SISTERS

Sistemic Innovations for a SusTainable reduction on the EuROpean food waStage

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D6.3

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Table of contents

Acronyms

EAB	External Advisory Board
API	Application Programming Interface
B2B	Business to Business
B2C	Business to Customer
B2B2C	Business to Business to Customer
BCorps	Benefit Corporation certification
BRL	Business Readiness Level
BMC	Business Model Canvas
CA	Consortium Agreement
CAFO	Concentrated Animal Feeding Operations
CAPEX	Capital expenditures
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
D	Deliverable
DoA	Description of Action
E&D	Exploitation and Dissemination
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EC	European Commission
EFSA	European Food Safety Authority
EIC	European Innovation Council
EU	European Union
FAO	The Food and Agriculture Organization
FLW	Food Loss and Waste
GA	Grant Agreement
GHG	Greenhouse Gases
IA	Innovation Action
IP(R)	Intellectual Property (Rights)
KER	Key Exploitable Result
KOL	Key Opinion Leader
KPI	Key Performance Indicator
LCA	Life Cycle Analysis

LCC	Life Cycle Cost
MAP	Modified Atmosphere Packaging
OTR	Oxygen Transmission Rate
PLA	Polylactic Acid
QR	Quick response
R&D	Research and Development
RINA	Registro Italiano NAvale (certification agency): https://www.rina.org/en
RTO	Research and Technology Organization
SAFE	SAFE Food Advocacy Europe
SAPEA	Science Advice for Policy by European Academies
SDG	Sustainable Development Goals
SME	Small and/or Medium Enterprise
SWOT	Strengths, Weaknesses, Opportunities and Threats
TRL	Technological Readiness Level
TT	Technology Transfer
VCM	Voluntary Carbon Market
WP	Work Package

Executive Summary

This report constitutes deliverable D6.3 of WP6 "MEASURING IMPACT AND REPLICABILITY OF THE PROJECT RESULTS of SISTERS project "Systemic Innovations for a Sustainable reduction of the EuRopean food waste" (https://sistersproject.eu/).

It establishes the plan to guarantee the replicability of the project, that is, its adoption by companies in the food value chain, mainly in the EU market. To this end, this document describes the methods for recruiting stakeholders and companies in the industry. Among these tools, a list of companies from the production, logistics and distribution sectors that have already expressed their interest in continuing the conversations with SISTERS and learning more about the project stands out. These potential partners justify a commercial pain, related to the environmental regulatory framework, on which SISTERS has a great business opportunity.

For this, SISTERS also presents a unique market positioning, as there is currently no company in the market that addresses the entire food value chain with a solution for each step. This allows SISTERS to present ourselves as an integral partner for sustainability. Based on these assumptions, a series of actions to be carried out to develop this replicability and impact model are presented, including a feasibility study and sales and financial forecasts. As a result of this analysis, some conclusions point to the need to strengthen its standardization strategy, about the decisions that will need to be made to constitute an entity that allows exploitation and sales, and about the time to wait before the model to be profitable.

1 Introduction

This report has been prepared in the framework of WP6 "MEASURING IMPACT AND REPLICABILITY OF THE PROJECT RESULTS of SISTERS project "Systemic Innovations for a SusTainable reduction of the EuRopean food waStage" (GA: 101037796).

The focus of this report is the analysis of the replicability of SISTERS' promising Business Model, as a sum of all the individual business models that can be developed around each outcome. In sec. 2 the main definitions and the background are presented; over it, the rest of the document is built. In sec. 3, main tools to design and execute such business case are presented. As a first step, here presented for the first time as individual commercial value propositions. In the light of the insights drawn of the preliminary study stated in the DoA and GA a set of real application pilot studies to provide a clear and comprehensive understanding of performance of SISTERS solutions on a real environment, reaching TRL 7 – 8, are identified and thoroughly studied. Here, after 1 year of development of the project, pathway from these pilot studies to be replicated in different local, regional or national food value chains are set. A capital conclusion of this document is that replicability of SISTERS is assured through its commercial deployment.

The safest way to ensure that SISTERS is replicated is for it to be marketed. In a value chain subject to strong trade fluctuations, otherwise the actors in the chain will not find sufficient incentives for its implementation. Indeed, from producers to retailers, they are subject to increasingly restrictive and intense environmental regulations (sec. 3). But SISTERS needs a product, marketing and sponsorship strategy to penetrate efficiently and be able to achieve the impacts to which it has committed. In short, this is an exploitation strategy focused on impact that, effectively, must have significant support from public institutions. In other words, an adequate exploitation strategy for SISTERS is that of a value proposition seeking for the sustainability of the food value chain by reducing FLW through its prevention.

After some preliminary definitions (sec. 4), it is presented another great conclusion: SISTERS contains an additional value proposition and impact channel that cannot be exploited if SISTERS is not conceived as a business case: its unique value proposition along the whole value chain that allow to position itself as the first comprehensive sustainability partner for any actor in the chain, extremely interesting for normative compliance through B2B lines (sec. 4.4). It is also important that SISTERS, even related with food production, can replicate on very different geographical (climate) context and productions. It is another great advantage of the commercial-deployment path for replicability of SISTERS, though the replication actions should also consider the determining parameters which can strongly differ even between neighboring countries.

Also, a potent stakeholder and partners network, as potential future Business Cases, must be built. So far, about 45 stakeholders from 6 different European countries (Spain, Italy, France, Portugal, the Netherlands and Denmark) have been already contacted through SISTERS with the aim of replicate its model and have answered very positively (Annex I). By the moment, SISTERS' role is to keep them posted and interested, in order to build a commercial – replication agreement based on trust. Importantly, also 5 stakeholders abroad have been also engaged on the same (Egypt, South Africa, Morocco, Chile, Costa Rica, Ecuador and Brazil). A more in deep analysis of replicability and exploitation carried out at a country level would be very desirable at the end of SISTERS' project, or even after it. For this market penetration, they are identified those steps needed (sec. 5) and the possible obstacles specific to the replication contexts (sec. 6). Finally, it has been carried out the preliminary financial and sales forecast (sect. 8) and analyzed any other positive collateral impact of this initiative (sec. 9).

2 Definitions and objectives

In Deliverable D 6.1, the key concepts of the exploitation routes for each of the SISTERS key outcomes were, in general terms, outlined. After a year of project execution, this deliverable takes advantage of the results obtained and the first Dissemination actions, to identify and develop, as far as possible up to now, the key factors for the replicability of the project.

The exploitation of SISTERS goes through its replication, that is, its adoption by users (companies, end-users…) in their respective activities. On the other side, the replication of SISTERS goes through its exploitation, since SISTERS' replication agents are economic agents (mainly companies), focused on profit. A replication will not be possible if SISTERS, focused on impact, is not perceived as a value proposition. SISTERS' replicability needs stakeholders (especially customers and licensees/assignees of SISTERS' IPRs - see D6.2 -) to adapt (purchase) SISTERS' solutions in their own businesses and activities, demonstrating that the results of SISTERS are comparable and standardized. The needed and even more restricting environmental regulation is probably the main pain of the food value chain that SISTERS can leverage for its replicability.

Each SISTERS value proposition has its own means of being replicated, depending on whether the exploitable result is an object that will not be replicated (for example, the Short-Chain Platform, in which the fundamental business replication mechanisms is its licensing for use) or it is an object, experimental procedure or knowledge that must be replicated by users (e.g., the packaging material formulation). Refer to the comments on the exploitation routes and the possibility of direct or indirect exploitation of each Key Exploitable Result (KER) that were defined in Deliverables D 6.1 and D 6.2. Refer to the DoA for the in-depth description of each KER.

To achieve significant impacts (in the DoA, they are validated through technical pilots by the industrial partners: PROEXPORT, RIBEREBRO and EROSKI), SISTERS needs to be properly replicated and, therefore, exploited. For SISTERS' impacts to be maximized, as many replication agents as possible must be achieved. The impacts described in the DoA are social and environmental, declared with the appropriate KPIs. These must be expressed in economic and market impacts KPIs that remain to be solidly justified and evaluated, and only if the latter KPIs are achieved will the former be achieved. The dissemination-related tasks along the WPs are indeed the preparation to market launch.

Since SISTERS replicability needs a market deploy, developing a product strategy is a key step. With this we refer to all the actions carried out to design and produce the goods and services of SISTERS, having as main guide the needs, tastes and preferences of consumers, which in SISTERS' case encompass the entire Food Value Chain. Due to the highly competitive environments that are occurring, these types of strategies are of great importance since they allow to adapt and update to the requirements of consumers to be more competitive. This high competition has also reached the FLW segment, where different actors have already positioned themselves to do business with unsold food surpluses, or to take advantage of the different business opportunities that are opening up thanks to the increasingly restrictive regulatory framework.

With this product strategy as one of the main conclusions of this replicability plan, SISTERS can define a commercial plan, beginning the project outcome, and passing through the additional features to add that make in more attractive for replication agents (product strategy: the design of SISTERS' good or service), the marketing strategy (which starting point are SISTERS' Communication actions), and the choice of the market in which it is going to enter, among others. A good product strategy is one that emerges after a detailed exploration of the product's characteristics and also carrying out market research work that leads to a correct consumer segmentation.

2.1 Project background

The context of the project is described in greater depth in other Deliverables and in the Grant Agreement. The issue is briefly described and updated here, but with a genuine commercial bias. Since this document has a vision of SISTERS as a business and exploitation opportunity, an analysis of the broader food value chain will be carried out, also citing the problems of environmental sustainability. This is in line with SISTERS' market positioning as a sustainability partner in the food business described in sec. 4.4.

To address this problem, SISTERS develops five outcomes that are stated in D9.1 and DoA, but described as Value Propositions in sec. 4.3.

2.1.1 The Food Value Chain

The **Food Value Chain** entails a series of interlocking political, societal, health and environmental systems (**Fig. 1**). It is the interconnected system of everything and everybody that influences, and is influenced by, the activities involved in bringing food from farm to fork and beyond. It includes the chain of activities from producer to consumer; the factors that influence the chain of activities and are influenced by it; these are drivers and outcomes of the food chain, which have economic, political, environmental, health and social dimensions; the many entities, institutions and people directly and indirectly involved; the connections between all these elements, meaning that action in one part of the system has repercussions across the system.

2.1.1.1 The ecosystem: environmental impact of the Food Value Chain

Conservative estimates suggest that the global population is set to increase to around 9.7 billion by 2050 from its current level of 7.7 billion[1]. Unless significant changes in food systems are achieved, addressing food waste and consumption patterns, this increase in population means that 50 – 70% more food will need to be produced to keep pace with the anticipated level of demand.[2] It is a rate that has a huge environmental and ecological impact, especially considering that the food value chain system, both at European and global level, is very unsustainable. Demand is also likely to increase as countries whose diet is currently based on rice and vegetables go through a "nutrition transition" towards diets that are more heavily dependent on meat and dairy products.[3] A radical system-wide change is required, with 'business as usual' no longer a viable option. [4]

Furthermore, the Food Value Chain (which includes all the actors and institutions involved in producing, distributing, consuming and disposing of food) is beset by multiple problems, from unacceptable levels of food waste to the growing ecological footprint of agriculture, from chronic soil depletion to recurrent food scares.[5] This is reflected in the growing attention paid by international and European institutions to food system challenges. Several initiatives, including the recently created European Food Forum, are promoting a system shift. Similar concerns are acknowledged in the United Nations' Sustainable Development Goals (SDGs), many of which are directly or indirectly related to food production and consumption (**Fig. 1**).[6]

[1] World population prospects 2019. UN **2019**. *Online* [Link].
[2] FAO. How to feed the world in 2050. *Online* [Link].
[3] Popkin, B. M. (2006). Global nutrition dynamics: The world is shifting rapidly toward a diet linked with noncommunicable diseases. The American Journal of Clinical Nutrition, 84(2), 289-298. doi:10.1093/ajcn/84.1.289.
[4] A sustainable food system for the EU", Science Advice for Policy by European Academies (SAPEA). Grant Agreement 737432. **2021** *Online* [Link].
[5] Science Advice for Policy by European Academies (SAPEA). A sustainable food system for the European Union. Evidence Review Report No. 7.
[6] Hawkes, C., et al., Understanding the food system: Why it matters for food policy. *Online* [Link].

Fig 1. Mapping the Food Value Chain. From Ref. #6.

Furthermore, the Food Value Chain is known to be a **main driver of environmental impacts**, including climate change.[7] It is impossible to separate our food production, processing and distribution from our environment. Unfortunately, the industrial or "conventional" way of producing food causes large-scale environmental degradation. Industrial agriculture harms the environment through pollution of air, soil and water. Air emissions from livestock operations make up 14.5 % of global greenhouse gas (GHG) emissions. Conventional crop production degrades soil health and causes soil erosion. The high content of nitrogen and other nutrients in manure runoff leads to dead zones in downstream waterways. Monocropped fields require chemical fertilizers and pesticides that run off into soil and waterways. Concentrated animal feeding operations (CAFOs), also known as factory farms, result in excess animal waste that pollutes soil, water and air.[8] The main supply and transportation methods in the Food Value Chain are water (58.97% of total), road (30.97%) and rail

[7] Special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Summary for policy-makers. Intergovernmental Panel on Climate Change (IPCC) **2019**. *Online* [Link].
[8] Food and the Environment. FoodPrint. **2022**. *Online* [Link].

(9.90%).[9] While road transport constitutes the highest proportion of overall transport emissions (in 2019 it emitted 72% of all domestic and international transport GHG).[10] In 2017, 27 % of total EU-28 GHG emissions came from the transport sector (22 % if international aviation and maritime emissions are excluded). International shipping and road transport were the two largest percentage increase in greenhouse gas emissions over 1990 levels (+32% and +23%).[11]

But the food system needs to be sustainable not only in terms of environmental impact, but also for social and economic aspects related to the wide range of interconnected enterprises which operate across the scales and levels discussed above. This is also reflected in Sustainable Development Goal 2: Zero Hunger, which aims to end hunger and ensure access to safe, nutritious and sufficient food for all by 2030. Food production has not only kept up with a growing world population, but since the early 1960s it has actually outpaced population growth, increasing by more than 30%.[7] But this does not translate into food security for all. For example, in EU countries about 20 million people are affected by disease-related malnutrition, costing EU governments up to €120 billion annually.[12] This is essentially determined by our access to food, coupled with a range of other factors: affordability, preference, convenience, cultural norms and other factors, and the prevailing 'food environment'. The price and quality of food available to consumers is set by a wide range of policies, actors and activities comprising the food value chain, i.e., the array of processes and people that convert the biomass coming from the farm, forest or ocean into the food we eat.

The echoes of this need are repeated in different political and technical instances. SAPEA's report "A sustainable food system for the EU":[4,13]

> The European Commission's reflection paper *Towards a sustainable Europe by 2030* expresses the need for "a comprehensive approach entailing a genuine change in the way we produce, transform, consume and distribute food by accelerating the transition to a sustainable food system based on circular economy principles and making innovative, healthy, environment and animal welfare-friendly, safe and nutritious food production one of our key European trademarks". It also calls for "a socially fair transition", raising important ethical issues of equity and justice that this Report seeks to address. Similarly, European Commission President von der Leyen highlighted the need for a comprehensive new farm-to-fork strategy for a sustainable food system along the whole value chain as well as "a just transition for all". The strategy aims to design a fair, healthy and environmentally friendly food system as part of the European Green Deal, working across three Commission directorates-general, AGRI, SANTE and MARE.

Among the causes of the problem and the efficiency problems of some action strategies, it is usually pointed out the lack of coordination based on complex governance structures, a complicated regulatory environment which hinders the development of joined-up thinking, vested interests, strong cultural determinants and the prevalence of short-term over longer-term time horizons.

[9] Share of global food miles by transport method. Our World in Data. **2018**. *Online* [Link].
[10] Greenhouse gas emissions from transport in Europe. European Environment Agency (EEA). **2021**. Online [Link].
[11] Greenhouse gas emissions from transport in Europe. European Environment Agency (EEA). **2019**. *Online* [Link].
[12] Freijer, K., et al. (**2013**). The economic costs of disease related malnutrition. *Clinical Nutrition*, 32(1), 136-141. doi:10.1016/j.clnu.2012.06.009.
[13] European Commission. Reflection Paper Towards a Sustainable Europe by 2030. **2019**. *Online* [Link].

2.1.1.2 The problem SISTERS is addressing: Food Losses and Waste

SISTERS is focused on acting on an especially harmful aspect of the Food Value Chain: Food Losses and Waste. 88 million tonnes of food waste are generated in the EU each year with associated costs estimated at €143 billion[14]. This amount of waste has a huge environmental impact, accounting for about 6% of total EU GHG emissions. As a key element of the European Green Deal, the new Farm to Fork strategy will step up its action to prevent Food Losses and Waste (FLW), in the framework of EU's first Circular Economy Action Plan, adopted in 2015. Established in 2016, the EU Platform on Food Losses and Food Waste has supported the Commission in this sense. The EU is committed to achieving the global Sustainable Development Goal (SDG) Target 12.3 to halve per capita food waste at the retail and consumer level by 2030, and reduce food losses along the food production and supply chains. To accelerate the EU's progress, the Commission will propose legally binding targets for food waste reduction by 2023, as called for by the Farm to Fork Strategy.[15] Among others, moving from a linear ('farm-to-fork') approach towards a more holistic, systems-based approach addressing the FLW also helps advance a more circular, balanced and inclusive view with the intention of providing sufficient, safe and nutritious food for all.

2.1.1.3 The commercial pain: increasingly restrictive regulatory framework

The normative frame addressing FLW has been studied in depth in the recent report by SAFE "Internal report on the situation of food loss and waste in Europe":[16]

> The 12.3 SDG objective to address FLW issues has been taken on board by strategic communications from European Commission (EC), starting with its 2018 Bioeconomy Strategy. This political pledge to act was further recalled in later key communications: the European Green Deal (EGD) in December 2019 and, more specifically, the Farm to Fork (F2F) Strategy published in May 2020. An action point from the F2F Strategy (already hinted in the new Circular Economy Action Plan published in March 2020) underlines the Commission's will to propose a new revision of the Waste Framework Directive (WFD, Directive 2008/98/EC).
>
> This Directive already establishes annual reporting obligation on food waste generation as of reference year 2020 (data collection is regulated by the Delegated Decision and the Implementing Decision on food waste). As a matter of fact, the first reference year for obligatory reporting is 2020 to be reported before 30 June 2022. Collection of food waste data on a voluntary basis has already started through Eurostat in 2020 (reference year 2018), while Eurostat and the Directorate-General for Health and Food Safety (DG SANTE) of the European Commission have also called for food waste data in 2021 (for reference year 2019).
>
> The 2018 revision of the Waste Framework Directive indeed already laid down some specific obligations for Member States (MS) as regards food waste prevention (ie. the adoption of national food waste prevention programmes, and monitoring and reporting on food waste amounts). The new EC proposal (expected for 2023) will address reduction targets for food waste for Member States in order to meet the 2030 objective of halving food waste. Clearer indications and requirements are necessary, as, according to the first Inception Impact Assessment, it has been observed that: ""[Members States'] responses to food waste have been uneven and are not sufficient to address the risk of prolonged environmental damage, and the consequent economic impacts for consumers, enterprises and society as a whole. The variation in efforts across Member States as regards reduction of food waste generation

[14] FUSIONS (2016). Estimates of European food waste levels.
[15] European Commission. Q&A. Frequently asked questions: Reducing food waste in the EU. 2021. *Online* (Link).
[16] SISTERS (2022). Internal report on the situation of food loss and waste in Europe

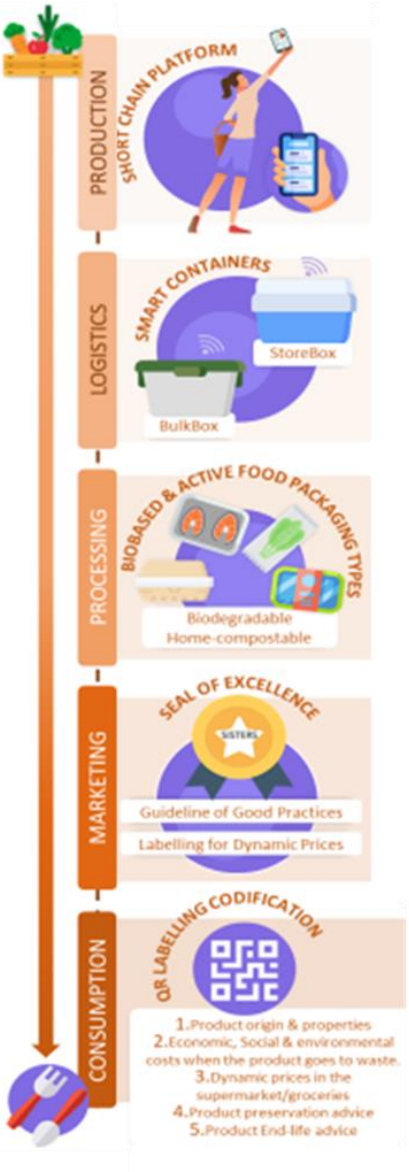
indicates a need for more coordinated and uniform measures at EU level to drive the progress at the breadth and pace required to achieve SDG target 12."
A first public consultation on a roadmap took place in October 2021 and a second one is expected to be held on the second quarter of 2022.

Therefore, it is clear that in the future, businesses, both small producers and large import-export multinationals, will have to contend with laws that increasingly closely monitor the generation of FLW. Lacking reliable tools, these businesses are very receptive to solutions that allow them, without large operational investments (CAPEX), to address this problem.

2.1.2 SISTERS' approach

SISTERS is an impact-oriented EU-funded project to campaign against Food Losses and Food Waste. Overall, SISTERS targets the complex problem posed by FLW at all the key stages of the value chain (**Fig. 2**). It is a comprehensive approach to reduce food loss and food waste generated in the main stages of the Food Value Chain in Europe that will result in a consistent reduction of the environmental & economic impact of the current dynamics in the food system, as well as achieving optimal shelf-life of widely consumed food products, which are responsible generating high amounts of FLW.

Concretely, five innovative strategies, one at each stage of the food chain, are developed in the project and described in the **Fig. 2**. In this document, these solutions will be presented as **business value propositions**, in alignment with the focus of SISTERS' Impact and Replicability plan defined in the following sections. In this sense, it is important to clearly establish the technical and business model advantages of these solutions, taking into account the propositions of competitors. In addition, SISTERS as an exploitation opportunity presents new additional value propositions beyond these five technical solutions. In the first place, a position in the market that allows it to present itself as the partner for the environmental sustainability of other companies in the value chain (production, distribution, etc.). Secondly, a single point of sale based on claiming a transversal and complete approach to the entire value chain, compared to the main competitors, who act only at the level of a single step in the chain. These aspects will be dealt with in sec. 4.4.



Creating and validating via piloting an open user-friendly platform (App) for the first time available for all European primary producers to directly sell to consumers their fruits & vegetables that don't meet the market standards. This action during production also involves (a) influencing in primary producers' dynamics through guidelines promoting direct sales and reductions in food losses from overproduction/discards, and (b) fostering results to policymakers and relevant national authorities (e.g., Ministries) of the 27 EU countries.

Designing containers for fresh food produce transportation with cutting-edge sensors with respiration studies and creation of an atmosphere suitable for each specific product. This will be applicable to bulk food products from the production stage (called BULKBOX) and packed products after processing (called STOREBOX). The performance of the two containers will be validated via piloting (case studies).

Producing bio-based packaging materials with optimised recyclable, and compostable properties to manufacture different widely-used types of packaging adapted to consumer's needs. Besides, we will also incorporate smart labelling at affordable cost to show the status of the food as a kind of alert system that may influence in consumer's dynamics.

Overall in this stage, SISTERS will design and integrate an action plan adapted to European citizen's lifestyle to change current unsustainable consumption dynamics in households, canteens and restaurants. We will incorporate a QR Labelling Codification with extensive information for consumers regarding the origin of the product, the economic and environmental cost of wasting the product and advises for product conservation and end life. With this, we expect to highly impact in consumer behaviors & dynamics. To quantify this, an extensive consumer survey will be carried out for achieving the expected impact.

Elaborating behavioral guidelines with a compendium of sustainable best practices, and fostering their implementation among wholesalers and retailers, together with an associated "Seal of Excellence" for the entities committed to practices diminishing FLW. At this stage, we will carry out assessments in market centers to validate results from this strategy as well as validating a pricing dynamic label for automatic and agile product price changing as closer it gets to the expiration date.

Fig 2. Key Exploitable Results (KER) of SISTERS.

3 Methodology and early commercial and industrial tracking

3.1 Networking Action for Replicability

SISTERS' main tools to access the actors of the value chain that may be interested in SISTERS solutions are:

- Dissemination activities. The activities developed so far are listed in Table 1.
- The portfolio of members and partners of ENCO and the business partners of SISTERS (RIBEREBRO, PROEXPORT, EROSKI). For replication and exploitation tasks, current suppliers and business partners are also counted among stakeholders and will be taken into account as potential customers.

Table 1. Dissemination events attended to date. From INNOVARUM.

Date	Name	Audience group	Partner	# Stakeholders	Link
16/12/2021	Ad OCC / Occitanie Transformation Digital Day		BMS		-
17/02/2022	ACI'S European Food&Beverage Packaging	Other	AITIIP	150	-
17/02/2022	TRANSFIERE 2022	Other	AITIIP	3,000	transfiere.fycma.com/
17/03/2022	AREA Occitanie		BMS	100	-
22/03/2022	Inyection Moulding Workshop at Aitiip	Other	AITIIP	11	-
23/03/2022	Circular economy Dialogues	Other	AITIIP	20	-
29/03/2022	Advanced Factories	Other	AITIIP	50	-
06/04/2022	11ª Conferencia Programa Marco-CDTI	Other	AITIIP	10	-
20/04/2022	MeetingPack 2022	Industry - processors & distributors	ITC	200	meetingpack.com/congreso-programa-envases-barrera/
17/05/2022	FOOD4FUTURE Bilbao 2022	-	RIBEREBRO	-	-
24/05/2022	PACKAGING PREMIERE & PCD Milan	Industry - processors & distributors	ARCHA	230	packagingpremiere.it/en/exhibitor/archa-srl/
31/05/2022	PLMA Amsterdam	Other	RIBEREBRO		-
01/06/2022	EU Green Week: Workshop on the agrifood value chain	General public	INNOVARUM	35	-
14/06/2022	XIII Congreso Nacional y XI Ibérico de Maduración y Postcosecha	Primary Producers	AITIIP	150	postcosecha2022.es

22/06/2022	PRSE 2022	Industry - processors & distributors	AITIIP		-
29/06/2022	AECOC Thematic Conference 2022	Industry - Retailers & wholesalers	EROSKI	7,300	https://www.aecoc.es/minisite/trend-builders-22/
13/09/2022	EUROSENSE 2022: A sense of earth		FEM	-	https://www.eurosense.elsevier.com/
23/09/2022	Asamblea PROEXPORT 2022	Primary Producers	PROEXPORT	-	-
04/10/2022	Scanpack 2022 - Presentation at the Pioneers stage	Industry - processors & distributors	GAIA	200	-
04/10/2022	FRUIT ATTRACTION 2022	Primary Producers & distributors	ENCO & RIBEREBRO	90,000	ifema.es/en/fruit-attraction
06/10/2022	CircularWeek2022	General public	KTH	102	youtube.com/watch?v=Dj92m4zwS9I
15/10/2022	SIAL Paris 2022		BMS	-	sialparis.com/
21/10/2022	Castiglione delle Stiviere (MN), Italy	Industry - processors & distributors	ARCHA	-	compacknews.news/it/news/2022/teoria-e-realta-a-convegno/
Total				**11608**	

Among the dissemination actions carried out, it stands out FRUIT ATTRACTION 2022, celebrated between October 4th – 6th 2022 in MADRID, at IFEMA Congress Palace. This edition consolidated the position of FRUITATTRACTION (https://www.ifema.es/en/fruit-attraction) as the **global leader in the fields of agricultural fruit production and importation-exportation** by surpassing the figures seen in 2019, until now the most successful edition in its history, with 1,800 companies from 55 countries, more than 58,000 m^2 of fruit and vegetable produce on offer and attendance of 90,000 professionals from 130 countries. It is by far the most important event attended, so it is detailed here.

Fruit Attraction has become the leading commercial tool of reference for the worldwide marketing of fruit and vegetables. Its ability to promote world exports in the sector, make it the commercial connection nexus for the whole group of professionals that make up the entire value chain, whilst consolidating its position as the innovation stage for the fruit and vegetable market.

In terms of its impact on international participation, 55 countries were represented on this occasion, confirming Fruit Attraction as the key trade event for production, marketing and distribution worldwide. In addition to strong European participation, with companies from France, Italy, the Netherlands, the United Kingdom, Belgium, Portugal, Poland and Germany, there will be group participations from Serbia. Elsewhere, countries such as Colombia, the United States, Korea, Peru, Chile, South Africa and India will

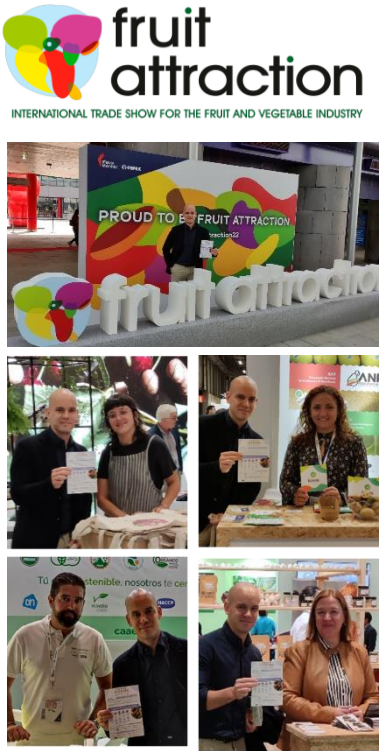


Fig 2. SISTERS presented to fruit producers and distributors at FRUITATTRACTION 2022.

be represented, and Africa will see an increase in participation, especially from Kenya, Guinea and the Ivory Coast.

The complete programme of technical seminars makes the Fair the great centre of knowledge of the fruit and vegetable sector, with sessions characterized by the great diversity of content, as well as the high level of the participants and speakers.

Fruit Attraction is also the setting for other events such as the 3rd Fresh Food Logistics Summit, as well as the Biofruit Congress and Biotech Attraction 2022: Biotechnology and innovation for the agriculture of the future, and the 6th Grape Attraction Congress, among others.

ENCO has presented SISTERS at FRUITATTRACTION 2022 (**Fig. 2**). At this fair SISTERS had the opportunity to comment and discuss with fruit producers, distributors exporters and importers in different countries and in different food value chains throughout the world the reception that the SISTERS solutions may have in the market, especially the Short Chain Distribution Platform, the Smart Containers and the Smart Labels (sect. 4.3), that are those related the most with primary production and supply.

3.2 Literature and market studies

In preparation for commercial deployment, as well as for the preparation of this document, it is necessary to obtain reliable information on the state of the art in the market and the food value chain. As for the literary sources, just official documents verified by the most reliable entities have been used. Specifically, for the present deliverable, twelve reports are highlighted as the most used and closely related to SISTERS' work:

- EASAC (European Academies Science Advisory Council), 2017. Opportunities and challenges for research on food and nutrition security and agriculture in Europe.
- EC FOOD2030 (European Commission, Directorate-General for Research and Innovation), 2018. FOOD2030: Recipe for change.
- EEA (European Environment Agency), 2017. Food in a green light: A systems approach to sustainable food.
- FAO (Food and Agriculture Organisation of the United Nations), 2018. The future of food and agriculture: Alternative pathways to 2050.
- Fresco & Poppe (Wageningen University & Research), 2016. Towards a common agricultural and food policy.
- GO Science (UK Government Office for Science), 2011. The future of food and farming.
- IIASA (International Institute for Applied Systems Analysis), 2018. The world in 2050 transformations to achieve the SDGs.
- iPES-Food (International Panel of Experts on Sustainable Food Systems), 2019. Towards a common food policy for the EU.
- STOA (Science and Technology Options Assessment), 2013. Technology options for feeding 10 billion people: Sustainable food and agriculture in the EU.
- WRI (World Resources Institute, in partnership with the World Bank, UN Environment, UN Development Programme, CIRAD & INRA), 2018. World Resources Report, synthesis report: Creating a sustainable food future: A menu of solutions to feed nearly 10 billion people by 2050.
- WRR (The Netherlands Scientific Council for Government Policy), 2015. Towards a food policy
- Opinion of the EESC (European Economic and Social Committee), 2017, Civil society contribution to the development of a comprehensive food policy in the EU.
- The market studies about FLW FoodTank. 59 Organizations Fighting Food Loss and Waste and OneThird. Food Waste Prevention. 8 of the Coolest Products that Reduce Food Waste.

3.3 Stakeholders and commercial partners already engaged

SISTERS was received at FRUITATTRACTION 2022 as a very interesting project by many companies worldwide. Fig. 3 contains the geographical distribution of the interested companies. The foreign companies have been highlighted, since it is also a very important result to have aroused interest even in South America or African producers.

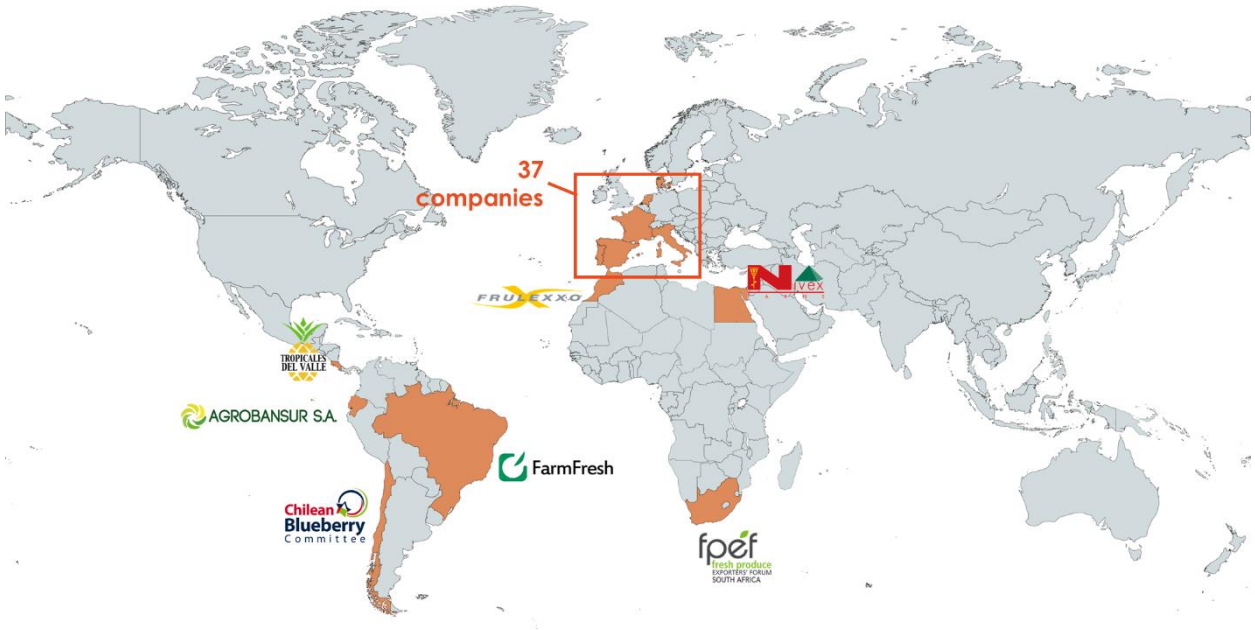


Fig. 3. Geographical distribution of the early companies commercially interested on the replication of SISTERS.

Focusing on EU market, the list of all the companies currently engaged that want to know more about the project and that have declared their commercial interest on contributing to the replication of SISTERS are contained in the Annex I. ENCO will keep them informed of the main results, and when SISTERS is ready to go to market, ENCO will let them know for potential commercial agreements and partnerships.

3.4 Partners' commercial background

Experience in business development is also a fundamental asset to maximize the replicability of an R&D project. SISTERS counts on world-class wholesalers and retailers who have been very successful in expanding their business models, as shown in Table 2 and in the GA. ARCHA Labs is also included since their involvement is crucial for normative and regulatory compliance, as pointed in next sections.

Table 2: Greatest industrial partners of SISTERS and their commercial background

Now called The Real Green Food (https://www.therealgreenfood.com/), since its foundation in 2007, and with more than 200 years of history of its specialist subsidiaries, RIBEREBRO Group carries out its activity in the agri-food sector. RIBEREBRO controls the entire production process, from the cultivation and transformation of raw materials, to final commercialization. Likewise, they are present in all the business areas of the sector: cultivation, transformation and distribution.

The company is the result of the sum of three historical brands of canned vegetables from Navarra and La Rioja (ES): Gvtarra, dedicated to vegetables since 1910; Ayecue, specialist in mushrooms and cultivated mushrooms; and JA'E, a pioneer in cooked legumes.

For over a hundred years, the RIBEREBRO Group has been dedicated to the production and commercialization of fresh mushrooms, preserved mushrooms and preserved vegetables and legumes. Fresh mushrooms are farmed in own crops and commercialized from the fresh retail Centre. Vegetables and legumes are also produced by associated farmers.

As specialists in plant solutions, RIBEREBRO's purpose is to help people eat healthily and live better. RIBEREBRO bets on vegetables and mushrooms, because without a doubt they are the best allies when it comes to following a balanced diet.

RIBEREBRO is the leading company within the Spanish premium vegetables and legumes market. More accurately, RIBEREBRO is Spain's top company in the mushroom sector and is situated in third position at European level. The company commercializes its own brands as well as third-party brands for international food retailers, with presence in the five continents.

RIBEREBRO Group's headquarters are located at RIBEREBRO INTEGRAL, which is formed by different business units.

RIBEREBRO's innovation model integrates facilities, technicians, an open innovation space, and consumer and market focus. RIBEREBRO forms a Mixed Research Unit with a Technological Centre (CTIC-CITA), combining facilities (pilot plant, labs, sensorial rooms) with technical staff from the company and from the Technological Centre. The team works together with common objectives

PROEXPORT (https://www.proexport.es/) is the Association of Producers-Exporters of Fruits and Vegetables of the Region of Murcia (ES). It has founded in 1975 to defend the interests of the sector and to achieve the best results for our associated companies.

PROEXPORT currently has around 50 company members, which are among the leaders of the sector that moves 20% of the Spanish exports of fruits and vegetables. Every year, PROEXPORT's associates directly employ more than 28,000 workers, who are involved in the growing, packing and marketing of an average of 1.2 million tonnes of fresh fruits and vegetables. Their tomatoes, sweet peppers, lettuces, broccolis, spinach, celeries, melons… are sent to more than 35 countries. In addition, PROEXPORT concentrates more than 70% of the total regional production and export of these products, directly boosting the regional economy.

The main objective of PROEXPORT's activities is to tend to the needs of the member companies and help them in the productivity and development of their day to day. In order to do so, PROEXPORT offers its members different services such as:

• Agricultural support. The Technical Department offers PROEXPORT's associates all the production and quality information that affects the activity of agricultural companies, updates in the legal framework, both at the regional, national and community levels, as well as the representation and defence of the interests of the sector before the institutions.

• Environmental support. With the aim of making fruit and vegetable production sustainable, the Department of the Environment reports on current regulations, advises on best agricultural practices and represents PROEXPORT associates before the competent bodies.
• Training
• External promotion. The Foreign Promotion Department collaborates in the organization of events and fairs that favour the promotion of fruits and vegetables produced by PROEXPORT companies.
• Labour support. PROEXPORT negotiates the Collective Agreements of the Murcia Region for harvest and field companies. In addition, they have a Human Resources Coordinator, an Occupational Risk Prevention Service and a national representative in the sector's bargaining bodies.

PROEXPORT provides its members with services such as technical research, environmental programmes, marketing actions, phytosanitary measures, innovation plans and it talks on its members' behalf in regional, national and European institutions.

The Technical Department is in charge of the environmental, research and innovation, and phytosanitary measures to be adopted by the growers in order to improve their agricultural productions, organizational systems, environmental sustainability and any other issue needed or helpful to its members.

Corporate social responsibility is one of the pillars of PROEXPORT's business practices. Their action has four main areas of implementation: sustainability, employment, healthy habits, and society. PROEXPORT is aware of the importance of the fruit and vegetable sector for the Region of Murcia and aims to reach the people who work in it.

For this reason, PROEXPORT collaborates with different non-profit organizations and we are open to all kinds of proposals with social impact.

PROEXPORT has offices full equipped with administrative, computer and communication material to carry out its duties, but above all, PROEXPORT works side by side with its 50 members. They make their experience available to carry out projects and plans. In addition, experimental fields and testing equipment from different members are available for research and innovation programmes.

Eroski Group (https://www.eroski.es/) is one of the most important distribution cooperative companies in Spain, which in turn is part of the Mondragón Corp. It is based in the town Elorrio (Basque Country, Spain).

It was founded in 1969 and is one of the most important distribution companies in Spain, with a workforce of more than 35,000 workers spread throughout Spain. 4 The company has around 2000 different brands establishments, including "Eroski" hypermarkets, "Eroski City" and "Eroski Center" supermarkets, "Eroski Merca" supermarkets, "Cash Record" supermarkets, "Caprabo supermarkets"," Familia "supermarkets," Aliprox" supermarkets, "Eroski Viajes", "Viajes Caprabo", "Eroski Óptica", "Eroski Service Stations" and "FORO Sports Shops".

EROSKI is the leading retail distribution cooperative group of consumer goods and services in Spain and the sector's reference group inthe regions of Galicia, the Basque Country, Navarra, Catalonia and Balearic Islands. The parent company of the group is the cooperative EROSKI, S. Coop., which has three dimensions: it is a distribution company, a consumer organization and a cooperative project in which consumers and workers share leadership and sovereignty.

EROSKI emerged 50 years ago, when seven small consumer cooperatives joined with the aim of achieving quality products at a good price and defending the rights of consumers. Ever since, EROSKI has maintained its business strategy aligned to this end, thanks to ensuring an effective link between the entity's strategy and demands of workers and consumers in general.

Currently, the development and management of the commercial network of its businesses is carried out through the cooperative and the other 27 companies dependent on it.

The EROSKI Group logistics network is made up of 20 own platforms, although for the supply to all the Group's establishments its trucks transit through some 40 logistics platforms, including others that belong to external companies. In total, they represent more than 360,000 m2 of warehouse area, from where they distribute up to a million boxes daily.

As a fundamental part of its commercial proposal, the supply of fresh, quality and close product is key. EROSKI aims to be recognized by the consumer as the reference food chain in the offer of this type of product and, for this, it is necessary to work both in the logistics networks and in the supply flows, hand in hand with producers in the area.

ENCO (https://www.enco-consulting.it/) is an innovation and research-consulting firm based in Naples, active since 1987 working as an experienced advisor for both private business and public authorities involved in territorial development and opened two new offices in Rio de Janeiro and Brussels. The company participates in national and international R&D&I projects as a facilitator for business, product, technology and process innovation in different industrial areas, including energy, environmental management, the agri-food sector and logistics. The company has a long track record participating in EU-funded projects as WP leader, task leader and project coordinator. The company is specialized, inter alia, in two main fields:

• Development of market analysis, business plan and exploitation plans: studies (elaborated at European and international scale) for innovative products, technical solutions and systems are focused on market trends, market profitability and distribution channels. ENCO conducts market surveys with potential customers, Desk analysis, SWOT analysis, identification of economic, legislative and behavioural barriers, customer segments analysis and competitor analysis, market feasibility studies and Risk analysis. Moreover, ENCO develops innovation and business strategies, quantitative assessment of pricing and cost-benefit analysis, identifying Capital and Operational Costs.

• Communication and dissemination strategies: developing action plans for dissemination and communication activities; identifying target stakeholders, tools and actions to be implemented; developing tailor made campaign to raise audience's awareness on the project rationale, activities and results; identifying and selecting events, workshops and meetings; organizing information and dissemination events; producing publications and marketing materials; setting up and managing project websites, and participating in relevant events and exploiting institutional communication channels; building a broader community around the project topics.

Laboratori ARCHA S.r.l. Unipersonale (ARCHA, https://www.archa.it/) is an Italian SME that provides chemical & biological analytical, research and consultancy services to enterprises, in different industrial sectors such as food, waste management, paper, tannery, textiles, ICT, metallurgical, pharmaceutical and biomedical. ARCHA staff is composed by 31 employees, supported by consultants and contract researchers. ARCHA is organized in three main sectors:

• Technical sector, composed by Laboratory area performing chemical and biological analyses (accredited according to ISO 17025) and reporting activities related with the characterization of chemicals for ECHA agency and REACH registration, Research area performing R&D&I activities, Consulting area provides services related with regulatory compliance on the environment, H&S in workplaces, implementation of Quality, Environment and Safety systems.

• ICT sector designs and develops software applications for process control, management and archiving of

data concerning the environment and safety, the management of laboratories of analysis and service activities.

• Industrialization sector. ARCHA annually invests more than 5% of the volume of business for the development of new products and technologies and know-how to industrialize for its business.

3.5 Partners and stakeholders' feedback

The solution of SISTERS focuses on the action of the private entities towards sustainable food commerce, and for this reason it is equally relevant for the private organizations (e.g., companies) and for the public authorities. Both are SISTERS' key stakeholders, while the former are SISTERS' customers and present an increasingly influential political force for sustainable development.

The feedback obtained from companies in the food value chain confirms the postulates collected in other sources. According to the general opinion of the stakeholders interviewed, **the present business era, with its emphasis on contributing to sustainable development globally, presents opportunities for businesses that wish to demonstrate commitment to more ethical and sustainable practices in food sector**. A greater obligation towards embedding responsible and ethical practices across all aspects of company operations and delivering Corporate Social Responsibility (CSR) coherence would go some way towards resolving the tension between a food company's need to maximize profits while also constructing policies to regulate potentially adverse activities and enact programs to ensure equitable and sustainable development. On many occasions there are a number of barriers to the food private sector being a sustainable development actor have been noted, often underpinned by the clash between the dominant business model, which is based upon short-term planning with a narrow focus on finances, and a sideline agenda of longer-term planning with social, economic and environmental goals. It was asserted by that most businesses do not respond to the soft language of business responsibility; rather, they only make substantive changes if they are obliged to do so.

Second, stakeholders and partners totally agree that governments are in the path to enabling an environment for business to address the SDGs. However, it will be necessary for governments to also enact appropriate legislation to oblige businesses to be more social and environmentally responsible. Private sector will be forced to change more in future, as we move from a situation where CSR reporting has mainly been driven by the needs of risk management or to provide positive publicity on a company or brand, to more comprehensive monitoring and evaluation of the impacts and effectiveness of CSR activities, including comprehensive systems evaluations and procedural indicators.

It is a central certainty of SISTERS and its partners that it is not enough to focus only on minimizing harm in the belief we can grow our way out of this problem. It is needed to transform the entire food economic system towards one that is regenerative, equitable, and operates within planetary boundaries. The way the economic system is designed and operates is inherently unsustainable due to the fact that economic growth is the unwritten goal regardless of its impact on nature and human well-being. SISTERS is one more tool for public institutions to strengthen themselves in this fight for the common benefit.

Over the past few decades, hundreds of thousands of new ventures have been created due to the lack of action by mainstream private sector actors and governments. Alongside them, certification schemes have emerged to set the rules by which these organizations should operate. A key example is Benefit Corporation Certification (BCorps).

Currently, many companies and private sector actors now see themselves as partners in achieving sustainable development and they engage in this pursuit in a myriad of ways, even in the FLW field (sect. XX). Some realize this is essential not just for the future of their business, but for the planet. The private sector forms a key part of implementing the Sustainable Development Goals (SDGs), particularly SDG 17 (partnerships).

This is the main point in which SISTERS promotes the expectations of stakeholders, as a tool to support governments' efforts aimed at developing a sustainable food private sector. The private sector's role is not limited to financing and investment. The capacity for introducing innovation, human resources, technical information and technological inputs are other potential contributions. SISTERS promotes sustainable economic growth involving opportunities for value creation. Further, it is certain that sustainable development action will also improve business environment and markets. Trillions of dollars of public and private funds will be reallocated to the Sustainable Development Goals. Thus, there will be great opportunities for responsible companies to find solutions.

4 SISTERS' Business Readiness

4.1 Definitions on Business Readiness

Following the definitions of the European Innovation Council (EIC)[17], the Business Readiness or Market Readiness is an indicator that measures the business maturity, providing very useful information about the commercial readiness with regards to the knowledge and relationship with the market and customers. This scale measures the capacity of a business to be ready to go to market with useful, useable and trusted products/services/solutions.

Within the project Cloudwatchhub (https://www.cloudwatchhub.eu/), Business Readiness Level (BRL) concept was stablished as a numeric indicator to complement the TRL scale and to understand what is expected both at technology and business levels. Even more, as the ultimate purpose of achieving 'market readiness' is to develop a commercial offering for a group of customers, the proposed scale can be further discretized to only 3 states: business conceptualization, business testing and business deployment (**Fig. 4**).[18]

BRL scale is important, since the transfer of an innovation to the socio-economic environment is inherently risky. It is crucial when assessing market maturity to ensure that all the necessary aspects are taken into account to eliminate or minimize the risk of innovation market penetration. In fact, by considering only the TRL scale, there is a risk of finalizing a technology that does not respond to any "market" problem, *de facto* destroying any possible market launch. Therefore, it is necessary to reconcile the Technology and Market maturities to be placed in a successful position for technology transfer.

Technological and market maturity are measured on scales from 1 to 9, to work together to reconcile Technology and Market concerns:

[17] Access2EIC: National Contac Points for Innovation. DELIVERABLE 4.1. Toolbox for research - output-based businesses. **2020**. *Online* [Link].
[18] Grenoble INP – UGA. BRL: Business Readiness Level. **2021**. *Online* [Link].

- BRL 1 to 3: Identification of solved problems and main potential fields of application. These levels correspond to TRL 1 to 3 of technical feasibility.
- BRL 4 to 6: Market segmentation and strategic positioning options. These levels correspond to TRL 4 to 6 proof of concept.
- BRL 7 to 9: Market launch. These levels correspond to pre-production TRL 7 to 9.

Fig 4. BRL scale according to EIC.

These BRL levels are intended to be developed in parallel with the technological maturation of projects and innovative solutions. By design, the ideal situation is for a project to be at similar TRL and BRL scales at all times. Otherwise, it is possible that the developed solution is not taking into account a real market need, or that the market entry strategy has a wrong timing or design (TRL > BRL), or that the technological development is incapable to satisfy the business opportunity identified (TRL < BRL) (**Fig. 5**). The objective of the SISTERS exploitation plan, and of ENCO as the leader in the project, is to ensure this transition in a smooth and adequate manner.

4.2 SISTERS in the BRL scale

According to **Fig. 4**, **SISTERS is on a BRL = 4 – 5**, which is aligned with SISTERS' TRL level, therefore showing the good tech-business alignment (**Fig. 5**). SISTERS is building a business based on a perceived need that SISTERS' offer can satisfy. SISTERS has a candidate product/service, a collection of evidence from SISTERS' clients and an idea on how to generate value to them. Market is the strongest "sparring" SISTERS will have for its business. Testing SISTERS' business will involve close stakeholder or even early adopters. SISTERS' objective here is to measure & evolve if SISTERS' solutions really match with SISTERS' clients needs. Afterwards, SISTERS will need to consolidate paying customers and the product and services SISTERS is offering in the long run. After these steps, SISTERS will become a trustful business for y SISTERS' clients and your cash flow starts to become predictable.

Evolution on the BRL scale is not simply a matter of getting hits from stakeholders. It also involves important internal factors. Throughout SISTERS, ENCO will attend at all times if bringing about a change is an appropriate strategy to address SISTERS' needs, and if it is the right time to implement the changes, whether SISTERS leaders will support such changes and the efforts required to implement and maintain the quality of go-to-market and replicability initiatives. SISTERS has to attend to aspects such as the resources (among them, human resources) that will support the release to the market, or those that are dedicated to the necessary deliverables once the project ends (standardization, regulation, etc.). SISTERS has to ensure in the future plan that it has adequate resources to measure and evaluate exploitation progress and replicability, as well as to reinforce and reward positive

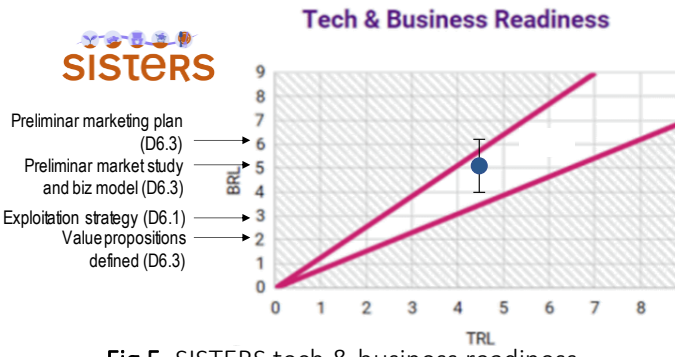


Fig 5. SISTERS tech & business readiness

behavior and improvements in the process. In definitive, that the change towards exploitation and replication of SISTERS in order to achieve its impacts is made in a sustainable and, therefore, reliable way.[19]

4.3 SISTERS' Value Propositions

As business case, SISTERS is a multifaceted concept. In Deliverable D 6.1 – Exploitation Plan, the Top Five Key Exploitable Results (KER) of SISTERS were listed. Each of them will, at the end of the project, be developed as a commercial asset, as a product, to be exploited along the preliminary lines set out in D 6.1. Table 3 lists these five KERs, presented as value propositions, plus an additional one.

Note that SISTERS presents more exploitable results than these five value propositions. However, all the others are initially conceived as integrating elements of the "Five Principal technical outcomes". This does not exclude that any other KER listed in D 6.1 or D 6.2 may be exploited separately. In fact, this document has been prepared using the Five Principal technical outcomes as a reference, but it can be extrapolated *mutatis mutandis* to any other result of the project. For example, the Fruits & Vegetables (F&V) Open-source Database is a constituent element of the Short Chain Platform, but may be copyrighted or used as a database of interest for exploitation and traded individually. An especially important case of this aspect of individually exploitable component is the formulations of packaging materials. Its protection under patent will contemplate the use in materials of rigid and flexible fresh food packaging, but the formulation may be exploited for different applications.

Each of these products will be presented (see sec. 4.4) as a solution to a different aspect of the great problem of FLW, with the objective of the food value chain at the EU level, but with the vocation to be extrapolated and exploitable anywhere in the world.

In the conversion of KERs to products, they must be clearly defined what the Value Propositions of these products are, that is, it must be established what competitive advantages, innovations or differentiations each of these assets presents with respect to the state of the art and the competitors. These aspects will determine the interest of the consumer, the client or the stakeholder. Table 3 presents the Value Proposals of the Five Main KERs, highlighting these aspects.

As for the sixth and last value proposition, it is a result of the exploitation and market analysis carried out in WP6, and it will be used in the same way as the technical propositions. It is described in more detail in sec. 4.4.

[19] SlideTeam. Top 10 Readiness Assessment Templates To Improve Business Outcomes. 2021. *Online* [Link].

Table 3. The value propositions of SISTERS

Product	Competitive advantages	Route to the market	Time to the market
SISTERS Short-Chain platform" SaaS E-commerce web app platform	1st European Short Chain App of its type, available for every language and for the characteristics and regulations of every EU country.	Promotion through Ministry & council portals and engagement events directed to producers & local consumers. Along the project, an annual fee covering the hosting, support and platform maintenance will be defined.	After project end (approx. 2026), partners will use their resources for market uptake. Possible Business-to-Consumer (B2C) strategy.
Smart containers for transport of food in optimal conditions	Cutting-edge sensors providing the best atmospheric condition for different food products based on its respiratory rate and its tolerance to different compositions of O_2, CO_2, etc. Include real-time data, shelf-life predictions and alert systems by measuring spoilage gases and cold conditions and providing alerts	Competitive landscape reporting with analysis of market leaders and important players, in order to generate alliances for market exploitation after patentability.	1-2 years after project ends for reaching a completed and qualified system and assurance of competitive manufacturing by 2027.
Biobased and home compostable packaging material	+20-30% compostability, resistance increase to processing temperature during compounding, increase in the thickness at which it is composted up to 2mm as well as food contact approval by EFSA in 2023. Superior bio-based coatings with proven decreased OTR for MAP applications. +15% tensile strength, permeability, and stability of the packaging.	Validating biodegradability under operational environment for scale composting conditions. Financial boost by industrial partners within the SISTERS project for industrial scaling and product tuning for market uptake, considering regulations.	Packaging certified under schemes labels such as OK home composting. All EFSA requirements satisfied by 2027.
Smart labelling for retailers and consumers	QR code with biodegradable/compostable inks, informing about origin and property of the product, name and location details of the farm, environmental and economic costs of the packaged food, methods for proper conservation, end life treatment of product package, Expiry and best consumption dates.	Final uptake for the smart label in packaging, the dynamic label for retailer and QR code for packed product for consumer information with own resources.	Final industrial validation for manufacturing and compliance with regulations by end 2026.
Seal of Excellence for retailers/ wholesalers	To be promoted among consumers, who will have the guarantee that the retailer promotes sustainability. A Dynamic Label that changes the price of the product automatically change while the food products are closer to the expiration date.	The effectiveness of the SISTERS Seal will be validated in at least 1,000 centers from 5 EU countries. Developments in visual identity will be made.	Initially, validation in real environments by AITIIP and it will be available in the market from 2027.
Unique position in the market	Unlike most brands acting on the FLW, SISTERS will be the only one acting at all levels of the value chain, from production to marketing. For this reason, it can present itself as the partner to guarantee regulatory compliance in terms of FLW to companies in the industry. SISTERS presents another marketing innovation: it is not focused on exploiting FLW, as most of the companies in the field do, but on reducing it.		

4.4 Marketing Plan

4.4.1 The vision of SISTERS as trademark and its use cases

Although nothing is ruled out at such an early stage, the **vision** of SISTERS, is not to develop five final products for an individual replication and exploitation. SISTERS is a comprehensive initiative to fight FLW at different levels with an integrative vision that is also crucial to achieving SISTERS' target impacts. SISTERS' value propositions will have much more impact if the synergies that can be stablished between them are exploited. This is understood both from a technical and commercial point of view:

(a) From a commercial point of view, the key actors to whom SISTERS has already been introduced can act, on many occasions, as key opinion leaders (KOLs) to promote the acceptance of SISTERS' products. This approach is especially important for customers and partners with a high specific weight in the sector. At this point, the Dissemination work of SISTERS' project becomes important. SISTERS has been disseminated in top-level forums throughout the entire Food Value Chain, such as the recent FRUITATTRACTION 2022 (October 2022), as discussed in sec. 3. There, SISTERS initiative was presented to world leaders in the production, logistics (import/export), packaging, retailing and wholesaling sectors (**Fig. 3** and **6**). On the other hand, large companies operating at different levels (e.g., production and packaging) can adopt different SISTERS solutions. The establishment of large-scale collaborations will be favored if SISTERS presents itself as a versatile, transversal initiative, instead of as a highly focused and specialized partner (see Value Proposition #6, **Table 3**).
On the other hand, the exploitation activities of SISTERS are synergistic, and can support each other: a producer who is interested in the Short Chain Platform, may also be interested in acquiring the Seal of Excellence for his practices, thus increasing e.g., its CSR environmental performance and preparing for normative compliance.

Fig 6. *Some KOL with which SISTERS has already entered into contact. See that they have international projection and can adopt more than one solution of SISTERS.*

(b) From a technical point of view, SISTERS solutions are synergistic. E.g., unsold products that are distributed regionally thanks to SISTERS' Short Chain Platform App can be packaged with SISTERS' materials. This is a way, on the one hand, to maximize impacts (among other routes, increasing SISTERS' lines of business), and on the other hand, to strengthen SISTERS' position in the market as an actor at multiple levels in the Value Chain.

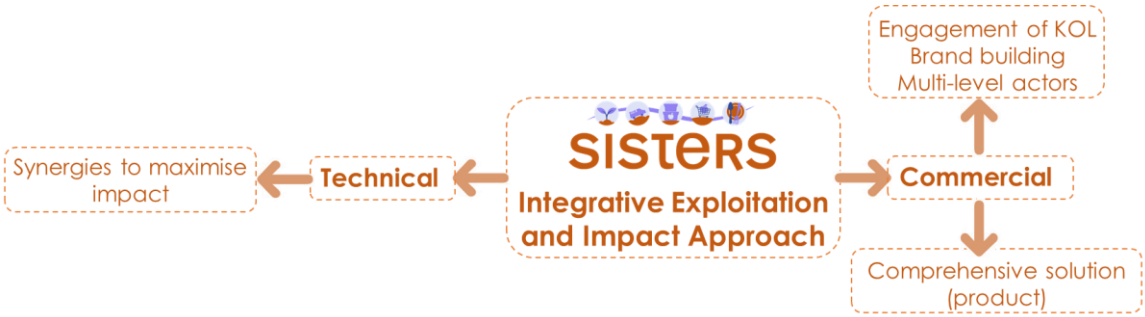


Fig 7. *Key Concepts on the Integrative Exploitation for Impact maximization of SISTERS. It is the basis of the Brand building justification.*

The arguments presented here are the starting assumptions to justify that SISTERS should be exploited jointly, creating a single brand image, through different products or lines of business. In this context, it will be important to have a clear copyright and IPR policy. But, over and above the management difficulties, a joint exploitation guarantees the achievement of the impacts before an individual exploitation.

4.4.2 SISTERS' unique selling point and positioning on the market

There is also another important reason supporting an integrated approach to SISTERS exploitation: this would give SISTERS a **unique position in the market**. According to the FoodTank observatory, [20] (which is the most important nonprofit organization focused on building a global community for safe, healthy, nourished eaters), all companies currently fighting FLW are doing so at a specialized level: in a single, or at most two, steps of the value chain. FoodTank is responsible for the most important market study of FLW, taking into account 59 different types of companies and organizations around the world. Most of them focus on the processing of surpluses produced by farmers, so, according to the nomenclature adopted in SISTERS, they act just at the processing level. There are also many platforms, both public and private initiatives, that act at the logistics level, distributing surpluses under a brand that takes advantage of the message of social action. **Fig. 8** shows some examples of this.

- Imperfect Foods: Delivering fresh produce that is considered too "ugly" for retailers directly to consumers.
- Uglies Snacks: Making potato chips from potatoes deemed "too ugly".
- The 2050 Company: Creating smoothie powders from recovered fruits.
- Rise Products: Using leftover grains from breweries and turning it into a variety of products.
- Ripe Revival Market: Delivering local foods to people at home and to those in need.
- Pulp Pantry: Making chips from upcycled veggie pulp.
- Upprinting Food: Recovering food and turning it into decorative (and edible) 3D-printed food products.
- Rubies in the Rubble: Making condiments from surplus food.

The FUSIONS project (https://www.eu-fusions.org/) deserves a separate mention. With 21 project partners in 13 different counties, FUSIONS monitors waste production, encourages social innovation, facilitates dialogue,

[20] FoodTank. 59 Organizations Fighting Food Loss and Waste. *Online* [Link]. **2016**

and develops policy guidelines. The project aims to establish a European Multi-Stakeholder Platform to generate a shared vision and strategy to prevent food loss and waste across the whole supply chain through social innovation. Its action level is more transversal than the previous ones, reaching the Marketing and Consumption stages, niches in which it also exists much les competence (although FUSIONS is focused more on development as a platform of social interest than as exploitable products).

Fig 8. *Unique market positioning of SISTERS regarding its transversality in the Value Chain.*

Furthermore, in this state of things, apart from presenting itself as a comprehensive initiative, SISTERS presents another marketing innovation: it is not focused on exploiting FLW, as most of the companies in the field do, but on reducing it. This is itself another innovation from the business model perspective.

It is concluded that the exploitation of SISTERS as a brand presents clear advantages, favoring the feasibility of impact objectives and providing a unique position in the market as a comprehensive approach to the FLW problem.

4.4.3 Product strategy

This last section is devoted to the product strategy: the features and design of SISTERS' products should have (when applicable). This design, as the value proposition itself, must take into consideration the needs and preferences of the potential customers as well. Here they are drafted some key lines in order to, immediately to the SISTERS finishing, deploy such strategy:

(a) New attributes, characteristics, benefits, functions, uses and utilities will be added to the products. From a marketing point of view, the advantages established in SISTERS can be completed with utilities that make it more attractive to the consumer. Thus, the smart contaniers or any packaging item developed by SISTERS must follow, if appropriate, a process of embellishment or polishing in order to favor their acceptance, also taking into account that they have been designed for the storage of food products.

Given the wide possibility of mobile Apps, it will be the product that should be worked on the most in this regard, e.g., adding elements that allow Saving time in the data analysis process, fast automation

of the data analysis, improvement of the data analysis and visualization service for companies and organizations, improvement of the data compatibility with national and international standards, especially for the Public Authority and, importantly, **alignment with GDPR for EU 2016/679**.[21] The application of the principle of privacy by design must be envisaged, to ensure that user security is consistently placed at the center of the service design process. In addition to native GDPR compliance, efforts will be made to always assess all potential threats to users' personal data and to always provide transparent and simple information.

It would also be interesting to allow **advertisements on the platform**, for which the necessary means must be enabled at a later stage of reproducibility through product development.

It is likely that it is necessary to improve aspects related to the robustness of the algorithms (to ensure that the developed system is robust, i.e., that it is able to perform consistently under different environmental circumstances), but also in terms of its security (resilient to potential attacks and able to promptly deal with and inform about critical issues, failures and errors). This means carefully assessing every slightest vulnerability, enabling specific security measures that must be constantly updated, and defining a failover plan so as to be prepared for any kind of misfunction. The platform interfaces must be designed and developed to be accessible, i.e. increasing the degree of accessibility of touchpoints (specifically, the focus will be on the mobile app and the website with the aim of making it simple and intuitive to navigate, also considering visually impaired and blind people).

The first initiatives taken regarding product development for the Short Chain Platform app are collected in sec. 5.1.1.

(b) Optimization of product characteristics, such as: design, presentation, packaging, labelling, among others.

(c) Launch new product lines that complement those already sold. This means, at a later stage, opening new lines of business synergistic to those of SISTERS.

(d) In connection with the above, expand the existing product line.

(e) Set replication and exploitation or commercial objectives. They are the ones that will measure the progress of SISTERS' replication and exploitation action. Numerical objectives will be established for each SISTERS line (Value Proposition), considering the number of channels in which SISTERS' solutions have been placed. These channels can refer to physical establishments, sales portals or distributors. As the products begin to be replicated and exploited, these products may be fine-tuned. For reference, sec. 8 displays an estimated sales forecast. Objectives will also be established for profitability, market share, referencing (which seek not only to replicate a solution a given number of times, but also to replicate different lines of SISTERS' range of solutions) and linkage (which seek to ensure that the agent that replicates SISTERS' solutions have the maximum of SISTERS solutions).

[21] EUR-Lex. Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) (Text with EEA relevance). *Online* [Link].

4.4.4 Brand strategy

The promotion and strengthening of the brand are the most significant factors to achieve product recognition in order to obtain greater possibilities of market penetration. The SISTERS brand is the name, logo and design that allows the identification of the products. And the branding strategy is a long-term plan for developing a strong brand in order to achieve specific goals. It involves the establishment of values and differentiators with respect to the competition, and thus manages to be relevant to its audience.

A brand is not a product, a logo, a website or a name. In fact, it is much more than that; it is an intangible asset that can be very useful in customer loyalty. Along with the benefits of the product and the dissemination and communication strategy, brand identification is one of the most important aspects that can contribute to achieving long-term business objectives.

In this sense, the SISTERS brand has to seek to create emotional links with the product. In SISTERS' case, it can exploit concerns about environmental impact, climate change, etc. In addition, the fact of being a project financed by the EU, together with the sponsorship of public and regulatory institutions (sec. 5.8), exploits the links of rigor and sacrifice towards the achievement of objectives.

The relationship with the client and the working method will give clients confidence, thus offering not only the SISTERS products, but also an experience related to the identification of those who make up SISTERS' public. In this experience, the construction of a narrative about SISTERS' objective is also very important. Every brand makes a promise, but in a market where consumer confidence is low and budget constraints are high, standing out from other brands is not just about making a promise.[22] SISTERS is an initiative focused on impact, so this aspect is crucial.

In the future, the SISTER brand must be consistent, promote the feeling of being connected with others in a common effort, must be flexible (adapt to eventual regulatory changes, market changes, etc.), involve the employees, reward the customers, and recognize the competition.

4.4.5 Communication strategy

On the other part, the communication strategy must be based on a situational analysis that takes into account both the internal environment of SISTERS (human and material resources, dynamics and processes, etc.) and the external environment (countries, regulatory frames, etc.). It must reflect the mission, functions and scope of activity of SISTERS, and collect SISTERS' analysis of political, economic, social and technological factors, as well as the analysis of the competition.

Any communication strategy must clearly and precisely reflect the vision and objectives of the organization, and taking these into account, here the communication objectives are stablished, identifying the target audience, messages and means, planning and metrics, also in alignment with SISTERS' brand strategy.

[22] Forbes. Nov 2019. *Online* [Link].

5 Steps in the Replicability and Impact plan

In the previous sections they have been established the starting points on which to start SISTERS' replicability plan. Fig. 9 shows the steps that ENCO proposes to replicate the SISTERS initiative in the most efficient way.

The first step, Opportunity Identification, was completed during the preparation of the DoA, and the second has been completed with the description of the Value Propositions, which were also validated during the DoA.

Fig 9. *Unique market positioning of SISTERS regarding its transversality in the Value Chain.*

5.1 Technology transfer

According to the EU Competence Centre on Technology Transfer:[23]

> Technology transfer (TT) refers to the process of conveying results stemming from scientific and technological research to the market place and to wider society, along with associated skills and procedures, and is as such an intrinsic part of the technological innovation process.
> Good or high-quality research results are not enough for successful technology transfer; general awareness and willingness both at the level of organizations and individuals, as well as skills and capacity related to specific aspects, such as access to risk finance and intellectual property (IP) management, are also necessary components.

As an IA of final TRL 7 – 8, SISTERS has carried out some of the main milestones in the TT process, such as discoveries and validation of some products at laboratory or relevant scale (initial TRL done). But many of the milestones must be planned to ensure maximum impact through replicability and actions are needed for them, as illustrated in Fig. 10.

[23] European Commission. Competence Centre on Technology Transfer. What is technology transfer? *Online* [Link].

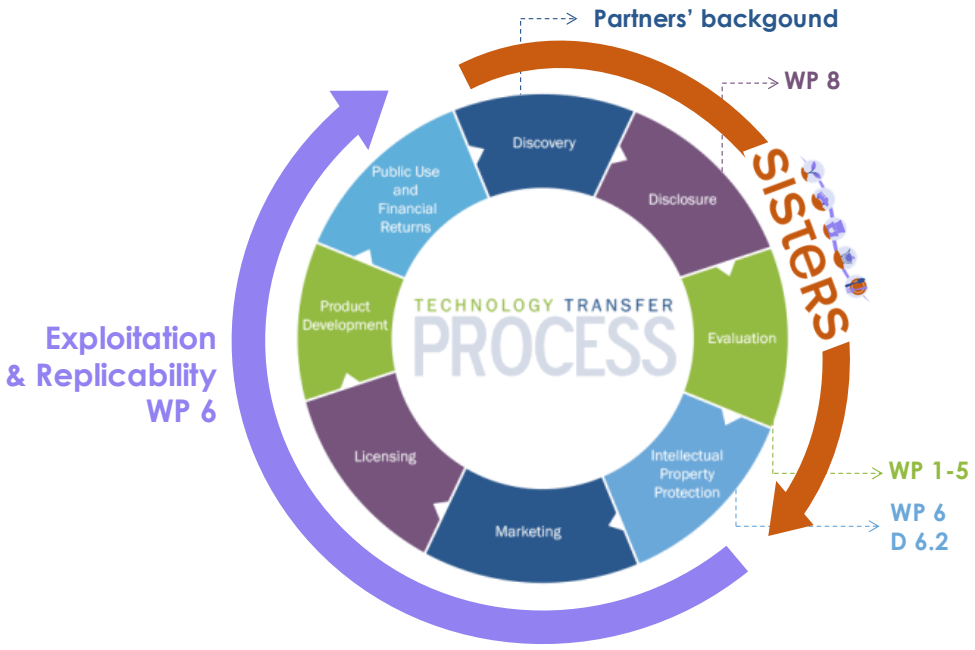


Fig 10. *TT tasks to achieve the complete replicability and impact of SISTERS. In orange, the planned tasks during the project. In blue, the tasks to be done, both during or after the project.*

After the IP protection, a marketing plan is necessary, as stated in sec. 4.4, specially in 4.4.4 and 4.4.5. The entry into the market and the competitiveness of the product will be associated, based on the experience acquired during the R&D phase, with the incorporation of new functionalities (although considered in the marketing plan, a large amount of important information will be obtained from the first experiences with customers). Product development must not be confused with R&D; the tasks contained in product development are those commented in sec. 4.4.3.

Although no considered in the figure, special attention will be paid to all ethical aspects related to the service, which can be addressed through the creation of a specific checklist as well as a series of supporting documents such as ethical self-assessment or templates for informed consent or invitations to initiatives.

5.1.1 Product development of the Short Chain Platform

Mobile apps are a special business case due to the enormous TT possibilities. The SISTERS Short Chain Platform App must add additional elements such as the calculation of the carbon impact generated in the distributions. There are algorithms on the market that not only allow this estimation, based on ISO methods, but also allow access to new markets, such as the Voluntary Carbon Market (VCM). Gamification platforms can also be added. This would allow distributors and producers who use the SISTERS Short Chain App to use these results for the elaboration of their CSR policies and reports and for the development of accreditations such as the B-Corp (https://www.bcorporation.net/).

As a first key result, the first talks have been established with the company MUV (Mobility Urban Values). This spin-off of the high-impact start-up PUSH (https://www.wepush.org). PUSH is a design lab that works in the fields of environmental sustainability, digital technologies and social innovation: they design and develop solutions to improve the quality of life in cities, reduce consumptions and tackle climate change. MUV is one of the main projects. MUV is a technological startup with a social vocation (and Pending B Corp), result of an eight-year of research by PUSH, with the aim to turn sustainable urban mobility into a sport. It encourages responsible and healthy habits, measures progress by certifying CO_2 reduction and, thanks to the data collected, lets companies and institutions co-create mobility plans.

MUV app is unique in the market because it provides disruptive technical innovations. MUV can enter the VCM. **It is the only ISO-certified platform for CO_2 emissions calculation and therefore, for impact assessment and regulatory compliance/CSR** (certified method by RINA, ISO14064-2). While these results are of maximum interest for municipalities and institutions to set up mobility plans. Furthermore, regarding gamification, it presents an innovative approach, where local merchants act as sponsors for players, offering rewards, which is totally synergistic with SISTERS' vocation to revitalize local economies through FLW. MUV is an initiative that has been possible thanks to projects partially financed through the EC.

SISTERS has been presented to MUV and, given the great mutual interest, they have reached an agreement to continue working on the possibilities of joint development. From the point of view of exploitation, this will also allow SISTERS to work on its CSR and the possibility of certifications as B-Corp. Through joint development, KOLs in the logistics sector who have already been contacted can see an even more attractive solution in the Short Chain Platform app, supporting their environmental policies and their CSR.

Fig. 11. *Ecosystem under construction towards the Product Development of the SISTERS' Short Chain Platform App.*

5.2 Feasibility study

A feasibility study is the initial design stage to any project or plan. The feasibility study of SISTERS investigates its viability as a potential business venture and for its replication. In SISTERS' case, as it has been stated, replication indeed implies business development. In SISTERS' feasibility study, it is assessed if (a) the project worth investments; or (b) is the project not doable, because it will not show profits, or requires too many resources that prevent an organization from using elsewhere. It is an analysis into the viability of SISTERS' idea. In SISTERS, the feasibility study will help answer the essential question, "should we proceed with the proposed idea in our project? Should any change or amendment be made?"

Conducting SISTERS' feasibility study will give a clearer picture of the SISTERS project. After 1 year of project development, the perfect timing to do it is now, before committing business resources, and more time and

budget. Implementing the results of this study might be an expensive and time-consuming process for SISTERS, but now it is the moment where the decisions can be implemented without the need of additional resources respect to the budget allocated for the project. Furthermore, not doing a feasibility analysis can be even more expensive. Much of the early investigation and exploration of your business idea will be already done before to schedule the full-blown execution of the project. Furthermore, this Feasibility Study will be carried out by ENCO, a project member, and thus not being pressured to state what the Consortium wants to hear.

A feasibility study is not just a first evaluation. ENCO will ensure that it is conducted properly all along the project. ENCO will be engaged in the project and the evaluation process, understand the issues involved, question the basic assumptions used in the study, and challenge the conclusions of the study if needed. ENCO will function as the liaison between the stakeholders that validate SISTERS' assumptions and the Consortium to ensure that the study progresses, consistent with the project's objectives, representing the project needs and interests, reviewing and clarifying what is needed from each member, including the External Advisory Board (EAB) and the external stakeholders, and providing periodic reports to the Consortium in the periodic meetings.

This document represents a draft of the Feasibility Study. Of course, most of the tasks have already been made as part of the project conception and proposal preparation, but there are still important uncertainties that is useful to bring to light. It is completed with the Sales and Financial Forecasts in sec. 8.

Once the consortium gives the green light, the execution phase of the study (or, in its case, the normal development of the tasks as planned in the GA) begins. Mistakes at this step may be present for a long time. Common mistakes made by groups at this stage are:

(1) The committee members have already made up their minds and rationalize the study results to fit their decision.

(2) Because project committee members tend to be action oriented rather than deliberators, they become restless to move forward with the project and gloss over important aspects of the study;

(3) Because of the importance of the decision and the lack of clear direction from the feasibility analysis, committee members find they cannot bring themselves to make a decision. Rather, they continually seek more information.

(4) The committee members become confused by the array of information presented to them and pressure their consultants and others to give definitive answers of whether to move forward with the project. When committee members respond to questions pertaining to why they moved forward with a project by replying, "our consultants said it would work," are abdicating their decision-making responsibility.

5.2.1 SISTERS' feasibility of replication and impact

The objective study is started and completed together with a SWOT planning process that was made in Deliverable D 6.1 – Exploitation Plan (**Fig. 12**). Together with this preliminary feasibility study, it concludes the project possess the required resources or technologies; but, however, the project must take care on offering a reasonable return vs. risk from the investment for future replication and business development. This is crucial to generate adequate cash-flow and profits to withstand (a) the short-term risks it will encounter, and (b) remain viable in the long-term to meet the goals of the founders, in this case the European Commission (EC).

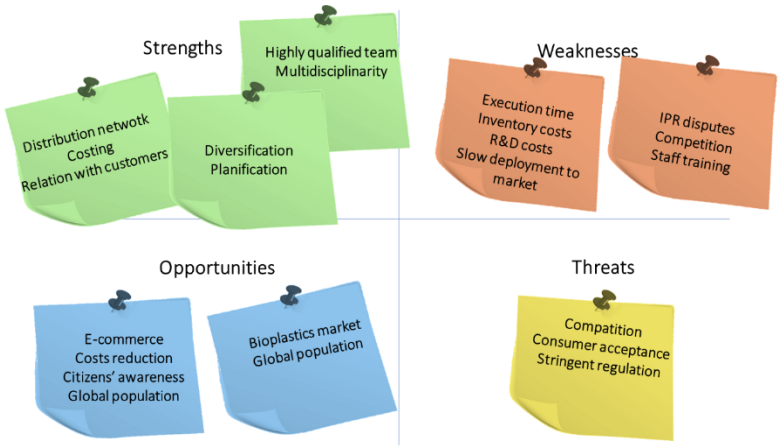


Fig. 12. *Scheme of the SWOT analysis of SISTERS.*

Table 4 shows the sections included in SISTERS' Feasibility Study and the current state of development of each of them. [24,25]

Table 4. Different sections and aspects covered in SISTERS' Feasibility Study and their state of development

Section / Aspect	State
Executive Summary	Contained in Deliverable D6.3. Replicability for SISTERS is accomplished through Commercial Deployment (at least for 3 out of our 5 Value Propositions: the Short Chain Platform, the new Packaging Materials and the Smart containers; probably also for the Smart Labels) and Business Development (for all of them).
Description of Products and Services	Done, in the GA and in Deliverable D6.3 as commercial Value Propositions (section 4).
Technology Considerations	Done, in the GA
Legal, Regulatory and Political Considerations	Partially done. Legal, political and regulatory landscape analyzed in D6.1. **Standardization and regulatory compliance plan not covered yet.**
Product or Service Marketplace	Done. Market study contained in Deliverable D6.1. Updated and enriched, especially for the Short Chain Platform, in Deliverable D6.3. Design of Positioning on the market studied in D6.3 (section 4.4).
Identification of Specific Market	Done, in the GA and in Deliverable D6.1, enriched with first Dissemination/Marketing and liaison described in D6.3 (section 3 - 4).
Marketing strategy	Basic pathway described in Deliverable D6.3 (section 4.4). To be developed after project implementation
Organization Structure	**Not done. The management scheme for SISTERS' project implementation is not developed (e.g., Directive Board of a start-up, spin-off or company).**
Schedule	Not done. Will be developed during the project as part of WP 6.

[24] Iowa State Universtity. What is a Feasibility Study? **2020** *Online* [Link].
[25] Iowa State Universtity. When to Do and How to Use a Feasibility Study. **2020**. *Online* [Link]

Financial Projections	Done. Preliminary forecasts in Deliverable D6.3 (section 8), including sales forecasts as main assumptions. To be updated along the project and in Business Model development after the project.

As can be seen, SISTERS' marketplace and positioning and its marketing strategy, which are the sections that this Deliverable D6.3 contributes with, have been conducted after discussing a series of business ideas or scenarios. These points help to "frame" and "flesh-out" specific business scenarios (e.g., individual exploitation and branding of the different Value Propositions vs. Joint exploitation of SISTERS). It has therefore been preliminary investigated, e.g., using previously published market analyses like FoodTank (sec. 4.4), different business alternatives and alternatives to position the product in the marketplace as initial starting point.

An important conclusion is that a variety of ways to set an **organizational structure for post-project exploitation** must be investigated. Obviously, there is still time for that: still 3 years of project execution, but organizational and decision-making structure issues delaying SISTERS' replicability and exploitation actions must be prevented. As a primary objective in the development of SISTERS' replicability plan, **the SISTERS consortium must agree on an exploitation organization model**, which entails, among other important decisions, through an Executive Board that coordinates the actions once the project is finished. Together with these decisions, staffing requirements, including management and labor alignment will be assessed.

The market assessment has been conducted to help SISTERS to determine the viability of SISTERS' proposed brand and products and services in the marketplace. Together with the studies carried out during the proposal preparation, demand in the market has been identified, while the pricing is assessed here at D6.3, in section 8.1. There are also important conclusions from the Financial and Sales Forecasts that are analyzed in sec. 8.2.1.

Factors that are internal to the project and represent vulnerability to the project's short- term or long-term steps are reviewed and analysed in section 6. Mainly, the Feasibility Analysis has identified that the procedure for testing and standardization compliance for most of the Value Propositions is missing; it is solidly contemplated in the DoA just for Value Proposition #2 (Packaging Material) and the LCA studies. This is elaborated on in sec. 5.4.

5.2.1.1 Conclusions

As general conclusion, along the Project design and preparation and in the Deliverables D6.1 y D6.3, various exploitation and replicability scenarios have been outlined in-depth. Therefore, after carefully examined the feasibility study and challenge its underlying assumptions, the *Go* decision is clear, but it must be beard in mind from the outset that there are factors that determine the success of exploitation and replicability that will make the difference when it comes to achieving SISTERS' impacts. SISTERS is currently identifying new opportunities through key stakeholders. **The great challenge for SISTERS is not the viability of the technical execution, nor the resources (and this is another of the great advantages of presenting many different Value Propositions), but rather the interest that it is capable of arousing in SISTERS' replication clients and in SISTERS' potential future clients**. The important conclusions of SISTERS' Sales and Financial Forecasts must also be taken into account.

To implement solutions in line with regulations in the food market, strong institutional support is required, through regional, national or local bodies and sponsorship, and at this point Dissemination tasks are also key. As described in section 4.4, SISTERS must be able to offer the different production, logistics (distributors, exporters) and sales (retailers, wholesalers) companies convincing compensation plans for their investments (in money and time), leading to a strong willingness to engage. In practical terms, this means to work on the transition from a Dissemination plan to a true Marketing plan and a Business Model.

The clearest way to replicate and achieve the impacts of SISTERS is its commercial exploitation as a brand where SISTERS' different KERs become different Value Propositions and different business lines afterwards, with regulators and institutions as the key partners (and perhaps also non-profit organizations). SISTERS foresees to do so through two key business models: B2C, selling solutions such as the Smart Containers and the Short Chain Platform, and B2B2C, exploiting e.g., the material formulations with plastic materials converters (this also includes exploitation of SISTERS' IPR). The sections in the rest of this document develop this assumption, leading to a business model as an effective plan of action. Strengthening relations not only with business agents, as has already been done (sec. 4.4), but also with policy makers, must therefore be one of SISTERS' main future lines of action.

5.3 Prototyping

In the language of the TRL scale, TRL level 6 corresponds to the "System or subsystem model or prototype demonstration in a relevant environment". All SISTERS Value Propositions will reach at least the prototype level (TRL 6) during the project. For example, in the case of the Short Chain Platform, a case-study will be carried out in real environment that will consist of opening and running the first stores or app for 100 producers ready to test the solution. In the case of packaging materials, using it in manufacturing by thermoforming or rigid injection.

5.4 Demonstration and Testing activities (compliance)

Demonstration and Testing activities, specially using standardized ISO relevant tests, determine the step forward from TRL 7 to 8. As abovementioned, one of the main conclusions of SISTERS' feasibility study is that they are missing an exhaustive checklist of the relevant standards in the food industry that may represent a barrier for the market deployment of SISTERS. This will be well covered for the packaging materials (Value Proposition #2), that will be assessed during SISTERS project in Subtask 3.4.1 *Safety and shelf-life analysis*, by ARCHA, e.g., to ensure that the new packaging materials comply with Regulation (EU) 1935/2004 & (EU) 10/2011 or food sensory attributes according to ISO 13302:2003 and ISO 8589:1988, or composting tests through ISO 14855. However, for the rest of Value Propositions, this analysis is missing.

Indeed, the food industry is one of the most heavily regulated. The food quality and safety are the main demands of consumers, and standards are the certifications for governments, markets and users. Here it is reported a brief revision, without the intention of being exhaustive, that intends to be the starting point for the complete and comprehensive **standard and regulatory compliance** actions carried out in the last steps of the project and immediately after it (is the main point to move from TRL 7 to TRL 8).

Updated in 2008, **ISO 22,000** is a specific standard for the food industry covering the entire food chain from the primary sector to the restoration, to processors and distributors, in order to ensure safety at all stages of the food chain. This important standard also contains references to aspects related to the packaging, labeling and safety of all products that come into contact with food. Their bases are some preliminary requirements of hygiene and traceability, HACCP also defined by the Codex Alimentarius of the FAO and the World Health Organization (http://www.codexalimentarius.org). All the value propositions that SISTERS intends to launch on the market must be aligned with this standard (among others). This requirement is essential.

It is important to note that standards are not a substitute for legislation, but provide an interpretation of the legislation to allow its implementation and ongoing compliance by food businesses. Many standards require

the implementation of procedures which are beyond the requirements of legislation, which forms the foundation of all food safety management systems.[26]

Regarding regulation, the most crucial reference for SISTERS, especially for the packaging material (Value Proposition #2) and smart containers (#3) are the frame for Food Contact Materials (FCM). SISTERS products will come into contact with food or food products during its distribution, processing, storage and selling, before its eventual consumption. Such materials and articles include food packaging and containers, machinery to process food, and kitchenware and tableware. From a regulation point of view, these materials are called **Food Contact Materials (FCMs)**. Constituents of food contact materials that transfer from these materials into the food may affect the chemical safety of the food and affect human health, as well as the quality of the food, its taste and smell, and its appearance.

To ensure a high level of food safety, all food contact materials must comply with Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food when placed on the European market. In addition to this Regulation, all FCM must be manufactured in accordance with Good Manufacturing Practices (GMP, Commission Regulation (EC) No 2023/2006), and specific Union legislation on certain materials, including on plastic and ceramics, as well as with National legislation on other materials.

For smart labels, compliance must be examined with Regulation (EU) No 1169/2011 on the provision of food information to consumers.

5.5 Pilots

A pilot is accomplished when a new product / service / software is given to a smaller group of intended audience for use before complete roll out. It is done to understand the implementation issues before complete roll out, how the product is being used and/or misused, refine the shortcomings (if any) and get initial acceptance. This corresponds to TRL level 7 “Demonstration of a system or prototype in a real environment”. This real environment is ideally provided by a replication agent or a customer (demonstrator; but a demonstration is often considered larger and more commercial than a pilot).

Piloting is assured for the Short Chain platform app and the smart containers through the key partners provided by PROEXPORT, RIBEREBRO and EROSKI. For the packaging material, pilot production level will be reached e.g., thanks to ITC, which is a great plastic converter, until 1,500 pieces for rigid injection, an average rate of 30 strokes per minutes with a minimum of 2,000 pieces for thermoformed trays. For the innovations at the marketing stage and at the consumption stage, pilots are also achieved through the networking of big wholesalers acting across different levels in the whole value chain: PROEXPORT, RIBEREBRO and EROSKI.

[26] European Food Information Council (EUFIC). HACCP and GHP: Standards in Food Industry. **2013**. *Online* [Link].

5.6 Engagement by industrial research teams

Industry requires some projected future payoff to justify research funding and adoption of innovations. The early engagement of industries in the Food Value Chain can led to the involvement of industry at critical points in the research planning and review process of SISTERS and help it in the crucial path to replication. In SISTERS' Impact and Replicability and Exploitation Plans, it is essential that SISTERS' research and management teams recognize the importance of industrial input, consider the opinions of industry representatives in their decisions, and encourage the research staff to do likewise.

5.6.1 Strategies to serve industry

With the inclusion of EROSKI, RIBEREBRO and PROEXPORT, mechanisms for including industrial input in formulating new research and overseeing ongoing work have been already established. Specially on the last years of project development, ENCO will monitor the strengthening of industrial participation and the refining of these mechanisms.[27] As described in sect. 3, the first steps in this sense have been made in worldwide relevant dissemination and industry engagement events. Among these mechanisms, holding industry-specific breakout sessions as separate events during the Project Meetings or General Assemblies will be considered. One of SISTERS' objectives is for the last years/months of development of the project and after its execution to explore the possibility of Sponsored Contract Research, Fellowship Research or Corporate Venture Funding. ENCO on behalf of SISTERS will take care the industry members to be aware of the various collaborative opportunities and have a clear understanding of the difference in IP policies under the various options, as it pertains to multiple partner institutions.

Throughout the research, development, and commercialization process, it is important to balance the needs of industry and SISTERS, since SISTERS is impact-focused, while industry is concerned with maximizing financial value. The potential for conflict between the two must be acknowledged and dealt with in a balanced manner. If needed, questions about the nature of confidential information, the length of time a discovery must remain confidential, and how results can eventually be published can be specifically addressed in the research contract and confidentiality agreement, that ENCO as Innovation Manager will monitor. For generated IP, the SISTERS can offer the option to license to the industry firms engaged. If an industry partner exercises the option, then the technology may move directly to the partner or the partner may sponsor a translational research project to develop the product, but under IP arrangements specific to the project. If the industrial R&D project is carried out by the industrial partner, the SISTERS' researchers at this point can move from directing the research into the advisory role, which had been occupied by the industry representative, and vice versa. Responsibility for scaling up the technology may move to someone in industry who had not been connected to the development of SISTERS. In these cases, the SISTERS team, if involved as advisor, should seek to remain available and involved. In cases in which the SISTERS researcher has a financial interest in the commercial success of the technology (such as inventorship of the IP), the incentive for involvement is obvious. The importance of input from the researcher in maximizing the chances of success of the technology (regardless of IP ownership) should not be overlooked, however.

[27] Engineering Research Centers (ERC). Building an Industrial Constituency. **2019**. *Online* [Link].

5.6.2 Attracting interested firms

ENCO, with the support of the industry partners in SISTERS, will manage this activity, carrying out proactive approaches to industry member recruitment, including the appropriate firms along the value chain most relevant to SISTERS vision. In this way, the SISTERS research teams are informed by the appropriate firms involved in the technologies underlying. In addition, these firms also find benefit in interacting across the value chain together with SISTERS.

An important component of the strategic plan for industrial interaction is not only a clearly defined dissemination strategy, but to include an important marketing component on it for recruiting industrial sponsors and partners. A well-developed dissemination-marketing strategy typically includes an analysis of the industry sectors affected, the value chain, and the value drivers that industrial sponsors will find attractive in a research and technology transfer relationship. The dissemination-marketing plan includes financial and technology commercialization goals, specific actions and timelines needed to reach those goals. In SISTERS, an important part of this work has already been done as part of deliverable D6.1 and D6.3. It would be advisable to book a budget for the Industrial Membership Program. This program would include strategies not only for recruiting new members, but also for retaining existing ones through partner/customer service activities such as communications of SISTERS partners' research activities and results, faculty interactions with sponsor companies, interactions with students to gain know-how and recruit, and regular visits to sponsors' sites.

ENCO has experience working in industry, but they also need to understand the academic culture of all SISTERS' members and university/industry collaborations in research of each of them, ideally exchanging with the universities and centres technology transfer offices, reporting to SISTERS' partners, WP leaders and coordinator, industrial researchers, and if needed with students. Many SISTERS' members (AITIIP, the industry partners, etc.) have high industry exposure, with experience e.g., presenting at technology meetings attended by academic and industrial scientists and engineers and disseminating projects to industry, so the industrial awareness of SISTERS is heightened.

Advertising and "cold calls" to potential "sponsors" or stakeholders usually are not productive. SISTERS will instead target specific companies based on their involvement in the particular industries, their interactions with other sponsors, and their degree of involvement in technology development, and will focus on face-to-face events (e.g., FRUITATTRACION 2022, as described in sec. 3). Results of this mapping is presented in the firms already engaged listed in sec. 3.3. The exploitation of the leading industrial partners in SISTERS is particularly effective in identifying potential new members. As in many business endeavours, perseverance is rewarded in recruiting members. Strong and continuous follow-up with several people in the organization, often involving visits to the SISTERS partners' facilities and to the companies, is usually required after the initial contact.

Carefully identifying the companies that can benefit from SISTERS, that is, finding the right partners, is important also in successful marketing. Presenting information about the members must be accompanied by clearly defining the value of partner participation from the company's perspective: i.e., mainly the Value Propositions, or new propositions arising from the collaboration and future joint research. This is particularly difficult in industries with a poor track record for R&D funding. These Dissemination & Marketing techniques include literature, newsletters and brochures (hard or softcopy); visits to industry; visits to the partners' facilities; booths and exhibits at trade association meetings; participation at technical society conferences; publication of technical papers; participation in industry research consortia; a website; informational videos or vlogs; mailing to potential industrial sponsors identified through contacts; and topical workshops.

Centres disagree on the value of virtual or printed materials in marketing, but most believe that personal contact at professional and trade meetings or other venues and visits are very effective. Particularly valuable are visits to companies. These visits not only introduce the centre to a broad audience of company personnel;

but also help SISTERS members to understand the company's products, business climate, and issues so that the value of SISTERS membership can be specifically defined. In arranging such a meeting, ENCO will gather in-depth information on the company, brief the SISTERS' partners, and set objectives for the meeting in advance. Contacts will also come from companies referring to the centre's website, and social media such as LinkedIn.

Finally, successfully commercialized technologies are valuable tools in marketing SISTERS to prospective future members. To the extent that technological advances cross industry lines, a new process or idea may enhance the appeal of SISTERS to new industries and partners. The ongoing process of market analysis for new membership will constantly evaluate the appeal to potential sponsors.

5.7 Possibility of launching a start-up

A start-up is a new brand entity created by an existing company. In the case of SISTERS, it would be a *complete* start-up, a new entity created by some, of all of the SISTERS partners, plus eventual entrepreneurs or investment groups. Here the dissemination actions are therefore also crucial.

It makes sense to develop a spin-off or start-up when a product concept (a value proposition) has matured. When this product is a business line of a company already developed, it often means that the company's future growth reaches a plateau or significantly slows.

As mentioned in previous sections, achieving the impacts of SISTERS and ensuring its replicability requires its exploitation. And the exploitation of SISTERS, in addition to the exploitation of the IPR and the involvement of teams and industrial partners, can go through direct exploitation, for which the constitution of a company is a necessary step. This is because, to do so, SISTERS partners will need to have both the financial strength and the ability to leverage the assets of the project, in combination with the knowledge base of the partners and the industrial partners, that will definitively help the start-up succeed. The ideal situation would be also to largely leverage customer lists and brand positioning opportunities of both project partners and industrial external partners to give SISTERS an advantage as a new marketplace is entered.

SISTERS' start-up would also allow to extend the product line of the project, even to the same core customers identified, or to share the same core brand attributes as the project partners and the industrial partners and to seek to leverage all other key assets, such as allied supply chains that can make SISTERS benefit from shared vendors or the management expertise. Even more, if the start-up cannot leverage the brand's image and heritage of the consortium and industrial partners, it is better to think twice; the key to a successful start-up lies in the similarities between the platform companies' and industry partners, their customers and brand positioning. If SISTERS management team believes that the start-up can either leverage assets other than the customer list or differentiate the potential new concept or brand from the platform company concept, then it may make sense to consider a start-up. Specially if it will leverage current supply chains and channel dynamics of partners, while exploiting general and administrative efficiencies, such as shared warehouse expenses, variable cost efficiencies and combined personnel responsibilities.

Of course, the start-up company should not share key merchant positions with consortium or industry partners. The merchants' priorities are often tied to the responsibilities of the original companies or partners, not allowing them the freedom to focus on the start-up's new concepts.

5.7.1 Introduction to launch expenses

Start-ups require the development of a new brand (surely, SISTERS' brand must be already taken) —with the associated expenses of attracting a new customer, establishing a new brand image and developing a delivery system. If the consortium members are not solvent enough to handle this financial risk, it should not pursue this strategy.

The value of developing a successful start-up out of a platform company can be two-fold. First, overhead expenses can be allocated over a larger revenue base, with general and administrative expenses as a percent of sales reduced. The expanded company can share one president and one CFO, possibly one warehouse, and can achieve a multitude of other economies of scale. Second, the matrix consortium can increase its growth rate and profitability if the start-up is successful. Investors pay a premium for growth and growth potential. A successful start-up will increase the valuation and multiple potential of the matrix consortium.

Finally, growth is essential for increasing a company's value. As illustrated, a start-up can generate this growth. However, when determining whether a start-up is right for a company, SISTERS should consider timing first and make sure the consortium's core business is strong and self-sustaining. No member should sacrifice its core business for a new initiative. [28]

In summary, when evaluating the possibility of generating SISTERS', leveraging assets is crucial. Can brands, consortium members, industry partners, management expertise, customer lists and operational capabilities be leveraged? Again, SISTERS' liaison abilities are crucial.

5.8 Future investment: funding strategy

5.8.1 Grants and investment from public authorities

SISTERS believes that the bulk of public funding has already been achieved with this project. However, public investment can be a powerful tool to boost latter SISTERS growth, but considered as a tool to provide right infrastructure to leverage private investment. SISTERS is benefiting from the fact that most of the sub-national public investment goes to areas of critical importance for future economic growth, sustainable development and citizens' well-being, aligned with SISTERS.[29]

Especially, SISTERS consider EIC Accelerator as the main source of potential public funding. The EIC Accelerator supports individual Small and Medium Enterprises (SMEs), in particular start-ups and spinout companies to develop and scaleup game-changing innovations. The EIC Accelerator provides substantial financial support with: (a) grant funding (non-dilutive) of up to €2.5 million for innovation development costs; (b) investments (direct equity investments) of up to €15 million managed by the EIC Fund for scale up and other relevant costs. Companies working on technologies of strategic European interest can apply for EIC investments of more than €15 million.[30] Although may not be direct financial investment, SISTERS will also investigate the

[28] Business News Daily. Financial Management for Startups. 2022. *Online* [Link].
Start Up Donut. What do you need to know about starting a business? Essential guide to financing your start-up business. *Online* [Link].
[29] OECD. Effective Public Investment. Across Levels of Government. 2014. *Online* [Link].
[30] European Innovation Council. EIC Accelerator. *Online* [Link].

opportunities that the EU Institute of Innovation & Technology (EIT) gives to directly plug innovation policies in to the European level and align resources to boost efficiency. SISTERS' participation in an innovative organisation such as an EIT Innovation Community[31] can be crucial to capitalise on SISTERS' strengths and adapt to a rapidly changing innovation landscape. Specially, SISTERS is focusing on EIT Food (https://www.eitfood.eu/), EIT Manufacturing (https://www.eitmanufacturing.eu/) and EIT Climate (https://eit.europa.eu/our-communities/eit-climate-kic).

Finally, through ENCO, SISTERS has a direct connection with the Horizon Results Booster (https://www.horizonresultsbooster.eu/), an initiative of the European Commission which aims to bring a continuous stream of innovation to the market and maximize the impact of public funded research within the EU. It steers research towards strong societal impact, concretising the value of R&I activity for societal challenges.

5.8.2 Capital investment

After initiating a private initiative, and in synergy with SISTERS' Dissemination actions, SISTERS will investigate private funding possibilities. SISTERS will address Venture Capital options initially, and investment funds at a later stage. In both cases, these are capital investments to acquire a shareholding in SISTERS, which at that time will be a small company, a startup. Once the SISTERS model is tested (which may require some more time after the financing of the project), and it is credible that it will need new financing to grow and to develop new lines of business or improve existing ones, SISTERS will consider starting investment rounds. At the beginning, SISTERS will need a minimum investment (Seed Capital) to start its activity, which can even come from the investors themselves. To start the activities, SISTERS counts on the important network of contacts and influence of its members (sec. 3.4). This network of contacts is also important to find the first possible Business Angels (private investors who wish to invest part of their assets in projects in their initial phase), who can also contribute as advisors.

After this first phase, it is a good time to seek the intervention of Accelerators (expert institutions in promoting startups through investment, intensive training, mentoring, etc.). In the previous section they are mentioned EIC Accelerator, but ENCO, as the expert partner in exploitation, is connected with other Accelerators, such as the Spanish CLAVE CAPITAL (https://clave.capital/), specially focused in agri-food through the instrument Tech Transfer AgriFood (https://techtransferagrifood.com/). In later stages, SISTERS will also consider the possibility of debt financing, such as small-business loans, from traditional lenders, online lenders or fintech companies. If convenient, SISTERS will assess to structure debt financing in the form of an installment loan (lender upfront and repay), revolving loan (credit line that can be drawn from and used as needed) or cash flow loan (an advance of funds based on the business revenue).[32]

There will be no financing issues that could compromise the ability of a project partner to exploit the innovation. Credit, liquidity, and operational risks will be reviewed among project partners and prior to commercial agreements and market deployment. There are not either issues detected in the investment or business ventures.

[31] EIT Knowledge and Innovation Communities What is an Innovation Community? *Online* [Link].
[32] What Is Debt Financing — and Is It Right for Your Business? Nerdwallet, **2022**. *Online* [Link].

6 Risks and barriers for replicability and impact

6.1 Commercial risks

6.1.1 Incoming competitors

There is always the risk of incoming competitors with lower prices and/or higher quality. SISTERS is aware it is working in a growing market such as FLW and new competitor's presence is a plausible scenario, but it also knows that it is a sector that has technological entry barriers, and in this aspect, SISTERS has an outstanding position. Furthermore, as discussed in sect. 4.4, SISTERS is a pioneer initiative also in the market positioning, addressing the whole value chain. In any case, to secure it SISTERS will consciously monitor the market to be aware of and react to any technological changes, scale SISTERS' production to adjust its costs, and offer to customers high-level products, even able to be customized (especially, considering the Short Chain App and the Smart Labels and Containers). But most importantly, SISTERS is continuously developing new and improved its solutions.

The FLW market is continuously evolving, but also is so the polymers and bioplastics market, or the smartphone apps market, due e.g., to the rapid legislation (in the FLW and biopolymers) or technology (in the smartphone app) changes that happen in the short term. E.g., the new legislation about plastics use is forcing plastics-consuming companies to shift their business to either recycled or biobased alternatives. For legislation frame of FLW, the deliverables from SAFE partners offer a high-quality, updated view. So, and as SISTERS has assessed in events like FRUIT ATTRACTION, currently the demand for innovations in the FLW and for sustainable corporate commitment in the field is very high, whereas the offer is low. This fact is causing a strong movement of entrepreneurs that are e.g., experimenting in the sustainable packaging and logistics sector to cover a great demand that is currently not being covered.[33]

So, indeed, the possibility that many competitors will be appearing in a few years, could be a sharp slowdown in the exponential growth that SISTERS intends to achieve by offering a comprehensive solution that do not yet exist in the Food Value Chain. However, SISTERS presents clear advantages that other companies do not, combining it with a unique market positioning as abovementioned. Besides, SISTERS is currently researching and developing its products strategy in order to cover additional applications. So, by means of continuous research, SISTERS solutions and positioning will always be one step ahead of SISTERS' competitors.

6.1.2 PLA supply

Regarding SISTERS' packaging proposition, where PLA is one of the major components, SISTERS has to face that currently, there is high demand and low supply of PLA, worldwide,[34] which may lead to a shortage of SISTERS' principal raw material, thus limiting its production capacity. There are only two big producers of PLA in Europe, Total Corbion and NatureWorks, but their output cannot cover all the current PLA demand. Despite, there are more virgin PLA suppliers in different countries, mainly located in Asia, positioned with higher prices.

Currently, those big European PLA producers cannot provide this biomaterial to all interested companies, generally leaving small and medium-sized companies out of supply. This fact generates a supply handicap that

[33] New Data Reveals Preference for Sustainable Packaging Remains Strong in a Changing World. CISION PR Newswire. 2022. *Online* [Link].
[34] Why is there a global PLA shortage? W.K. Thomas. 2020. *Online* [Link].

forces many companies to stop their research or to buy raw materials at higher prices, thus making it unfeasible to put their products onto the market. The demand that those big companies cannot meet is absorbed by other companies that also sell this material, probably not as producers but as intermediaries.

Then, a deficiency of PLA supply would mean an important lack of raw materials that would absolutely limit SISTERS' production. Then, the sales of the packaging line would be limited and restricted by the PLA supplier, slowing down SISTERS' entry in the food packaging market. This fact will be a critical risk of SISTERS livelihood as it cannot compete with other bioplastics companies and will strongly affect its feasibility.

SISTERS will search commercial contracts will PLA suppliers, especially with one of these two big PLA EU producers. Besides, SISTERS will also check and analyze other PLA suppliers. In this point, the already stablished network of SISTERS' partners, such as AITIIP, GAIA or ITC, will be crucial. Therefore, in SISTERS' case this risk is low, since SISTERS' future PLA supplier will consider its necessities.

6.2 Regulatory risks

Another risk is an eventual EU regulatory change that warns that SISTERS' solutions are not a valid alternative to current ones. This is a plausible risk, especially in the bioplastics, packaging, container and labelling fields, and SISTERS is aware of it. But, in first place, although legislation may change in the future, there is still a need to cover the high demand for solutions to FLW. E.g., in the packaging sector: regarding recycled materials, not all the applications can be covered since they do not usually offer the same quality than the original material. Then, depending on the sector the recycled solutions are not valid enough to cover the necessities of a specific market. In the specific case that EU makes an important regulatory amendment affecting SISTERS' solutions, SISTERS' strategy of will have to change to adapt to the new scenario. Depending on the situation and the change implemented by EU, SISTERS will adapt its research and commercial strategy.

In any case, and in second and more important place, SISTERS has partners who perform a crucial advisory task regarding regulation and normative in the food value chain: SAFE and ARCHA. In their tasks at SISTERS, they are keeping the consortium informed in real time of the focus of its activities in the European regulatory framework and technical regulatory compliance, through the needed ISO rules to achieve technical-commercial acceptance (sec. 5.4). Finally, the industrial partners PROEXPORT, RIBEREBRO and EROSKI, will also provide first-hand information on the market-regulatory novelties and adaptation options.

6.3 Marketing/acceptance risks

Consumers (e.g., retailers, distributors) might be unwilling to pay anyhow more for new products than for conventional ones. Moreover, the current inflation crisis has caused many companies to get lower incomes and to suffer increasing price of raw materials. Additionally, the social acceptance is quite important to introduce new materials in different markets, mainly in packaging and textile.

As a strong point of SISTERS, the society is generally very concerned with the environmental challenge and willing to give support to changes that will help to drastically reduce pollution, and FLW is one of the ecological battlefields.

Provided that SISTERS' prices will be affordable for the majority of its commercial partners (see sect. 8.1), the end-user price will not be deeply impacted, and SISTERS will be able to occupy gradually a position in different markets through B2B lines, will the B2C lines of SISTERS' partners will not be impacted. Besides, with the plausible new regulatory scenarios (e.g., taxes imposed by EU for single-use plastics[35]) the price difference

[35] Plastics own resource. EC. *Online* [Link].
Plastic Taxation in Europe. WTS Global. **2022**. *Online* [Link].

between current models and SISTERS' ones will get closer, so the slight price increase should therefore affordable for its customers and for the end-users. However, as stated in sect. 8.1, SISTERS is in a very preliminary phase to set definitive figures for SISTERS' pricing policy.

Finally, SISTERS pretends to heavily increase its production capacity, especially for packaging material and smart containers, to achieve very competitive prices that may allow final product prices affordable for any final customer and end-consumer. Besides, the well adaptation of Evanesto® to industrial current processes and equipment will allow reducing the production costs and of course the final product price of SISTERS' new packaging materials. It is being created some evidence that, with less amount of Evanesto®, the same quality product can be achieved, fact that can also make decrease the cost per unit of product of the packaging materials.

6.4 Market entry barriers

6.4.1 Technological

Such comprehensive and ambitious approaches such as SISTERS require a considerably high investment in R&D and product development. Despite the contribution from the EC, SISTERS anticipates that it will be very expensive, both in terms of time, effort and money, to develop, maintain, manage and update SISTERS solutions, SISTERS' production level, infrastructure and resources. This is normal for all high-production business models. It is even probable that the associated costs can offset SISTERS' in its first years.

SISTERS' budgets for the project and its financial forecasts (sec. 8) have been prepared considering the costs of creating, modifying, and regularly updating SISTERS' equipment and production plants. SISTERS will be expanding its workforce, including business development and marketing efforts. The extensive experience in innovation and entering competitive markets of SISTERS' partners and the technical excellence of SISTERS' team demonstrated in previous projects and entrepreneurial experiences are the assets that will allow SISTERS to overcome this barrier.

6.4.2 Business acceptance

Also, as said, food innovations are subjected to a very demanding certification. Furthermore, today, "green" labels are more and more co-opted by companies for marketing purposes. As a consequence, customers are becoming confused and even skeptical about the real sustainability of the solutions. Consumers are demanding more relevant information about the products they buy. Renowned certification of products and services become a driver for growth and increased internationalization of the sector. SISTERS hopes that through SISTERS' certification by CE and ISO Standards, SISTERS will be seen as a real guarantee of quality by the customers. These certifications are an efficient mean to make the client trustier to buy and use SISTERS products, and to strengthen SISTERS' brand on international markets.

6.4.3 Legal and regulatory

Environmental policies and the level of local commitment to them are subject to political fluctuations. SISTERS' approach is based on the assumption that public authorities are willing to tackle impact from FLW firmly. But this may not be the case in all cities or in all countries, depending on political and/or economic circumstances. This may condition SISTERS' entry into the market. In its marketing and dissemination campaigns, SISTERS should highlight the climate emergency and the urgent need to implement environmental measures as initiatives that cut across all political initiatives. In addition, SISTERS should also promote a long-term relationship with public authorities to implement stable plans that involve an irreversible improvement in the footprint of Food Value Chain, which is not subject to political fluctuations because it is aimed at the objective well-being of citizens.

7 Preliminary Business model Canvas

The preliminary business model of the future start-up of SISTERS has been outlined along this document and in the GA. SISTERS will develop a more mature one in future deliverables once the project is near its end. By the moment, SISTERS summarizes the main conclusions in the Canvas format.

8 Financial forecast

Financial forecasting refers to financial projections performed to facilitate any decision-making relevant for determining future business performance. SISTERS is still at a very early stage for a detailed forecast, but it is nevertheless important to make a preliminary estimate to ensure the feasibility of replication of SISTERS in the future, and to set future goals and expectations. Accurate forecasting will help SISTERS predict whether (and by how much) SISTERS' replicability will grow or decline. As such, SISTERS can set realistic and achievable goals, manage SISTERS' expectations and help SISTERS identify ongoing problems by analyzing the business' past performance. Additionally, SISTERS will be able to identify potential problems by getting an insight into what the future holds.

8.1 Starting assumptions

8.1.1 Pricing policy and unit economics

Table 5 below shows the unit prices for each of SISTERS' value propositions. First of all, signing up for the Short Chain App, (B2B SaaS line of business) would be free, and producers will not pay anything unless they sell food through the app. Once they start selling food, SISTERS will deduct an annual fee and a small commission for each batch of food sold. This commission rate will vary depending on what they charge for their lots. SISTERS will also study the possibility of charging annual licenses to large distributors and wholesalers.

The sale price of smart containers for fresh food is more difficult to determine, as there are no similar products on the market (the closest is that of the London start-up BlakBear, which is not yet on the market[36]). As a tentative value, taking into account that similar pallet boxes are priced at €47 per unit, around €60 per unit is proposed, both for the BULKBOX and the STOREBOX.

The price of the packaging material is shown in kg. The production costs with a first 100-liter reactor are around €2.60/kg just for the production of the Evanesto® additives, the unit cost with the incorporation of PLA is €5.74/kg. With a unit price of €6.62/kg, SISTERS will get a margin of 13.2%. With a 500-liter reactor, SISTERS will improve production costs achieving a reduction of around 55%: production costs will be €1.76/kg for additive, production cost of €4.59/kg for final product, unit price €5.80/kg, and a margin of 21%. As a reference, the price (in Spain, country of production) of high-quality home compostable plastic supplies for fresh food is approximately in the range of €4 - €8/kg for start-ups in the industry.[37]

As regards smart labeling, the main means of exploitation that SISTERS see is through an IP license, for which SISTERS proposes a value ranging €3,000 - 15,000/year + 4% of royalty payments on the net sales as a tentative value, taking into account that the values of reference in the branch range between 0.1 and 8%.[38]

Finally, for the Seal of Excellence, SISTERS proposes annual licenses that can have a starting value of around €5,000 per year, variable depending on sales forecasts.

[36] BlakBear. *Online* [Link].
[37] AD·Bioplastics. *Online* [Link].
Ecologic. *Online* [Link].
[38] How to set food royalty rates. Royalty Range. **2019**. *Online* [Link].

8.1.2 Market deployment and sales forecast

In a first pre-commercial phase, 2022 – 2027, during the project development, SISTERS is carrying out the technological development at partners' facilities. At the final years, 2026 – 2027, and even 2028, SISTERS will create brand awareness among potential customers and interested parties, to prepare for going to market. Here the customers and partners portfolios of industrial members of SISTERS will be extremely important. SISTERS prepares for the market launch at the beginning of 2028.

SISTERS' commercial expansion strategy can be assimilated with areas of influence. At first (2028 – 2029), SISTERS will focus on the regional area of its industrial partners and coordinator: Spain. Then (2029 – 2030), SISTERS plans to penetrate the national markets of the big RTOs in the consortium and the WP leaders: France, Germany, Italy, Sweden and Belgium. The already engaged stakeholders (sect. 3) and the continental vocation of partners like SAFE and ENCO can anticipate this European replicability deployment at even around 2029. SISTERS will consolidate its business in these EU countries due to a better understanding of the market and the stakeholders involved.

In the middle/end of 2030, SISTERS will enter a first phase of international expansion. SISTERS will start with countries where the market is larger, where the food value chain and users have integrated the concept of environmental impact of FLW and where the industrial network is greater. Specifically, SISTERS will expand to United Kingdom and the rest of Western EU. SISTERS will do it with local partners already engaged by the consortia, through collaboration with prescribers or with main actors in the sector, with which the scalability is greater and the risk is lower. For rapid but sustainable growth at an international level, SISTERS will reach agreements by areas with partners (companies already established in the respective national markets). SISTERS will offer them standardized and packaged product, so that it is feasible to implement it in their businesses. SISTERS will share with them its margin for implementations, and to a lesser extent the annual fees. SISTERS will also study the programs of national institutions and Chambers of Commerce (e.g., for Spain: ICEX, IGAPE or the Spanish Chambers of Commerce) of the destination countries that help internationalization, innovation or diversification. In this phase, SISTERS will also try to start international expansion with the selected international stakeholders SISTERS has already engaged (sect. 8.1.2).

In a second phase (from 2033), SISTERS will continue to promote sales in the EU countries where SISTERS has already launched the product and will cover the rest of the EU, especially the East and Turkey, as well as the United States and Canada. These first target countries have a considerable food production industry and a well-stablished culture of environment care. At this stage, once SISTERS have a proven track record in the industry, SISTERS will look at diversifying into other types of niches.

In collaboration with the industrial partners of the consortium, SISTERS has established a sales forecast for these markets that is shown in Table 6. The foreseen sales are not cumulative: e.g., in year 2030, SISTERS foresees to sell 7 licenses for smart labels to small and medium producers (SMEs), while at year 2031, SISTERS expects 9 new agreements.

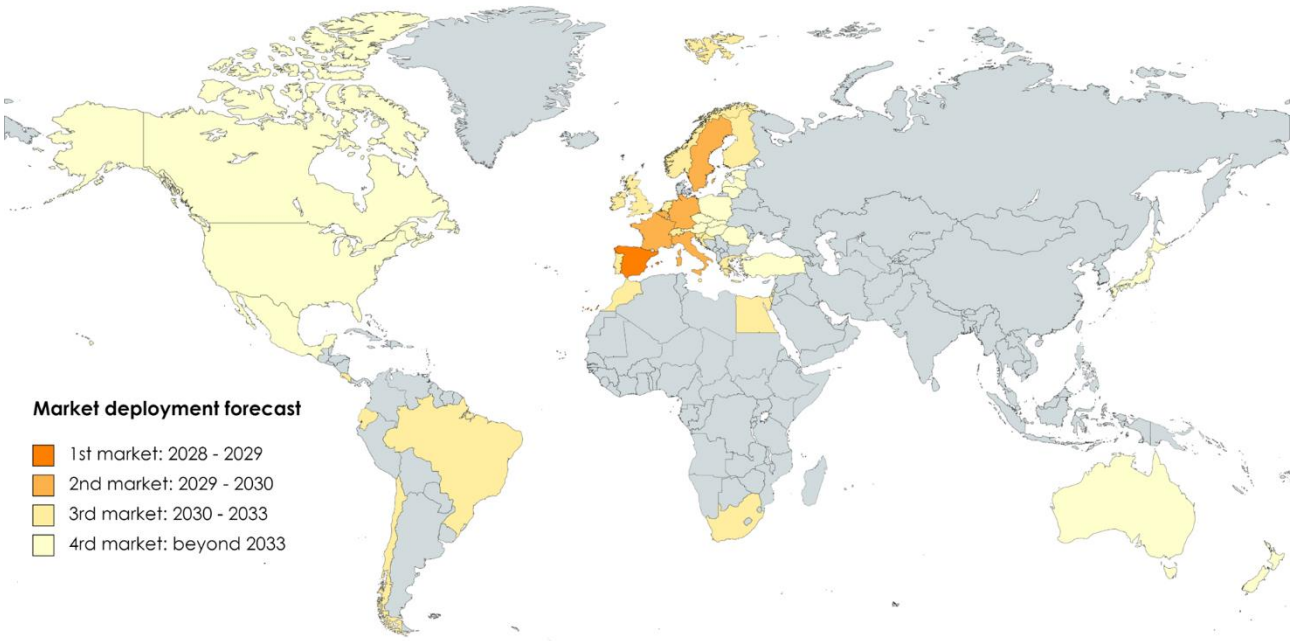


Fig. 13. *Timeline of market deployment forecast for SISTERS.*

8.2 Simplified financials

The financial estimates for SISTERS have been made in collaboration with the leaders of the technical WPs. They are contained in Table 6. The first row, Revenues, is the result of the sum of the products of the sales forecast and the individual prices established in Table 5. The Gross Margin (row 2) is revenue minus the Cost of Goods Sold. This latter metric shows the direct costs attributable to producing the goods sold or services provided, including the cost of materials used to create the good, along with the direct labor costs used to produce the good or service.

The following rows show the operating expenses, obtained as the sum of the estimates of each of the leaders of the technical work packages. It is observed that in the first years the Gross Margin represents a lower percentage of net revenues (77%) than in recent years (85%). Administrative expenses (row 3) and R&D (row 4) also represent a decreasing percentage. It is observed that administrative, marketing and sales expenses increase considerably in 2029, due to the preparation for the jump to international markets, as discussed in the timing of sec. 8.1. The same thing happens in 2030 and 2033.

Regarding R&D expenses, they are destined to its product strategy. They are employed, for example, in the maintenance and addition of new functionalities to the Short Chain Platform App, or in the development of new formulations of packaging materials based on new customer requirements and signed commercial contracts. In the early phases of commercial consolidation, 2027 - 2029, SISTERS does not expect to invest too much in product development. The expense increases in 2030 and 2033, due to the new agreements that SISTERS can establish with new clients in its international expansion, which also includes new expenses for certification and regulatory compliance.

The items of "Other operating expenses" include expenses for industrial scaling, acquisition and depreciation of equipment, etc. Above all, they come from the "Smart Containers" and "Packaging Material" value propositions, since the operational expenses for the others are much lower. The highest expenses are in 2027, at the beginning of the activity, and in 2030, due to international expansion.

Finally, the row “Other revenues/expenses” sums the quantities in the “Cashflows” table, regarding grants and investment finances.

8.2.1 Analysis and conclusions

Analyzing Table 5, it can be seen the expected growth potential of SISTERS in terms of profit. The net income is positive in the first years (2027 – 2029) only considering a strong positive cashflow from investing activities. After this first chasm, the profitability grows at a good pace, reaching 253k€ aprox. by 2032, with no investment foreseen. EBITDA is positive just after 2031. The first million value is reached by 2034.

As a general conclusion, it is observed that the expenses of industrial scaling make SISTERS not profitable until 1 to 5 years after the end of the project, mainly due to the expenses necessary for industrial scaling. According to its forecast, the first profitable year, 2032, has an EBITDA of about 253,000 €. To finance these expenses, SISTERS mainly relies on its policy of seeking public subsidies and private financing, which is described in the "Cashflows" table. It is noted that among its financial objectives is to obtain approximately € 2.5 M grants (see sec. 5.8.1) in the first three years, and a private investment of approximately € 2 M between 2033 - 2035, a time in which the consolidation of sales in Europe SISTERS hopes it will encourage investors. There are also items that are complemented by debts, although it is possible that the necessary amounts can also be obtained from private investors.

Table 5. Sales forecast for SISTERS' value propositions.

	SHORT CHAIN PLATFORM APP				SMART CONTAINERS (/unit)	PACKAGING MATERIAL (/kg)	SMART LABELLING			SEAL OF EXCELLENCE (anual license)	
	Anual licenses (small producers)	*Anual licenses (large wholesalers)*	*Sales commissions (small producers)*	*Sales commissions (large wholesalers)*			*Licensing fee (SMEs)*	*Anual licenses (large wholesalers)*	*Royalties (net sales)*	*SMEs*	*Big companies*
PRICING POLICY (€, average)	**1.000,00 €**	**5.000,00 €**	**1%**	**5%**	**40,00 €**	**5,80 €**	**3.000,00 €**	**15.000,00 €**	**4%**	**3.000,00 €**	**15.000,00 €**
SALES FORECAST (€, average)			*(income estimated)*						*(income estimated)*		
2027	3	3	3.000,00 €	15.000,00 €	1100	10	3	3	45.000,00 €	3	3
2028	4	1	3.600,00 €	18.000,00 €	1705	18	4	1	- €	4	1
2029	8	1	4.320,00 €	21.600,00 €	2643	48	9	1	- €	5	1
2030	14	1	5.184,00 €	25.920,00 €	4096	132	21	2	15.000,00 €	6	2
2031	26	2	6.220,80 €	38.880,00 €	6349	364	47	2	15.000,00 €	7	3
2032	46	2	8.709,12 €	58.320,00 €	9841	1001	109	2	30.000,00 €	9	4
2033	83	2	12.192,77 €	87.480,00 €	15254	2752	251	3	75.000,00 €	11	6
2034	150	3	17.069,88 €	131.220,00 €	23644	7569	577	4	187.500,00 €	14	9
2035	269	7	23.897,83 €	196.830,00 €	36648	20815	1328	6	468.750,00 €	18	14
2036	485	10	33.456,96 €	295.245,00 €	56804	57240	3054	7	1.171.875,00 €	22	20
2037	873	10	46.839,74 €	442.867,50 €	88046	157410	7024	8	2.929.687,50 €	28	30

Table 6. Simplified financial forecast of SISTERS, in thousand €

P&L	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Revenues	233,06	151,45	215,80	369,45	591,17	997,55	1816,32	3460,02	6910,28	14277,79	30509,92
Gross Margin	181,52	117,96	164,20	296,16	473,90	831,74	1514,42	2884,91	5899,87	12190,12	26048,82
Selling, General and Administrative expenses	-19,64	-12,77	-105,06	-209,41	-224,07	-239,75	-427,66	-483,25	-546,08	-617,07	-697,28
R&D expenses	-12,19	-19,04	-15,39	-93,13	-108,96	-17,48	-19,52	-230,75	-256,13	-284,31	-315,58
Other operational expenses	-921,60	-160,06	-86,40	-1121,60	-312,12	-321,48	-331,12	-341,06	-351,29	-361,83	-372,68
EBITDA	-771,91	-73,91	-42,65	-1127,97	-171,24	253,03	736,12	1829,85	4746,37	10926,92	24663,28
Other revenues/expenses (including grants)	891,44	830,00	1267,70	1130,60	200,00	-	619,48	619,48	619,48	-	-
EBT	119,53	756,09	1225,05	2,63	28,76	253,03	1355,60	2449,33	5365,85	10926,92	24663,28
Net Income	119,53	756,09	1225,05	2,63	28,76	253,03	1355,60	2449,33	5365,85	10926,92	24663,28

CASHFLOWS	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Cashflows from investing activities (net)	**61,44**	**-**	**37,70**	**725,60**	**200,00**	**-**	**619,48**	**619,48**	**619,48**	**-**	**-**
Cashflows from financing activities (net)	**830,00**	**830,00**	**1230,00**	**405,00**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
of which											
Proceeds from grants	830,00	830,00	1230,00	-	-	-	-	-	-	-	-
Proceeds from issuance of debt	-	-	-	405,00	-	-	-	-	-	-	-
Proceeds from issuance of equity	61,44	-	37,70	725,60	200,00	-	619,48	619,48	619,48	-	-
Net increase/decrease in cash and cash equivalents	**891,44**	**830,00**	**1267,70**	**1130,60**	**200,00**	**-**	**619,48**	**619,48**	**619,48**	**-**	**-**

9 Replicability, Scaling and Impact

SISTERS has great impact ambitions. In the **Table 7** are shown the main impact commitments made in the GA. As can be see, some of them are environmental impacts, while other ones are socioeconomic. It is stated in the GA that SISTERS' impact is verifiable through case studies with the solutions generated in SISTERS project. These case studies are pilots validating the solutions. E.g., in the case of the Short Chain Platform, the case study involves 100 primary producers from five different countries, while the pilot for the Smart Containers is represented by a demonstration of the use of the containers during real transportation from Spain to Italy and vice versa that will be conducted by PROEXPORT, EROSKI and RIBEREBRO. For the rest if the pilots, see the GA.

Table 7. Impact commitments of SISTERS

Item	Impact
Value Proposition 1: Short Chain Platform	▪ 20 – 40% FLW reduction of common food losses in agriculture due to market requisites ▪ 20 – 25% Farmer's incomes growth and favor local economies by enabling them to monetize their effort in production, promoting circular bioeconomy ▪ Savings for consumers, that will be able to buy local fresh fruits and vegetables with the same quality but different aspect at lower prices.
Smart Containers	▪ 20% FLW reduction in transportation ▪ 20 – 25% indirect CO_2 emissions reduction: 220 – 275 million tons CO_2 eq. per year ▪ Saving of 10-20% of fuel consumption thanks to the lower transportation needed to treat the food waste generated.
Biobased & active food packaging types	▪ 10 – 30% FLW reduction ▪ 20 – 30% food shelf-life improvement ▪ Reduction of CO2 emissions during residues treatment (e.g. incineration or landfill) by 10-20%
Seal of Excellence	▪ 10 – 15% FLW reduction ▪ Sustainable practices applied by retailers and wholesalers
QR Labelling Codification	▪ 10 – 20" FLW reduction from Retailers/Consumers ▪ Positive impact on consumer's sustainable awareness
SISTERS project as a whole	▪ Demonstrable 20-25% FLW savings through case studies with the solutions generated in SISTERS project ▪ Contribute to 30 - 50% savings of CO_2 emissions by 2030-2050 with the projected data analysis for the EU ▪ 10-15% higher estimated cost savings from data of the case studies

However, as explained in previous sections, an impact strategy that seeks the replication of SISTERS in the greatest number of value chains, through the greatest number of replication agents, will ensure that these impacts are not limited to the pilots of the project, but rather have an impact effective in Europe and even outside of it (as discussed in section 3, a suitable replication strategy can also have an impact outside Europe's borders).

9.1 Contribution to EU priorities and collaboration with other EU Projects

As stated in the GA, SISTERS will contribute to the he EU Platform on Food Losses and Food Waste[39], which tries to clarify EU legislation related to waste and facilitate food donation and use of food no longer intended for human consumption. SISTERS define procedures at each stage of the value chain to measure the reduction in food losses and food waste (WP1-5), promoting best actor's practice with specific guidelines, and evaluating progress made over time in terms of environmental sustainability, social impact, and costs (WP6). The assessment of indicators on food loss and waste and environmental & economic advantages, which aims to effectively monitor implementation of SISTERS innovations, will feedback on policies with close collaboration with European bodies (WP7). For all the previous, it is also synergistic with the recent revision of the European waste Directive in 2018[40], adding new objectives to reach regarding food waste reduction within 2030.

The SISTERS project is in line with the principles of the Updated EU Bioeconomy Strategy,[41] aiming at using sustainable industrial processes with improvements at multiple stages. The achievements from SISTERS project will: strengthen and scale up the bio-based sector by implementing sustainable packaging production, unlock investments and markets that are still following untenable systems, deploy local bioeconomies rapidly across different EU regions, through the promotion of direct/local sales, and support the understanding for ecological boundaries, especially on those regarding the production and consumption, where food losses and food wasted are highest.

SISTERS also contributes to innovation towards the Common Agricultural Policy post-2020[42] with instruments like eco-innovations and sustainable guides that contributes to increase a fair income to farmers increasing local business and reducing losses from production dynamics (WP1), to increase competitiveness of the European food industry for maintaining the leadership in food sustainability (WP6-7), to rebalance the power in the food chain working with market orientation in the different stages of the system (WP1-5), to increase sustainability in terms of carbon footprint, energy consumption and residues accumulation, promoting land use care (and thus, the associated biodiversity) and preserving landscapes from unsustainable practices (WP1-4), and to protect food quality and safety 6 health, validated in different active innovations with food compliance (WP2-3, 5).

On the other hand, the European Green Deal, published by the European Commission (EC) at the end of 2019, addresses environmental objectives and it incorporates the Farm to Fork Strategy, which directly mentions FWL as one of the tackling issues at the moment.

Part of SISTERS' contributions towards these initiatives are framed in the collaboration with brother projects. So far, and thanks among all to the tasks developed by SAFE, SISTERS is currently working together with the AGROBRIDGES, COCOREADO, COACH, FOOD'R'US and LOWINFOOD projects.

AGROBRIDGES was born from the need to stimulate the adoption of Short Food Supply Chains (SFSCs) in the European Union. SFSCs introduces key economic, social and environmental benefits for sustainable development, like: rebalancing the market position of farmers and increasing their income, better connecting

[39] EU Platform on Food Losses and Food Waste. European Commission. *Online* [Link].
[40] Waste Framework Directive. European Commission. *Online* [Link].
Directive 2008/98/EC of 19 November 2008 on waste. European Commission. *Online* [Link].
[41] Bioeconomy strategy. European Commission. Research and Innovation. *Online* [Link].
[42] European Network for Rural Development. Common Agricultural Policy post-2020. *Online* [Link].

farmers with consumers and reducing intermediaries, meeting the societal demand of providing safe and quality local food and reducing the environmental impact of agriculture.[43]

COCOREADO is a project designed to rebalance the position of the farmer as an individual actor, as a key player in innovative food supply chains, and as a supplier for public procurement. Based on the multi-actor approach and a deep understanding of Agricultural Knowledge and Innovation Systems (AKIS), the project applies a three-fold approach to maximize impact, relying on ambassadorship, good practices, and a focus on youth. The project involves both academic and close-to-farmers partners across Europe, recognizing regional differences and barriers in terms of replicability of good practices and regional opportunities in terms of solutions. The project will encourage young people in rural areas to co-create innovative solutions that overcome obstacles for farmers, address consumer needs and improve the conditions for the sustainable public procurement of local and seasonal food. [44]

COACH project aims to facilitate collaboration between farmers, consumers, local governments and other actors to scale up short agri-food chains which rebalance farmers' position, create win-wins for producers and consumers and drive innovation in territorial food systems. [45]

FOOD'R'US project is working to tackle the food waste and losses by creating resilient food systems across nine European regions. To achieve this, the project will test 23 circular solutions through diverse forms of collaborative innovation, including: technological (blockchain solutions to manage food losses and waste), social (educational materials and citizen science activities to promote sustainable consumption habits), organisational (last mile networks to foster local consumption and donation), and fiscal (new 'Pay As You Throw' schemes). These innovative solutions will empower and engage all actors in local food systems, from farmers to end-consumers and everyone in between, to build a multi-actor alliance to tackle the challenge of food loss and waste. [46]

And finally, the aim of LOWINFOOD, "Multi-actor design of low-waste food value chains through the demonstration of innovative solutions to reduce food loss and waste", is to provide the necessary demonstration and upscale to allow market replication. The core activities of the project are all focused on the evaluation of the efficacy of these innovations in reducing food losses and waste. The impact of the innovations will be evaluated considering the amount of food waste avoided as well as in environmental and socio-economic terms. [47]

[43] AgroBRIDGES Project. https://www.agrobridges.eu/
[44] COCOREADO Project. https://cocoreado.eu/
[45] Coach Project. https://coachproject.eu/
[46] FOOD'R'US Project. https://www.foodrus.eu/
[47] LOWINFOOD Project. https://lowinfood.eu/

9.2 Other impacts

9.2.1 Sustainable Development Goals

Apart from the abovementioned, SISTERS will contribute to more sustainable and environmentally friendly production, processes, and consumption by solving the great economic and environmental impact caused from the discarded food, improving the efficiency of product storage along the chain as well as the increasing shelf-life of goods and food properties. However, SISTERS will develop tools and knowledge that will impact society and reduce food waste in general and, consequently, pave the way to more sustainable processes on a much broader scale than just the related industry, from greener conversions to healthy foods to neutral farms to antimicrobial activities, etc. Therefore, SISTERS is aligned with at least seven Sustainable Development Goals (SDG) (**Fig. 14**).

Fig. 14. *SDG with which SISTERS is aligned.*

9.2.2 Impact on the dynamic of the market

SISTERS' impact on the overall market is primarily mid-/ long-term, but profound. As mentioned, governments are putting more and more pressure on companies in the food value chain to reduce their environmental impact, and FLW is one of the main battlefields. This is creating a key market niche where different companies are positioning themselves to use this FLW as a business asset. SISTERS is therefore facing a growing market that responds to a real need motivated by regulatory entities.

In this state of things, SISTERS will present initiatives that do not act on the FLW itself, but rather try to reduce it. This is already, on the one hand, an innovation in market positioning and in the business model. On the other hand, compared to the brands currently on the market, SISTERS also has a unique position, since it operates at all levels of the value chain.

Accompanied by an adequate Dissemination - Marketing - Communication task, SISTERS hopes that, by 2030 (see sec. 8), SISTERS will break into the market as a disruptive solution. At first (2030 – 2032 approx.), SISTERS' competition will be low, while potential competitors seek to design value propositions that allow them to position themselves at its same point. This will be the key stage that SISTERS will have to win the loyalty of its customers and partners, through its Innovators and Early Adopters, for which, as mentioned, the collaboration of the industrial partners of the consortium will be key. Starting in 2032, SISTERS hopes that there will be initiatives similar to SISTERS that will compete with SISTERS in a more multi-systemic way.

9.2.3 Job creation

SISTERS will be a start-up young but highly oriented towards a sector with a huge growing potential (food and FLW), especially regarding the synergistic orientation of regulation. SISTERS plans to add highly qualified personnel to its current team for all technical tasks. Given that it works on highly innovative technologies, SISTERS estimates that many of the jobs created by SISTERS will be covered by personnel with qualifications in specific Degrees related to the food/circular economy sector. SISTERS thus promotes the insertion of these profiles in the labor market, substantially increases the added value of the company and contributes to changing the current production model. SISTERS foresees to create up to 4-5 positions at SISTERS by 2025. But the job creation will be much higher after project completion and commercial deployment, and salary costs have been taken into account in the financial forecast (sec. 8). SISTERS is aware that validating and certifying its solutions, expanding to new markets and trying to engage more and more customers in a very competitive landscape require expanding the business development area. Finally, the sales department will be expanded with Business development specialists to support the distribution network and supply markets in EU.

10 Conclusions

SISTERS is a project financed by the EU with high impact commitments, which are impossible to achieve if not accompanied by a solid replication strategy. As a main conclusion, this replication strategy must have much of a commercial exploitation strategy. Therefore, this document focuses on the actions to be taken and the plans to follow in accordance with the preparation for the market.

As strong points, SISTERS has conscientiously designed its value propositions. But these must follow a marketing strategy and product design to match. Likewise, a product strategy that responds to the real needs and desires of customers and stakeholders is also very important. Throughout the dissemination tasks carried out, especially those carried out precisely to plan this replicability strategy, key conclusions have been obtained that support the design of SISTERS from the beginning and strengthen its chances of success. Governments are putting more and more pressure on the food sector, which is a real commercial pain that SISTERS is going to alleviate through reducing FLW.

The second great strength of SISTERS is the great interest that it has shown to be able to generate in the food industry, especially if it has been shown in major events such as FRUITATTRACTION. This starting point is perfect for deploying a strong engagement strategy by industrial research teams, whose main lines have been detailed. In addition, SISTERS presents key advantages, such as a unique positioning in the market, thanks to its comprehensive approach addressing the entire food value chain. On the other hand, the perspective of reducing the generation of FLW instead of turning it into an asset, which is the traditional approach, is an innovative business model, born in an ideal regulatory environment.

Finally, the exploitation of SISTERS goes through the constitution of a fiscal entity. The formation of a start-up is the most obvious modality. SISTERS' sales and financial forecasts show it to be viable, but with important conditions. Among them, the public subsidy and private investment is essential for it to be a profitable business in the long term, while the first profitability is not obtained until about 3 years after the project is finished.

Annex I. Commercial partners already engaged in Dissemination Events by SISTERS

Company name	Country	Web	Sector*	Contact name	Position	email
Biorizon Biotech	Retamar (Almería, Spain)	biorizon.es	P	M. Santamaría Blanco	Sales manager	msantamaria@biorizon.es
Inagroup Biotech	La Mojonera (Almería, Spain)	inagroup.es	P	L. Marcos Maldonado	Responsable Logísticas	pedidos@inagroup.es
Napolitrans	Eboli (Italy)		L	Food Logistics	General Manager	gerardo@napolitrans.it
Ecotrampa	Granada (Spain)	ecotrampa.com	P	Jose Javier Leyva Ruano		jleyva@ecotrampa.com
Bioera	Constantí (Tarragona, Spain)	bioera.es	P			info@bioera.es
Grupo Vegaverde		vegaverde.es	P, pack, M	Francisco Godínez Espinosa	General Manager	pacogodinez@vegaverde.es
Cítricos El Romeral	Alhaurín de la Torre (Málaga, Spain)	citricoselromeral.com	P	Luis Fernando Jiménez		
Setas Meli	Casasimarro (Cuenca, Spain)	setasmeli.com	P	Francisco Redondo	Director Comercial	
				Sergio Mondéjar	CEO	
Biotropic	Mijas (Málaga, Spain)	biotropic.com		Gina González	Comercial / Venta	ggk@biotropic.com
Distrimex	Avignon (France)	distrimex.fr	L	Nathalie Casal	General Manager	n.casal@distrimex.fr
Dalia	Marseille (France)	daliadouanes.fr	L	Caroline Dalia	Formalités en douane	caroline@daliadouanes-services.fr
Campo & Tierra del Jerte	Malpartida (Cáceres, Spain)	campoytierra.com	P	Raúl Heras Redondo	Commercial Dept.	rheras@jertefruit.com
Associaçao Interprofissional de horticultura do oeste	Lourinha (Portugal)	aiho.pt	P, L	Renato Gouveia		renato.gouveia@aiho.pt
Kiwis de Portugal	Santa Maria da Feira (Portugal)		P	Alexandra Gomes	Technical Dept.	alexandragomes@apk.com.pt

Frutas Mobilon	Sumaré (Brazil)	frutasmobilon.com.br	P, E	Mayra Mobilon		mayra@frutasmobilon.com.br
Nivex Farms	Cairo (Egypt)	nivexfarms.com	P	Sara Nabil Yacoub		info@nivexfarms.com
CSIC - Estación Experimental Aula Dei	Spain	eead.csic.es	R&D	A. P. Mata Bordonaba	Tech. Transfer	amata@eead.csic.es
Coopertiva Frutos del Campo	Aldeanueva de Ebro (La Rioja, Spain)	frutosdelcampo.es	P	Rodrigo Mauleón Ajona	CEO	direccion@frutosdelcampo.es
Egalsa Soluciones de Envasado	Boiro (Coruña, Spain)	egalsa.com	Pack	Didac Guillamon Reverte	Commercial Dept.	didac.guillamon@egalsa.es
Fresh Quality	Brazil	freshquality.com.br	P, S			customer@freshquality.com.br
FMI (Fruit Market International)	Barendreacht (The Netherlands)	fmibv.nl	P, E, L	Daan van Dalfsen	Account Manager	daan@fmibv.nl
Kissabel	France	kissabel.com	P			contact@kissabel.com
Termotécnica	Brazil		Pack, E, L			marketing@termotecnica.com.br
South Africa Fresh Produce Exporters' Forum	Cape Town (South Africa)	fpef.co.za	P, E			info@fpef.co.za
Fontestad	Museros (Valencia, Spain)	fontestad.com	P, E, L			
Marfret Compaignie Maritime	France		E			cneill@mrfret.fr
Green Peas	Orbaek (Denmark)	greenpeas.dk		Peter Skov Johansen	CEO	psj@greenpeas.dk
Chilean Blueberry Committee	Chile	chileanblueberrycommittee.com	P, E	Andrés Armstrong		aarmstrong@asoex.cl
Agrobansur	Machala (Ecuador)	agrobansur.com	P, E			
Proband Ibérica	L'Hospitalet de Llobregat (Spain)	cintransfer.com	R&D	Accounts Management	-	cintransfer@proband-iberica.com
Cerima Cherries	Tivissa (Tarragona, Spain)	cerimacherries.com	P			cerima@cerimacherries.com
Super Sweet Pinneaple	San Carlos (Costa Rica)		P			afigueroa@frutainternacional.com
CPR System	Gallo (Italia)	cprsystem.it	P, L, D			info@cpriberia.com
Fundación Agroecosistema	Spain	agroecosistema.org	M			
Lusilectra	San Sebastián de los Reyes (Spain)	lusilectra.com	D, L			lusilectra@lusilectra.com
Viveros Brokaw España	Algarrobo (Málaga, Spain)	brokaw.es	P			info@brokaw.es

Frutas do Brasil	Brasil					
Hortícolas Gelves	Gelves (Sevilla, Spain)		P	María Candau	Quality and Sales	maria@horticolasgelves.com
Frulexxo	Marocco	frulexxo.com	P			
Kiwicoop	Oliveria do Barro (Portugal)	kiwicoop.com	P			geral@kiwicoop.com
Agromex	Lesquin (France)	agromex.fr	I, E			info@agromex.fr
Alphatex	Saint Wandrille-Rançon (France)	aphatex.eu	Pack, Pol			
Thader Cieza	Cieza (Murcia, Spain)	thadercieza.com	P	Mª Carmen Salinas	Commercial Director	carmen@thadercieza.com
Zoberbac Agrocompany	Vilanoveta (Barcelona, Spain)	zoberbac.com	P			

* P = producer; I = Importer; E = Exporter; Pol = Polymers; L = Logistics; M = Marketing; S = Supplier; D = Distributor

SISTERS

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