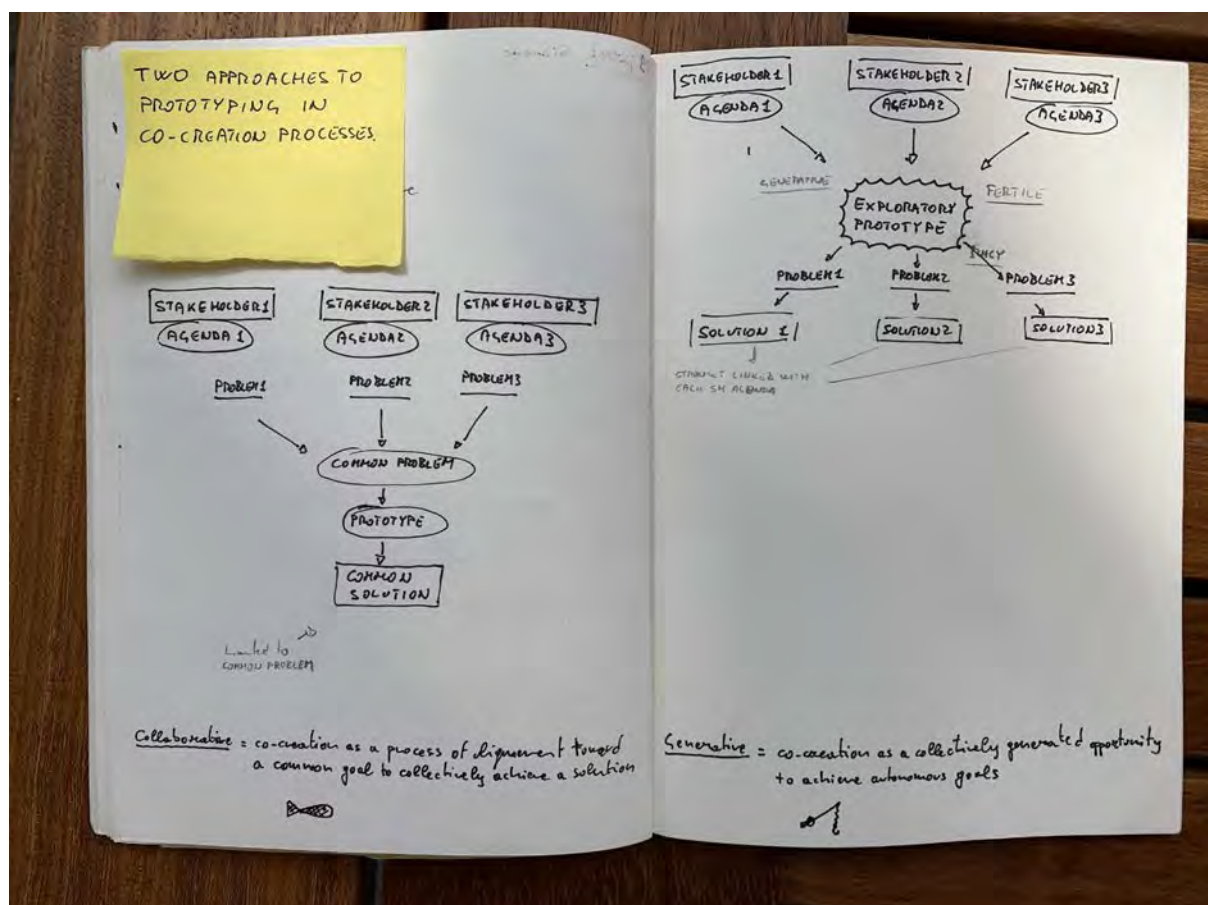


Fig 4.10.2: Two approaches to prototyping un co-creation processes

This general approach has a strong consequence on the role given to the prototype, on the engagement of stakeholders, and on the sustainability strategy. In fact, it implies to focus on the impact of the prototype on the actions, behaviour and change process of the engaged



stakeholders. This raises many questions, since measuring the change produced in very diverse institutions, at very different time scales, can be extremely challenging and sometimes impossible. These considerations will be developed in the following chapters.

A second interesting action research question addressed through Traces's challenge is the relationship between cultural activities and co-creation activities within an informal education venue.

In recent years, there is an increasing interest of the science engagement community for the world of participation and co-construction, and vice-versa. Science centres are integrating fab-lab spaces and living lab approaches in their offer, citizen science activities are increasingly merging with science engagement activities, design thinking and discussion game methods are fertilising each other. This is a wonderful opportunity of renewal for science communication practices. However, co-construction activities and science culture/engagement activities do not necessarily share the same objectives, neither the same business model. Also, this marriage could be influenced by fashion effect, masking differences and blurring the clarity of the political value of such activities.

During the entire journey, Traces tried to keep their challenge at the border of these two worlds, with a double objective: enriching the challenge itself, by hybridizing the two cultures, and exploring the common feature and the diversities among them.

The tentative effort to keep on working at the frontier between cultural activities and co-creation, and possibly blurring this frontier, also strongly oriented the choices of exploration.

#### **4.10.3.2 The specific challenge**

TRACES' challenge aims at raising the issue of intelligibility of AI, at a time where it has become pervasive of all human activities.

*How can we enforce our “right to be informed” in automated decision processes using algorithms in everyday life?*

*How can the presence of AI-based support to professional or everyday life decisions become noticeable and readable for end users / citizens so they can make informed choices in crucial aspects of their lives?*

*How can we make people more conscious of automated decision processes / services / applications and of criteria used by algorithms?*

*How can we make ethical issues explicit and understandable for the generic users?*

The team has observed a strong need to tackle the issue coming from several different sources, and more specifically from the following communities:



Community	Indicators
<b>The scientific community</b>	emergence of many research projects and networks to tackle AI related issue from scientific, technological, as well as social perspective
<b>The cultural community</b>	emergence of many exhibitions, educational programs, cultural programs around AI
<b>The artistic community</b>	emergence of exhibitions, collectives, or individual artworks interrogating AI
<b>The civil rights activists community</b>	emergence of collectives, action movements and whistle blowers for data protection and individual rights protection
<b>The political community</b>	emergence of reports, parliamentary committees, studies etc. to frame and steer the spreading of AI related research and social concerns.

Fig 4.10.3: Needs of addressing the challenge for various stakeholders

It was observed that there is a real need of including discussions on the topic in contexts and situations easily accessible by general audiences, such as in educational or cultural activities.

Starting from a rather traditional framing of the issue, the co-creation journey led to the identification of a non-explored angle, that is, shifting from AI as subject of cultural and educational activities or as tool for cultural and educational activities, to AI as a target group for educational or cultural products.

## 4.10.4 The co-creation process of the envisioned solution

### 4.10.4.1 Analysis of the context

After a preliminary analysis that led to the first statement of the general challenge, the lab adopted an innovative approach for context analysis and reframing of the problem, in line with the general principle of working at the frontiers between co-creation and cultural activities (see above: Section 3.1). This consists in setting up an exhibition as an exploration tool, a platform used to generate encounters and collect inputs and ideas from many different stakeholders. This approach was already tested by Traces and was recognised by the 2017 Mariano Gago – ECSITE award for innovations in science communications. It was decided to adapt the approach to the co-design approach of SISCODE.

Following Traces methodology, the exhibition “Under influences – the science of choice” started with an incubation period, where a series of event were organised to generate the content and identify the relevant stakeholders to engage, followed by a deployment period, where a series of events enriched and enlarged the topic. Part of these events where directly linked to the issue of algorithmic assisted decision making, that is, the application of AI to support our personal or professional choices (from the choice of a transport system to the choice of a sex partner, from the application of AI to law and medicine, to the use for advertisement).

Each of these events were intended to satisfy at the same time a set of needs typical of cultural activities (allowing the public to discover a topic and enjoy intellectual stimulation as well as

social moments, etc.) and a set of needs typical of co-design activities (identify relevant stakeholders, collect inputs and allow interactions among potentially diverging agendas, redefine the questions and challenges based on participants inputs, etc.).

The format of these events was very diverse, but always characterised by a highly participatory approach: from an ill-fated tribunal on autonomous car, to a moving debate on algorithmic love/sex matching on Valentine's day, from a traditional round table to a living lab-oriented co-creation workshop. Each part of the event was useful for the co-creation journey: during the preparation phase (identification of relevant literature, speakers, communities), during the event (collection of viewpoints and ideas, engagement of new stakeholders), and in the post-event follow-up (reframing of the question based on participants inputs). A summary of the main events is reported in section 8.

Participants were involved at different levels: from fully committed, long term engagement participants, to “one shot” contributors who provided their input on a single event. This follows Traces principle of “engagement à géométrie variable”, that is, a setting that allows the public to participate at different depths and timings, depending on their interest, time and energy to invest.

In section 8, a list of named individuals that participated in the various phases of the journey is reported. However, many more people should be counted in: in fact, many intuitions that allowed us to identify and redefine the challenge and to shape the solution also came from insights from visitors actively participating in interactive events, although not counted in as workshop participants.

This phase allowed the use of an exhibition and a series of public events as a tool for stakeholder analysis, context analysis, stakeholder engagement and idea reframing.

This is one of the key innovations of our approach, and one of the major Traces's insights for SISCODE general understanding of co-creation.

The outcome of this phase was the framing of the problem, as well as the identification of the five main communities to be involved and their most relevant representatives to engage (see above: Section 3.2).

#### **4.10.4.2 Reframing of the problem**

The later stages of the “science of choice” phase started reframing the challenge. In fact, in addition to open and collaborative events, more targeted events were organised as well as one specific workshop, involving the key communities identified: science, art, culture and policy making. This workshop, which included an open-lab day and was organised before a public event, embedded the various inputs collected and allowed to explore different angles under which to tackle the general issue of empowering people with respect to AI.

It became apparent that most efforts to explore AI in our life revolved around two approaches: AI as subject of cultural and educational activities or AI as tool for cultural and

educational activities. That is: about AI or using AI. What was missing was cultural and educational activities for AI. In order to fulfil our general objective, that is, increasing the transparency and intelligibility of IA for the end users, it was necessary to operate a paradigm shift: it was essential to explore AI as a target group for cultural and educational activities.

After the idea was reframed, Traces's team used the opportunity of two workshops scheduled at the Caen "living lab festival TURFU" ([www.turfu-festival.fr](http://www.turfu-festival.fr)) to test the approach and enrich it. A participatory workshop was designed involving scientists, facilitators, and two groups of 25 people, mainly students 18-20 years old. Through a series of steps, involving an exploration of personal experience with AI in daily life, a direct experience of machine learning mechanisms, and a creative brainstorming, an "ideal library for algorithms" was built. In fact, before starting the big step of creating a cultural product with algorithms as a target group, we wanted ourselves and the young people to ask this question: "since we now know that algorithms are listening to what we do, what do we want to tell them?". This ideal library took the form of a graphically appealing representation of books, films and TV series, paintings, political slogans and music. In itself an interesting exploration, this ideal library was to be used as a boundary object to define the subsequent steps of the journey.

#### **4.10.4.3 Envisioning of alternatives**

The Turfu festival represented the turning point to start the prototyping sequence, of which the first step was to translate the redefined and now content-rich idea into a challenge that the team could be able to prototype. For this phase, it was decided to stabilize the co-design team, trying to have a group of people committed to move together until the end of the journey.

At this stage, it has become clear that the prototype desired to be developed was a rich and generative situation that would allow the lab to increase their understanding of the topic, by being staged and analysed by different participants in the co-creation process. The first of this workshop held on 27th of January 2020 was devoted to exploring and characterizing the situation that stakeholders wanted to describe. By using an approach inspired by the service design blueprint, different potential bifurcations were explored, and led to the choice of thinking of AI as co-spectators, accompanied by human spectators, and using this co-spectatorship as the actual prototype of the lab, following the prototype driven approach to co-creation.

The lab conceived the co-design team as a group of persons committed to take part in at least 2 or 3 workshops, and with a specific interest in the topic. About 10 people are part of this "core group". Other people participated in single workshops, but were also extremely productive in their contributions, and allowed to enlarge the spectrum of interests in the topic.

Among the active participants, it is worth mentioning the following profiles:

- Axel Meunier, a student starting a doctorate in design and member of the MediaLab, was interested in SISCODE actions as field study. He participated in all prototyping workshops, and his contribution was essential to frame the notion of co-spectatorship.
- Baptiste Caramiaux et Teo Sanchez, two researchers on IA and deep learning, interested in the workshop to understand the reactions of people participating in machine training.
- Sylvie Tissot and collectif DataDADA, an art group exploring artificial intelligence through art performances.
- Robert de Barretin, the AI developed by the [Datadada collective](#), who participated in two prototyping workshops, playing his own role.
- Armelle Rancillac, a curious and amused neuroscientist and science fiction writer.
- Claudia Aguirre and Clara Belloc, two science educators working for a science centre (Exploradôme) and an association (L'arbre des connaissances) in Paris, developing exhibits and serious games on AI.
- François Millet, organizer of the TURFU Living Lab festival.
- Gaëlle de Naurois and her assistant Amaury Demenat, the person in charge of scientific culture in the Ile-de-France Region.

The team was extremely happy with this heterogenous and committed group of people, that could span all the different angles needed to explore the challenge. Also, each of them carries a very specific professional and/or personal agenda, that will be satisfied in ways that are different, and possibly divergent, from the ones of Traces and SISCODE. For Traces, this is a great measure of success for the co-design approach (see above: Section 3).

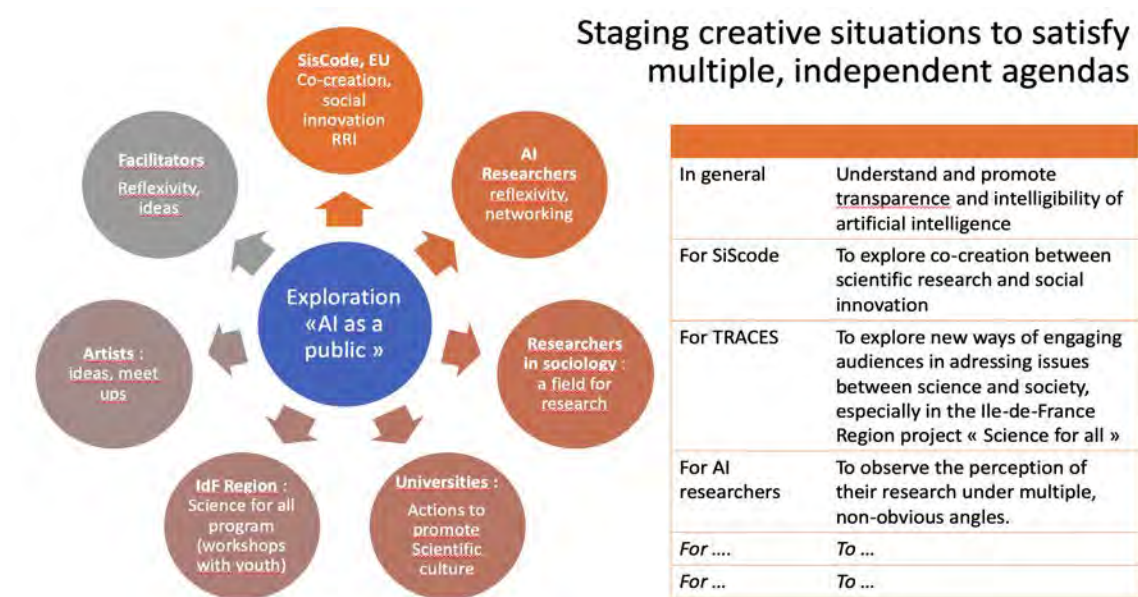


Fig 4.10.4: Objectives of the prototype for various stakeholders

#### 4.10.4.4 Development and prototyping

For the prototyping phases, a series of events/performances was planned in which artificial intelligence interfaces and real people would have been spectators together. Each event was intended to test the reactions of the audiences and refine the service blueprint prototype. Due to Covid-19 restrictions, some of the activities were adapted. The lab was nevertheless able to organise 3 events:

1. Hamlet in the gym with MTV @Maison de Metallos, Paris: AI and humans co-spectators of a theatre play
2. Robert in Zoom: participating to a Zoom meeting with an AI / machine learning as a show
3. Accompanying AI to visit a science festival @TURFU festival, Caen: visitors accompany AI conceived as a support for visually impaired persons to see the *tiers lieu* and a science festival.

##### Hamlet in the Gym with MTV

On March 10 2020, a workshop was organised in a well-known theatre and cultural venue in Paris, la Maison des Métallos. Participants from various fields (art, engineering, scientific facilitation and communication, research) experienced a situation of co-spectatorship with artificial agents.

Axel Meunier, who participated in the workshop as part of his PhD work, described the workshop with these words: “We are trying to pay attention to the moments of suspension when machines that can hear and see cease to be tools. When we stop being users. When we become public together.”

In concrete terms, a short performance was staged, “[Hamlet in the Gym with MTV](#)”. In an extremely simple setting enriched with objects that can be found in a gym, an actor dictates to his smartphone the famous monologue of Hamlet. Each of the spectators decided to accompany an Artificial Intelligence to see this show. Following the previous workshop decisions, AI were not the unique spectators, nor were they our “assistants” as they are normally conceived. They were literally brought to the show by us human spectators. The participants as humans were their chaperons. Axel Meunier called this experience co-spectatorship, a perfect description of the situation.

The AI participating in the show were the public domain apps SeeingAI, GoogleLens, Yolo, Camfind, Ava, Voice translator, Teachablemachine, Notes, and Robert de Barretin, an artificial intelligence developed by the collective DataDADA.

Each of the AI, as each of their chaperon, reflected a different perception of the play: some app just transcribed the text, other translated it in real time, other were taking pictures of the show to recognise the objects, other were suggesting shopping choices based on the actor outfit, others were trained to recognise the posture of the actor. Beside producing an

extremely energetic and creative cacophony (AI don't know how to remain silent during a theatre performance), the data generated were of extreme richness.

A preliminary analysis conducted by Axel Meunier showed many interesting features that were summarised in the various outcomes of the workshops.

For example, a fluid approach to gender: by privileging simple color codes with respect to evident anatomical characteristics of the person observed (for example, Google lens often “saw” a woman when the actor was lying on a pink mat, and a male when he was lying on a blue mat).

Visual AIs perceived subtle differences that projected a stable situation – a guy on a yoga mat – in very different contexts, such as the world of fitness, or the world of fashion.

Details appearing unimportant to their chaperone, were essential for the accompanied AI. For example, details referring to valuable shopping propositions were relevant for apps designed to promote and facilitate shopping. This is obvious, but it is extremely powerful to clarify that AIs are not there to assist us, but rather to pursue specific, autonomous tasks while they assist us.

The chain of automatic translation of voice recognition, transcription for audio impaired, and language translators generated extremely poetic variations of the original text, reflecting on one side the lack of precisions of AI, and on the other a form of adaptation to the needs of the chaperon.

Surprisingly enough, in the translation chain, the original text came back : “Rever, peut etre” (pronounced in French by the actor) was translated with “perchance to dream”, revealing that the translation made use of the AI data-base, a sort of “reference culture”, obviously non neutral and revealing a sort of “education level” of the AI.

This list could continue beyond the scope of this case study report. What is important is that the situation that has been collectively set up allowed the team to generate an explosion of insights and understandings of many non-trivial aspects concerning our relationship with AI. Insights that will inform and enrich each of the participants’ professional practices, in many different ways.

The videos and the dataset generated by the performance was stored, and edited in synthetic form in a Prezi presentation, that can now be used as ignitors for similar activities.

[Here is a narrative](#) about what came out from the co-spectators' experience of [Hamlet in the Gym with MTV](#).

#### **Robert de Barratin on Zoom**

A second, similar workshop was originally planned to refine the solution, but the Covid-19 crisis required to make a sidestep, and cross the original exploration with the specific conditions of working and socializing that characterised the lockdown.



Two reasons influenced the choice of the content of the following workshop: first, during the lockdown, people were all participating in situations in which AI would have felt “at home”, that is, videoconferences; second, the process of machine learning, when humans categorize choices to train machines, is a crucial aspect that can be put at the core of the process.

Then, it was decided to organise a co-creation workshop in which the co-creation group would have questioned machine learning as a show.

By taking advantage of the artificial co-design team member Robert de Barattin, Traces devised a workshop intended to explore the impact of the presence of an artificial agent among the participants to a zoom meeting, and test if they were able to influence Robert behaviour in the meeting.

In concrete terms, the workshop included a moment of small group discussion, during which participants were asked to tell anecdotes about their zoom meeting experience, disturbed by the presence of Robert (the AI) as one of the discussants. This was followed by an attempt to train Robert to react to specific conditions performed by the participants: for example, emitting rooster crowing when all participants were showing something red on their camera.

Although not everything went as planned, the workshop highlighted many interesting aspects that remained invisible until then: why didn't everything go as planned? Because in this highly creative setting, adaptation skills are essential, to follow the flow of the creative process. In an online context, adaptation margins are reduced, communication among facilitators diminished: in other words, it was impossible to steer the workshop in order to accommodate deviation from prediction and harness counterintuitive events.

So, the initial intention to train Robert to recognise zoom bombing – non-welcomed participants at the meeting – could not be achieved, missing a key element of the planned exploration. However, many interesting aspects (and a seriously fun moment) emerged, allowing to adjust the protocol of the following event.

### **AI chaperons at a science festival**

One year after the first workshop at the 2019 TURFU festival, the team went back with an advanced prototype of co-spectatorship.

The protocol was simple: visitors of the TURFU living lab and science festival were asked to accompany AI interfaces originally conceived to assist visually impaired persons, and question what they perceived, together, of the festival.

The situation was extremely juicy, and generated many advancements in our co-creation journey thanks to reactions, suggestions, and insights of the more than 60 people participating in the various workshops organised on the 9th and 10th October.

The fact of equipping non-blind visitors with AI interfaces for the blind, and asking them to visit together the spaces and the events, was a way to discuss the presence of IA in our life, their limits, but also the modification of our perception of a cultural event when recognising that IA were also participants to this observation.

Visitors collected outputs of two applications, *Seeing AI and Sullivan*, shared them collectively and discussed the experience. Adding a moment of collective exploration of machine learning mechanisms through the Teachable Machine application allowed all participants to have a strong, emotional and at the same time critical and constructive experience of sharing a cultural experience with an AI, and thus of the intelligibility and transparency of the presence of AI in our lives. In other words, the event acted as a validation of the protocol/prototype.

#### **4.10.4.5 The role of policies and policy maker engagement**

Following the general approach described in section 3.1, our objective is to produce a situation that has an impact through influence. Concerning policy makers, this means that their engagement in the co-creation process should have the effect to widen their understanding of the issue.

The key policy makers identified were the Ile-de-France Region (in France, science and technology culture is among the institutional competences of the regions), the Town of Paris, and the university and research leaders.

Concerning the Ile-de-France Region, the strategy was very successful: the persons in charge of research and scientific culture participated in several events, expressed high appreciation for the approach, and enlarged their views on public perception of AI and how to promote it. This engagement led to the funding of a follow up of the SISCODE challenge, to involve specifically high school students in the period October 2020 – June 2021.

Concerning the town of Paris, the involvement was mostly passive: while expressing interest in Traces's exploration, the lab did not obtain a real participation or appropriation of the challenge from them.

Concerning research policy makers, according to the general approach described in section 3.1, it was accepted that our respective interests can be different, but still mutually enriching. In fact, it appears that in most cases they accept to participate in order to develop effective outreach tools, rather than to explore the benefits of co-creation for deeper understanding of AI in the social sphere. In a sort of "Trojan horse" strategy, it could be considered as a useful collaboration that will provide strong, although hardly measurable, impact in the medium term.

### **4.10.5 Status of the solution**

#### **4.10.5.1 Concept**

The outcome of the exploration – "the solution" – is a procedure to support an audience to engage with AI in a live cultural event, thus enabling them to discover the way we can live this co-spectatorship. Through this experience, Traces offers ways of informing various communities of artists, science facilitators, activists, researchers and policy makers on

innovative ways of exploring this issue of co-spectatorship among human beings and artificial agents.

This procedure has been and will be tested in several settings and has the objective to inspire the stakeholders categories identified in section 3.2 to enrich their way of treating the AI-human relations.

In very simple terms, the procedure implies assuming a reverse role (identifying ourselves as chaperon of AI to a cultural event), observing a cultural event together with the AI, and analyse how the AI “perceives” the same event.

Three tests were conducted to test and refine the protocol (see above).

The procedure cannot be reduced to a protocol, as it is a live performance that needs to be adapted to each specific situation, implies a creative and imaginative way to take the AI to the show, and is expected to produce mostly unexpected results.

Having said that, a service design blueprint of the activity would look somehow as follows.

1. Analyse the setting of the cultural activity
  - a. Online/offline
  - b. Main communication media used (sound, writing, text, images...)
  - c. Physical configuration (collective/individual, clear division between spectators and performers, etc.) and timing (start-end/continuous, few minutes or several days, etc.)
  - d. Motivation and purpose of the cultural activity
  - e. Motivation and purpose of the human participants
  - f. Other
2. Identify relevant AI that need to be accompanied to the cultural activity
  - a. Interfaces (smartphone, computer, sensors, etc.)
  - b. Type of data produced (text, images, shopping lists, etc.)
  - c. Availability (free, freemium, paid, with registration, etc.)
  - d. Motivation and purpose of the chosen AI (aid for visually unpaired persons, commercial pressure, data collection, research on AI, etc.)
  - e. Other
3. Analyse ethical and technical feasibility
  - a. Evaluate technical compatibility and acceptability of the presence of accompanied AI (interference with the show, visibility of the artificial participants, etc.)
  - b. Evaluate ethical compatibility (use of personal data, mix of agendas, etc.)
  - c. Evaluate costs, needed personnel, etc.
  - d. Definition of a “Altiquette” specific for each setting (AI interfaces should or should not produce sound, AI interfaces should/shouldn’t be declared and/or visible, etc.)
  - e. Other
4. Equip human participants with AI
  - a. Organizers provide a device vs participant use their own device
  - b. Participants use AI in their own name vs on organizers’ name

- c. Take care of practical technical issues (help participants download apps, provide interfaces, have predefined accounts, etc.)
  - d. Other
- 5. ACTION: Take the AI to the cultural activity or performance
  - a. Define (if needed) requirements for the chaperon (AI always on, AI activated on pre-defined moments, etc.)
  - b. Define (if needed) a beginning and an end for the participation of the AI
  - c. Organisers keep track of accompanying participants and AI participating to the event
  - d. Other
- 6. Collect feedback/data from AI and participants
  - a. Set up a data collection system (collaborative board, dropbox/gdrive folder, etc.)
  - b. Facilitate participants to feed in the data collection system
  - c. Organise AI data and connect them with the cultural activity / performance
  - d. Provide questionnaire / interviews with human participants
- 7. Analyse and restitute collected data
  - a. Imagine a format for restitution (Prezi, exhibition, short film, data representation, etc.)
  - b. Organise collected data with such format
  - c. Imagine a situation for restitution (online, live events, within the original event/after the event, 1 day later or 1 year later).

#### 4.10.5.2 Sustainability strategy

From the beginning of the project Traces adapted a very precise strategy concerning sustainability. This consists in interpreting “sustainability” as the continuous, long term change produced in engaged stakeholders. According to this approach, the product or the idea or the prototype do not need to be sustainable. It is their impact that needs to be sustainable.

This is clearly linked to the generative approach to co-creation adopted by Traces (see above-Section 3.1).

Sustainability strategy involves thus two separate aspects: the application by our own institution of the outcome of the prototyping process; the consequences on the practices, visions, understandings of all other participants and stakeholders. The first aspect is measurable and controllable. The second aspect, by far the more important and truly linked with the impact that the overall co-creation journey sought to obtain, poses many problems in terms of assessment and follow-up.

For the first aspect (impact controlled by Traces), beside the organisational learning and change induced by SISCODE (see above - Section 6.1), the strategy consisted in enriching Traces offer with issues related to artificial intelligence in general culture. Strategically, this involves embedding and applying in future projects co-design and co-creation approaches,

and the understanding of “blind-spot” in interpreting public perceptions of AI obtained thanks to the SISCODE prototyping journey.

The value of this strategy is clearly confirmed by the funding of the project “Young people as educators of algorithms” by the Ile-de-France Region, supporting the application of the prototype learning to a series of activities with high school students. Such activities will make use of the learning acquired, they will involve students as participants of a co-creation process rather than as “target groups”, and will be observed by policy makers as innovative, potentially change-making ways to treat the topic.

For the second aspect, more questions than answers were raised.

The sustainability strategy is simple: ensuring that the situation proposed in the workshops is “rich & juicy” enough to produce a progressive change in the way workshop participants and other stakeholders conceive the issue of AI in culture and society. This impact, according to the team, would be the true measure of the change produced, that might last longer and have a deeper effect than the prototype itself.

The question then is: how do we measure this impact? What is the time span to observe? How to identify common indicators, since the impact on each stakeholder might be of very different types? How do we go beyond the purely anecdotal report of the reactions of the participants? How to spot if the participants were indeed influenced by the prototype in their subsequent choice, given that the participation in the prototyping will surely not be the only agent of change, but just one of several driving forces?

As for now, the journey's analysis will rely on personal exchanges with participants, possibly for a year or so, in order to collect narrative experience. However, a more systematic and solid approach is needed, and this might be an open question for the final phases of the SISCODE project.

## **4.10.6 Transformations triggered and outcomes**

### **4.10.6.1 Organisational transformation**

Our organisation was deeply influenced by the project, and this at several levels.

First of all, the team acquired a deeper understanding of co-creation processes. This helped sometimes to test new approaches, but also helped to make sense of what has been already initiated but not fully understood practices. In other words, together with the introduction of new practices, the level of self-consciousness and reflexivity of the organisation was clearly enhanced through a variety of subjects (artists, researchers in design, policy makers, etc.), with a direct impact on Traces's networking capacity. This can also be measured in terms of the internal appreciation of the value of such collaborations.

Thirdly, the lab acquired competences that are directly enhancing the credibility of the organisation, both concerning the content (AI in social context) and the form (co-creation). This is easily recognisable in success such as the funding of a continuation of the project at

Regional level, or the participation in a EU project applying living lab methodology to open schooling (SALL).

#### **4.10.6.2 Transformations in the ecosystem**

Since the events occurred a few weeks before finishing this report, and since a cultural approach was adopted to social innovation and impact through influence, as defined in the first part of the report, transformations in the ecosystem are mainly expected to occur in the medium to long term. Although objective measures are difficult to collect, a raise of attention to alternative ways to explore intelligibility and transparency of AI and AI interfaces was clearly observable in representatives of the key stakeholder categories of the journey (see above). In fact, they moved from a curious but doubtful observation of our moves to a full understanding of the potential of the approach.

#### **4.10.7 Conclusive reflections**

The team still expects to work on deeper analysis of the last phases of the project. Nevertheless, a number of critical, interesting issues could be anticipated:

- The journey offered many unexpected and extremely rewarding creative turns, thanks to the participation of a very diverse group of people to the co-design process: from a quite standard first enunciation of the challenge, a truly innovative and non-standard solution emerged. This is considered as a genuine proof of the power of co-creation.
- Making the approach understandable was a challenge in itself, both within the SISCODE consortium and with respect to some of the stakeholders. These difficulties in understanding allowed a reflection on the process, and identified one of the critical issues on the different roles that a prototype can have in a co-creation process: a terminology to clarify this was proposed – a generative model (the one adopted by Traces) vs a collaborative mode.
- Adopting the generative mode presents several difficulties in terms of clarity and concreteness of the outcome. On the other end, it allows to treat each stakeholder differently in terms of the impact and the change generated. In this case the impact enhanced, yet less clearly measurable. This poses tricky but interesting questions to the SISCODE exploration of co-creation.
- Only a subset of the identified policymakers were actively engaged in the process. As for the other (scientists, town representative, potentially industry representative) Traces will observe the medium term impact, in particular after completion of the journey (Decembre 2020) and finalisation of the follow up project funded by the Ile-de-France Region (Mai 2021).

-



### 4.10.8 References and Acknowledgements

Traces acknowledge the following participants to one or more of the Science du choix and AI spectatrices events, as each one of them contributed – with one insight or with days of work – to the shaping of this long journey.

- François-Louis Pelissier, Youtuber, F-L Reptile
- Christophe Rodo, Youtuber, La tête dans le cerveau
- Battle Karimi, Youtuber, Les poissons n'existent pas
- Hugo Le Chevalier, Youtuber, Ad Naturam
- Alice Thomas, Youtuber, Alice au pays des étoiles
- Emilien Cornillon, doctorate in computer science and science facilitator at Palais de la Découverte "Comment conserver des données"
- Florian Gouthière, Youtuber, Curiologie
- Claire Mathieu, doctorate in computer science and mathematics, research director at CNRS (Centre National de la Recherche Scientifique) in Paris, France
- Jean-Baptiste Guillon, Métaphysique et Philosophie de la connaissance au Collège de France
- Nathalie Labrousse, Doctorante en science de l'éducation à l'Université Paris Descartes
- Armelle Rancillac, author and neuroscientist at Collège de France
- David Gruson, fondateur de l'initiative Ethik-IA, membre de la Chaire santé de Sciences Po
- François Pellegrini, professeur à l'Université de Bordeaux, chercheur au LaBRI, commissaire à la Commission nationale de l'informatique et des libertés (CNIL) et président du pôle de compétences Aquinetic.
- Mathieu Bouthors, président de HackerzVoice, collectif organisant la Nuit du Hack
- François Millet, Living Lab manager, le Dôme, Caen
- Thalia Mambu, science facilitator and SISCODE project assistant at TRACES
- Paul Boniface, head of science facilitation at TRACES
- Clémentine Bricout, science facilitator and project manager at TRACES
- Alejandro Van Zandt-Escobar, E-Fabrik project coordinator at TRACES
- Claire Girard and Pauline du Chatelle, communications département at TRACES
- Aurore Bourdon, Lindy Petit, Manon Gaunet, Camille Lejollot, Maud Vardon, Etienne Feldbrugge, Floriane Surai, Bastien Lesachey, isabelle Rousseau, Arthur Leruey, Lucie Le Goff, Jehanne Ferreira, Marion Lemercier, Marine Allardin, Chaima Masloh, students at IRTS Caen
- Olga Weil-Flachat, Jade Poret, Emma Balaa King Obama, students at Science Politiques
- Marion Nigris, Manon Hubert, Romane Couapel, Clément Lecamus, Mathieu Lefèvre, Quentin Montcornet de Caumont, Nicolas Gullient, Baptiste Jamin, Yolène Gradwohl, Julien Boissel, Anouk Mace, students at STAPS
- Lisa Lélouard, Yvan lebecet, Sasha Barruiso, Clémentine Perrocheau, students at ESPE
- Pierre Le Dreff, Aurelia Mohier, master students GREEN
- Tommaso Venturini, CNRS, Centre Internet et société

- Séverine Trouilloud, Université de Lausanne - Service culture et médiation scientifique - L'éprouvette, laboratoire public
- Kensa Traore, ENSCI-LES ATELIERS
- Daniele Cannarsa, researcher in mathematics at Université Paris 7 - Diderot - Clara Jacquemoud, student in DSAA design interactif au Lycée Léonard de Vinci de Villefontaine
- Maria Castaldo, researcher at CIS Centre Internet et Société
- Julien Sipra, journalist
- Odile Flament
- Armelle Rancillac, neurobiologist, Collège de France
- Gérald Maillet, comedian at Théâtre de la Ville
- Alice Magdalena, comedian at Théâtre de la Ville
- Gaëlle de Naurois, head of Research and scientific culture at Region Ile de France
- Amaury Demenat, Ile-de-France Region
- Christelle Berdier, Ile-de-France Region
- Sophie Zuber, in charge of science culture at the Town of Paris.
- Rafael Carosi, artist
- Laurent Mertz, Phd candidate at Co-design Lab
- Baptiste Caramiaux, researcher at LRI in computer science
- Téo Sanchez, researcher at LRI in computer science
- Thierry Marcou, FING

**Summary of SISCODE events taking place during the exhibition “Under influences : the science of choice”.**

17/01/2019 - Science café "Celebrating data" with 7 mini-conferences from subjects from Big space datas to Neuromyths

22/01/2019 - Conference-reaction on "Medecine, algorithms and responsibility"

07/02/2019 - Ill-fated tribunal on “autonomous cars”

14/02/2019 – Moving debate “Valentine Day special” on algorithms and the choice of a partner

21/02/2019 - Launch of exhibition with several mini-conferences by youtubers

12/03/2019 - Moving debate "Does Free will exist?"

04/04/2019 - Ill-fated tribunal "Will AI dominate the world?"

23/05/2019 - Round table and informal debate during a "RGPD night”

## **5. Dissemination and relation with other WP's**

### **5.1 Further dissemination**

All the cases described previously include a variety of insights and learnings related to the operationalisation of RRI in specific contexts conducting real-life experimentations. While the preceding deliverable focused on the specific outcomes of the journeys, the prototypes (D3.3), this document encloses wider reflections and knowledge gathered that could be of value also for other practitioners in similar contexts or fields.

The experimentation itself and the included peer-to-peer learning and exchange among the labs shed light on the importance of those kinds of activities. Even groups working in very diverse contexts were able to profit from best practices and experiences of each other. This insight leads to a broader reflection to share the concrete outputs, outcomes and reflections in relation to the specific cases and contexts to a broader public to be uptaken eventually also by other practitioners.

The iteration of the prototyping process over a longer period combined with monitoring and evaluation lead to a variety of precious insights on constraints, how to cope with them and unexpected opportunities coming up during the co-creation journey. The illustration as case studies shall emphasize this aspect producing learning outcomes both for policy makers, interested stakeholders and other practitioners.

### **Book publication**

To sufficiently address this wider public and facilitate the dissemination among the newly defined target group, an alternative publication of these cases has been planned as a book of case studies which is currently under development.

The book is planned to be structured starting from a more general view on the shift of actors' and stakeholders' role in science and innovation and the need to include new forms of public engagement into STI policy making. In the light of public engagement and co-creation as means to operationalise RRI, SISCODE's learning framework and experimentation methodology is presented. Following this overview on SISCODE the specific methodology applied for the lab's experimentation is described as well as the use of case studies as a methodology of research and dissemination. Subsequently, all 10 labs present a synthetic version of their case as contained in this document followed by a concluding chapter containing a comparative analysis and broader reflection on the experimentation in general.

The volume therefore will present a detailed and critical analysis of the co-design processes activated in the 10 labs being part of SISCODE and that have tackled societal challenges across Europe setting the single cases into a greater context defining the pilot's policy framework.

### **Translation in local languages**

Apart from the various materials disseminated in English, it is also planned to translate the single cases in the local languages as well to serve directly their context of origin adding an additional layer of specificity and insights.

## 5.2 Connection with other WP's

Being one of the core activities of SISCODE, labs' experimentation and therefore also the case studies describing them in this deliverable are closely connected to all the other work packages.

The whole reasoning of the experimentation is closely related to what has been found during the analysis of RRI approaches and methodologies in **WP1**.

There's a direct interconnection especially with the playground for policymaking developed in **WP4** since it is based on the experiences made throughout the experimentation. Also, the labs as partners did conduct policy maker workshops as both as part of the work for WP4 and of their own journey.

Furthermore, the case studies on already existing initiatives written for **WP2** dedicated to the benchmark analysis and the comparison of co-creation cases across Europe are to be examined under the reasoning of **WP5** to be then triangulated with the experimentation conducted within SISCODE to not only enrich the model of co-creation ecosystems developed but also to progressively explore it transforming it from a static model into a dynamic one.

The exploitation strategy in **WP6** encloses both the creation of a sustainability strategy for each of the experimentations illustrated in the single cases enclosed in this document as well as the overall exploitation of the outcomes and impacts. The exploitation plan is closely connected also to the dissemination activities in **WP7**. Throughout their journeys, all labs have regularly posted updates both on SISCODE's website and their social media channels also keeping track of the amount of people reached with their activities.

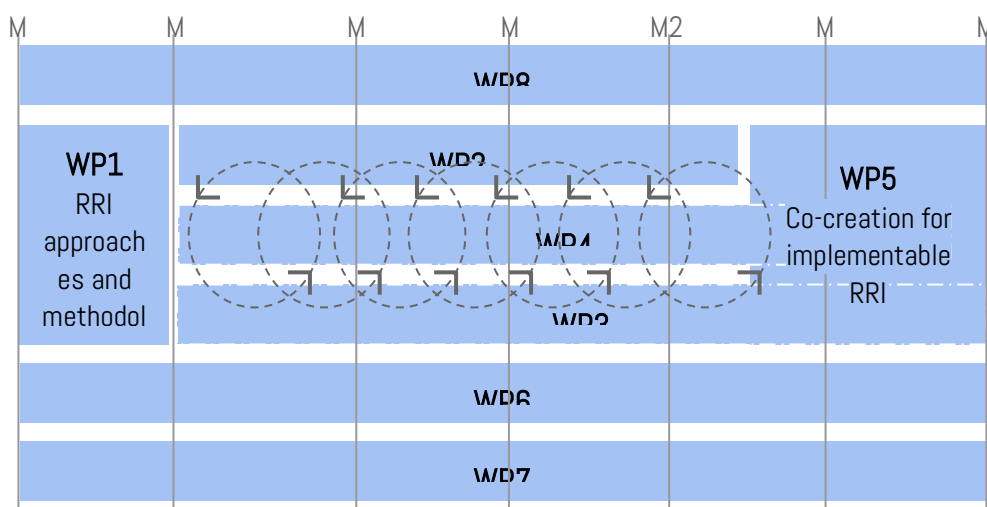


Fig 5.1: Interconnection of work packages in SISCODE

## 6. Conclusions

This dense document is aimed at describing the complexity of the experimentation and provides insights into co-creation processes at a very high level of detail. It does not aim to be and cannot be exhaustive but permits to build a rich picture of the processes and to enter in the intimacy of our 10 co-creation ecosystems. Each case-study was written by the ambassadors of the co-creation journeys, bringing their own styles and individual ways of telling the stories as well as their personal insights on the journey. This reflexive activity is at the core of the goals of the action-research process in the SISCODE project. As mentioned above, it was framed with a suggested common structure guiding the authors to think about various representations of their journey. It is worth taking time to read it and discover the thoughts of the authors, step by step. A lot of information can be extracted from what has been reported in the different case-studies.

Even if it is not the aim of this report to analyse all the contents produced, a first attempt of synthesis is proposed by the design of the four following tables, corresponding to different interpretations of co-creation processes and outcomes of the co-creation experimentation:

*Table 5.1* is synthesizing the journey of each lab following the approach of the SISCODE toolkit emphasizing the what - interconnections between challenge and solutions, the how-framing activities and iterations and the who - describing the main stakeholders involved.

*Table 5.2* is focused on the ecosystem approaches, synthesizing the main transformations identified at the micro, meso and macro level.

*Table 5.3* proposed a list of adaptations and visions from the Covid-19 situations.

*Table 5.4* proposed a list of both critical co-creation situations and good practices for better engaging, designing and scaling from the Lab's perspective.

Table 5.1: Synthesis of the co-creation journeys

Labs	Local challenges/Solutions	Design process	Stakeholders
IAAC Fab Lab Barcelona	Remix el Barrio, a Food Waste material making community in Barcelona	Co-design activities Iteration 1: 3 working groups Iteration 2: Remix El Barrio Assessment and Exhibition	Food stakeholders, local associations and entrepreneurs, designers
Polifactory	Body Sound, gaming platform for physical reactivation of childs	Targeted co-design activities: 3 iterations for BodySound, from specification, recording and demoweb platforms	Patient Associations, Family and children, designers
Maker	PIPO, ecosystem of plastic recycling in Copenhagen	Co-design activities Plastic sheets design (3 loops) Incubation of 9 cases Exhibition	Generators, Processors, producers, designers, university
KTP	Co-designing an Air Protection Programme and	Two parallel processes: APP: public consultation with 6	Policy Makers (region),

	a monitoring industrial air pollution platform	workshops and reviews Platform: 3 iterations from the Hackathon, testing	companies, citizens, associations
PA4ALL	Promoting ICT and precision agricultures with a new curriculum for highschoools	Exploratory activities 1st loop: sessions with meteostations in 1 high school 2nd loop workshop (october)	High school, farmers, researchers, and policy maker
ThessAHALL	Partners of Experience, a new life-long learning programme for older adults	Co-design activities Programme with 3 research groups Two moments of assessment e-coffee sessions	Older adults, researchers and policy makers
Ciência Viva	A learning and engagement module to reinforce the access to the river	Co-design activities Iteration on the blueprint mock-up design Final event of assessment	Teachers, students, schools, nautic centers, local association
Cube	A Co-design canvas for co-creation processes between policy makers and citizens	*Co-design activities *Design and 2 iterations of the canvas with Ransdaal municipality	Local citizens, policy makers, associations
SGD	Open Mind is an educational module for teachers to support the well-being of young people in schools	Co-design activities 1st iteration with 4 schools Redesign 2nd iteration ongoing Teacher's guide last version	Young people, schools, teachers, policy makers
Traces	Procedure to explore co-spectatorship among human beings and artificial agents.	Exploration phases Design workshops 3 prototyping workshops Living Lab Festival Testing	Researchers, artists, entrepreneurs, educators, policy makers

Table 5.2: Synthesis of the (potential) transformations in each ecosystem of co-creation.

Labs	Macro-Level	Meso-Level	Micro-level
Fab Lab BCN	Distributed Design Fab Cities, Citizen Science, Food sovereignty	From fab lab to innovation centre model and development of Fab City - community hub	Maturation of co-creation and circular design skills. New organisations in the lab and synergies with local communities
Polifactory	Decentralisation Italian Innovation Hub for healthcare Fab City	Recognised for their excellence in service and policy design, user-centred. Strengthen relationships putting theory in practices	Multidisciplinarity of the team. Integration of skills in IT and sociology. New experiences with childs and policy makers.
Maker	Fab City, Local Waste Management	Pushing “physical entrepreneurship” and “maker mindsets” in cities.	Diversification of co-creation practices Local influence of plastic



	Distributed Manufacturing	Legitimacy as local CE stakeholder with new BM	recycling practices (internal, companies, students)
KTP	Air Pollution in Poland, Citizen engagement and agency in policy making, Living Lab	Experienced Technological park within Living Lab approach, now acting as a BSO in supporting policy makers in co-creation and implementation of regional binding acts	A journey that permitted us to develop new practices and officialised a new team responsible for co-creation management recognised in KTP.
PA4ALL	Instability of Serbia, ICT development Precision Agriculture	Technical Institute specialised in the development of precision agriculture tools and its acceptability in society.	New strategy to involve and engage stakeholders and better acceptance of co-creation. New tools created and bridges towards other projects
ThessAHALL	Social discrimination and the cultural stigma of ageing at a national level	Experimented Living Lab specialised in Active and Healthy Aging, with a new service dedicated to older adults.	New knowledge and skills for the systematisation of its co-creation activities A Panel Management tool to better organise stakeholder relationships
CV	Ocean research and governance, uses of the ocean, ocean advocacy and education, Land occupations	Part of wide networks of science centres, Pavilion of Knowledge is involved in participatory processes with the school community, researchers, the public, policymakers, NGOs, business, artists	CV has made the first step towards co-creation, extending their panel of intervention by co-creation skills, testing many methods and tools, and diffusing them in other events.
Cube	Limburg's Population shrinking and ageing, From Welfare toward participation society	From a physical external lab to a more integrated pop-up Lab inside the Museumplein Limburg, Cube remains a mature design centres who has diversifying its practices towards social design project	Labs benefitted from Cube's experience, while the lab could extend their skills for using empathy, analyse the different roles of stakeholders, and better manage their expectations
SGD	Irish Mental Health Management system Young people voice in policy making	SGD is part of a large network targeting 15-25-year olds. Build a new community empowerment programme from youth advisors, mediators to leonardos.	Formalization of co-creation from the internal team to the more global communities of Science Galleries and other EU projects. The Open Mind Programme is now diffused nationally.
Traces	AI intelligibility GRPD law Controversies	Traces is strongly engaged in Science Engagement Community and now experiments with co-creation to generate new exploratory processes with stakeholders	The Labs bring their original creativity to the SISCODE approach and tools while acquiring a deeper understanding of other dimensions of the co-creation processes

Table 5.3: List of best practices of adaptation from Covid-19's situations in each Lab.

Labs	Covid-19's adjustments and original practices
Fab Lab BCN	Regular online peer learning sessions. Creation of Remix El Barrio online conversations, use of interactive tools, online tutorial making.
Polifactory	Prototyping remotely. Change of technologies to be accessible online and to more users. (PoseNet)
Maker	Actively engaged in local production for Covid-19's first necessities. Postpone prototyping and setting up of online exhibitions
KTP	Online activities or meetings adjusted to safety restrictions. More complex and time consuming to access data and gather feedbacks
PA4ALL	Postponement of precision agriculture activities. Engagement through social media and online communication platforms
ThessAHALL	Real difficulties due to social distancing and low digital skills of older adults. Success in organising a series of e-coffee phone group calls with homework.
CV	Internal development of skills for online co-creation activities. Cultural centres need a strategy for post-pandemic recovery of social distancing.
Cube	Use of online co-creation tools (MIRO, Padlet and Microsoft Teams) for testing the canvas
SGD	Rescheduling of activities for September. The SGD team adapted the OPEN MIND programme to create an online mental health resource.
Traces	Using online tools to set up a workshop "Robert in Zoom", sort of dialogs between human and AI/Machine learning.

Table 5.4: Challenges and inspiring practices for co-creation

	Engaging	Organizing /designing	Scaling
<b>Barriers and critical situations</b>	<ul style="list-style-type: none"> <li>*Fear of losing ownership of solutions</li> <li>*Lack of representativity</li> <li>*Online stigmatisation and inequalities</li> <li>*Lack of Fair Retribution in co-creation</li> <li>*Lack of interests/beliefs in co-creation</li> </ul>	<ul style="list-style-type: none"> <li>*Complexity of planning with existing infrastructures</li> <li>*Managing individual versus collective efforts and values</li> <li>*Managing divergences of interests</li> <li>*Segmentation of activities vs rich pictures</li> <li>*Guiding people with open ended process without well-defined destination</li> </ul>	<ul style="list-style-type: none"> <li>*Costs of investments</li> <li>*Coherence of calendars</li> <li>*Limit of actions due to national or EU legal legislation</li> <li>*Cultural differences for replication</li> <li>*Lack of agility of some institutions</li> <li>*Lack of comprehension of some approaches</li> </ul>
<b>Inspiring practices and new concepts</b>	<ul style="list-style-type: none"> <li>*Create an exhibition to engage</li> <li>*Select the places in adequation with your target</li> <li>*Use techniques to support solidarity and <b>cross-pollination of knowledge</b></li> <li>*Act with perseverance and as a value-keeper</li> <li>*Vulnerability oblige to create private moments to build trusts</li> <li>*Dare to be informal</li> <li>*Listen and dialogue</li> <li>*Offer a continuous communication to your panel</li> <li>*Showcase co-creation best practices to</li> <li>*overcome entry barriers.</li> <li>*Relinquish institutional ego before commencing the co-creation process could be central to the collaborative process.</li> </ul>	<ul style="list-style-type: none"> <li>*Customise canvases, tools, original workshop formats</li> <li>*Diversify facilitation bringing mediators, gurus, timekeepers, designers on the table</li> <li>*Build moments to share, make and reflect</li> <li>*Respect commitments by paying attention to times and spaces and informed participants</li> <li>*Adopting the metaphor of <b>hermeneutic circle</b> to navigate in and plan the process</li> <li>*Mindset and attitude of the stakeholders is much more relevant than the selection of tools. Tools are of no use if there is a lack of respect, empathy and equality.</li> <li>*Choose to opt for a <b>collaborative or generative</b> mode according to the intentions of the stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>*Connect with other initiatives and EU projects</li> <li>*Create ambassadors</li> <li>*Look at small changes and build upon it</li> <li>*Use SISCODE learning repository for building new training, programmes, projects.</li> <li>*Creating open source repository</li> <li>*Find funding for replicable projects locally, nationally or at the EU level.</li> <li>*Get back to first insights of co-creation processes to reflect on the path you have explored and see your own evolutions and perspectives</li> </ul>

Those preliminary elements of synthesis could serve as intermediary objects to further discussions and works, mainly for preparing the assessment report (D3.5) and follow on other work-in-progress activities to be conducted within WP5 and WP6.

This preliminary analysis clearly confirmed the high level of context-dependency of co-creation and the level of influence that the involved actors have on the overall process.

New learnings could also emerge from the analysis of the capacities of adaptation, action and innovation of the labs when facing external constraints such as the COVID-19 pandemic. The cases of Ciencia Viva and Thess-AHALL proved that the COVID-19 impact was dependant on the type of stakeholders involved, the core aims of the journey and the radicality of the restrictions imposed by the national government. Beyond local constraints, the creativity and perseverance of the labs have permitted to follow and sometimes originally shaped the co-creation process. The peer exchanges were crucial during this period, to avoid panic, overcome the obstacles and adjust the objectives and activities.

The experimentation also demonstrated that the main outputs of the journeys, the prototypes described in D3.3, are interesting objects of dialogue to foster changes and provoke new forms of interactions with different types of stakeholders on a broader level.

At the organisational and ecosystem level, those narratives are highlighting the *importance of not only focusing on the micro activities and effective design practices but also looking at the dynamic of such ecosystems and the impact that is generated.*

The labs and also their surrounding ecosystems attested to the gain of capacities related to co-creation at various levels. They mainly learned about how to better **engage stakeholders**, better **organize and facilitate co-creation** (from research, design, prototyping, to testing, from in-person to online practices), and finally better **anticipate, define and implement opportunities for replication and scaling** of the core outcomes of such journeys. Specific stories, tools, prototypes and outcomes created in the different journeys are to be extracted to collect good practices and feed the knowledge repository and contribute to the overall heritage of the SISCODE project.

Finally, interesting concepts have emerged from practices and need now to be investigated through further research activities. Among them, can be cited the metaphor of *hermeneutic circle* used by Gonalo Praa (Cincia Viva), the notion of *crosspollination of knowledge* elaborated by Anastasia Pistofidou (IAAC|Fab Lab Barcelona) and the reflection of Matteo Merzagora (Traces) on the relevance of a *more generative mode* of co-creation, that could guide the essence of certain forms of processes gathering stakeholders looking for designing autonomous trajectories of action while co-building an overall transformative and shared-value based ecosystem.

## 7. References and Acknowledgements

SISCODE (DOA) (2018). SISCODE's Description of Action.

SISCODE (D1.3) (2018). Theoretical framework and tools for understanding co-creation in contexts. SISCODE Deliverable 1.3

SISCODE (D2.2) (2020). Case Studies and Biographies Report. SISCODE Deliverable 2.2

SISCODE (D2.3) (2020). SISCODE Deliverable 2.3

SISCODE (D3.1) (2019). Co-creation journeys. SISCODE Deliverable 3.1

SISCODE (D3.2)(2019).Co-creation Labs: Solutions and Policies. SISCODE Deliverable 3.2

SISCODE (D3.3)(2020).Prototypes SISCODE Deliverable 3.3

SISCODE (D3.6). Dissemination plan in the co-creation labs. SISCODE Deliverable 3.6

Dorst, K. (2010). The nature of design thinking. In Design thinking research symposium. Kaletka, C.; Markmann, M., & Pelka, B. (2017). Peeling the Onion. An Exploration of the Layers of Social Innovation Ecosystems. Modelling a context sensitive perspective on driving and hindering factors for social innovation. In: European Public & Social Innovation Review 1(2), pp. 83-93.

Kolb, D. A. (1983). Experiential Learning: Experience as the Source of Learning and Development (1 edition). Englewood Cliffs, N.J: Prentice Hall.

Yin, R. K. (2014). Case Study Research: Design and Methods. 5th edition, London: Sage Publications.

We would like to thank all the authors for their times and contributions as well as all the various stakeholders involved in the different phases of the journeys.

A particular thanks to Marion Real, Felicitas Schmittinger, Anastasia Pistofidou and Milena Juarez Calvo, Asger Nørregård Rasmussen and Malte Hertz Janzen, Carla Sadini, Laura Cipriani, Mirko Gelsomini, Stefano Maffei, Massimo Bianchini, Agnieszka Włodarczyk, Monika Machowska, Aleksandra Gabriel, Isidora Stojacic, Evdokimos Konstantinidis, Despoina Mantziari, Despoina Petsani, Panos Bamidis, Gonçalo Praça and João Marques, Anja Köppchen and Gene Bertrand, Grace D'Arcy, Aude Ghilbert and Matteo Merzagora, Olga Glumac, Tedora Aibu, Alessandro Deserti, Francesca Rizzo.



Fig 4.6.1: Photo of the first interactive session between the Labs.

## Annex: template of the case studies

### General instructions

#### *How to prepare the draft for the case?*

Most material needed for the description of the case might already be at your disposal or easy to retrieve with a desk research within your organisation. If necessary, additional information can be retrieved conducting interviews to specific members of the organisation. It is not necessary to strictly stick to the template, but you can add any additional information or questions relevant for your case.

#### *How to write the actual case?*

A list of key points/questions is provided to guide the input for the various sections. However, the final result is supposed to be a fluid narration, structured in paragraphs, where the guiding questions disappear.

In the following the final structure that each case should follow is reported.

#### *Technical details*

Each case should contain a number of photos and eventually graphical representations.

There are rough indications for the length of every chapter, that may vary based on the specific case.

#### *General structure*

1. Synthesis of the pilot's journey
2. Initial context
  - 2.1. External context and ecosystem
  - 2.2. Organisational background
3. Challenge
4. The co-creation process of the envisioned solution
  - 4.1 Context analysis
  - 4.2 Problem framing
  - 4.3 Envisioning solutions
  - 4.4 Developing and prototyping
  - 4.5 The role of policies and policy maker engagement
5. The final solution
  - 5.1. Final concept
  - 5.2. Sustainability strategy
6. Transformations triggered and outcomes
7. Conclusive reflections
8. References



## 1. Synthesis of the pilot's journey

*Approx. word count: ~ 400*

This section should provide a brief overview on the core aspects of your organisation and of the journey that it has been going through with SISCODE

### 1.1 The organisation

- Name, location, activeness and/or duration,
- Place of origin and extent
- Key concept and characterization
- Key idea and scope
- Members
- Form of organisation, ways of financing
- Societal challenges addressed, cross-cutting themes adopted,
- Role of co-creation activities and the entity facilitating the process

### 1.2 The co-creation journey

- Background of the initiative
- Key idea and scope
- Duration and brief structure
- Members, participants
- Main output/Final solution

## 2. Initial context

*Approx. word count: ~ 600*

This section has the scope to depict the given context before the project initiative describing both the external and internal situation in the organisation.

It will also give more details on the contextual tensions/ reference problems that this case provides a solution for.

### 2.1 External context and ecosystem

- National and local specificities
- Economic, political and societal norms and values (imperatives)
- Political and policy landscape

### 2.2 Organisational background

- Competences present inside the organisation
- Pre-existing culture of dialogue and exchange between citizen and politics?
- Organisational culture
- Tools and methodologies at disposal and frequently used
- Resources at disposal (human and economic model)

## 3. Challenge

*Approx. word count: ~ 300*

Describe the challenge in detail keeping in mind and including the following points:

- Derivation of the challenge
- How has the decision to tackle this specific challenge been made?
- Who was involved in deciding and defining the challenge?

- Policy context of the challenge

## 4. The co-creation process of the envisioned solution

*Approx. word count: ~ 1000*

This section aims to describe the entire co-creation process of your lab in detail

- How has the actual co-creation journey been different from the planned one and why?

### 4.1 Analysis of the context

- How has the analysis been conducted?
- What kind of methodology/tools have been applied?
- Who has been involved? (inside and out the organisation)
- How kind of direct outputs did it produce?
- How did those direct outputs influence the planning for the following phases?

### 4.2 Reframing of the problem

- How has the problem/challenge been reframed and at what level?
- What kind of methodology/tools have been applied?
- Who has been involved? (inside and out the organisation)
- Comparison old/new challenge – what has not been considered/needed to be added?

### 4.3 Envisioning of alternatives

- How has the ideation phase been conducted?
- What kind of methodology/tools have been applied?
- Who has been involved? (inside and out the organisation)
- How has the idea been narrowed down/chosen and who made the final choice?

### 4.4 Development and prototyping

- How has the idea been developed and then prototyped?
- What kind of methodology/tools have been applied?
- Who has been involved? (inside and out the organisation)
- First insights on the effectiveness of the prototype/lessons learned from prototyping

### 4.5 The role of policies and policy maker engagement

- The role of policies in the decision, development and implementation of the final solution
- Role and importance of policy makers
- Engagement of policy makers in the process of decision, development and implementation of the final solution
- Barriers and opportunities identified regarding policies and policy makers in the implementation process

### 4.6 Adaptation to the Covid situation (optional)

## 5. The final solution

*Approx. word count: ~ 600*

This chapter entirely focusses on the final solution and is therefore directly based on the previous chapter describing the co-creation process.

It details the final product/service

### 5.1 Final concept

- Detailed description of the solution itself
- Pictures/Graphics/Schemes
- Brief technical aspects
- Involvement of stakeholders in taking/shaping this decision

- Direct involvement of policy makers in the final solution (if applicable)

## 5.2 Sustainability strategy

- What are the plans to make the prototype sustainable and how?
- What steps does the strategy foresee?
- Eventual collaborations and/or integration with other projects

## 6. Transformations triggered and outcomes

*Approx. word count: ~ 400*

This section is focussed on the transformations that have been initiated or triggered through/during the project.

This can be directly related to the ideated solution, but also more to the organisation itself and its parts not directly related to SISCODE (i.e. enhanced use of tools, new internal processes, shift of resources).

It is closely connected to chapter 2 describing the changes and transformation identified in the organisation itself and the ecosystem in respect to the initial situation.

This part can be partly subjective relying also on the perception of the author, but should be undermined with some evidence.

### 6.1 Organisational transformation

- Describe an eventual process of organisational learning
- Has co-creation been applied beyond SISCODE
- What did the introduction of new knowledge provoke?
- New initiatives or strategies implemented
- Any organisational transformations related to Covid situation that influenced the impact of the Siscode co-creation journey?

### 6.2 Transformations in the ecosystem

- Changes and development triggered by the lab and its activities
- Further activities planned following the activities of SISCODE
- New initiatives or strategies implemented
- Any ecosystem transformations related to Covid situation that influenced the impact the Siscode co-creation journey?

## 7. Conclusive reflections

Here, we are asking for more general reflections on the activities conducted and also the entire case.

The focus lies on a concluding review.

- How could identified barriers be overcome?
- How could opportunities be fully exploited?
- Identified opportunities that you were not aware of
- Considerations on future directions
- Your perceptions of co-creation in the field
- Considerations on how co-creation is reflected within the field your lab is active in
- If (relevant), considerations about the Covid Situation in the context of your co-creation journey.

## 8. References

Please list all references with endnotes. Please list all interview partners with name (organisation, function)

