User eXchange #3

Co-Design for DestinE

Dr. Alexandre Azoulay
Post-doc researcher

Malik Terfous
PhD Student

Dr. Elena Magliaro
Research engineer

Centre for management science (CGS),
Observation, Impacts, Energy Center (O.I.E.)

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Funded by the European Union

Destination Earth implemented by ECMWF esa EUMETSAT

Introduction to the project

Contract

Partnership agreement for service experimentations

The European Space Agency

Entrusted entity engaged by the European Union on the Destination Earth project :

- Responsible for the development of the Destination Earth core service platform
- Actively involved in the development of user communities for DestinE

esa

Two research laboratories from Mines Paris PSL

Both involved in the co-design Work Package of the E-Shape projects from 2019 to 2021 :

- The Center **Observation Impact Energy (OIE)**, specialized in Earth observation and solar
- The **Centre on management of Science (CGS)**, specialized in the management of design and innovation activities

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The city of Marseille (France)

EU MISSION LABEL CLIMATE-NEUTRAL & SMART CITIES

The city of Marseille is has the typical profil of a potential end-user of Destination Earth :

- The second largest french city
- Faced with critical issues related to climate change (warming, air quality, etc.)
- Selected by the European Union for the program Climate Neural & Smart Cities

VILLE DE MARSEILLE

Our collective goals :

To develop Co-Design Methods & Toolkit for DestinE to put the users at the center of service development
To develop an experimental supersite to help the city of Marseille to reach its objectives toward sustainability

Agenda

Presentations

I. Introduction to Co-design for the DestinE platform

Why co-design is required in the specific context of the Destination Earth Platform, Introduction to the toolkit and methods, Lessons learned during the co-design with the City of Marseille, Video testimonies from stakeholders involved in co-design activities with the city of Marseille

II. Introduction to the interactive part of the workshop

Introduction to the tools to be used , Explanation of the two exercises

Workshop session

Phase 1 – Diagnosis of co-design needs

1. Active work by participants (10min) :

Participants will be asked to carry out their own co-design diagnosis using the data-information-value journey (as a part of the co-design toolkit). Co-design facilitators will help them in using this framework and identifying the structure of their ecosystem both upstream and downstream, as well as their position within it.

Feedback and discussion (10min)

Phase 2 – Structuring co-design sessions

1. Active work by participants (10min)

Based on the diagnosis, participants will be asked to identify the main co-design issues they have to manage and to propose a structure for co-design sessions that would enable them to address these issues. Co-design facilitators will help them in drawing conclusions from the diagnosis and envisioning a proper structure for co-design sessions.

Feedback and discussion (10min)

I.
Introduction to Co-design for the DestinE platform

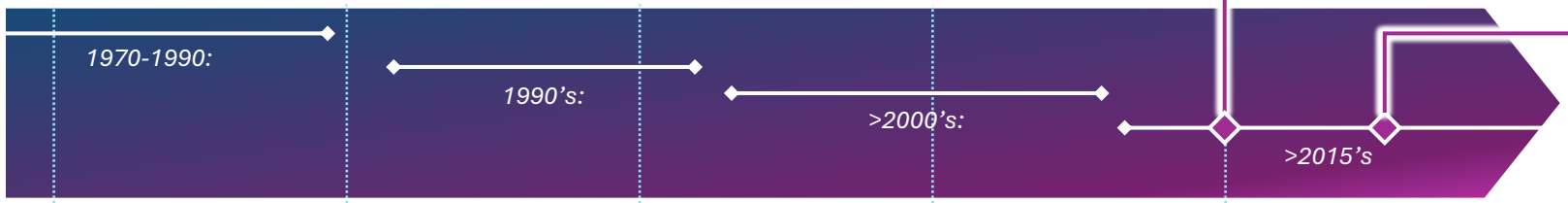
The co-design methodology

A brief history of co-design in innovation and design research

Co-design methods have a long history of development with academic research performed in design sciences, innovation and management sciences from 1970's.

For a decade, the Center on Management Science is at the forfront of the research on co-design with some critical contributions, including :

- The PhD Thesis of Louis-Etienne Dubois (2015)
- The PhD Thesis of Raphaëlle Barbier (2023) – e-shape



Co-Design for embedded systems to support better HW/SW integration *(eg., Computer Industry)*

Co-design between buyers and suppliers to ease system integration in manufacturing *(eg., Automotive Industry)*

Co-design between firms and their users to innovate based on users' needs *(eg., Consumer Goods)*

Co-design to cross the Grand Distance between service developers and their potential users *(eg., Earth Observation)*

The critical contribution of e-shape (2019-2021)

- Unveiled the issues arose due to Grand Distance
- Proposed a co-design method for Earth Observation (Barbier, 2023) :
  1. *Diagnosis Phase*
  2. *Action Phase*
  3. *Outcomes Phase*
- Coined the 'resilient-fit' perspective, focused on 'the design of the co-'

Towards co-design for Destination Earth (>2024)

The specific context of the Destination Earth Platform raise new challenges :

- Managing the tension between contextualization and genericity
- Managing multilateral relationships between various stakeholders
- Ensuring that users develop the ongoing ability to use the platform's services autonomously

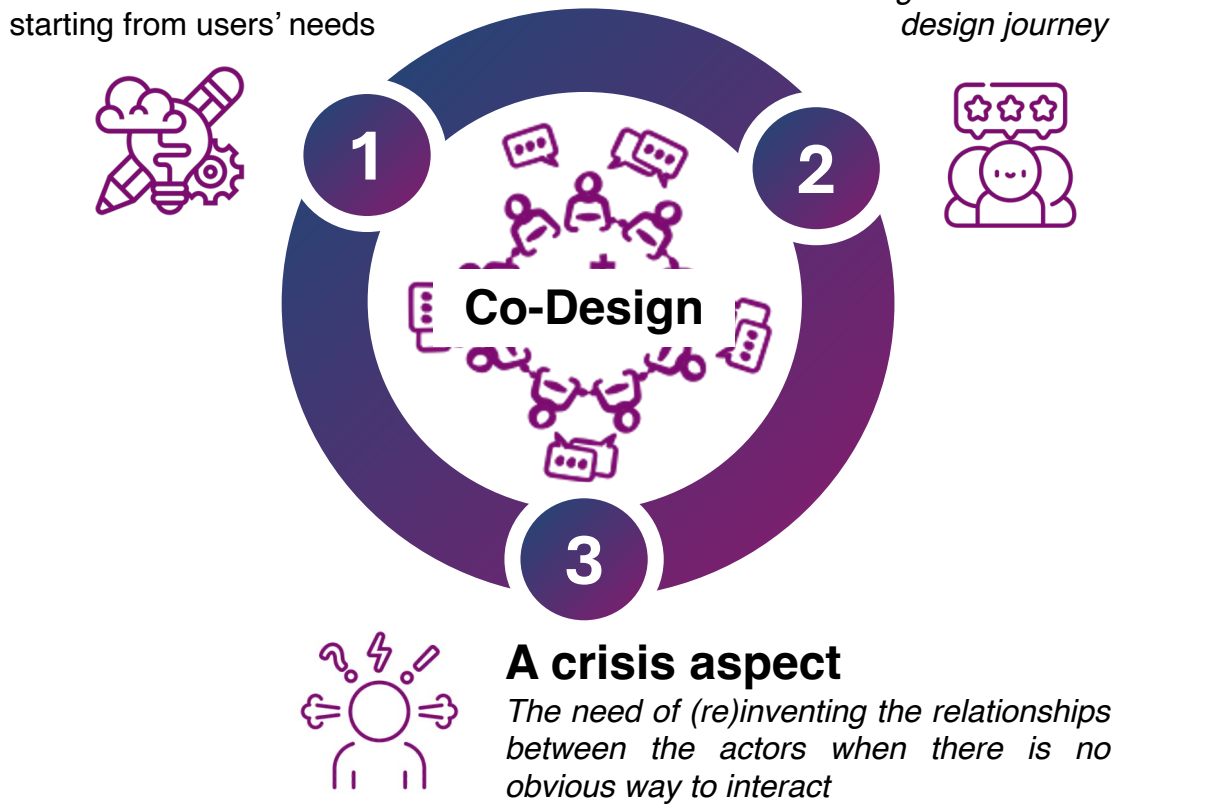
What is Co-Design ?

Overall, co-design can be defined as

> **« A form of collaborative innovation that puts a specific emphasis on the need of (re)inventing the relationships between the involved actors. » (Barbier, 2023)**

It encompasses three critical aspects :

- **A design aspect:** the need to explore innovative solutions beyond existing services and starting from users' needs
- **A collective aspect:** The need to involve heterogenous actors along the design journey
- **A crisis aspect:** The need of (re)inventing the relationships between the actors when there is no obvious way to interact



Why does co-design matter for Destination Earth ?

Co-Design methods stand as a consistent way to answer some of the key challenges faced by climate data based service developers.

Key challenges faced by services designers

How Co-Design can Help ?

1

Crossing the Grand Distance between Data experts and potential users

The potential users do not know how to use climate data and often do not even know that they could be usefull for them.

Co-Design has proven efficient for crossing Grand Distance and putting users at center

The proposed co-design methods support a collective exploration by the service developers and their potential users that foster a mutual learning

2

Structuring multilateral relationships within a complex data ecosystem

Designing services based on climate data requires a complex chain of players with diverse skills and interests to be set in motion.

Co-Design allows to organize interactions as to build resilient relationships

The co-design methods rely on disentangling the various needs as to identify the right sequence of workshops within the chain of stakeholders

3

Fostering service reuse accross various use-context

As an emergent platform, DestinE implies to manage the tension between context-specific solutions and generic reusable services

Co-Design allows to manage the tension between contextualization and genericity

Some co-design mechanisms can help to conciliate contextual answers to specific needs with the genericity required for service reuse accross contexts

The typical co-design journey for Destination Earth

1 - THE USER APPROACH

The first step in the co-design process relies on identifying and getting in touch with promising potential users. Engaging them requires specific efforts, covered by the co-design methodology.

This phase is required to clarify the usage ecosystem, disentangle the various opportunities and select the more promising ones.

2 - CO-DESIGN DIAGNOSIS

The Co-Design Diagnosis phase consists in assessing the status of the system both from a technical and an organizational perspective. The co-design workshops have to be organized based on this careful diagnosis.

This phase is critical to clearly delineate the various challenges to adresse through the co-design workshops.

3 - CO-DESIGN WORKSHOPS

Co-Design workshops are the very heart of co-design. The success of the overall co-design process depends on structuring the right sequence of workshops as well as on using the right protocols for each of them.

These workshops are essential when it comes to place the users' needs at the center and to feed strong, resilient relationships

4 - CO-DESIGN OUTCOMES

Co-design outcomes can be of varying natures. The final phase of co-design consists in agreeing on these outcomes and the next steps they could lead to.

A clear formulation of the outcomes is required to support resilient relationships between the stakeholders and to foster subsequent collaborations.

Step 1
User Approach

Step 2
Diagnosis

Step 3
Workshops

Step 4
Outcomes

Such a co-design journey serves a variety of design objectives beyond 'one-shot' service development

- ✓ To set the ground and foster subsequent collaborations around other potential services
- ✓ To develop a collective ability to design new services on an ongoing basis
- ✓ To develop stakeholders' individual abilities to leverage the platform
- ✓ To set up relational and organizational channels that support coordination between stakeholders

Marseille use-case

The case of Marseille – The diagnosis of co-design needs

Marseille
(ie, the user)
Formulation of needs and use scenarios

O.I.E.
(ie, the pilot)
Service development based on users' needs

DestinE Platform
(ie, the platform)
Ensure access to data and relevant digital infrastructure

The 'Data - Information – Value' Framework

Users' needs	*Value-embedding usage*	*Valuable information*	Data	Digital infrastructure
???	???	???	???	???

Identification of the issues related to usefulness

Identification of the issues related to operability

Identification of the issues related to usability

Thanks to a carefull diagnosis based on the DIV Framework, we identified several critical issues to adress through the co-design workshops

Issues related to usefulness :
- *Identification of the potential users' profile*
- *Understanding use contexts and scenarios*
- ...

Issues related to usability
- *Identification of the skills and tools available*
- *Understanding the various users' workstreams*
- ...

Issues related to operability
- *Identification of the data required*
- *Identification of the data processing required*
- ...

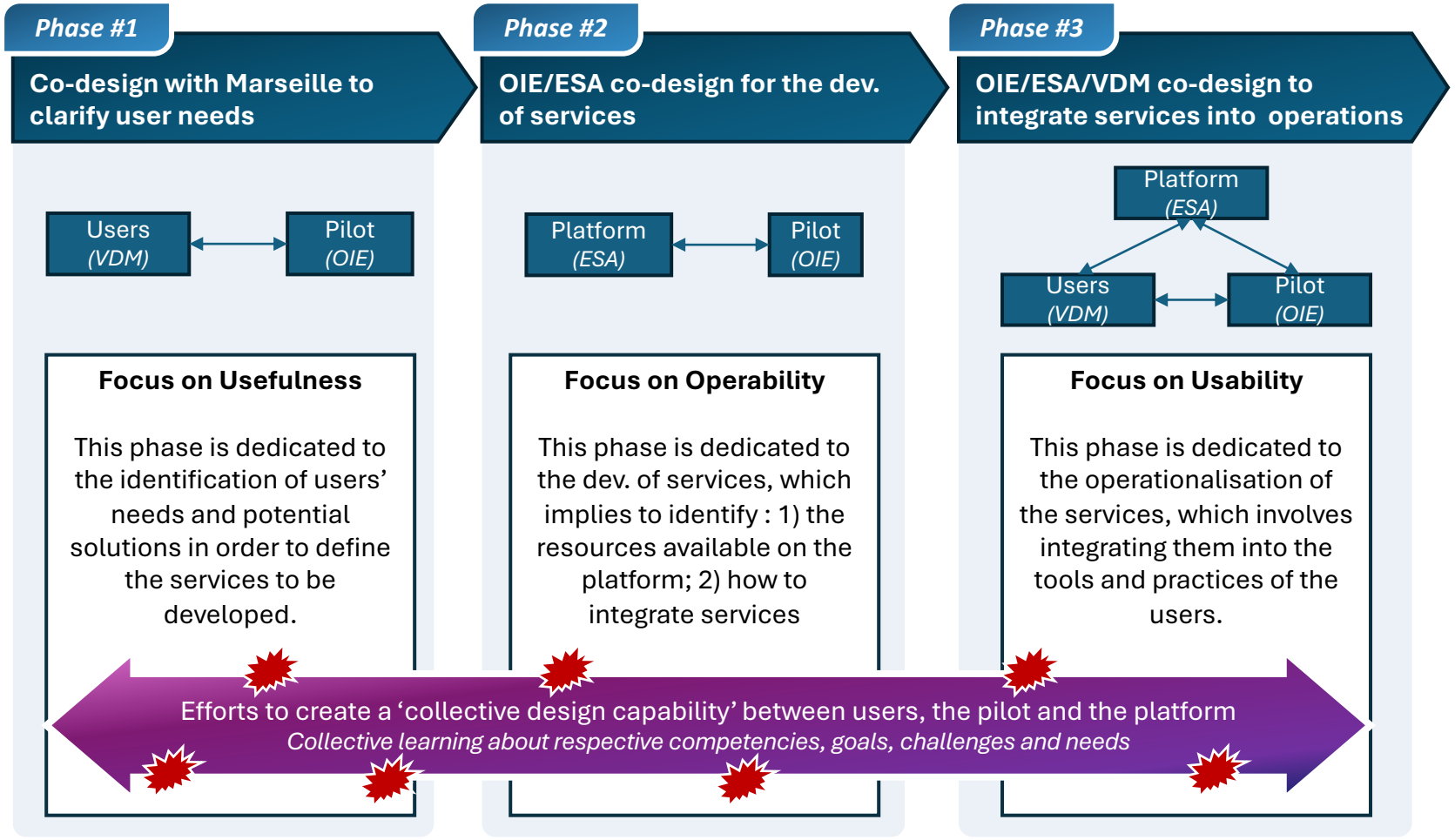
The case of Marseille – The co-design workshops organized in three phases

Based on the challenges identified during the diagnosis, we decided to structure the co-design sessions in three phases

Phase 1 – Clarification of the users' needs (to reach usefulness)

Phase 2 – Clarification of the developement process (to reach operability)

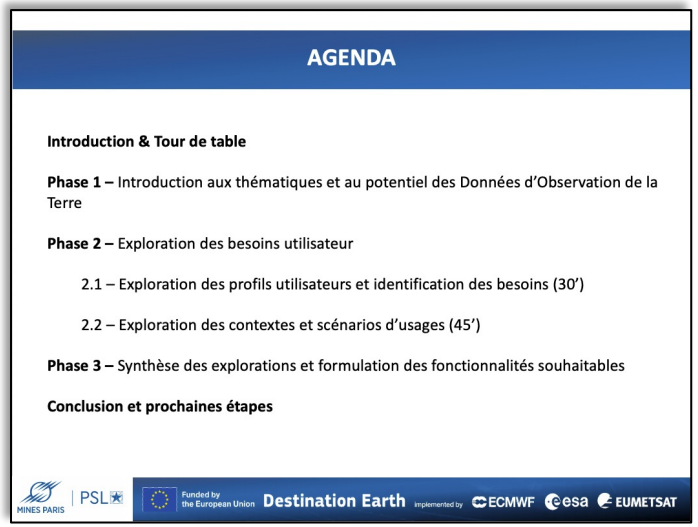
Phase 3 – Integration within the operations of the city of Marseille (to reach usability)



The case of Marseille – Focus on the phase #1 with Nature in Town (1/6)

Co-Design Workshops

Agendas designed to gradually build a constructive dialogue with users



AGENDA

Introduction & Tour de table

Phase 1 – Introduction aux thématiques et au potentiel des Données d'Observation de la Terre

Phase 2 – Exploration des besoins utilisateur

2.1 – Exploration des profils utilisateurs et identification des besoins (30')

2.2 – Exploration des contextes et scénarios d'usages (45')

Phase 3 – Synthèse des explorations et formulation des fonctionnalités souhaitables

Conclusion et prochaines étapes

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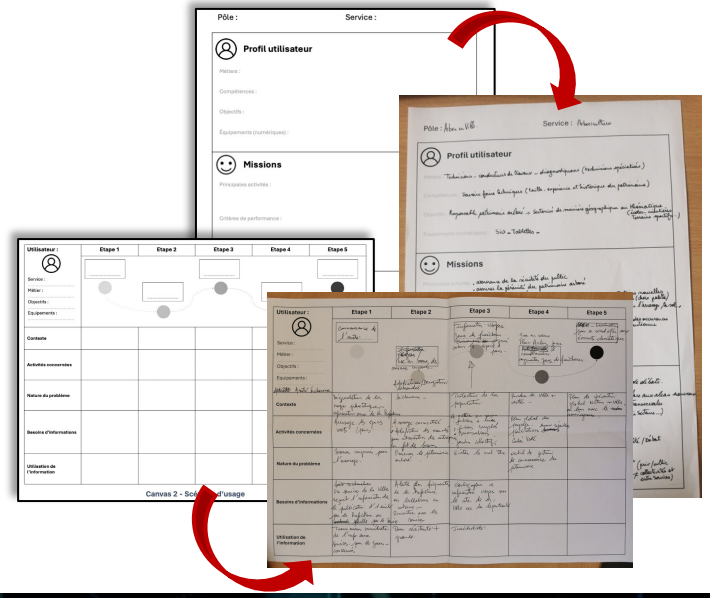
Close interactions facilitated by the co-design sponsor

Ideation supported by generic template to help users to formulate their needs



The case of Marseille – Focus on the phase #1 with Nature in Town (2/6)

Phase #1

Co-design with Marseille to clarify user needs regarding Nature in Town

Workshop #1.1

Objectives :
Specify the operational needs of the city of Marseille
Participants :
City operational agents

Workshop #1.2

Objectives :
Enrich the list of requirements for each subjects
Participants :
City planers & local experts in Geographical info. system

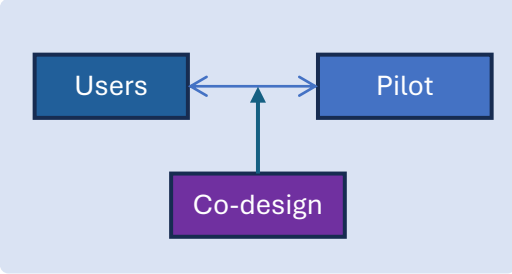
Workshop #1.3

Objectives :
Identify consistent answers to the needs formulated
Participants :
Internal workshop with OIE and CGS

Workshop #1.4

Objectives :
Validation of the strategy for answering the needs with feasible specifications
Participants :
Head of the Nature in Town commission

- The focal user and the pilot are required to explore the problem space as to **address the issues related to identifying potential value (usefulness)**;
  - The **first workshop** is dedicated to the exploration of the problems encountered by the main potential users related to managing nature in town.



Theme	Description
Drought warning	In the event of a drought warning, the prefecture prohibits the watering of parks and gardens, which threatens their role as islands of freshness
Participatory referencing of trees	Trees in the private domain are not referenced in the city's GIS. However, they are an integral part of nature in the city: pest management, coolness, etc.
…	…

The case of Marseille – Focus on the phase #1 with Nature in Town (3/6)

Phase #1

Co-design with Marseille to clarify user needs regarding Nature in Town

Workshop #1.1

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City operational agents

Workshop #1.2

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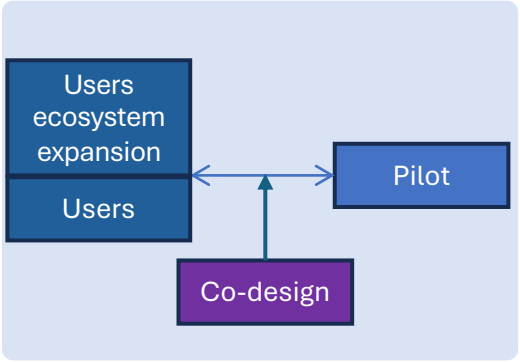
Objectives :
Identify consistent answers to the needs formulated
Participants :
Internal workshop with OIE and CGS

Workshop #1.4

Objectives :
Validation of the strategy for answering the needs with feasible specifications
Participants :
Head of the Nature in Town commission

- **The second workshop** is dedicated to the exploration of the problems encountered by other potential users, in the local ecosystem around Marseille



Users	Ecologists, botanists
Context	Tree planting and maintenance
Activities concerned	• Selection of species, and creation of plant palettes • Tree planting and maintenance
Nature of the problem encountered	**The species planted do not always take into account the present and future local eco-climatic conditions of the site**
Information needs	• Species-climate relationships • Climatological data (temperature, local rainfall, etc.)
Use of Information	• Estimation of changes in the local climate in 5-50-100 years • Identification of geographical areas that already have this climate profile • Definition of inclusion/exclusion criteria for species

Possible services:

Short-term PoC:

Creation of maps to identify areas conducive to certain species according to a series of criteria: Rainfall (T0 and T+10)..

Long-term solution:

Creation of a taxonomy of local species adapted to climate trends and city uses

A co-design methodology tailored for future DestinE cases

5 major themes of interest

1.
Legitimize park watering during drought warnings

2.
Participatory referencing of the city's trees

3.

Pilot assistance for park and garden safety

4.

« The right tree in the right place »

5.
Monitoring and measuring the impact of the plant canopy

2 Main categories of use

1 – Supporting operational teams in their daily work

- *Parks and garden managers*
- *Horticulturalists*
- *Arboriculturists*
- *Etc.*

2 – Analysis, forecasting and planning

- *Urban planners*
- Ecologists
- *Planning services*

Users' skills and tools

Strong scientific and empirical understanding of 'Nature in Town' issues

Existing local GIS Platforms, but fragmented

Existing skills in managing data layers within the QGIS software

3 principles of our strategy to meet expressed needs

Exploit commonalities between expressed needs

Propose generative solutions

Capitalize on existing skills

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The case of Marseille – Focus on the phase #1 with Nature in Town (5/6)

Phase #1

Co-design with Marseille to clarify user needs regarding Nature in Town

Workshop #1.1

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Participants :
City operational agents

Workshop #1.2

Objectives :
Enrich the list of requirements for each subjects
Participants :
City planers & local experts in Geographical info. system

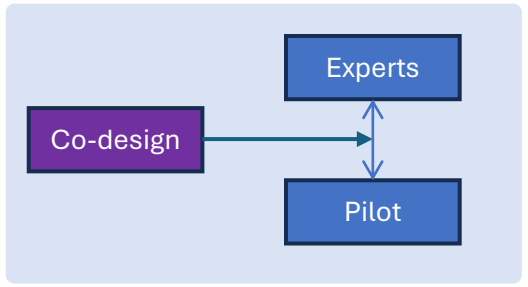
Workshop #1.3

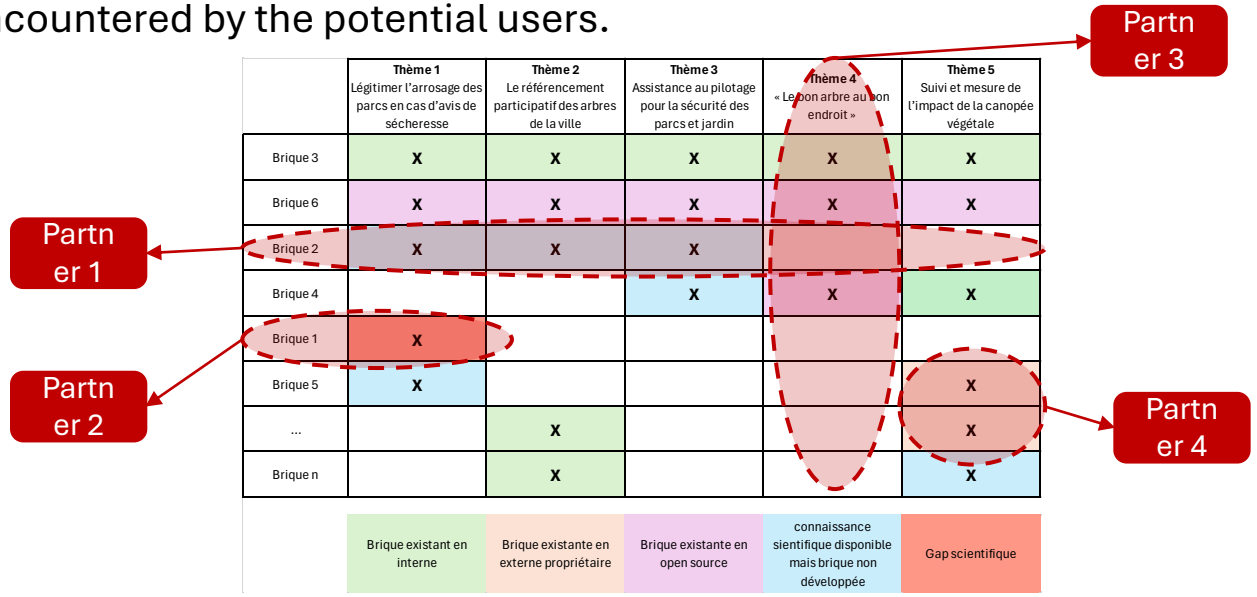
Objectives :
Identify consistent answers to the needs formulated
Participants :
Internal workshop with OIE and CGS

Workshop #1.4

Objectives :
Validation of the strategy for answering the needs with feasible specifications
Participants :
Head of the Nature in Town commission

- **The third workshop** is dedicated to unravelling existing systems that could answer, at least partly, the problems encountered by the potential users.





The case of Marseille – Focus on the phase #1 with Nature in Town (6/6)

Phase #1

Co-design with Marseille to clarify user needs regarding Nature in Town

Workshop #1.1

Objectives :
Specify the operational needs of the city of Marseille
Participants :
City operational agents

Workshop #1.2

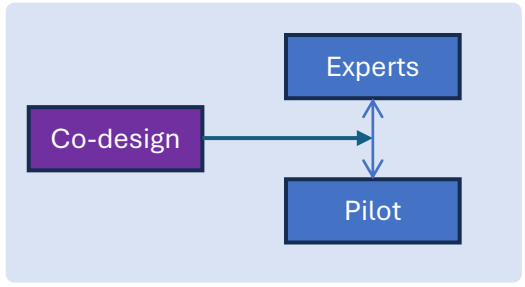
Objectives :
Enrich the list of requirements for each subjects
Participants :
City planers & local experts in Geographical info. system

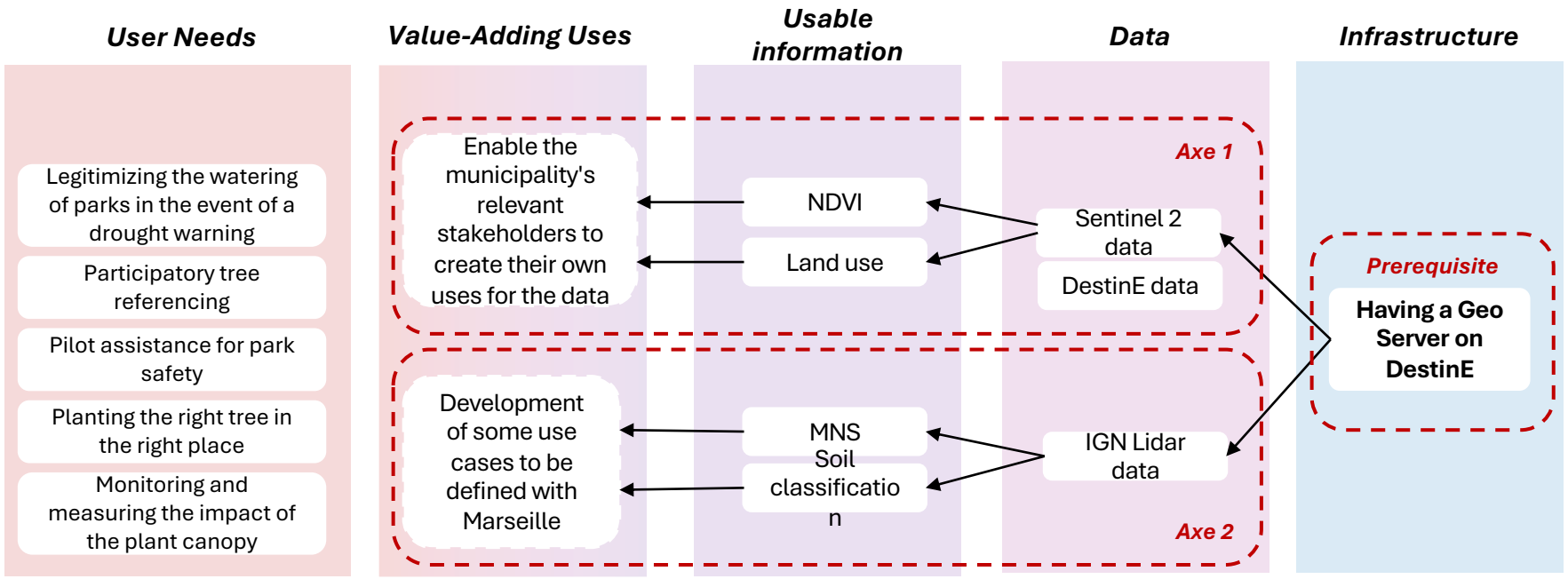
Workshop #1.3

Objectives :
Identify consistent answers to the needs formulated
Participants :
Internal workshop with OIE and CGS

Workshop #1.4

Objectives :
Validation of the strategy for answering the needs with feasible specifications
Participants :
Head of the Nature in Town





The case of Marseille – Focus on the phase #1 with Nature in Town (6/6)

Phase #1

Co-design with Marseille to clarify user needs regarding Nature in Town

Workshop #1.1

Objectives :
Specify the operational needs of the city of Marseille
Participants :
City operational agents

Co-Design tools Used :
- **User profil Canvas**
- **User journey canvas**

Exploration of users' needs

Five subjects of interest identified :
1. The right tree at the right place
2. Monitoring the plant canopy
3. Measuring the impact of drought orders
4. Park safety management
5. Participative referencing of trees

Relational perspective

- A first discovery of the potential users' profils, goals, concerns, work habits
- A better understanding of the pilot capabilities by the potential users
- Definition of the collaboration strategy

Workshop #1.2

Objectives :
Enrich the list of requirements for each subjects
Participants :
City planers & local experts in Geographical info. system

Co-Design tools Used :
- **Canvas to enrich user specifications**

Enriched list of requirements for each of the subjects of interest

- Better understanding of users' competencies, tools and design capabilities

Workshop #1.3

Objectives :
Identify consistent answers to the needs formulated
Participants :
Internal workshop with OIE and CGS

Co-Design tools Used :
- **Theme-to-Tech Mapper Matrix**

Specifications and strategy for meeting needs :
- Identification of relevant data to meet needs
- Identification of commonalities between needs
- Formulation of a service architecture concept

Refining the pilot goals and vision to align with the expectations and capabilities of potential users, thereby establishing a shared foundation for effective collaboration.

Workshop #1.4

Objectives :
Validation of the strategy for answering the needs with feasible specifications
Participants :
Head of the Nature in Town commission

Validation of the specifications and the strategy for meeting needs

Crystallising a shared vision and a way of working together

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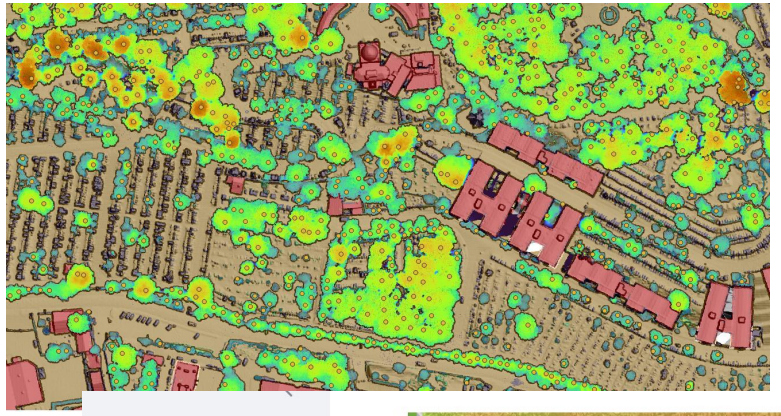
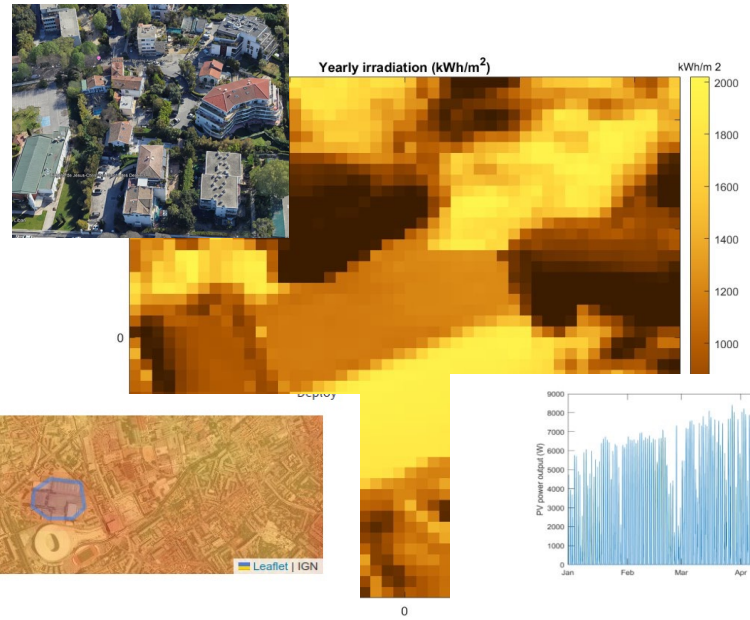
The co-design journey for DestinE – The case of Marseille

The case of Marseille – Phase #2 PoC developement

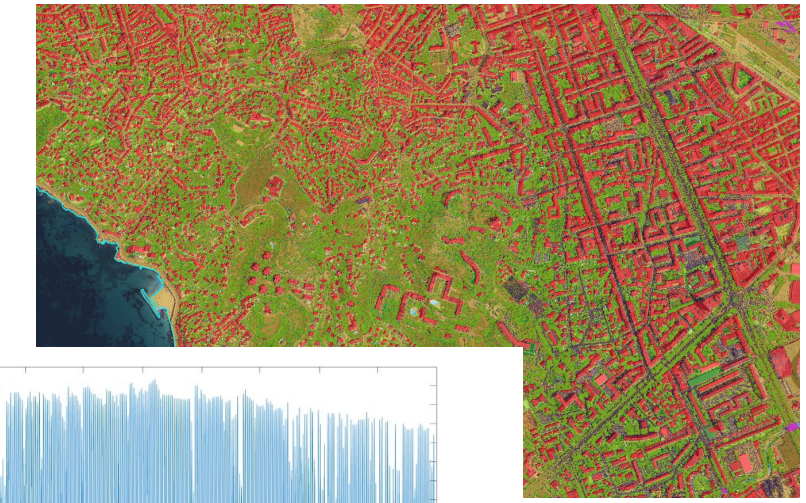
Trees detection

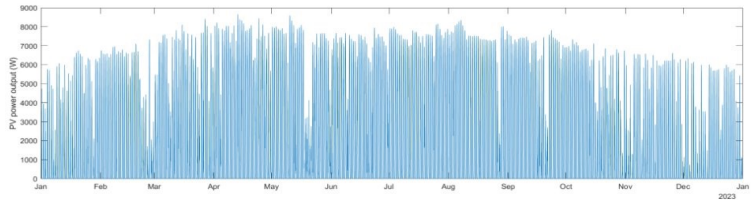


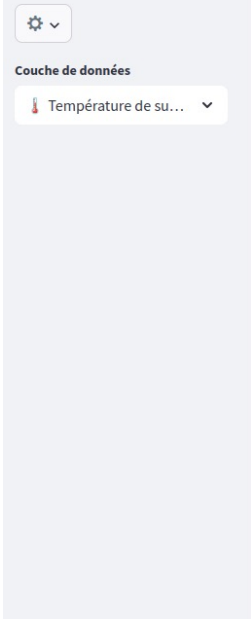
Dynamic Solar cadaster

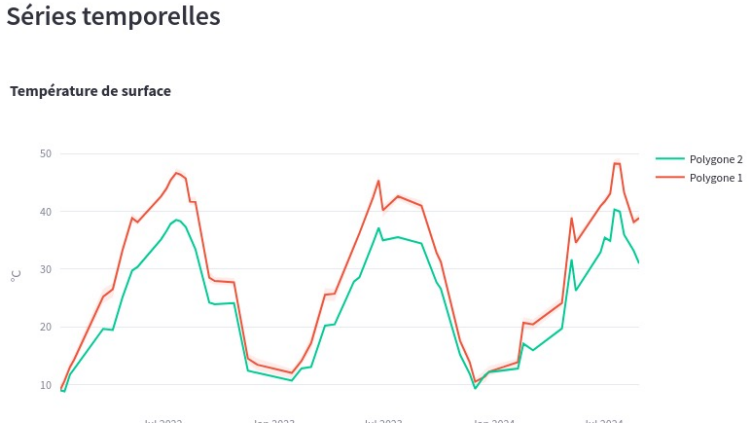


Land usage : classification









NDVI & LST WebApp

The case of Marseille – Focus on the phase #1 with Nature in Town (6/6)

Co-design assumptions	Co-design for DestinE
The core of the process resides in the workshop sessions, where collaborative interactions are believed to foster the most critical advancements	The diagnosis enlightened the co-design needs: a progressive exploration of the problem and solution spaces would be necessary to foster both contextualization and retrofit towards genericity.
Focus on a single type of stakeholder or set of needs.	Leverages the expansion of the user base and the scope of usefulness.
Focus on offering a solution tailored to a single defined need, based primarily on the expertise at hand.	Exploration of both existing and potential technological bricks, as well as the commonalities among various requirements, to deliver a solution that addresses a portfolio of needs while ensuring its resilience.

An example through the case of Marseille

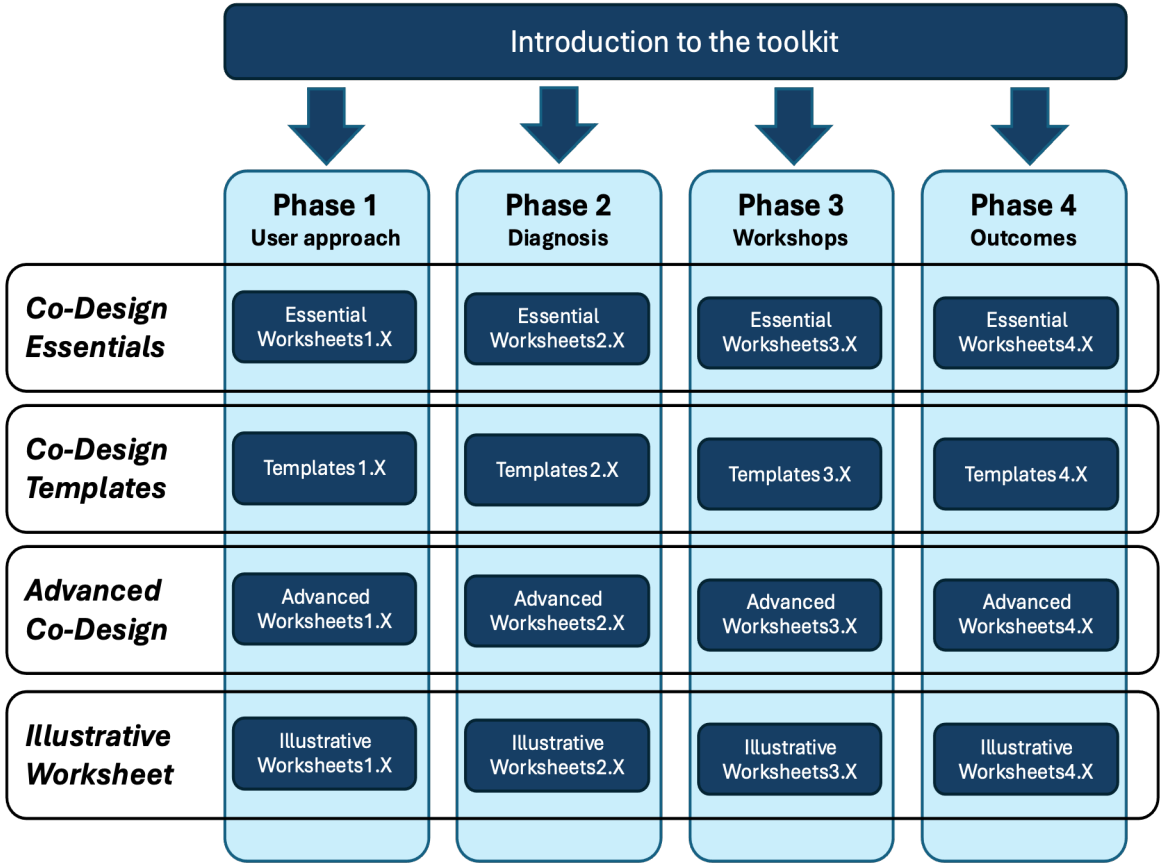
Brice Dacheux-Auziere

Head of Foresight, Expertise, and Projects Department of the Nature In Town commission Marseille

Watch Testimony

The Toolkit – Concept, structure and releases

Structure of the co-design toolkit



Release Plan for the Toolkit

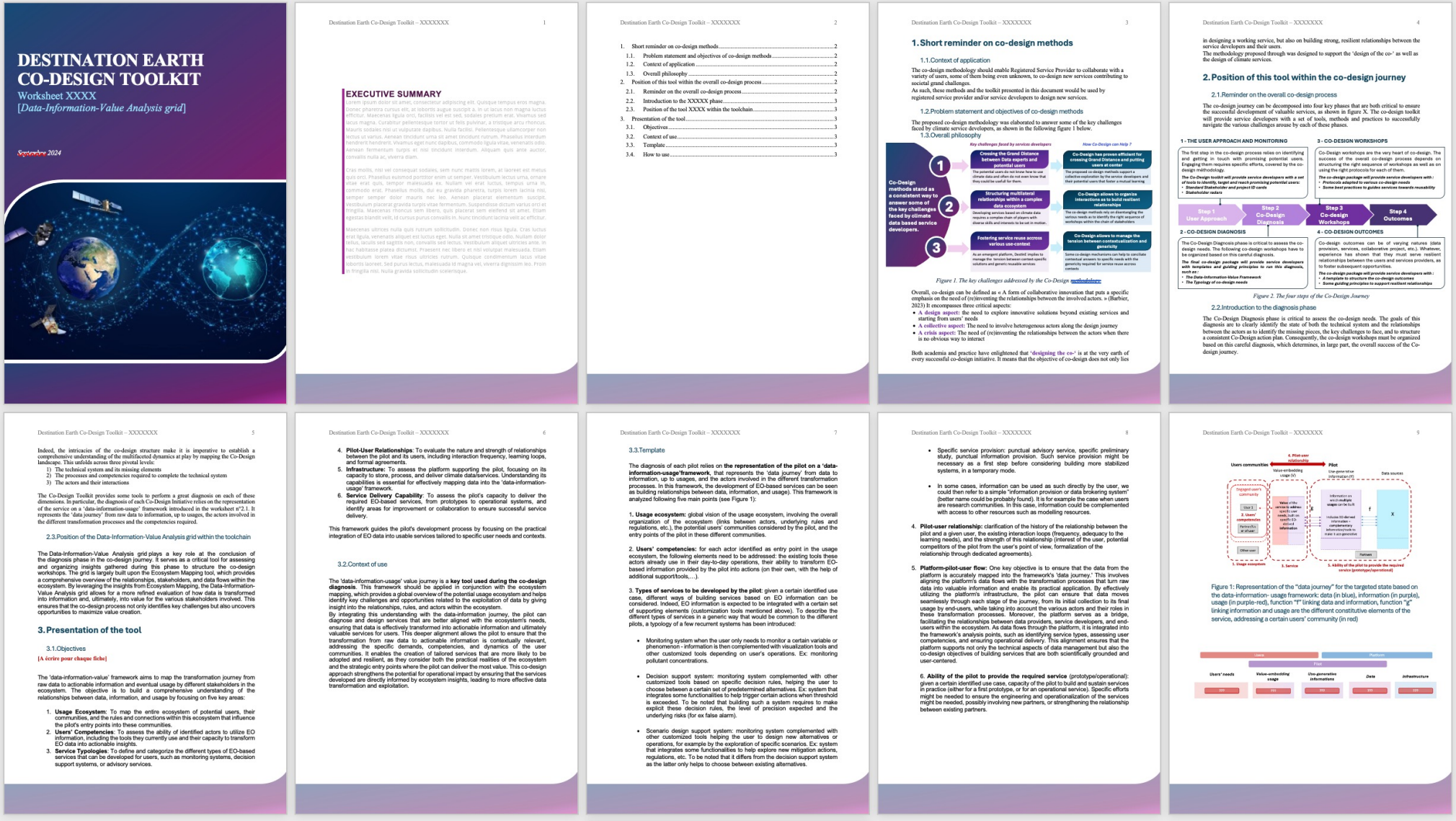
Phase	Worksheet	Project timeline
Phase	Worksheet	09/24 · 10/24 · 11/24 · 12/24 · 01/25 · 02/25 · 03/25 · 04/25 · 05/25 · 06/25 · 07/25 · 08/25 · 09/25
Phase 1 User Approach	Essential Worksheet 1.1 - User monitoring framework	
	Co-Design Template 1.1 - Projects and stakeholders ID cards	
	Co-Design Template 1.2 - Projects and stakeholders Assessment radars	
	Advanced Worksheet - Ecosystem Mapping method	
	Illustrative Worksheet 2.1 – User approach in the case of Marseille	
Phase 2 Diagnosis	Essential Worksheet 2.1 - The Data-Information-Value journey	
	Essential Worksheet 2.2 - Competency map	
	Illustrative Worksheet 2.1 - The diagnosis of Marseille	
	Essential Worksheet 2.3 - Classification of co-design needs	
Phase 3 Workshops	Essential Worksheet 3.1 – Guiding principles to build a co-design protocol	
	Co-Design Template 3.1 - Canvas for user profile	
	Co-Design Template 3.2 - Canvas for use scenario identification	
	Co-Design Template 3.3 - Canvas for user need precision	
	Essential Worksheet 3.2 - The Data-Need mapper Matrix	
	Illustrative Worksheet 3.1 - Structure of the workshops in the case of Marseille	
Phase 4 Outcomes	Essential Worksheet 4.1 - The outcomes matrix	
	Essential Worksheet 4.2 - Fostering resilient fit	
	Advanced Worksheet 4.1 – Fostering retrofit towards genericity	
	Advanced Worksheet 4.2 – The concept of "Supersite" and its interest to DestinE	
	Illustrative worksheet 4.1 – The supersite of Marseille	

10/24 First release · *02/25 Second release* · *06/25 Third release* · *09/25 Final release*

Design of the Tool · Improvement · Finalization

First version · *Improved version* · *Final version*

The Toolkit – Concept and structure



DESTINATION EARTH
CO-DESIGN TOOLKIT
Worksheet XXXX
[Data-Information-Value Analysis grid]
Septembre 2024

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EXECUTIVE SUMMARY

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1. Short reminder on co-design methods

1.1. Context of application

The co-design methodology should enable Registered Service Provider to collaborate with a variety of users, some of them being even unknown, to co-design new services contributing to societal grand challenges.
As such, these methods and the toolkit presented in this document would be used by registered service provider and/or service developers to design new services.

1.2. Problem statement and objectives of co-design methods

The proposed co-design methodology was elaborated to answer some of the key challenges faced by climate service developers, as shown in the following figure 1 below.

1.3. Overall philosophy

Figure 1. The key challenges addressed by the Co-Design methodology

Overall, co-design can be defined as « A form of collaborative innovation that puts a specific emphasis on the need of (re)inventing the relationships between the involved actors. » (Barbier, 2023) It encompasses three critical aspects:

- **A design aspect:** the need to explore innovative solutions beyond existing services and starting from users' needs
- **A collective aspect:** The need to involve heterogenous actors along the design journey
- **A crisis aspect:** The need of (re)inventing the relationships between the actors when there is no obvious way to interact

Both academia and practice have enlightened that '**designing the co-**' is at the very earth of every successful co-design initiative. It means that the objective of co-design does not only lies

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in designing a working service, but also on building strong, resilient relationships between the service developers and their users.
The methodology proposed through was designed to support the 'design of the co-' as well as the design of climate services.

2. Position of this tool within the co-design journey

2.1. Reminder on the overall co-design process

The co-design journey can be decomposed into four key phases that are both critical to ensure the successful development of valuable services, as shown in figure X. The co-design toolkit will provide service developers with a set of tools, methods and practices to successfully navigate the various challenges arouse by each of these phases.

Figure 2. The four steps of the Co-Design Journey

2.2. Introduction to the diagnosis phase

The Co-Design Diagnosis phase is critical to assess the co-design needs. The goals of this diagnosis are to clearly identify the state of both the technical system and the relationships between the actors as to identify the missing pieces, the key challenges to face, and to structure a consistent Co-Design action plan. Consequently, the co-design workshops must be organized based on this careful diagnosis, which determines, in large part, the overall success of the Co-design journey.

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Indeed, the intricacies of the co-design structure make it is imperative to establish a comprehensive understanding of the multifaceted dynamics at play by mapping the Co-Design landscape. This unfolds across three pivotal levels:

1) The technical system and its missing elements
2) The processes and competencies required to complete the technical system
3) The actors and their interactions

The Co-Design Toolkit provides some tools to perform a great diagnosis on each of these dimensions. In particular, the diagnosis of each Co-Design Initiative relies on the representation of the service on a 'data-information-usage' framework introduced in the worksheet n°2.1. It represents the 'data journey' from raw data to information, up to usages, the actors involved in the different transformation processes and the competencies required.

2.3. Position of the Data-Information-Value Analysis grid within the toolchain

The Data-Information-Value Analysis grid plays a key role at the conclusion of the diagnosis phase in the co-design journey. It serves as a critical tool for assessing and organizing insights gathered during this phase to structure the co-design workshops. The grid is largely built upon the Ecosystem Mapping tool, which provides a comprehensive overview of the relationships, stakeholders, and data flows within the ecosystem. By leveraging the insights from Ecosystem Mapping, the Data-Information-Value Analysis grid allows for a more refined evaluation of how data is transformed into information and, ultimately, into value for the various stakeholders involved. This ensures that the co-design process not only identifies key challenges but also uncovers opportunities to maximize value creation.

3. Presentation of the tool

3.1. Objectives

[A écrire pour chaque fiche]

The 'data-information-value' framework aims to map the transformation journey from raw data to actionable information and eventual usage by different stakeholders in the ecosystem. The objective is to build a comprehensive understanding of the relationships between data, information, and usage by focusing on five key areas:

1. **Usage Ecosystem:** To map the entire ecosystem of potential users, their communities, and the rules and connections within this ecosystem that influence the pilot's entry points into these communities.
2. **Users' Competencies:** To assess the ability of identified actors to utilize EO information, including the tools they currently use and their capacity to transform EO data into actionable insights.
3. **Service Typologies:** To define and categorize the different types of EO-based services that can be developed for users, such as monitoring systems, decision support systems, or advisory services.

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4. **Pilot-User Relationships:** To evaluate the nature and strength of relationships between the pilot and its users, including interaction frequency, learning loops, and formal agreements.
5. **Infrastructure:** To assess the platform supporting the pilot, focusing on its capacity to store, process, and deliver climate data/services. Understanding its capabilities is essential for effectively mapping data into the 'data-information-usage' framework.
6. **Service Delivery Capability:** To assess the pilot's capacity to deliver the required EO-based services, from prototypes to operational systems, and identify areas for improvement or collaboration to ensure successful service delivery.

This framework guides the pilot's development process by focusing on the practical integration of EO data into usable services tailored to specific user needs and contexts.

3.2. Context of use

The 'data-information-usage' value journey is a **key tool used during the co-design diagnosis**. This framework should be applied in conjunction with the ecosystem mapping, which provides a global overview of the potential usage ecosystem and helps identify key challenges and opportunities related to the exploitation of data by giving insight into the relationships, rules, and actors within the ecosystem.
By integrating this understanding with the data-information journey, the pilot can diagnose and design services that are better aligned with the ecosystem's needs, ensuring that data is effectively transformed into actionable information and ultimately valuable services for users. This deeper alignment allows the pilot to ensure that the transformation from raw data to actionable information is contextually relevant, addressing the specific demands, competencies, and dynamics of the user communities. It enables the creation of tailored services that are more likely to be adopted and resilient, as they consider both the practical realities of the ecosystem and the strategic entry points where the pilot can deliver the most value. This co-design approach strengthens the potential for operational impact by ensuring that the services developed are directly informed by ecosystem insights, leading to more effective data transformation and exploitation.

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3.3. Template

The diagnosis of each pilot relies on **the representation of the pilot on a 'data-information-usage'framework**, that represents the 'data journey' from data to information, up to usages, and the actors involved in the different transformation processes. In this framework, the development of EO-based services can be seen as building relationships between data, information, and usage). This framework is analyzed following five main points (see Figure 1):

1. **Usage ecosystem:** global vision of the usage ecosystem, involving the overall organization of the ecosystem (links between actors, underlying rules and regulations, etc.), the potential users' communities considered by the pilot, and the entry points of the pilot in these different communities.

2. **Users' competencies:** for each actor identified as entry point in the usage ecosystem, the following elements need to be addressed: the existing tools these actors already use in their day-to-day operations, their ability to transform EO-based information provided by the pilot into actions (on their own, with the help of additional support/tools,…).

3. **Types of services to be developed by the pilot**: given a certain identified use case, different ways of building services based on EO information can be considered. Indeed, EO information is expected to be integrated with a certain set of supporting elements (customization tools mentioned above). To describe the different types of services in a generic way that would be common to the different pilots, a typology of a few recurrent systems has been introduced:

   - Monitoring system when the user only needs to monitor a certain variable or phenomenon - information is then complemented with visualization tools and other customized tools depending on user's operations. Ex: monitoring pollutant concentrations.
   - Decision support system: monitoring system complemented with other customized tools based on specific decision rules, helping the user to choose between a certain set of predetermined alternatives. Ex: system that integrates some functionalities to help trigger certain actions when threshold is exceeded. To be noted that building such a system requires to make explicit these decision rules, the level of precision expected and the underlying risks (for ex false alarm).
   - Scenario design support system: monitoring system complemented with other customized tools helping the user to design new alternatives or operations, for example by the exploration of specific scenarios. Ex: system that integrates some functionalities to help explore new mitigation actions, regulations, etc. To be noted that it differs from the decision support system as the latter only helps to choose between existing alternatives.

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   - Specific service provision: punctual advisory service, specific preliminary study, punctual information provision. Such service provision might be necessary as a first step before considering building more stabilized systems, in a temporary mode.
   - In some cases, information can be used as such directly by the user, we could then refer to a simple "information provision or data brokering system" (better name could be probably found). It is for example the case when users are research communities. In this case, information could be complemented with access to other resources such as modelling resources.

4. **Pilot-user relationship:** clarification of the history of the relationship between the pilot and a given user, the existing interaction loops (frequency, adequacy to the learning needs), and the strength of this relationship (interest of the user, potential competitors of the pilot from the user's point of view, formalization of the relationship through dedicated agreements).

5. **Platform-pilot-user flow**: One key objective is to ensure that the data from the platform is accurately mapped into the framework's 'data journey.' This involves aligning the platform's data flows with the transformation processes that turn raw data into valuable information and enable its practical application. By effectively utilizing the platform's infrastructure, the pilot can ensure that data moves seamlessly through each stage of the journey, from its initial collection to its final usage by end-users, while taking into account the various actors and their roles in these transformation processes. Moreover, the platform serves as a bridge, facilitating the relationships between data providers, service developers, and end-users within the ecosystem. As data flows through the platform, it is integrated into the framework's analysis points, such as identifying service types, assessing user competencies, and ensuring operational delivery. This alignment ensures that the platform supports not only the technical aspects of data management but also the co-design objectives of building services that are both scientifically grounded and user-centered.

6. **Ability of the pilot to provide the required service** (prototype/operational): given a certain identified use case, capacity of the pilot to build and sustain services in practice (either for a first prototype, or for an operational service). Specific efforts might be needed to ensure the engineering and operationalization of the services might be needed, possibly involving new partners, or strengthening the relationship between existing partners.

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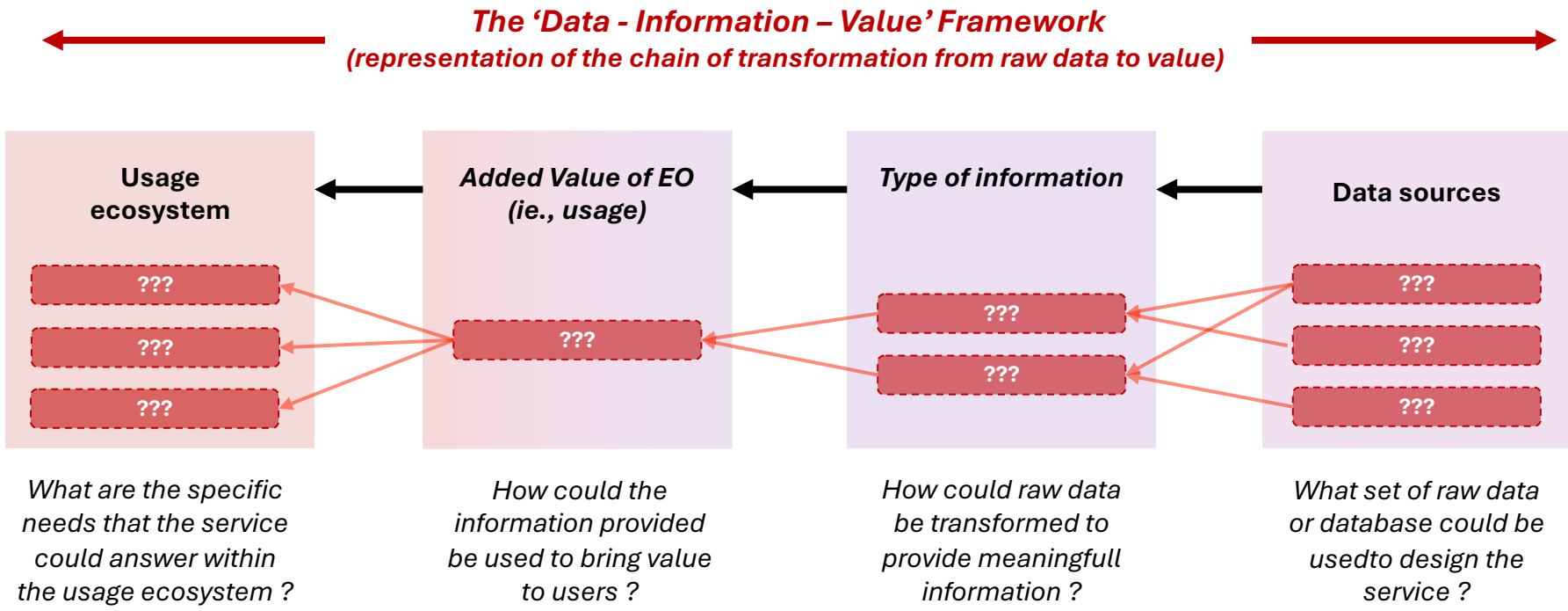
Figure 1: Representation of the "data journey" for the targeted state based on the data-information- usage framework: data (in blue), information (in purple), usage (in purple-red), function "f" linking data and information, function "g" linking information and usage are the different constitutive elements of the service, addressing a certain users' community (in red)

Q&A

II.
Introduction to the interactive part of the workshop

Introducing the 'Data – Information – Value' (DIV) Framework

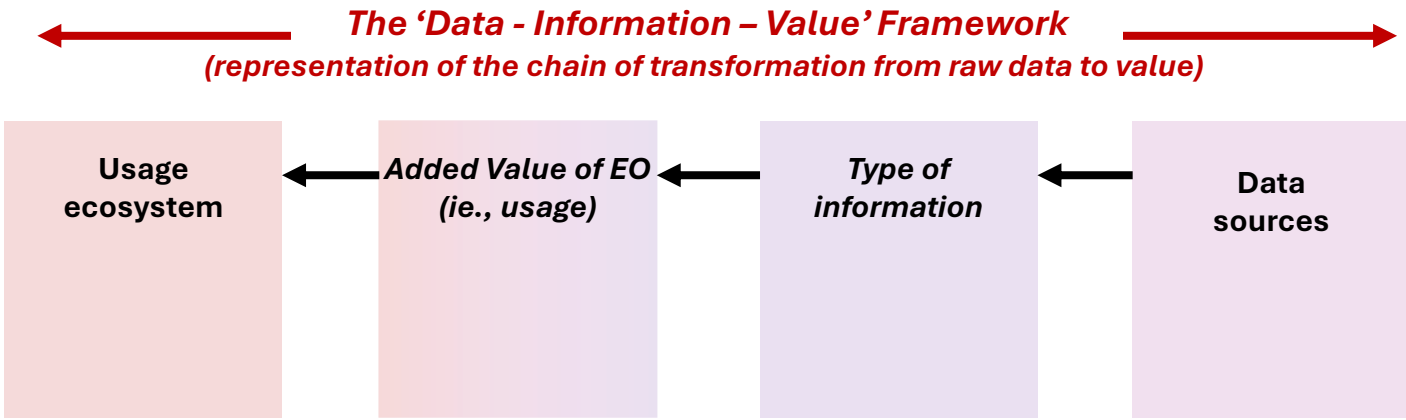
- The DIV Framework is a critical tool both to diagnosize co-design needs and to follow the evolution of the co-design process.
- It allows to decompose the potential service from raw data to value adding services.
- It supports a clear identification of the specific challenges related to each steps of service development



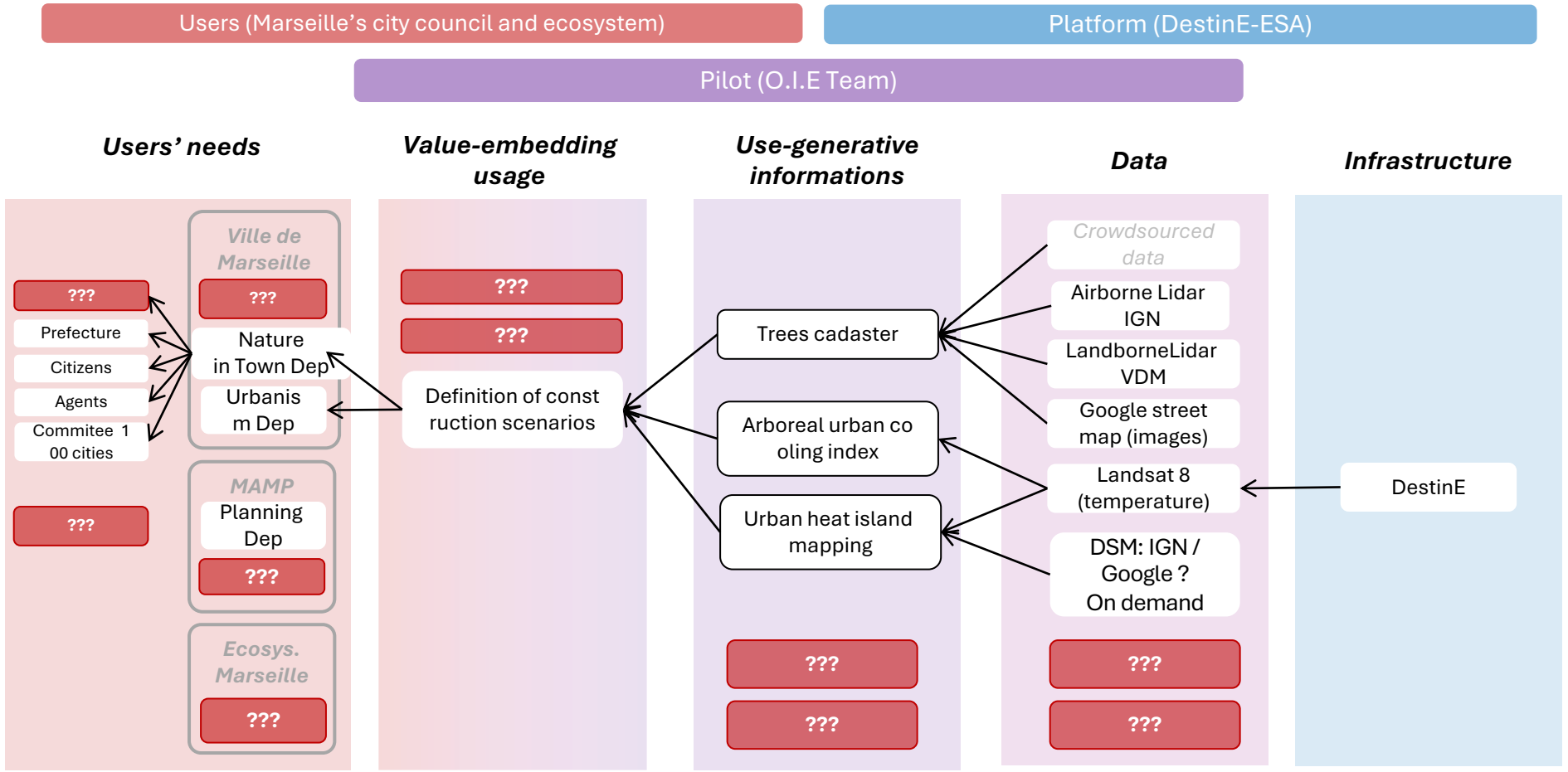
Introducing the 'Data – Information – Value' (DIV) Framework

The DIV Framework supports a progressive diagnosis of the co-design needs that can be performed through the following steps :

1. Broadly define the targeted service
2. Specify the potential user of the service to be designed and the needs to be adressed
3. Explore the usage ecosystem as to understand the structure of interactions and the challenges that must be faced
4. Envision the chain of data transformation that must be structured to bring value to the users



Example of the 'Data – Information – Value' (DIV) Framework



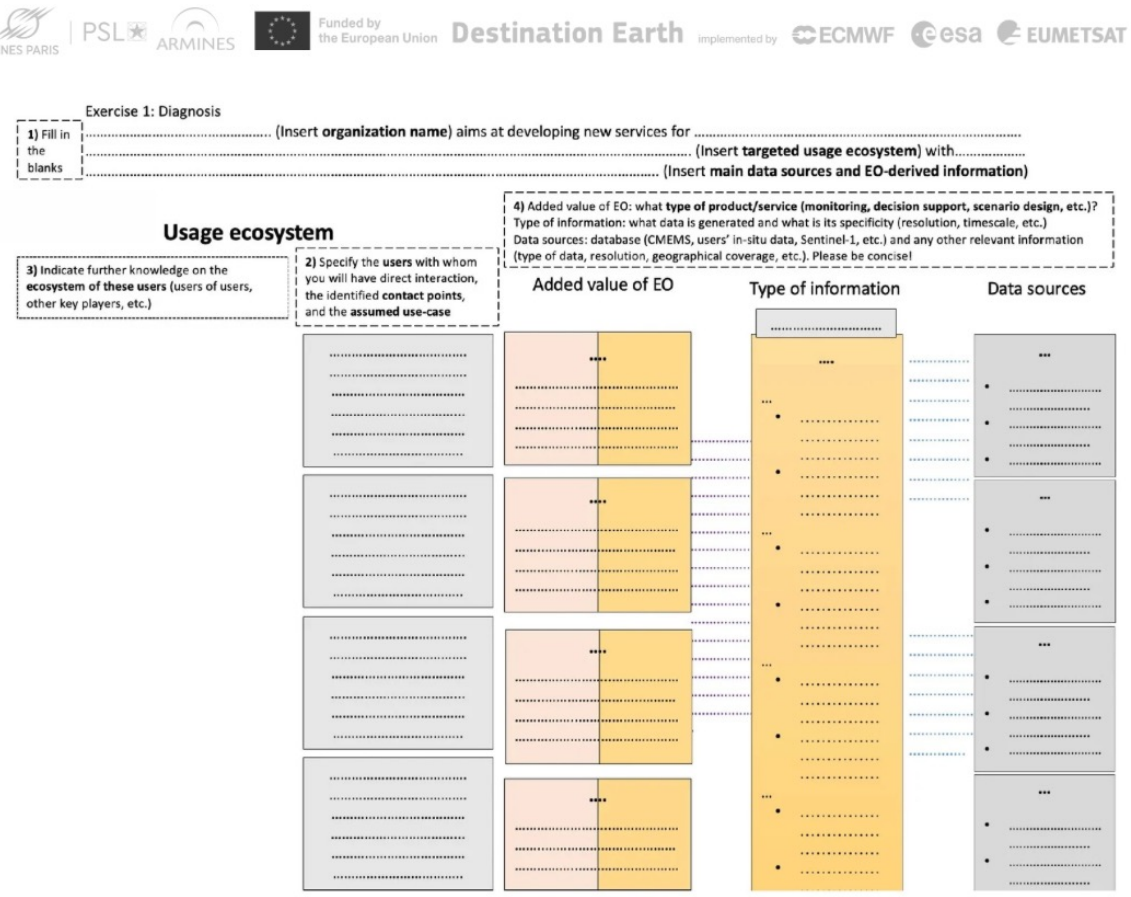
Introducing the DIV template for the diagnosis

Objectives of the interactive part of the workshop :

Based on the following template, you are asked to diagnose a service of your choice as to identify the key challenges to face through co-design

The final goal of the exercise will be to envision the structure of co-design workshops that could be relevant to design the service

- **Choose an example you are familiar with where data is being used for the development of a climate service.**



Exercise
Step 1

Broadly define a specific service to be developed :

1. Who will develop the service ?

2. Who are the targeted users ?

3. What are the main data sources and information to be used and/or provided ?

Exercise
Step 2

Specify the targeted users of the service :

1. With whom will you interact ?

2. Who are your potential contact points ?

3. What kind of usage/needs would be adressed (use cases) ?

Exercise
Step 3

Specify the broader usage ecosystem :

1. With whom do your users already interact ?

2. Who could stand as other potential users ?

3. What kind of needs could be adressed in the broader ecosystem ?

Exercise
Step 4

Specify how you will bring value to users :

1.What data must be used ?

2.How the data must be transformed to provide valuable information ? What type of service could be envisioned ?

3.How the information would be used to answer the potential users' needs ?

Exercise
Step 5

Identify the key challenges to address through co-design :

1. What are the missing knowledge in your current DIV ?

2. With whom you must interact to complete your DIV ?

3. What kind of co-design sessions could you set up to explore your collective unknowns ?

User eXchange #3

Co-Design for DestinE

Centre for management science (CGS),
Observation, Impacts, Energy Center (O.I.E.)

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