H2020 WORK PROGRAMME

D4.4 – FINANCIAL, CIRCULAR ECONOMY AND CUSTOMER REACTION ASSESSMENT.

Author(s): Daniela Cadena, Lorena Peña (Zero-e)

Contributors (R2M)

Date: May 31th, 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Project details			
Project acronym	SUPER-HEERO	**Start / Duration**	01-06-2020 / 30 months
Topic	Innovative financing for energy efficiency investments	**Call identifier**	H2020-LC-SC3-EE-2019
Type of Action	CSA	**Coordinator**	R2M Solutions
Website	super-heero.eu		

Deliverable details			
Number	D4.4		
Title	Financial, circular economy and customer reaction assessment		
Work Package	WP4 - Capacity building, Schemes assessment and replication in other sectors		
Dissemination level	Public	**Nature**	
Due date (M)	30	**Submission date (M)**	M36
Deliverable responsible	ZERO-E	Contact person	Daniela Cadena

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Deliverable Contributors				
	Name	**Organisation**	**Role / Title**	E-mail
Author(s)	Daniela Cadena	Zer0-E	PM	dcadena@zeroe-engineering.com
Contributors	Cristina Barbero Thomas Messervey Omar Caboni Paul Mlakar	R2M Solution	PM	cristina.barbero@r2msolution.com
Reviewer(s)	Ana Gomez	Zer0-E	Researcher	agomez@zeroe-engineering.com
	Johann Ramirez	Zer0-E	Researcher	jramirez@zeroe-engineering.com
	Thomas Messervey	R2M Solution		thomas.messervey@r2msolution.com
Final review and quality approval	Daniela Cadena	Zer0-E	PM	Zer0-E
	Thomas Messervey	R2M Solution		thomas.messervey@r2msolution.com

Document History			
Date	**Version**	**Name**	Changes
2021	v.00	Table of content	ToC

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

08/2021	V.01	First draft	Circular economy strategies for supermarkets and goods supply chain.
08/2022	V.02	Second draft	Circular economy aligned to Technology and Energy Efficiency measures. Circular Business models. Literature review.
03/2023	V.03	Final revision	Final version – Addition of circularity in Super Heero.
31/05/2023	FINAL	Final version	Reviewed by PM.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

TABLE OF CONTENTS

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

TERMS, DEFINITIONS AND ABBREVIATED TERMS

TABLE OF ACRONYMS

Acronym	**Definition**	**Acronym**	Definition
M	Month	CE	Circular Economy
WP	Work package	WP	Work Package
SMS	Super Market Sector	Dx.x	Deliverable of the project
EU	European Union	CEAP	Circular economy action plan
CBM	Circular Business Models	LCA	Life cycle Assessment
LCI	Life Cycle impacts	FIA	Financial Impacts Assessment

TABLE OF FIGURES

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

TABLE OF TABLES

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

1. EXECUTIVE SUMMARY

This document is the SUPER-HEERO project handbook (contract no. 894403) corresponding to D4.4 (M30) leaded by Zer0-E.

In this report, Circular Economy of Super Heero is presented, the financial important information regarding the project and the demo sites is amplified in regards to circular economy and project profitability, and the reactions of the customers from the demo sites are collected and also assessed to understand a better approach for involve them in this kind of projects.

This document contains an overview of Circular economy definition, importance and policies that have been developed in order to make the change to a more circular economy, the report also contains projects that have been carried out in several sector and show other successful projects implemented in supermarkets that have a similar approach to Super Heero.

2. INTRODUCTION

Super Heero, propose an approach where the different Circular Economy system levels (Environment, society and economy) are integrated, through the use of renovation measures, the innovative and circular business models and finally the involvement and the positive impacts on the community.

This assessment explains the importance of that integration, the analysis is based in literature reviewed that has already proved that the approach earlier mentioned is an important advance in terms of circularity.

The Financial schemes studied in WP1, the Technology aspects presented in WP2, and the implemented measures in the demo sites and Super Heero itself, are aligned to the sustainable development goals, since they seek to reduce the energy consumption from coal, fossil fuels and gas consumption, implement more efficient equipment and change the traditional purchasing business models to circular models such as product as service, leasing and finally innovative financing such as crowdfunding, by doing that Super Heero is driving sustainable economic growth.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

3. INTRODUCTION TO CIRCULAR ECONOMY

3.1. What is circular economy

Circular economy is a manifestation of economic models that highlight business opportunities where cycles rather than linear processes, dominate. It is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times. (Sustainability Guide, 2018)

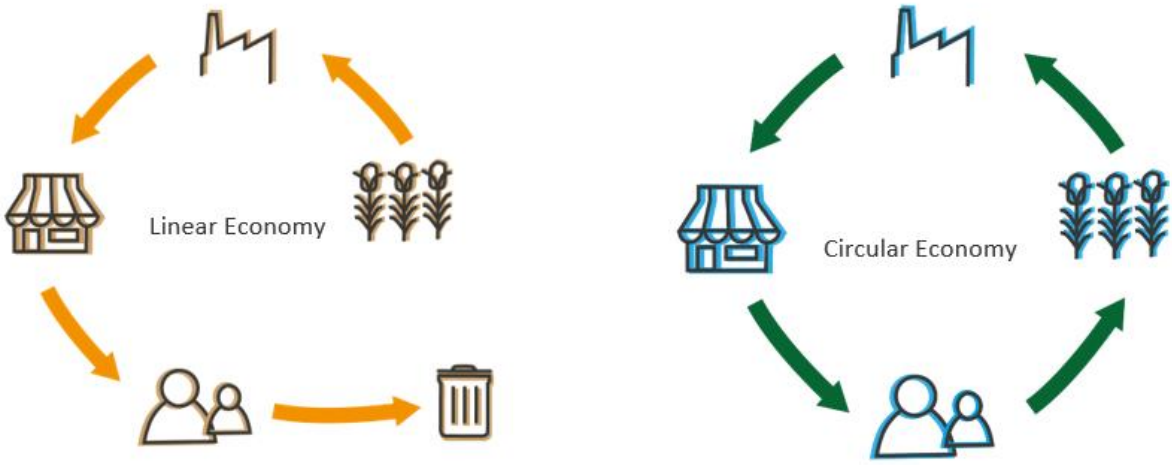


Figure 1. Linear economy vs Circular economy

To achieve circularity the social and economic sector must work together. The social sector plays an important role because the implementation of this system thrives more easily if the society is opened to new routines, aspects, strategies, and methodologies.

Circular economy is commonly confused with recycling but in fact it is just one of the strategies. “Circular economy seeks to rebuild capital, whether this is financial, manufactured, human, social or natural” (Ellen MacArthur Foundation, 2017). Circular economy is dived in two sectors, biological and technical; the biological is focused on the organic matter (flora and fauna) and the technical sector is more focused in the production.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

To illustrate this, Ellen MacArthur Foundation created a diagram to find relations and opportunities to implement circular economy. Ellen MacArthur Foundation, Circular economy systems diagram (February 2019), https://ellenmacarthurfoundation.org/circular-economy-diagram.

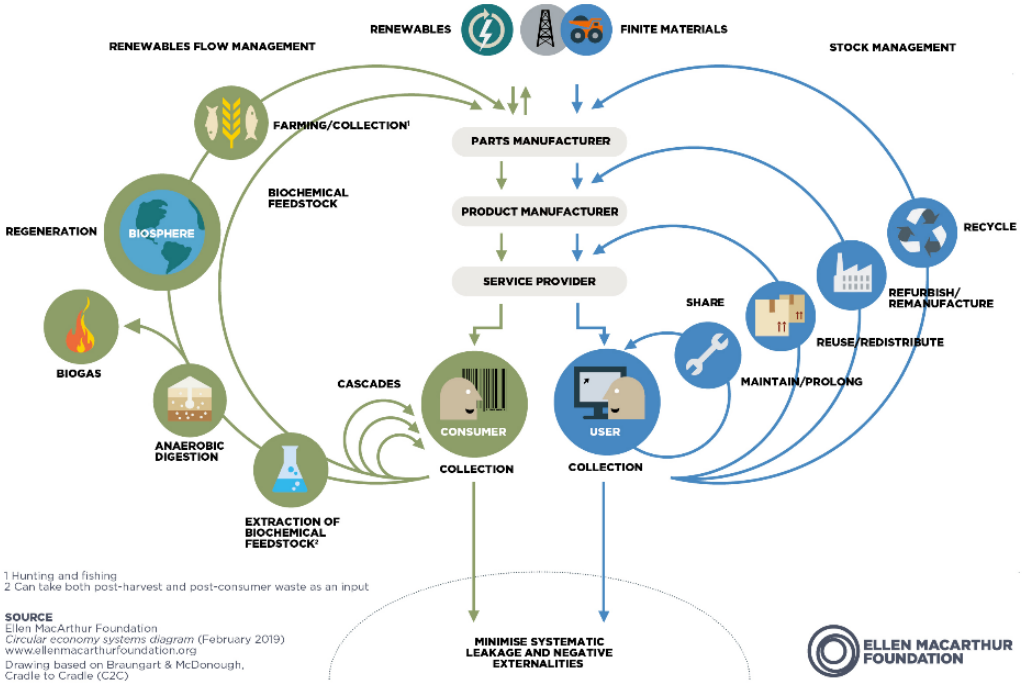


Figure 2. Ellen MacArthur Foundation, Circular economy systems diagram (February 2019)

As well Circular Economy can impact directly and indirectly all thein United Nations Sustainable Development Goals, yet the main related are the following:

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 3. United Nations Sustainability goals related to Circular Economy.

Retailers are key players of our economic system, allowing consumers to access goods from many establishments. Thus, the functioning of the food supply chain has important ramifications on consumers (given that approximately 13 % of their household expenditure is spent on food, as well as the functioning of a number of other essential economic sectors, such as agriculture, the food processing industry and retailers. Taken as a whole, the food supply chain generates value added of €715 billion per year, almost 6% of the EU GDP (EY et al, 2014).

Mentioned this, the importance to develop strategies and practices to make this sector sustainable has become a priority. Introducing circular economy in the supermarket sector not only will help to mitigate the environmental crisis but will promote the economic growth, aside from construct better consumption habits in the society.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

3.2. Circular Economy EU policy and legal framework.

The European Green Deal launched a concerted strategy for a climate-neutral, resource-efficient and competitive economy. Scaling up the circular economy from front-runners to the mainstream economic players will make a decisive contribution to achieving climate neutrality by 2050 and decoupling economic growth from resource use, while ensuring the long-term competitiveness of the EU and leaving no one behind.

To fulfil this ambition, the EU needs to accelerate the transition towards a regenerative growth model that gives back to the planet more than it takes, advance towards keeping its resource consumption within planetary boundaries, and therefore strive to reduce its consumption footprint and double its circular material use rate in the coming decade. For business, working together on creating the framework for sustainable products will provide new opportunities in the EU and beyond. This progressive, yet irreversible transition to a sustainable economic system is an indispensable part of the new EU industrial strategy. A recent study estimates that applying circular economy principles across the EU economy has the potential to increase EU GDP by an additional 0.5% by 2030 creating around 700 000 new jobs. (European Commission, 2020)

The main regulatory package of the ESIF 2014-2020 (European Structural and Investment Funds) does not use the specific term of “circular economy” yet there are some regulations that have a direct or indirect relation with circular economy. The Urban Agenda for the EU in the Action “Mainstreaming the circular economy as an eligible area into the post 2020 Cohesion Policy and corresponding Funds” shares a table with these regulations and their relationship with circular economy. Following a brief summary of the table with the regulations and articles and their relations with circular economy.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

3.2.1 Regulations, direct and indirect relation

Table 1. Table showing the direct and indirect relationship between the regulations presented. (UAEU, 2020)

Regulation	Direct Relation	Indirect Relation
REGULATION (EU) No 1303/2013 (Common Provisions Regulation) Article 9 Thematic objectives *Article 9.4* *Article 9.6*	The Common Provisions Regulation (CPR) sets out the common principles, rules and conditions for the operation of the ESIF. This regulation sets out the Thematic Objectives of the ESI-Funds, which are then broken down into Investment Priorities for the individual ESIF programs.	
	There is a strong link to the "use of less primary resources" category of CE processes, namely: ○ Recycling ○ Efficient use of resources ○ Utilization of renewable energy sources	The preservation and protection of the environment do not involve circular economy actions in every case. However, they may under certain conditions include the circular economy approach
REGULATION (EU) No 1301/2013 (ERDF)	This Regulation establishes the tasks of the European Regional Development Fund (ERDF), the scope of its support with regard to the Investment for growth and jobs goal and the European territorial cooperation	

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Article 3 Scope of support from the ERDF *Article 3.1* *Article 3.2* Article 5 Investment priorities *Article 5.1* *Article 5.3* *Article 5.4* *Article 5.6* *Article 5.6(a), (b), (f), (g)*	goal and specific provisions concerning ERDF support for the Investment for growth and jobs goal.	
	There is a direct link to the "use of less primary resources" category of CE processes, specifically to the "Utilization of renewable energy sources". Linked to the "use of less primary resources" category of CE processes, specifically: ○ Efficient use of resources ○ Utilization of renewable energy sources There is a strong link to Circular Economy and particularly in urban areas. The promotion of low-carbon strategies, at urban level, is directly related to the Use of less primary resources, process of Circular Economy.	Funding may include circular economy investments, like remanufacturing, refurbishment, re-use of products and components, etc. May also concern circular economy investments, as the sharing concept is a basic component of the Circular Economy approach. Innovative proposals/ ideas that are linked to circular economy may be financed, such as extension of product life, eco-design, eco-innovation, etc. New business models could include and promote the change of utilization patterns and to maintain

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

	Promoting low-carbon technologies is directly connected with Circular Economy's process "use less primary resources". Direct link to the most aspects of Circular Economy, such as: Recycling, Efficient use of resources, Remanufacturing, refurbishment and re-use of products and components, Product life extension, Shift in consumption patterns Direct link to Circular Economy aspects, like: Efficient use of resources, Shift in consumption patterns There is a strong link to circular economy, covering several aspects, like eco-Efficient use of resources, Remanufacturing, Product life extension, including	the highest value of materials. It could be about investing in innovative technologies projects to promote the mentioned sectors under the Circular Economy concept.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

	eco-design, industrial symbiosis, etc.	
REGULATION (EU) No 1300/2013 (CF) Article 2 Scope of support from the Cohesion Fund *Article 2.1* *Article 2.1(a)* Article 4 Investment priorities *Article 4.a* *Article 4.a.i* *Article 4.a.ii* *Article 4.a.iv* *Article 4.a.v* *Article 4.b* *Article 4.b.i* *Article 4.c* *Article 4.c.i* *Article 4.c.iv*	This Regulation establishes the tasks of the Cohesion Fund and the scope of its support with regard to the Investment for growth and jobs goal referred to in Article 89 of Regulation (EU) No 1303/2013.	
	There is a direct link to the "use of less primary resources" category of CE processes, specifically to the "Utilization of renewable energy sources". There is a direct link to the "use of less primary resources" category of CE processes, specifically: ○ Efficient use of resources ○ Utilization of renewable energy sources. The promotion of low-carbon strategies, at urban level, is directly related to	Circular Economy is a tool for the achievement of Sustainable Development and environmental benefits at urban level. There is a link to the "Efficient use of resources" There is an indirect link, as Circular Economy contributes to the adaptation to climate change by saving natural resources (used in energy production, manufacturing, etc) and by using them more efficiently, thus helping to ecosystem preservation.

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

	the Use of less primary resources, process of Circular Economy. Direct link to the most aspects of Circular Economy, such as: Recycling, Efficient use of resources, Remanufacturing, refurbishment and re-use of products and components, Product life extension, Shift in consumption patterns	There is an indirect link, as remanufacturing, refurbishment and re-use of products are Circular Economy processes.
REGULATION (EU) No 1304/2013 (ESF) Article 3 Scope of support *Article 3.2* *Article 3.2(a)*	This Regulation establishes the missions of the European Social Fund (ESF), including the Youth Employment Initiative (YEI), the scope of its support, specific provisions and the types of expenditure eligible for assistance.	
		There is a not very obvious link in the context of education and training. A shift towards circular economy requires the provision of new skills and

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

		an appropriate change of the mindset, the consumption patterns, etc.
REGULATION (EU) No 1305/2013 (EAFRD) Article 7 Thematic sub-programms *Article 7.1* *Article 7.1(f)*	This Regulation sets out the objectives to which rural development policy is to contribute and the relevant Union priorities for rural development. It outlines the strategic context for rural development policy and defines the measures to be adopted to implement rural development policy. In addition, it lays down rules on programming, networking, management, monitoring and evaluation on the basis of responsibilities shared between the Member States and the Commission and rules to ensure coordination of the EAFRD with other Union instruments.	
		EAFRD is not the appropriate fund to promote urban circular economy objectives. However, possible circular economy actions under EAFRD at rural areas might have an indirect impact at urban level (e.g. industrial symbiosis, food waste mitigation under sharing economy, etc.)

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

REGULATION (EU) No 508/2014 (EMFF) Article 5 Objectives *Article 5(a)* Article 6 Union Priorities Article 6.1 Article 6.1(a)	This Regulation defines Union financial measures for the implementation of: (a) the Common Fisheries Policy (CFP) (b) relevant measures relating to the Law of the Sea (c) the sustainable development of fisheries and aquaculture areas and inland fishing (d) the Integrated Maritime Policy (IMP).	
		Indirect relation in very broad terms, similar to the EAFRD case above. There might be a link to efficient use of bio-resources, as well as to recycling, refurbishment and re-use of products and components (e.g. recovery of fishing nets left in the sea bottom), etc.

The post 2020 Cohesion Policy[1] reaches to include policies which strengthen the social, financial and environmental sector; with this it aims to provide an easier transition to circularity.

- Social
  - Job creation and new skill responding circular economy.
  - Promotion of collaborative / sharing economy schemes and changes of consumption patterns.

[1] European comision (2020)

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

- Multilevel government involvement with the local stakeholders.

- Financial
  - Support SMEs, new business models and competitiveness responding to the needs of circularity.
  - Financial stability terms of availability of resources, better sharing of financial risk and higher financial leverage
  - Contribute to restructure industry.
- Environmental
  - Natural resources saving.
  - Contribute to tackling climate crisis.
  - Support of integrated sustainable urban development actions based on circular economy.

SUPER HEERO is a project that aims to provide a replicable financial scheme for energy efficiency investment in small and medium supermarkets, based on stakeholder and community engagement. This project is related with the last regulations mentioned:

Table 2. Table showing the relationship between the regulations and Super Heero.

Energy efficiency	No 1303/2013
	No 1305/2013
	No 1301/2013
	No 1300/2013
Stakeholders and community engagement	No 1304/2013
Financial scheme	No 1305/2013

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

As well, the project has strategies and objectives that are related to the policies to be include in the 2020 Cohesion Policy. Specially in the financial and environmental sector. Taking into accounts the following points

- Contribute to tackling climate crisis.
- Support of integrated sustainable urban development actions based on circular economy.
- Contribute to restructure industry.
- New business models and competitiveness responding to the needs of circularity.
- Financial stability terms of availability of resources, better sharing of financial risk and higher financial leverage

4. CIRCULAR ECONOMY IN THE RETAIL SECTOR

4.1 Retail Environmental Sustainability Code

In December 2008, the Retail Environmental Sustainability Code was recognized by the Council of the European Union. The adoption of this code is voluntary; however, it expresses the main commitments to reduce the environmental footprint. The target is to implement actions in the next 5 areas sourcing, resource efficiency, transport and distribution, waste management, and communication. Each area has a goal and recommendation to implement.

- **Sourcing** - Promote the production and use of environmentally friendlier products.
  - Increase in the availability of resource-efficient products.
  - Expansion of the range of certified products and/or the amount of certified material in the products (organic food, MSC, FSC, PEFC, Eco-label, etc.)

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

- Cooperation with suppliers, partners, and public authorities.
- Development of new environmentally friendlier products through engagement with suppliers.
- Awareness of suppliers of the environmental impact of production operations and improvement of these (e.g. implementation of requirements for suppliers to reduce the environmental footprint in manufacturing etc.)
- Application of life-cycle thinking approach when developing own-brand products.

- **Resource efficiency** - Reduce the environmental impact of retailers' premises.
  - Reduction in energy consumption.
  - Reduction in water consumption.
  - Increase in the share of renewable energy.
  - Use of efficient refrigeration and heating systems.
  - Change of lighting systems (i.e. increased use of natural light and/or of energy efficient lighting systems)
  - Implementation of eco-management practices.
  - Reduction in paper consumption.
  - Reduction in GHG emissions of own operations and/or stores.

- **Transport and distribution** - Improve the environmental performance of distribution, where the retailer does not operate its own fleet, working with transport providers and encourage workers and customers to use sustainable modes of transport.
  - Pooling and backhauling.
  - Optimization of truck filling.
  - Cooperation with suppliers to avoid empty trucks on the roads.
  - Joint deliveries: use of the same truck for delivering to stores in proximity.
  - Improvement of packaging solutions and handling materials (for example pallets)
  - Use of alternative modes of transport.
  - Use of innovative technologies such as clean and aerodynamic vehicles.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

- Promotion and support of the sustainable mobility of workers and customers.
- Collaboration with public authorities for the improvement of infrastructure and mobility.
- Promotion of use of public transport, bike and carpooling in head offices and shops.
- Implementation of a policy for less polluting company cars.
- Use of alternative means of conducting meetings such as videoconference systems, systems for internet meetings etc.

- **Waste management** - Continue to put in practice measures aiming to prevent or reduce the impact of waste on the environment.
  - Reduction of waste, including food, and packaging waste (promoting better suited selling formats, packaging minimisation, etc.)
  - Prevention, reuse and recycling of waste.
  - Reduction of packaging for disposal (including plastic bags)
  - Optimization of packaging systems at all stages with a view to smallest possible environmental impact.
  - Increase of recovery solutions for store waste.

- **Communication** - Inform and raise customer awareness on the environmental effects of their purchasing behaviour, alongside consumer education that might be provided by public authorities.
  - Information about the benefits and availability of environmentally friendlier products, the improvements made to products/product groups and the potential savings of resource-efficient (e.g. water, energy etc.) products through adverts, flyers, websites or point of sale.
  - Cooperation (e.g. through joint campaigns etc.) with selected stakeholders (e.g. suppliers, NGOs, public authorities etc.)
  - Working with customers (e.g. through surveys, consumer panels etc)
  - Internal communication tools to raise employees' awareness and staff training.
  - Promotion of the use of reusable bags.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Like the regulations mentioned before (2.2.) the year when the code was done, the concept of circular economy was not commonly used. Still, there are actions that applies to circular economy.

Moreover, it important to highlight that in 2018 the European Union Launched its first Circular Economy action plan where it listed come actions to be taken over material and products, later in 2020 this also commonly named CEAP, the EU built on the 2018 CEAP a new action plan, that after that would , and in 2018 adopted the circular economy monitoring framework, When the decision makers and policy makers started to realize that it was crucial to incorporate practices and strategies to have a more sustainable system, in a way they began to implement circular economy, the only thing was that the term “circular economy” was not formally stablished.

In both, Environmental Sustainability Code and ESIF regulation, mention waste management, upcycling concepts and energy efficiency. This affirms that supermarkets, being part of the retail sector, must apply practices and strategies regarding the mentioned to reach the goal towards circular economy.

4.2. Current Supermarket initiatives

All around the world Supermarkets have become an essential service into our life. It is where people buy some medicines, house supplies, stationery and among other things but mainly food. Supermarkets are crucial in our day to day, so their incorporation to Circular Economy will ensure a better transition to sustainability.

Supermarkets have applied different strategies and practices regarding to circular economy, they are divided mainly in three types:

- Bioclimatic design and architecture
    - Elements that are integrated in the facilities or construction design.
- Technical energy efficiency
    - Technologies and devices directly related to energy.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

- Indirect strategies
    - Strategies and practices that involves a third party.

The strategies belong to the technical sector in the Ellen Macarthur diagram of circular economy (Recycle, Refurbish/Remanufacture, Reuse/Redistribute, and Maintain/Prolong). https://ellenmacarthurfoundation.org/circular-economy-diagram

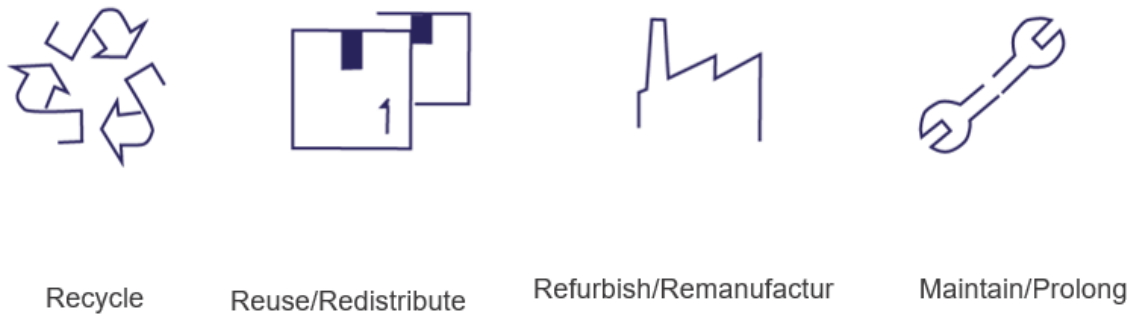


Figure 4. Strategies belong to the technical sector in the Ellen Macarthur diagram of circular economy.

Now, in the EU CEAP, 2020 (Circular economy action Plan) there's a is a set of interrelated initiatives which aim to reduce pressure on natural resources by transforming the design, production and consumption of products so that no waste is produced. These initiatives target many different materials and commodities such as packaging, technology, vehicles and textiles.

In the CEAP, Circular economy is defined as a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible[2].

[2] https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 5. CEAP Circular economy scheme.

Therefore, this definition is also aligned with the aims of Super Heero project, where its main goals are seeking the implementation of more efficient technologies, circular business models and the introduction of the customers as the final step of the production chain, to get involved in how things are initially conceived and its result.

As part of the development of the CEAP, there were several initiatives created that apply and directly affect supermarkets, including a Directive on single-use plastics and mandatory Eco Design requirements for energy-related products like household products, motors and power supplies.

As an introduction to the goals of Super Heero project regarding Circular economy strategies, it's important to deeply understand the next point, that was briefly mentioned before.

4.2.1 Technical energy efficiency

Energy efficiency means using less energy for the same output or producing more with the same energy input, and minimising energy waste.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Technologies and devices are directly related to energy efficiency, and the implementation of more efficient equipment or renewable sources of energy, can reduce costs and help the reduction of green-house gases generated by energy consumption.

This point, lists some of the strategies related to energy efficiency that can be applied to super markets:

- Renewable energy: Solar cells in places with high UV rays, reduce the cost in general electricity bills; sometimes when the generated electricity is higher than the consumption the electricity is "sold" to other companies or the public electricity generator. Depending on the country policies and establishments are the benefits that come along with renewable energy investment. "Renewable technologies create new opportunities for citizens to become energy producers themselves and to actively contribute to the energy transition. This is possible, for example, when households and businesses install solar photovoltaic (PV) panels on their roofs"[3], this report also empowers communities to "become energy producers themselves and to actively contribute to the energy transition."[4]

- CO_2 refrigeration: The principals supermarkets products are food and depending on the product is necessary to use a refrigeration system for their storage. But supermarkets also depend on refrigerants for the air-conditioned cooling system. One of the challenges was to find a refrigerant system efficient and less pollutant than others. "The last years, the use of CO_2 as refrigerant is a revisited idea in order to avoid the use of harmful working fluids. Especially, after the EU F-Gas Regulation 517/2014, the usual refrigerants are substituted with natural refrigerants such as CO_2, propane and NH_3. However, the CO_2 seems to be the most attractive choice due to the high flammability of the propane and the high toxicity of the NH_3."[5] (Evangelos Bellos,Christos Tzivanidis, 2019) Some advantages are:

[3] EEA Report No 1/2022
[4] https://www.eea.europa.eu/publications/the-role-of-prosumers-of
[5] (Evangelos Bellos,Christos Tzivanidis, 2019)

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

- Higher thermal conductivity
- Density
- Latent heat
- Specific heat capacity
- Lower dynamic viscosity compared to the other hydrofluorocarbons (HFCs)
- Low toxicity, flammability, and global warming potential (GWP) are extra advantages.

- LED lighting (light-emitting diode): “Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting… use at least 75% less energy, and last 25 times longer, than incandescent lighting.” [6](Energy.Gov, 2021)

- Real-time energy measurement monitoring: The goal of these types of technologies is to save energy and have the better performance as possible. With measurement on each device which consumes energy, the supermarket would monitor if there were any waste of energy, an inefficiency and take quick actions to solve the problems.

4.2.2 Supermarkets and energy efficiency technologies

As predecessors to SUPER – HEERO we can reference SUPERSMART, which was a project developed under HORIZONT 2020 and introduces “Super Smart - Expertise hub for a market uptake of energy-efficient supermarkets by awareness raising, knowledge transfer and pre-preparation of an EU Ecolabel”, in it, the project dig into the “review of the technical characteristics of eco-friendly supermarkets. This has been fulfilled by presenting the conventional and eco-friendly cooling and heating systems available in the European supermarket sector” and gives clear data about raising awareness and transferring knowledge

[6] Energy.Gov, 2021

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

about eco-friendly solutions in supermarkets among different stakeholders of the supermarket sector." [7]

Other projects that already found a way to be more efficient are listed in the next table.

Table 3. Efficient projects in Supermarkets. Mazyar Karampour et al,2016

SUPERMARKET	YEAR	RESULTS & STRATEGIES
HEB **Austin, Texas**	July 2013	Slashed its energy use by an estimated 64% over the grocery store national median. 60% percent reduction of regulated potable water
		○ Refrigeration/cooling systems, daylighting integrated with computer automated LED lighting, efficient equipment, and careful building design. H-E-B is the first supermarket retailer in North America to use a whole-store propane refrigeration system.
Aldi Süd Rastatt **Rastatt, Germany**	2010	23 % reduction in energy demand, compared with standard specific energy consumption of Aldi supermarkets
		• Efficient refrigeration and HVAC with an integrated CO_2system • Lighting controlled depending on the amount of daylight. • Use of surplus heat from cooling – possible to use the refrigeration system as a heat pump.

[7] Karampour, Mazyar & Sawalha, Samer & Arias, Jaime. (2016). Eco-friendly Supermarkets - an Overview. 10.13140/RG.2.2.26190.05445.

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

		• Energy flow monitoring • Automatic system control • Regenerative and passive cooling • Demand controlled ventilation by CO_2censors. • Heat recovery in ventilation system via rotary heat exchanger.
ICA Kvantum Täby **Täby, Stockholm, Sweden**	2013	9 % less energy consumption by using ejector, comparing Oct. 2014-May 2015 (non-activated ejector) and Oct. 2015-May 2016 (activated ejector)
		• First ejector-based system in Sweden • One liquid ejector • Glass doors on cabinets and freezers • Real-time energy measurements monitoring • 4 K higher MT evaporation temperature by using ejector.
Tegut supermarket **Marburg-Cappel, Germany**	2014	Overall estimated energy saving of 30% comparing to conventional supermarkets. The first supermarket to receive the German ecolabel BlueAngel, in 2015
		• Integrated CO_2refrigeration + heating system • Photovoltaic (PV)panels on the roof, 90 kW capacity • Glass doors, LED lighting and EC fans in the cabinets • LED lighting

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

		• Energy management system according to DIN EN ISO50001
REMA 1000 Kroppanmarka **Trondheim, Norway**	2013	Reduction in annual energy demand30 %, in comparison with a standard Norwegian supermarket Reduction in CO_2emissions~30 % Won the Energy Saving Prize in Trondheim (Energispareprisen) in 2014.
		• Integrated refrigeration system with heat recovery at multiple temperature levels, CO_2as the refrigerant • Controlling technologies for optimized, easier operation • AHU unit adapted to supermarkets All waste is sorted and recycled, and customers may also return several types of waste for recycling at the entrance
NorgesGruppen **Auli, Norway**	2014	Expected 50 % reduction in energy use compared with a similar sized store.
		• Integrated refrigeration system with heat recovery, based on CO_2as refrigerant • LED lights in the cabinets as well as in the store

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

		• 1300 $m_2$solar panels on the roof, which should give ~150 kW • Extra heat exchanger before compressor to ensure dry inlet
Iper Hypermarke **Milan, Italy**	2015	Energy savings of up to 50 % are expected. The centre is LEED Gold certified, designed and constructed to use less water and energy and reduce greenhouse gas emissions.
		• CO_2refrigeration system using multi-ejector technology, designed for energy-efficient operation at ambient temperatures up to 38 °C • Heat recovery for DHW production • Integrated control of light, HVAC and refrigeration; control system designed by Danfoss
Walgreens store **Evanston, Illinois, U.S.**	2013	60 % saving in energy consumption
		• Window glass with light redirecting film technology redirects 80% of the direct solar radiation to the ceiling reducing glare and enhancing natural daylight penetration. • Solar PV installation covering the entire roof area

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

		• 2 wind turbines • CO_2refrigeration system with heat recovery for the ventilation air heating and DHW pre-heating • AC+ parallel compression • “False load” heat exchanger in gas cooler for extra heat recovery • Power measurement and visualization • LED technology installation with an automatic light control system with daylight sensing zone • Motorized aperture in the roof controls natural ventilation for pre-conditioning • Centralized, demand controlled ventilation system based on CO_2 levels in retails space with single-zone air handling units for local temperature control.

This table collects a brief part of what SUPERSMART project aimed, and highlights mainly how the implementation of several refrigeration systems for air cooling ang heating, working with other measures can significantly reduce the energy consumption in supermarkets. At being eco-friendly stores, the main strategy was to go for sustainability and all of them proved that obtaining sustainability traduces in less consumption, which traduces in revenues and less costs of operation for the brand.

To conclude, it is clear that are many ways to introduce an efficient and less consuming refrigeration system. It is important to consider that every supermarket is different therefore to select the best solutions it is necessary to know and consider their location, distribution, products and organization. Renewable energy sources installation, LED lighting, architectural measures as well as several heating and cooling solutions were mentioned in almost all the supermarkets proving that pointing tours sustainability is good for businesses.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

5. CIRCULAR BUSINESS MODELS

In point 3.0, it is mentioned the different activities and strategies that can be and have been implemented over the retail sector. However, to fulfil the Circular Economy concept it is important to complement with a Circular Business Model (CBM).

Circular businesses no longer focus mainly on profit maximisation or pursue cost-cutting through greater efficiency in supply chains where factories and operations as the primary corporate objective. Rather, they concentrate on redesigning and restructuring their business plan to a circular one, like Product-Service-Systems from the bottom up to ensure future viability of business activities and market competitiveness (Florian et al, 2017)

The most comprehensive definition of the CBM is given by Frishammar and Parida: a circular business model is one in which a focal company, together with partners, uses innovation to create, capture, and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby realizing environmental, social, and economic benefits. (Frishammar and Parida, 2019)

Bocken, De Pauw, Bakker, and Van Der Grinten propose three important factors to make a CBM.

Figure 6. Factors to make a Business Circular Model.

The sustainable guide identifies four types of opportunities regarding the implementation of the circularity in a practical level. As well it is mentioned that not all of them are

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

necessarily innovative. Also, they are not exclusive, there can be a combination between models which can fit the companies' goals[8].

- Circular supplies

  It is based on supplying fully renewable, recyclable, or biodegradable resource inputs that sustain circular production and consumption systems. The value proposition focuses on the substitution of fossil, critical and scars materials.
- Access and performance

  Access and performance are concerned with providing the capability or services to satisfy users' needs without owning physical products. The value proposition includes the offering of Product-Service-Systems, a combination of products and services that seek to provide functionality for customers.
- Extending product value

  Extending product value focuses on exploiting residual value of products and delivering high-quality, long-lasting products supported by design for durability, reparability, upgradability, and modularity. Values that would otherwise be lost through wasted materials are instead maintained or even improved by repairing, upgrading, refurbishing, remanufacturing or remarketing products.
- Bridging

  It promotes platforms for collaboration among producers and consumers, either individuals or organizations. The value proposition concentrates on enabling interaction between different but interdependently actors and bring together supply and demand.

Some strategies and practices to build a circular business model are the following:

- Coordinating circular value chains through data
- Circular product design.
- Use, reuse, share, and repair.
- Collection & reverse logistics.
- Sorting & preprocessing.

[8] (Florian et al, 2017)

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

- Extend product value.
- Long-life.
- Encourage sufficiency.
- Industrial symbiosis.

These strategies are commonly applied in the use of specific products, yet there are some retailers that have applied them in a more systematic way. Following some examples.

Table 4. Circular business models applied in companies[9].

Company/project	Strategy	Description
Nestle	Use, reuse, share, and repair.	Nestlé is piloting reusable and refillable dispensers for pet care and soluble coffee as part of its efforts to reduce single-use packaging. The in-store dispensers offer consumers a shopping experience that is free of single-use packaging, along with flexibility and variety of product choice. https://www.nestle.com/randd/news/allnews/nestle-pilots-reusable-refillable-dispensers-reduce-single-use-packaging
Unilever	Circular product design.	Unilever has pioneered the use of a new detectable black pigment for its High Density Polyethelyne (HDPE) bottles for its leading brands, TRESemmé and Lynx, so they can be detected by recycling plant scanners and sorted for recycling.

[9] https://www.ellenmacarthurfoundation.org/assets/downloads/ES-Circulytics-2.0-Examples-List.pdf

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

		https://www.unilever.co.uk/news/press-releases/2019/unilever-pioneers-solution-that-enables-black-plastic-bottles-to-be-recycled.html
FACTOR10	Industrial symbiosis. Coordinating circular value chains through data	Factor10 is a premier, global platform for businesses committed to the circular economy. Factor10 convenes more than 30 companies from around the world to co-develop solutions to their greatest priorities in the circular economy. Through workstreams on Metrics, Policy, Bioeconomy and Buildings, Factor10 tackles both systemic and value-chain specific barriers towards a circular transition. It produces metrics, tools, advocacy and catalytic insights through cross-industry and value-chain collaboration. https://www.wbcsd.org/Programs/Circular-Economy/Factor-10
Replenish	Long-life.	Replenish 3.0 is a universal 'packaging platform', a reusable bottle that attaches directly to a concentrate refill pod. The system can be used in most packaged liquid goods, from cleaners to beverages. https://www.ellenmacarthurfoundation.org/case-studies/customisable-packaging-platform-for-liquid-concentrates

Horizon 2020
European Union Funding
for Research & Innovation

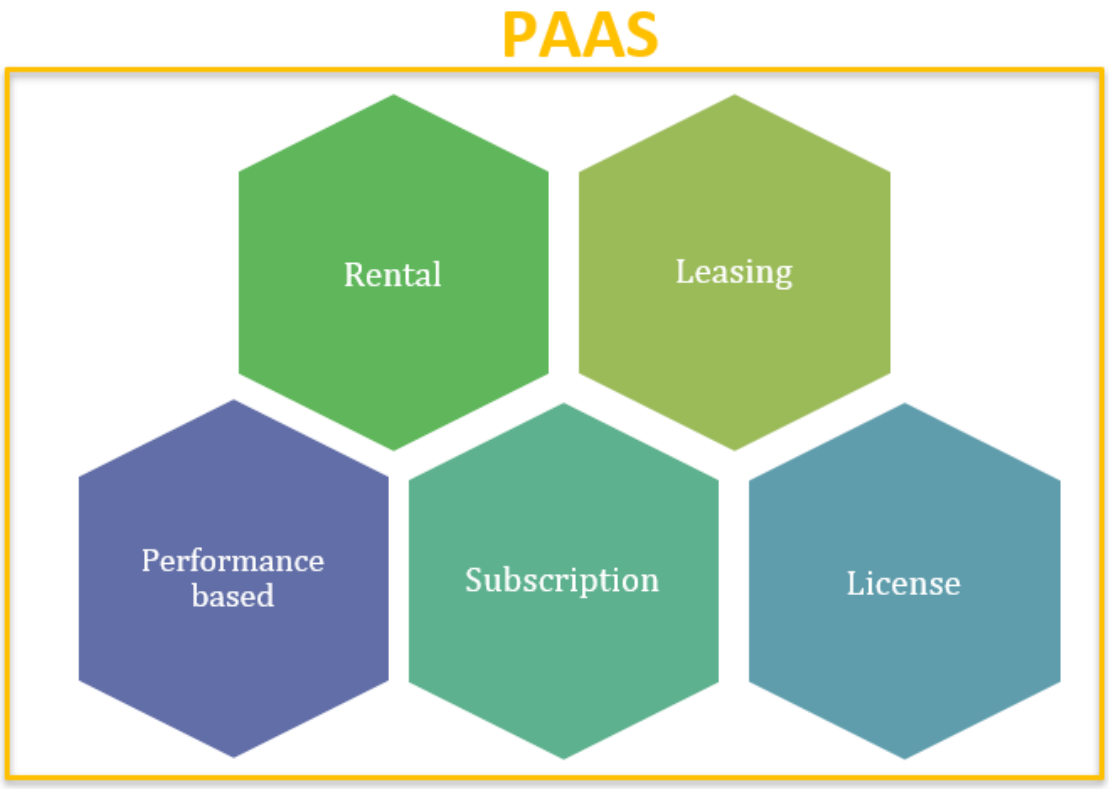
This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

For more examples: https://www.ellenmacarthurfoundation.org/assets/downloads/ES-Circulytics-2.0-Examples-List.pdf

CBMs are also one of the main goals, of Super Heero project, to create circular business models or ways to make contracts between stakeholders.

For this in WP1 the project assesses several of this models and review how the project can not only make deals but also in D2.2. cross them with the renovation kits to support technology providers tours a strategy to scaling up circular plans and start implementing CBMs.

One of the best ways to use these strategies is applying a product as a service (PAAS) model. An aspect of this model is that the service provider is owner of a product, equipment or even system.
It can be easily understood, as follows: The owner is looking forward to having a profitable business, so they give a good maintenance to the product, equipment, or system, to have



Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

a high efficiency and performance creating a satisfy and loyal customer. There is no rule or formula to implement PAAS, in fact most of them are accompanied with other models.

In retail sector, some projects and companies have already implemented PAAS. Below are listed some examples:

- **Subscription model:** The customer pays a recurring payment with a specific timeframe for the access to a specific product or service.

  Example: the lighting system comes from another energy company to supply the supermarket a specific amount of energy every month.

Company/project	Subscription Description	Source
HP Instant Ink	HP's Instant Ink is an IoT enabled subscription model for individuals and small businesses that increases cartridge recovery and recycling. The model uses connected printers to send customers replacement cartridges, along with pre-paid envelopes for returning used cartridges, before the customer runs out of ink.	https://www.ellenmacarthurfoundation.org/case-studies/bringing-printing-as-a-service-to-the-home

- **Leasing model**: the client "buys" a product but in fact the product is still from the supplier

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

- **Example:** a refrigeration system in the supermarket

Company/project	Leasing Description	Source
DLL&JLG	DLL developed a complete finance offering for JLG's new and reconditioned assets, including rental solutions. This means that customers can return the equipment to JLG at the end of the lease contract, allowing JLG to plan and predict when assets will reach its workshop for reconditioning.	https://www.ellenmacarthurfoundation.org/case-studies/financing-the-expansion-of-circular-business-models

Some of the things to take in consideration as a provider in order to execute a PAAS model and develop the best method and prince are:

1. **Lifetime or lifespan of the product/equipment:** this helps to plan a renovation equipment and prevent unexpected expenses
2. **Maintenance:** materials and procedure. What to do? How often?
3. **Parts of the equipment:** in case of a necessary reparation, or if it can be used after the use of the product/equipment
4. **Efficiency performance:** what are the best conditions to work? This help to predict possible future problems
5. **Labor hand available:** what are the services you can provide with the labour hand available?

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

6. Communication channel between provider and client

Another side of Super Heero is the community engagement. In WP3, Super Heero has built a crowd funding platform, where people can go and invest on its nearest supermarket project. This approach, allows people from the same community as the supermarket to be part of an environmental responsible community, and to receive not only the interest revenue over their investment, but through the award mechanisms, another part of Super Heero, to receive awards directly from the stores.

As a result, following scheme it's presented.

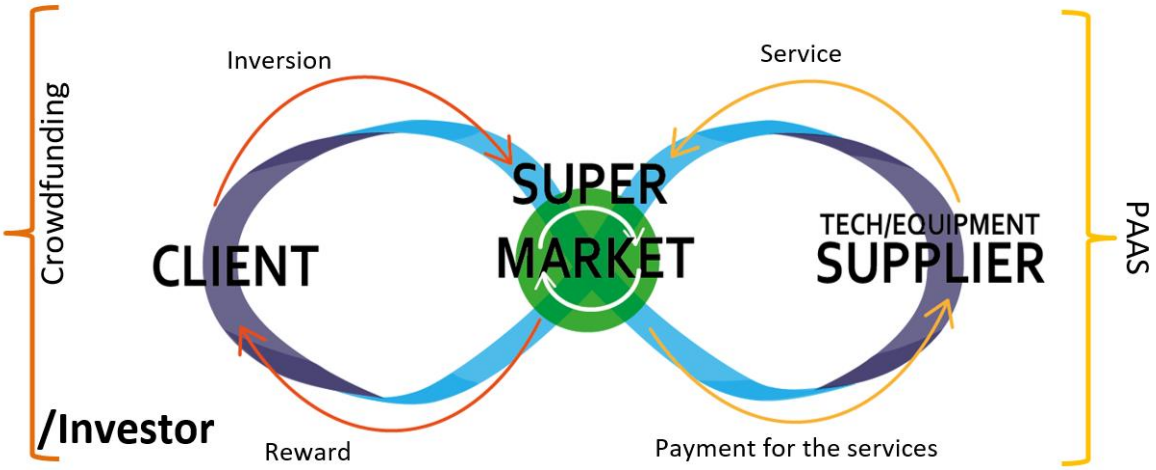


Figure 7. Super Heero scheme.

Some supermarkets have already implemented crowdfunding campaigns and have obtained good results from it, some are shown in Table 5:

Table 5. Supermarkets that implemented crowd funding campaigns.

Supermarket	Purpose crowfunding	Rewards
LA OSA	To obtain the necessary financing and pay for the	Try new (organic)

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Pioneer cooperative supermarket in Madrid. The supermarket is committed to responsible consumption (organic products, bulk sale of fresh and dry products). **http://www.goteo.org/project/la-osa**	preparations for the construction of your new premises: licenses, procedures, personnel costs, architectural studies, etc.	products, know their producers, waste reduction and training workshops on responsible consumption.
Deliberry **Deliberry is an online food shopping platform in supermarkets and local businesses that allows the user to make the purchase from home and receive it in just 1 hour.** **https://www.sociosinversores.com/proyecto/deliberry**	To strengthen its technological area and its territorial expansion plans, since it currently only operates in Madrid and Barcelona.	Be a company investor for 2-4 years.
Biolibere **Supermarket made up of member families that seeks to offer healthy products at affordable prices, thus meeting a growing demand and placing emphasis on local products, produced**	Increase in membership and having a larger premise will allow the supermarket to grow in scale that will result in good prices, guaranteeing sustainable	Membership for one year, organic products.

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

responsibly and under conditions of social justice. **https://crowdfunding.fundaciontriodos.es/-biolibere-supermercado-cooperativo-/1691**	criteria for purchasing products.	

6. Circular Economy and Financial assessment of SUPER-HEERO

As mentioned in the point 3. to be a business or project involved in circular economy means to be restorative and regenerative by design and seek to rebuild capital, whether this is financial, manufactured, human, social or natural.

SUPER-HEERO has two main elements regarding to CE; the first one is the energy efficiency introduced in the supermarkets. As an overall resume, this scope is about to install or substitute technologies and equipment in the supermarkets such as LED lightning, HVAC units, fridges and door cabinets and install cleaner energy generation systems.

Secondly are the financial schemes or circular business models (CBM). For this scope the involvement of the technology provider and the supermarket client is crucial. With each of the involved the CBM applied are different forthcoming there will be a deepest explication of CBM such as leasing, technology as a service and more.

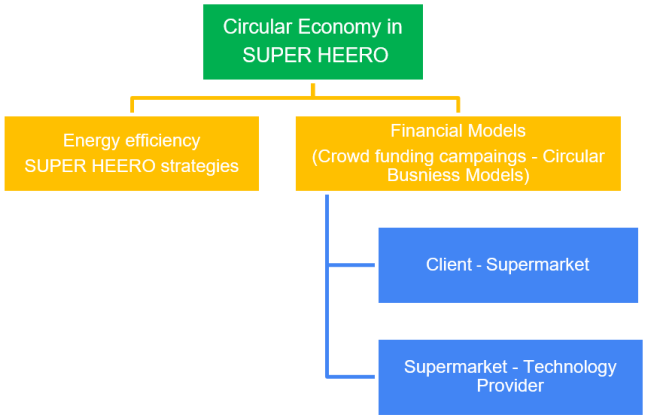


Figure 8. Circular Economy scheme in Super Heero.

Horizon 2020 European Union Funding for Research & Innovation
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

With the correct introduction of SUPER HEERO, this project could reach a symbiosis between the three main characters, supermarket clients (general public), supermarkets and technology

With the proposed Renovation interventions in D2.1. Super Heero aims to increase the value of the equipment by reducing the energy consumption of the supermarkets, and not only that but by implementing one of the circular financial schemes such as crowd funding campaigns it seeks for the community to be aware of the strategies of its nearest supermarket since it allows the direct customer to invest on the supermarket improvements, or such as one of the PAAS or EPC contracts where equipment can maintain its life value, since it allows that the technology provider remains responsible for the correct functioning of the equipment, its collection after its end of use, its disassembly, reuse of parts and correct disposal of those that has end their use. The result of that reflects directly in the reduction of environmental impacts, the economy of the supermarkets brand or store and the customers awareness and society improvement.

6.1 Super Heero strategies

6.1.1. Financia Schemes

As part of Work Package 1, Super Heero analyse the different financial schemes proposed in the Project, which are EPC, PAAS and Crowdfunding.

Table 6. Financial schemes proposed by Super Heero.

Financial Schemes	Insight	Is circular?	Why?	System level impacts
EPC	Contract between customer and provider of energy efficiency measure.	Yes	Allows to pay in relation of the intervention and the energy savings, therefor the energy saving is guaranteed by the energy provider.	Economy - environment - society
PAAS	It is a model used by manufacturing firms to offer their	Yes	Since ownership is kept by the TP, is the TP that has to make	environment – society – economy

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

	customers the possibility of receiving a performance instead of buying a product.		maintenance, change of equipment, recovery of parts, reselling while the customers only pays if the service, they're paying is always available.	
Crowdfunding	Money from the crowd to pay the Renovation Measures with short payback period and high interest rate.	Yes	Introduces the community as part of the renovations installed on the supermarkets, allows the customer to make profit from it and allows to finance the improvements that represent reduction of energy consumption, therefor CO2 emissions.	environment – society – economy

In Table 6, it is clear that all of the Financial schemes presented by Super Heero are circular, since they make good impacts in the three system levels (Environment, Society and Economy), if it's es true that the main focus of it is energy performance, efficiency and energy savings, it is also important to highlight that PAAS has the biggest opportunity on circularity since it keeps the responsibility of the equipment to the provider, and allows that they have the control over the complete life cycle of it, making import decisions on how to close the loop of several of the components in the equipment.

Financial schemes are a way to switch the change to more circular business models in supermarkets, from the table we can conclude that by introducing one or several of these Super Heero has made an important change in the way things are normally done in the demo sites, as will be clear in the next section.

6.1.2. Renovation measures

In WP2 Super Heero, D2.2. presented several Renovation measures that can be applied in the supermarkets and that can be distributed in 3 categories, as follows:

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Table 7. Renovation measures.

Energy	HVAC and refrigeration	Others
Overall Energy Management	Heating, Ventilation, Air Conditioning. Equipment measures	Retrofitting of Lifts
Energy Supply	Heating, Ventilation, Air Conditioning. Building measure	Retrofitting of Internal Logistic Equipment
Lighting	Products Refrigeration	Retrofitting of Office Equipment

Each one of this measure contains several measures that can be implemented, to improve supermarkets.

If it is true, that some of those measures are more circular that the others, it is important to highlight that all of them represent efficiency in electrical use, and lonely for that reason they all help in the reduction GHG emissions by reducing the energy consumption.

6.1.3. Technology Providers

And in D2.3 presented a list of several Technology providers that can be reached by the supermarkets to implement those Renovation interventions, the list includes 45 technology providers from Spain and Italy that were contacted and from which only 3 already make contracts trough Circular Business Models such as EPC and Leasing.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

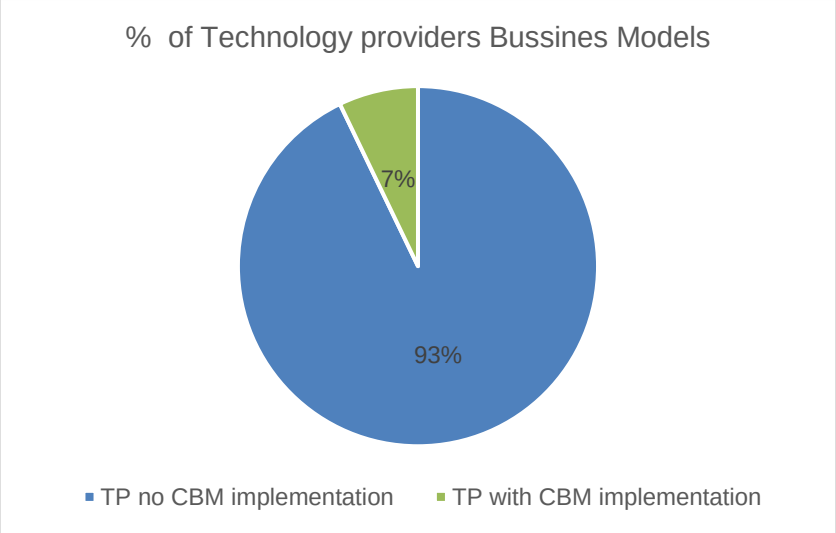


Figure 9. % of Technology providers Business Models.

Figure 9 shows that only 7 % of them already are making deals trough circular business models, showing that if the other 93% of the companies started to scale up their businesses to more circular ones, they could make bigger impacts, since the renovation measures combined with CBMs not only reduce energy consumption (fossil fuels, coal and gas exploitation impacts) but also integrate the equipment to a circular production chain and help close the loop.

6.2. Super Heero Scheme

To integrate the strategies mentioned before, Super Heero has work following the next logic:

Supermarkets need a renovation intervention, for that Super Heero counts with the list in D2.1. and the guide in D2.2, also some of the consortium partners can participate as project developers, making the analysis of the best measure to be implemented in the supermarket, after knowing that, they contact a technology provider and propose the business model that better suits all the parts, then they can go to the collection of the investment and make the install, the savings that result from the implementation then can return to the investors and can be translated into environmental, social and financial impacts.

A good example is shown in Figure 10, where the Supermarket follows the logic until the investment step, where the financial scheme is mixed and collects investment from the brand

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

owner, the project developer that entries as a leaser and the Super Heero crowd via the crowd funding platform developed in WP3. After the instalment is done, the savings translate into CO2 emission savings, cost reduction and loyalty programs for the crowd (customers, local community) that invest in the project, and finally returns the inversion to all the investors.

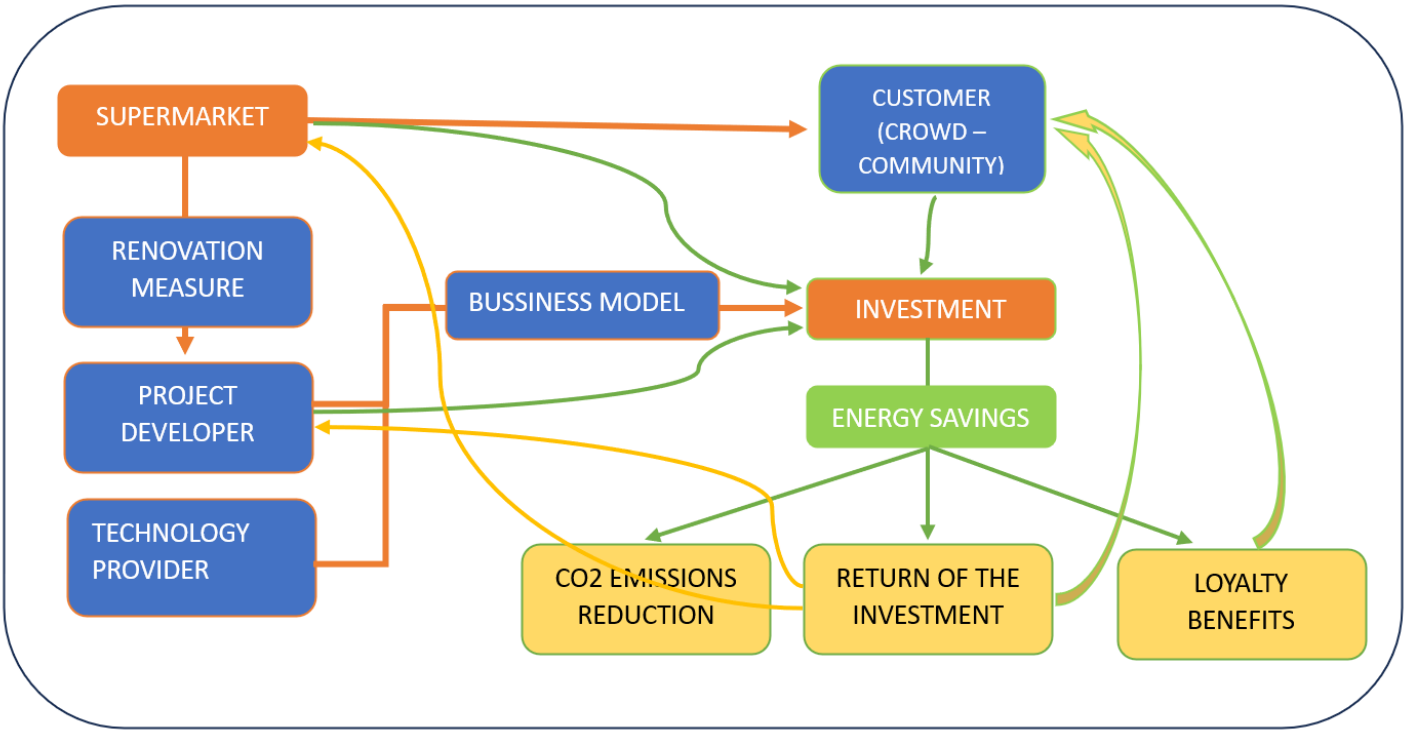


Figure 10. Super Heero Logic.

6.3. Circular Economy Assessment from the demo sites

The data analysed in this assessment was the data regarding the interventions made in the demo sites, important information is:

- Energy Efficiency measure implemented (Technology)
- Financing mechanism
- Business model
- Project life

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Table 8. Information of demosites.

Energy Efficiency measure implemented (Technology)	Financing mechanism	Business model	Project life
Regarding Renovation intervention from D2.1.	Brand owner, intermediate, Crowd, mixed.	EPC, PAAS, Crowd, Traditional purchasing.	Duration exploitation of the intervention.

6.3.1. CIRCULARITY OF THE INTERVENTIONS IN THE DEMO SITES

6.3.1.1. ITALIAN PILOTS

Pilot #1 Padova (F)

Overview:

The demo site is one store Location, with 300m2 available in the roof for the installation of a PV system.

Table 9. Project information, demo site F

Technology installed	Financing mechanism	Business model	Project life
Solar panel model TSM-DE09R.08W425 from the technology provider TRINA. The Inverter is a model 3PH 24000TL-V3-3PH24000TL-V3.	Joint financing by the crowd, brand and proponent	7 years leasing and handover at year 8	20 years

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Pilot #2 Pordenone (J)

Overview:

The demo site is one store Location, with 1000m2 available in the roof for the installation of a PV system.

Table 10. Project information, demo site J

Technology installed	Financing mechanism	Business model	Project life
Solar panel model TSM-DE09R.08W425 from the technology provider TRINA. The Inverter is a model 3PH 24000TL-V3-3PH24000TL-V3.	Joint financing by the crowd, brand and proponent.	7 years leasing and handover at year 8	30 years

According to tables 9 and 10, the PV project installation have specified model of solar panels, which have the following CE implications, according to "TrinaSolar_CSRreport_ESG_2022_EN" Trina has a low-carbon design process that consider the impact on resources and the environment in the selection, production, distribution, use, recycling, and disposal of raw materials, and strive to use as many harmless raw materials as possible to achieve a green and low-carbon development.

Trina Solar, has been keeping track of the impacts they have on several topics, having 2020 as base year and up to 2022, they have collected the information shown in the next figures, and can prove reduction of the negative impacts their economic activity has on the environment.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

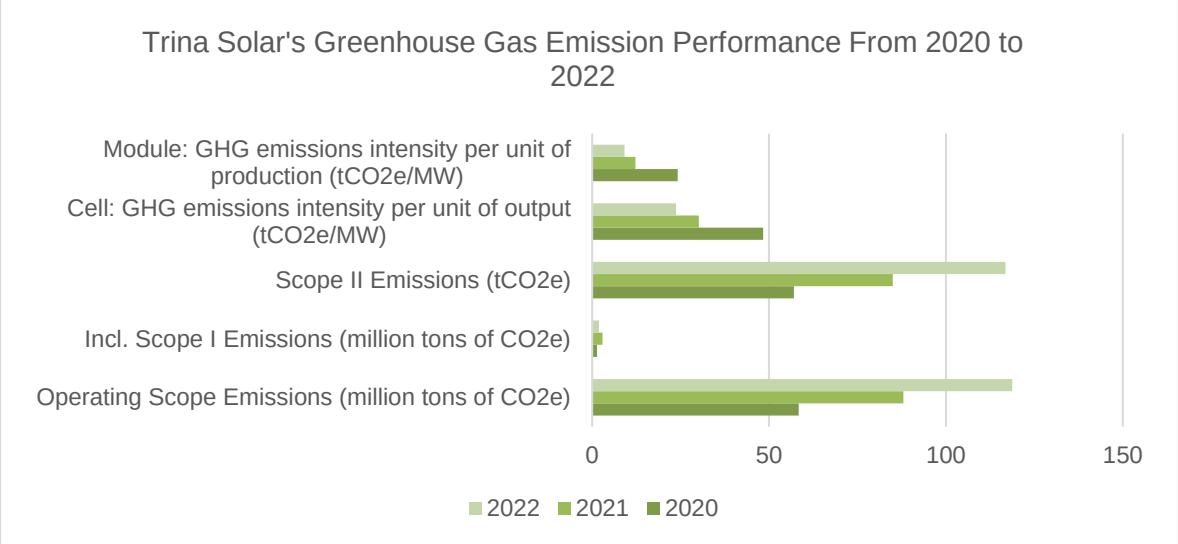


Figure 11. Trina Solar's Greenhouse Gas Emission Performance From 2020 to 2022.

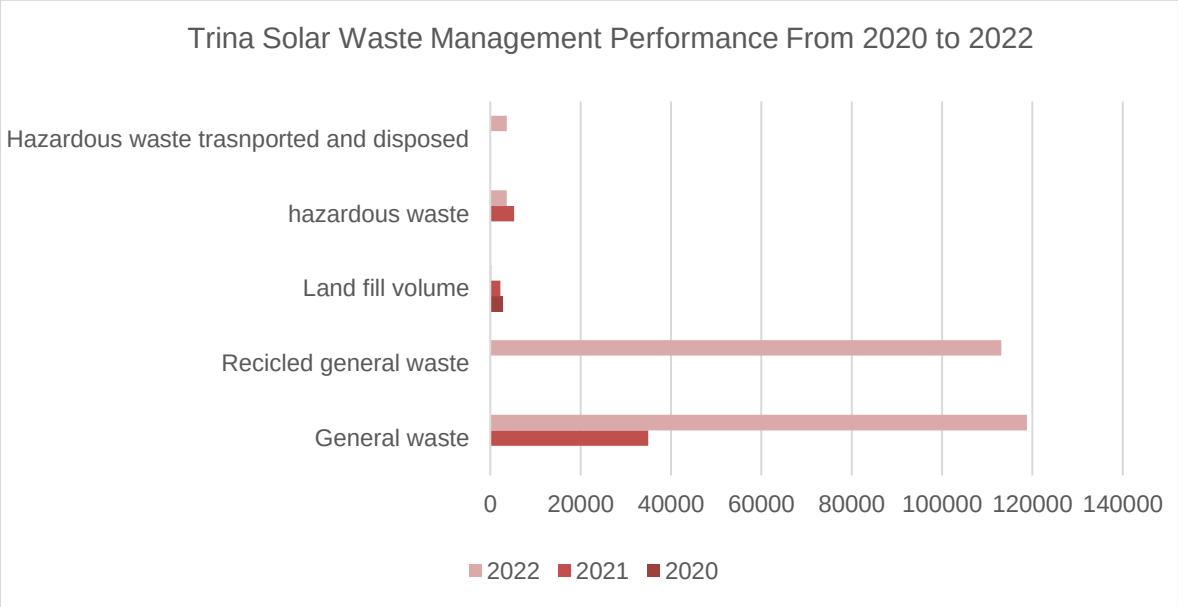


Figure 12. Trina Solar Waste Management Performance From 2020 to 2022.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

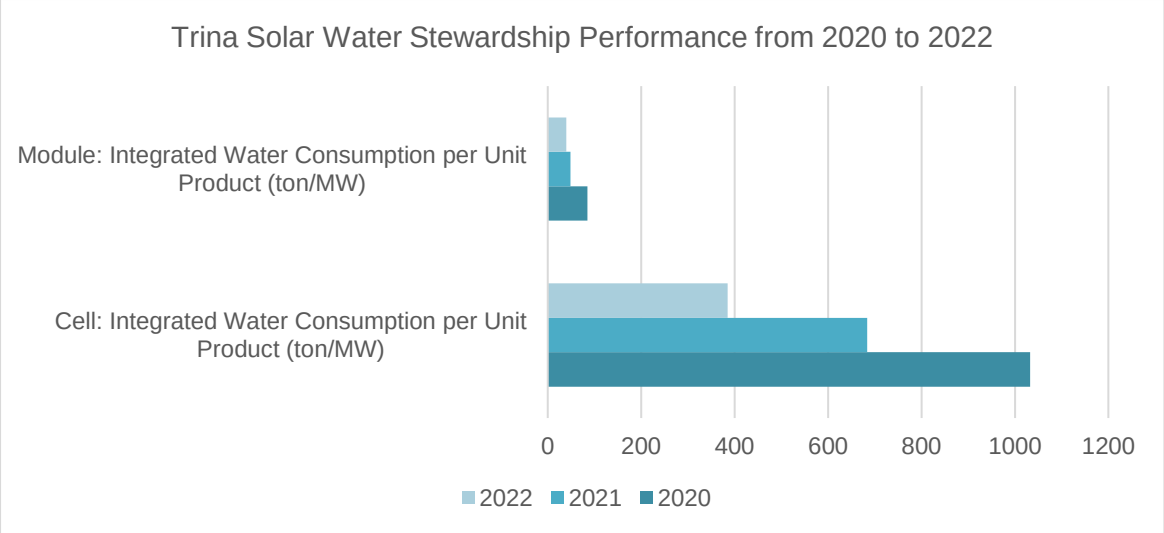


Figure 13. Trina Solar Water Stewardship Performance from 2020 to 2022.

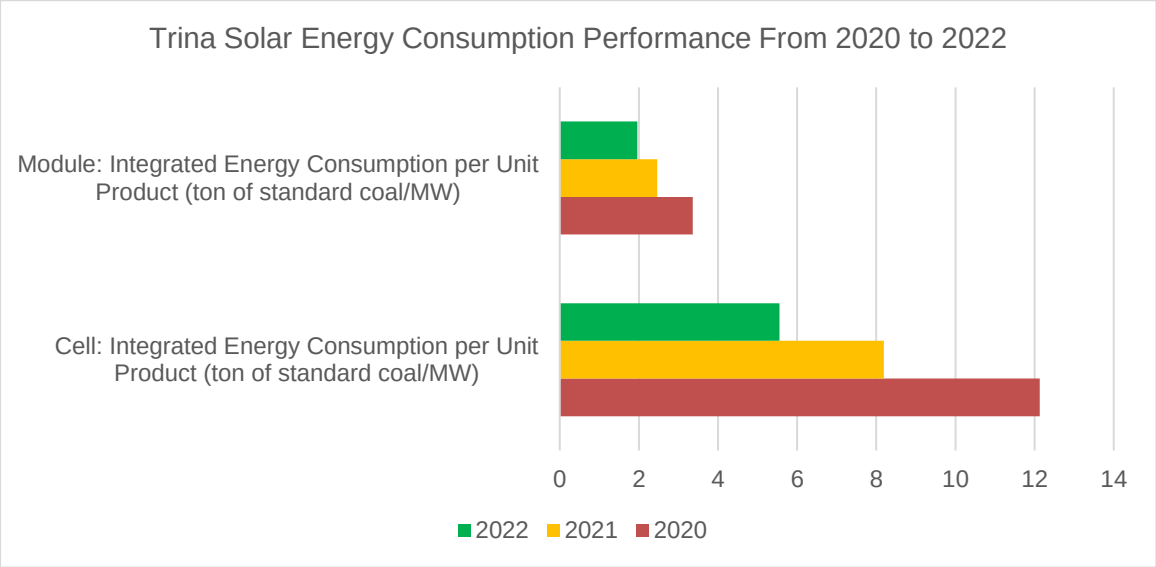


Figure 14. Trina Solar Energy Consumption Performance From 2020 to 2022.

The information from these figures it's important because it gives insights on the fabrication process of the PV System installed in the demo sites and proves that environmental impacts come not only from the renewable energy generation but also from the technology selected for the project and the commitment of the project to be Circular.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

4.3.1.2. SPANISH PILOTS

SUPER MARKET B (Spain)

The measures implemented were the following:

- Consumption monitoring system
- Temperature adjustment in HVAC
- Sectorization equipment in climatization
- Door installation in open fridges

With these measures implemented, the supermarket was able to obtain a reduction 50% in energy consumption.

The super market owner decided to make the interventions without the involvement of the Sper Heero Project, thus there is not information regarding Business models, Innovative financial schemes and profitability information.

SUPER MARKET C (Spain)

Note: By the time of finishing this deliverable, this demo site was interested in the implementation of two EE measures, such as:

- Photovoltaic panel for self-consumption
- Update of HVAC and Cooling systems in terms of refrigerants, trying to be ahead of the changing EU policies regarding this.

These measures were selected by the brand, seeking efficiency and less cost, as well as compiling with the new policies.

It is important to highlight that this demo site is part of a bigger brand and the brand management team, is also interested in the installation of the PV system in other 6 stores, in Portugal and Spain, and are counting with Super Heero to accomplish that.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

4.3.2. FINANCIAL ASSESSMENT

The Business model selected for pilots F and J are mixed, and the inversion comes from the brand/store owner, the project developer that has the figure of leaser during the payback period (7 years) and the crowd who sees the return of their investment plus an interest rate.

The percentage of investment of the parts are shown in the next figures, where it is clear that the crowd are the higher investors and can make possible that supermarkets implement renovation and energy efficiency measures.

Pilot #1 Padova (F)

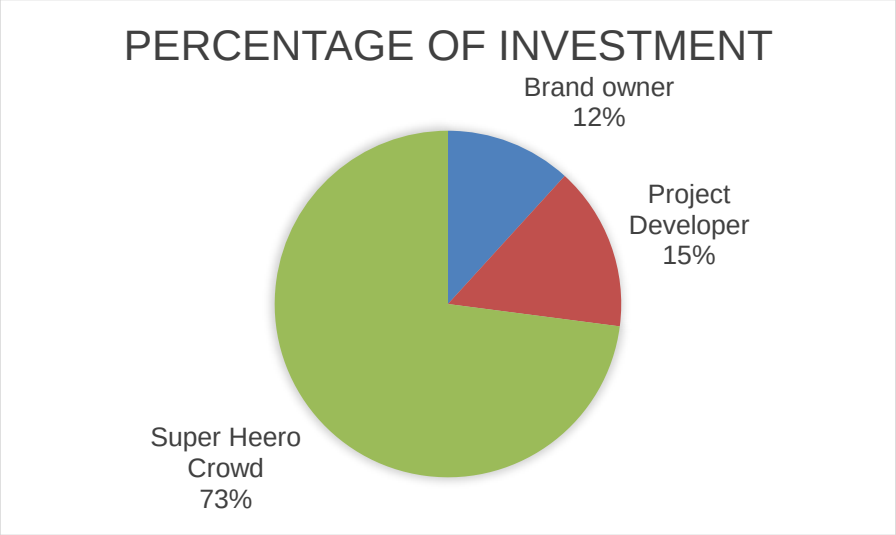


Figure 15. Percentage of investment in Super Heero F.

The interest rate also can be attractive for investors, since for the crowd it is 7% for the duration of the leasing 7 years, after that the project inversion will be completely recovered and since the project duration is 20 years, the supermarket can save every year up to 6.676 €, that equals the generation of 26.200 kWh of renewable energy.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Pilot #2 Pordenone (J)

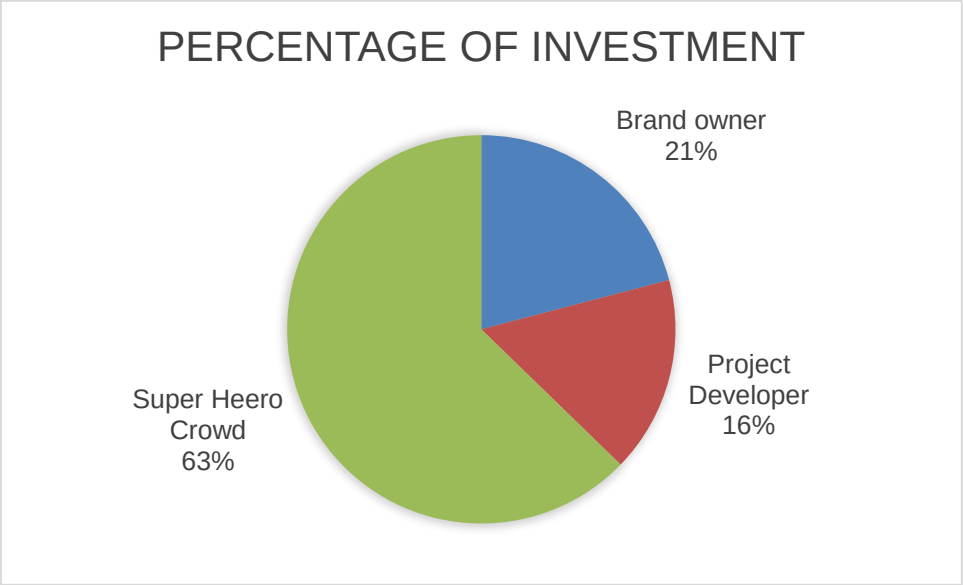


Figure 16. Percentage of investment in Super Heero F.

For this demo site the interest rate is 6% on average for the crowd, this rate is distributed during the payback period, seven years. Unlike demo site #1, the project duration is 30 years, after the handover year (8th year) the supermarket can save every year up to 22.846 €, that equals the generation of 91.400 kWh of renewable energy.

The information regarding environmental and a complete financial Assessments are part of D4.5. Where all the emissions reduction and the financial profits are widely analyzed trough methods such as, LCA (Life cycle Assessment), LCI (Life Cycle impacts) and Financial Impacts Assessment (FIA).

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

4.3.3. CIRCULAR ECONOMY INTRODUCED TO THE REWARD AND PROMOTING MECHANISMS

As mentioned before, Super Heero also seeks the involvement of the community, to accomplish that in D3.2. it introduces several reward and mechanisms strategies to implement by the Super Markets as Loyalty programs, as appointed in D3.2. The supermarkets already count with a great basis of customers subscribed to the Loyal Programs and that are part of a bigger customer data base.

To complement the Loyalty Card, Super Heero designed specific rewarding programs for the Pilot supermarkets that are already widely explained in D3.6, and are listed below:

- Crowd funding campaigns: To reward customers Super Heero opened the crowdfunding project and promote it early in the community where the supermarket is located, this way it gives the advantage to real customers to invest first, and those who does it have also bigger benefits than the general public in terms of higher interest rate.
- In kind rewards: This can be gifts to the supermarkets customers to interest them to be part of the project or to capture it interest in hearing what the project it's about.
- Local Municipality rewards: This allows that the general investors from the local community have also rewards, for this involvement of the Local municipality entities is also important.

PROMMOTING MECHANISMS

As mentioned in the next chapter, in the promoting mechanisms, Super Heero Team in Italy were present in the Pilot Supermarkets, in there they give way reusable shopping bags, 100% recyclable.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

It is important to clarify that, as many sustainability related products, reusable bags can carry out bigger footprint impacts since sometimes they are not properly used. So, it is very important that people do reuse them. Thicker reusable bags made of polypropylene must be used an estimated 10 to 20 times for them to be more sustainable than single-use plastic bags, while thinner reusable bags made of polyethylene only need to be used five to 10 times. Cotton bags, meanwhile, must be used 50 to 150 times.[10]

4.3.3.1. CIRCULARITY OF THE REWARD MECHNISMS IMPLEMENTED IN DE PILOT SUPERMARKETS

Pilot #1 Padova (F)

Monetary reward – Additional interest rate

The main form of reward for the customers of NaturaSì is the provision of an additional interest rate for the holders of the "Community Card". The following rewards have been set up:

- Local area cardholders (7%): Additional 2% interest rate for cardholders of the NaturaSì shop in Pilot, where the PV installation was made.
- Cardholders (6%): Additional 1% interest rate for cardholders of other NaturaSì shops.
- General Public (5%): Baseline interest rate available to all participants.

In-kind reward

Thanks to the cooperation with the Municipality of Padova, people who invested in the campaign were eligible to get free tickets to the "Anime verdi" festival (http://www.animeverdi.it/). The initiative allows the participants to explore and visit more than 40 private gardens in the city centre, which are normally closed to the public. Each ticket had a cost of 10 euro.

Other initiatives

As an additional incentive for the success of the crowdfunding campaign, the Municipality of Padova invited the campaign to participate in the planting of trees as part of the "Alberiamo Padova" initiative (https://www.padovanet.it/informazione/progetto-alberiamo-padova). It was decided to donate four trees to this campaign as part of the Parini Project. For this first pilot, it was costed by the ESCO promoting the project. In future campaigns, it can be a joint decision and costed into the eventual business plan in total or in part.

All the initiatives mentioned are aligned to the Super Heero Logic, since they involve the customers (society) in the PV installation projects which allows the production of renewable

[10] https://www.thecooldown.com/green-business/wattbuy-electric-charge-home-cost/

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

energies, that, as pointed several times in this report, allows with the reduction of CO2 emissions.

It's also important to highlight the commitment of the Local Municipality, since it enhances the scope of the project by making significant impact in the city itself, the next figure xxx explain the benefits of urban trees.

TABLE 1 A high-level overview of the benefits that urban trees provide, and how the direct and indirect benefits relate to the corresponding United Nations Sustainable Development Goals. Further, the presence of trees and green space can help a city meet Goal 11, or sustainable cities and communities, through providing universal access to green and public spaces

Benefit of urban trees category	Corresponding United Nations Sustainable Development Goals	Scientific benefits of trees highlights
Health and social well-being		
Trees promote physical and mental health for urban residents. They support community ties and reduced crime rates.	Goal 3: Good health and well-being Goal 11: Sustainable cities and communities Goal 16: Peace, justice, and strong institutions	Reduce pollution Improve physical and mental health Strengthen community ties Increase physical activity Decrease aggression and violence Reduce crime
Cognitive development and education		
Trees increase a student's ability to succeed in school.	Goal 4: Quality education	Improve student performance Reduce stress Increase in concentration Reduce symptoms of ADD/ADHD Increase in attention Increase in self-discipline
Economy and resources		
Trees are good for the economy and they reduce energy bills. They provide many resources, such as food, to a community.	Goal 1: No poverty Goal 2: Zero hunger Goal 7: Affordable and clean energy Goal 8: Decent work and economic growth Goal 10: Reduced inequalities Goal 12: Responsible consumption and production	High return-on-investment Support tourism Increase home prices and rental rates Reduce energy use and bills Promote food sustainability Provide resources and firewood
Climate change mitigation and habitat		
Trees mitigate the Urban Heat Island Effect and store and sequester carbon. They are important for habitat.	Goal 3: Good health and well-being Goal 13: Climate action Goal 15: Life on land	Reduce Urban Heat Island Effect Store and sequester carbon Provide critical habitat
Green infrastructure		
Trees are important forms of infrastructure, especially for storm water management	Goal 3: Good health and well-being Goal 6: Clean water and sanitation Goal 9: Industry, innovation and infrastructure Goal 11: Sustainable cities and communities Goal 12: Responsible consumption and production Goal 14: Life below water Goal 15: Life on land	Manage storm water Reduce pollution Protect life below water and on land

Figure 17. Benefits of urban trees.[11]

[11] The benefits of trees for liable and sustainable communities, Jessica B. Turner-Skoff, Nicole Cavender PLANTS, PEOPLE, PLANET.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

It is clear that the benefits are high, and that by doing this thought the Super Heero project, drives a bigger change.

Pilot #1 Padova (J)

Monetary reward – Additional interest rate

- 0.5% interest rate bonus for first time investors registering in the Super-Heero platform;
- 0.5% interest rate bonus for referrals granted from existing E2C or Super-Heero investors to new investors signing up into the platform (refer a friend program).

Brand Sponsored Awards (in-kind)

A store coupon valid in the two Pordenone shop locations for 5 Euro on 30 euro of purchases;

A 25kW charge at any SiRicarica charging point (at Pordenone or other NaturaSì store location with an SiRicarica EV point);

Mainly, the Charging column directly introduces the benefits from invest in the project, since it allows the investor to make direct use from the energy produced in for PV System. These columns are installed in other stores and if it true, the benefit is that the customers can use any of them, it is highly encouraged to make use of the one in Supermarket J.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

7. CUSTOMER REACTION ASSESSMENT

Although customers are likely first thought of as the shoppers of the stores or investors into the project, customers of the Super-Heero approach can be considered from one step back and include all stakeholders the multi-sided ecosystem and platform business model (Figure 18). These stakeholders include supermarkets (brands and franchise owners), the crowd (investors who shop at the supermarket and also investors who do not), technology providers and project developers. All sides must be present to operate the Super Heero approach and the crowdlending platform becomes the key enabling technology that allows the approach to function. Communities are an outer ring but can also be considered customers. For this reason, this chapter includes reactions and assessment from each of these stakeholders as we have worked with them across the duration of project activities.

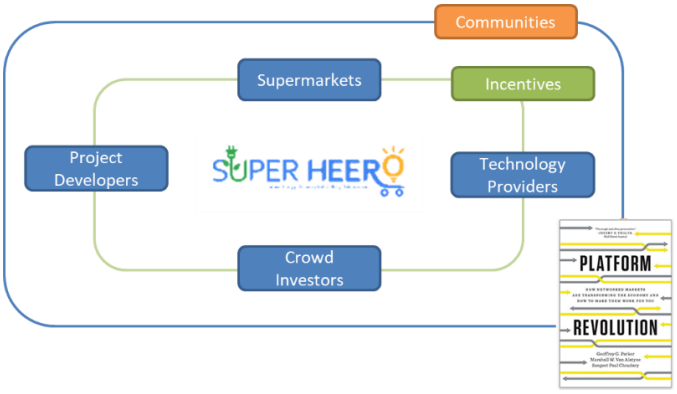


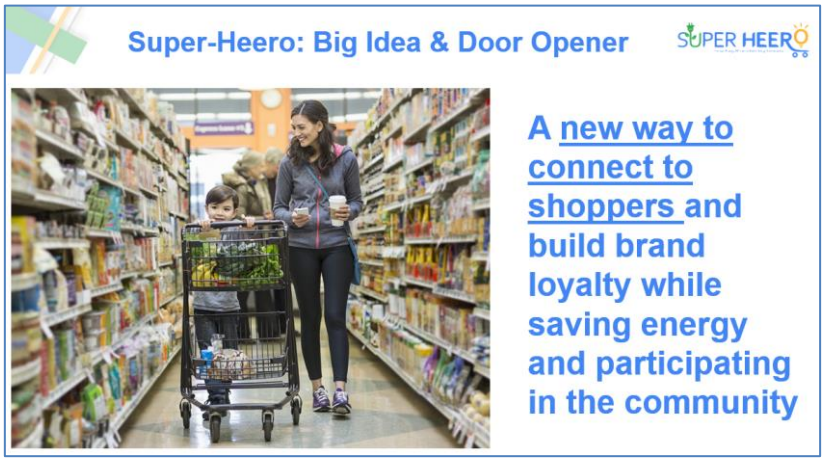
Figure 18. Super Heero Multi-Sided Platform

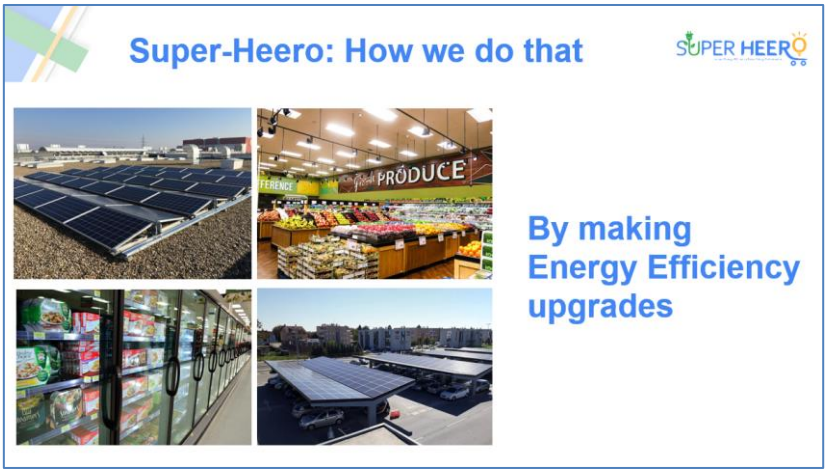
It is also relevant to consider the information provided to stakeholders for which they have reactions. For some, they worked with us on pilot activities. For others, they were informed in briefings with slide decks. At the pilots, in store events were held, gadgets handed out, mailing campaigns made, postcards made available, webinars given and so on. And lastly, for our investors, they experienced directly the crowdlending platform and experience of directly participating in a project. Figure 19 shows several images of in-store events and Figure 20 shows the opening slides used at most meetings, webinars and presentations to orient people to the main project idea.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 19. Images from in-store events





Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 20. Opening slides for most Super-Heero presentations

7.1 Reactions assessment: General

Supermarkets: Anonymous and generalized, the following reactions are documented / assessed.

- A first objection is often the concern of asking clients for money. Typically after some dialogue such persons come to understand that instead Super Heero projects are instead providing an opportunity for staff and clientele. This opportunity includes the interest rate, rewards / bonuses when present and the opportunity to do good and be part of a community project. Moreover, we extend such dialogues to include that supermarkets as part of the social fabric can play a role in educating / advocating sustainability in people and in their communities.
- We received on several occasions compliments with respect to the innovative nature of the project. That our visit was accepted because we were the first in a long time to present something new.
- The reaction from supermarkets most often depended on with whom we were talking. Marketing and communication people really liked the idea. Energy managers wanted information about new technologies or were sceptical. Managers were often undecided / wanted to see someone else who had gone first.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Technology Providers:

- Technology providers appreciated the Super Heero approach. Likely as it provides a tool to unblock financing for the use of their technology.
- The supplier for the two Italian pilots has become a champion of Super Heero routinely posting about activities before the project / advocating the approach in their routine activities.

Project Developers:

- The project developers within the Super Heero project are very optimistic on the approach as it provides a unique solution that others do not offer.
- Project developers outside the project have expressed curiosity. Now that first pilots are complete, it will be possible to approach such stakeholders with examples and results.

Communities:

- The participating municipality of Padova has very much embraced the approach making it part of their Net Zero Mission planning and pledge.
- The mayor of the first pilot (Ponte san Nicolo, Padova, Italy) in making a speech at the inauguration ceremony stated that the approach “was to be copied by everyone, everywhere.” That involving citizens in such measures was exactly what we need to do.

Citizens / Potential Crowdvestors:

- In store events were excellent for publicity but not effective in signing up investors. People are always being approached for some offer and many people (who came to the store for groceries) were not interested in learning about Super Heero.
- People in stores did however express curiosity to the various in-shop materials (posters, post cards, rollup) and did appreciate that there was something going on / were happy to learn indirectly (asking questions to the cashier at various moments) as opposed to when there we dedicated Super Heero people in the store.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 21. Images from the Inauguration ceremony, Padova

7.2 Investor reactions assessment: Pilot #1 Padova

The first pilot was a PV installation at a small urban periphery NaturaSi (300 m^2). The shop is licensed to a franchise owner team (husband and wife). The shop is recently renovated but did not have renewable energy generation making PV an attractive choice at this location.

Figure 22. Super Heero Pilot, Padova, Italy

To attain reactions, an exit survey was conducted upon conclusion of the crowdlending campaign. The crowdlending campaign (40k euro) had 35 investors of which 29 responded to the exit survey (83%). The first question asked how they heard about the campaign. The predominant response was the Ener2Crowd newsletters which makes sense as 30 of the 35 participating investors were already within the Ener2Crowd ecosystem. 5 investors were new and likely heard about it from the shop or Super Heero given the responses indicated.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

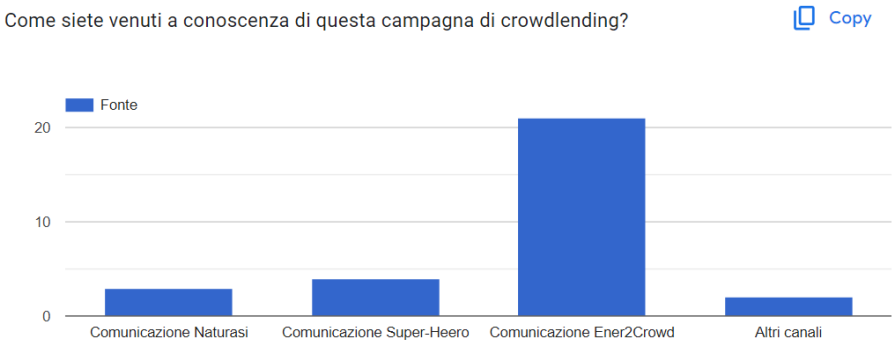


Figure 23. Source of information for discovering the first campaign

The next question targeted the investor rational for making the investment (Figure 24). What led them to put their money into the campaign? The question asked across four categories if each of those categories were not important, important or very important. From the responses of the first exit survey, we see that investing in sustainability is most important, followed by supporting the project idea, the interest rate and then supporting NaturaSi. These particular results are likely biased by the involvement of Super-Heero project participants (supporting the project idea). The responses also reflect that most investors arrived from Ener2Crowd where investing in sustainability is a clear motivation. The interest is important but does not seem the main driver for investor choices. With respect to supporting NaturaSi, the data does not correlate responses to cardholders but one can reason that cardholders or shoppers of the particular location likely are the ones rating this aspect as important or very important.

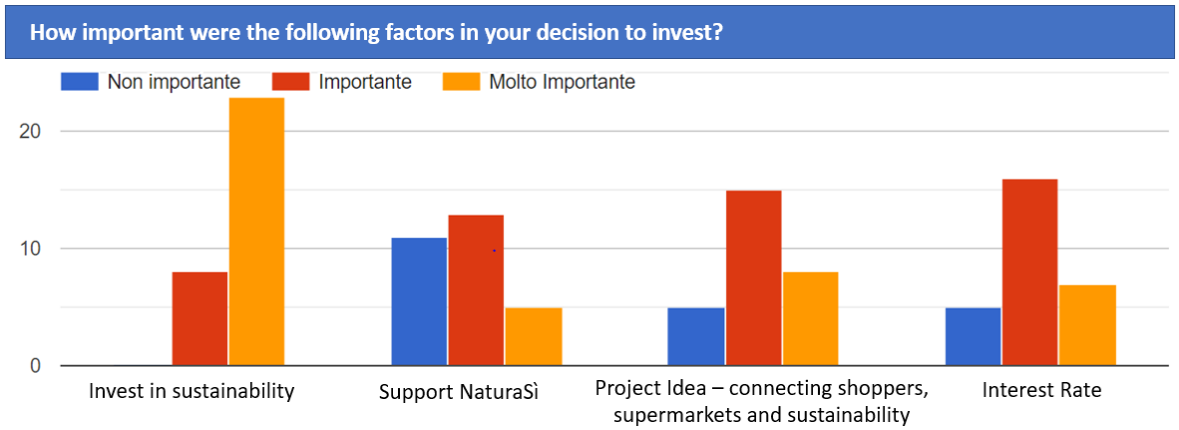


Figure 24. Investment decision rationale

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

The next two questions related to how investors relate to the supermarket and its brand after investing in the campaign (Figure 25). These particular questions are most interesting with respect to the value proposition created by the project. Can Super-Heero build brand loyalty and can it lead to increased traffic and sales? The responses are distinctly positive and were appreciated by the marketing and advertising + management at NaturaSi. 75.9% of respondents had a more positive impression of the brand and 56.2% of respondents stated they are more likely to shop at NaturaSi as a result of investing in the campaign. This was better than anticipated as the first pilot was an iteration for building the approach with processes and systems not yet validated / not everything perfect. Most participants were also not local, but a good number still appreciated and identified with the underlying concepts.

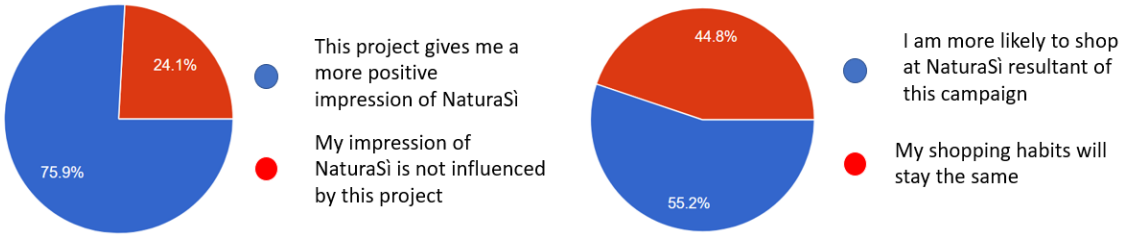


Figure 25. Impression of brand and shopping habit tendencies

The last question related to whether or not investors were likely or not to participate in a future Super-Heero campaign (Figure 26). Also with this question, the results were extremely positive. There were no “not likely” responses and 62.1% indicated that it was very likely and 37.9% indicated that it was likely. This is especially encouraging if the 5 new investors are those that participated in the exit survey. This would indicate that the project led to a change in behaviour / social impact.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

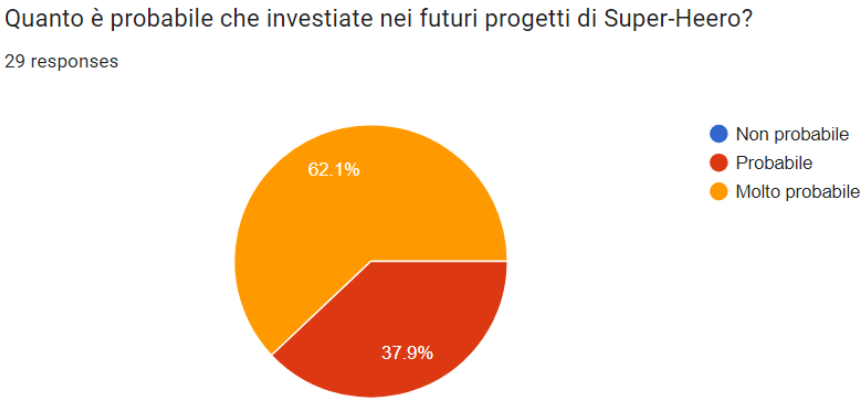


Figure 26 Likelihood to invest in future Super-Heero projects

7.3 Investor reactions assessment: Pilot #2 Pordenone

The second pilot was a NaturaSi not planned until the first intervention underway located in Pordenone (1000m^2)(Figure 27). The store is brand owned and managed by a store manager. This particular location is modern and a PV installation project was already considered in the past but not triggered. With respect to the first campaign, the differences are franchise vs. brand owned, a slightly larger shop, happening in a smaller city and without direct municipal involvement where the Commune di Padova is directly a project participant. The engagement of Pordenone was attained and the project will participate in an upcoming sustainability event in Pordenone, but this did not happen before the crowdlending campaign occurred.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

Figure 27. Super Heero Pilot #2, Pordenone, Italy

Once again, an exit survey was utilized by emailing project investors through the Super Heero platform (anonymous to project participants). The same questions were once again used to enable comparison between the two pilots. In total, this crowdlending campaign (60k euro) had 64 participants of which 30 participated to the exit survey (47%) using an equal number of reminders. This was lower than in the first campaign.

The first question again asked about how investors heard about the project (Figure 28). For this campaign and of the survey respondents, almost all came from the Ener2Crowd ecosystem. The results may be biased by investors in that ecosystem being more likely to participate in a survey request but it was disappointing not to see results from NaturaSí as the information and marketing campaign was improved from the first pilot.

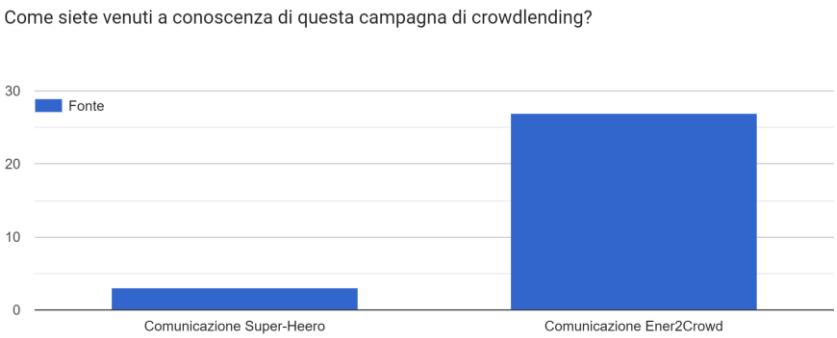


Figure 28. Source of information for discovering the second campaign

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

The next question again asked about investment rational (Figure 29). The answers are consistent with the first exit survey and the order of importance (summing important and very important responses) are to invest in sustainability, the project idea and interest rate (equal) and last supporting the supermarket brand. This campaign had 22 NaturaSi cardholders and 42 non-cardholders which is likely reflected in this result.

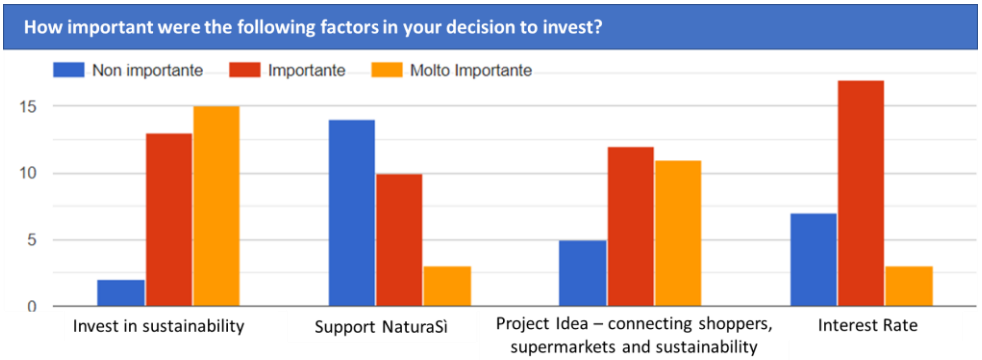


Figure 29 Investment decision rational Pordenone

The next question asked about the impact of impression on brand and future shopping tendencies (Figure 30). The results are again encouraging where 76.7% state they have a more positive impression of the brand and 43.3% indicate that they are more likely to shop at NaturaSi resultant of the campaign. The result on brand impression is interesting given the reduced presence of NaturaSi cardholders in this campaign (34%) vs. the first pilot (43%).

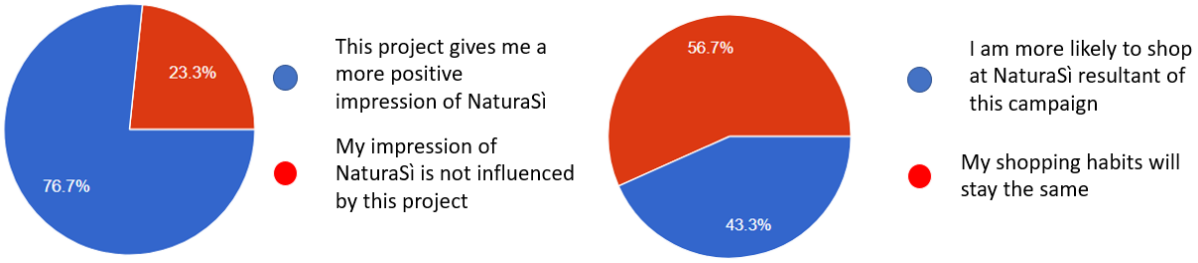


Figure 30. Impression of brand and shopping habit tendencies

The last question once again asked about the likelihood of investing in future Super Heero projects (Figure 31). The results are again encouraging. There were no “not likely” responses and 63.3% responded very likely and 36.7% responded likely.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

Overall, the results of these surveys give confidence to the Super Heero approach and also provide hints about how to improve future campaigns and to think about targeting specific demographics of potential investors. These results also make it possible to communicate better with future pilots / brands and to add questions based on what they might like to know. The datasets are still extremely small, but are encouraging.

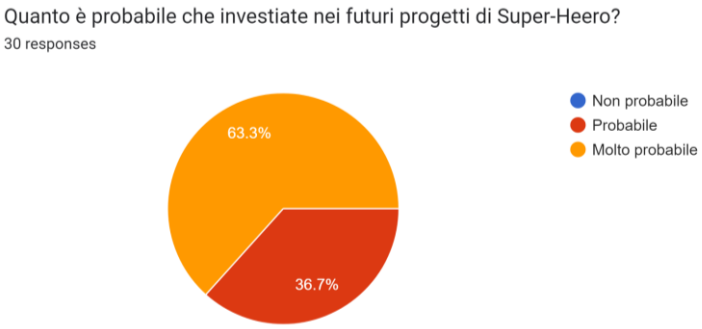


Figure 31. Likelihood to invest in future Super-Heero projects

8. CONCLUSIONS

The Energy Efficiency measures proposed by Super Heero in connection with the others strategies of the project, are aligned with the concept of circularity since they involve, crosse and put to work together the three systems of the CE principles (Economy, Society and Environment).

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

As a great support, EU have several policies and directives that can help on the decision of going circular, also the projects and initiatives mentioned in this report have proven that sustainability affects in positive manner the business that embrace the challenge.

As pointed in number 3.2.1 the Energy efficiency measures can be a great opportunity for supermarkets and the retail sector to work from the technical part in the direction to circularity.

To ensure circularity not only by the implementation of more efficient technologies, it's important to start a conversation with the technology providers regarding their internal path tours a circular production system, as pointed in this report, becoming circular its possible if the companies commit to the principles of circularity.

Super Heero is a great opportunity to continue working tours circularity, as a project with real results it's a great example for the tertiary sector of the importance of involving customers, implementing system optimization and monitoring technologies, and understanding the importance of working with the different stakeholders and general society.

To assess circularity of an equipment or technology, is necessary to understand the complete cycle of construction of it, it can be public information, but to asses if a technology provider is also working in a circular way it's necessary to at least know the next data from their side, so the project can introduce this relevant information to its reduction of impacts by technologies implemented.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404

9. REFERENCES

Sustainability Guide. (2018). Circular Economy. 2021, de Interreg Baltic Sea Region Sitio web: https://sustainabilityguide.eu/sustainability/circular-economy/

UAEU. (2020). “Mainstreaming the circular economy as an eligible area into the post 2020 Cohesion Policy and corresponding Funds”. 2021, de UAEU Sitio web: https://ec.europa.eu/futurium/en/system/files/ged/mainstreaming_ce_into_post_2020_cohesion_policy_-_final_report.pdf

Mattias Eriksson. (2015). Supermarket food waste. 2021, de Swedish University ofAgricultural SciencesUppsala Sitio web: https://pub.epsilon.slu.se/12756/1/Eriksson_m_151029.pdf

Energy.Gov. (2021). LED Lighting. 2021, de U.S. Department or energy Sitio web: https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/led-lighting

Evangelos Bellos,Christos Tzivanidis . (2019). A comparative study of CO2 refrigeration systems . 2021, de Elsevier Sitio web: https://www.sciencedirect.com/science/article/pii/S2590174518300023

CROFT. (2019). Bioclimatic Design. 2021, de CROFT Sitio web: http://www.croftandassociates.com/croft-and-associates-architecture/bioclimatic-design

European Commission. (2020). Circular Economy Action Plan. 2021, de European Commission Sitio web: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

Sustainability Guide. (2018). Circular Economy. 2021, de Interreg Baltic Sea Region Sitio web: https://sustainabilityguide.eu/sustainability/circular-economy/

Ellen MacArthur Foundation. (2017). Circular Economy System Diagram. 2021, de Ellen MacArthur Foundation Sitio web: https://www.ellenmacarthurfoundation.org/circular-economy/concept/infographic

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union’s Horizon 2020 research and innovation
programme under grant agreement No 894404

Mazyar Karampour, Samer Sawalha,Jaime Arias, . (2016). Eco-friendly supermarkets - an overview . 2021, de SUPERSMART Sitio web: file:///C:/Users/loren/AppData/Local/Temp/2-eco-friendly-supermarkets-an-overview.pdf

EY Cambridge Econometrics Ltd. Arcadia International. (2014). The economic impact of modern retail on choice and innovation in the EU food sector Final report. 2021, de European Commission Sitio web: https://ec.europa.eu/competition/publications/KD0214955ENN.pdf

Iyyanki V. Muralikrishna, Valli Manickam. (2017). Life Cycle Assessment. 2021, de Science Direct Sitio web: https://www.sciencedirect.com/topics/earth-and-planetary-sciences/life-cycle-assessment#:~:text=Life%20cycle%20assessment%20is%20a,From%3A%20Environmental%20Management%2C%202017

Marta MariaSesana. (2013). Overview on life cycle methodologies and economic feasibility for nZEBs. 2021, de ScienceDirect Sitio web: https://www.sciencedirect.com/topics/earth-and-planetary-sciences/life-cycle-cost

Frishammar and Parida . (2019). Role of customers in circular business models. 2021, de ELSEVIER Sitio web: https://www.sciencedirect.com/science/article/pii/S0148296320308821#b01125

Florian Hofmann, Tapani Jokinen, Max Marwede. (2017). Circular Business Models. 2021, de Sustainability Guide Sitio web: https://sustainabilityguide.eu/methods/circular-business-models/

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894404

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from
the European Union's Horizon 2020 research and innovation
programme under grant agreement No 894404