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Sustainable fresh food packaging: Highlights and lessons learned from the SusPack project

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Associazione Difesa Orientamento Consumatori

package testing + research

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The contents of this publication are summarising the training sessions organised during the project.

The presented examples and cases in the SusPack training material are mostly from Finland. At the European level, sorting/recycling is not yet standardized, so national variations should be considered in the sorting instructions and recycling procedures.

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1. Introduction

The European Project **"Building a positive attitude towards sustainable fresh food and takeaway packaging - *SusPack*"**, funded by the Erasmus+ program and coordinated by ADOC -Association for the Defense and Orientation of Consumers, has aimed at suggesting a positive attitude toward sustainable packaging for fresh food and takeout to citizens and at enhancing the cooperation on the topic among European organizations. The present publication contains the highlights and lessons learned from this experience.

Sustainable packaging is a key component of the circular economy. Eco-sustainable packaging uses raw materials, which are then returned to their original form, minimizing the waste of valuable resources, such as water and energy, needed to produce them. This is the only way to continue to promote sustainable globalization and maintain the well-being and integrity of our planet.

Two Finnish organizations have participated in the project as partners: the consulting and research agency ***Package Testing & Research (PTR)*** and ***Martha***, which specializes in home economics.

SusPack has aimed to **raise awareness of sustainability** and specifically **eco-design and sustainable packaging,** especially in the context of *takeaways*, thereby incentivizing **changes** in daily **behaviours** and **lifestyles**. The theme is highly topical as *takeaway* and *food delivery* demands have increased during the pandemic, and it is very likely that the situation will remain the same in the future.

The UN 2030 agenda aims at a radical change in the way goods and services are currently produced and consumed.

Sustainable development is aimed, on the one hand, at achieving continuous improvement in the quality of life and well-being of citizens without compromising, on the other hand, the well-being of future generations. It thus seeks to aim for economic progress while safeguarding the natural environment.

One of the goals to be pursued by 2030 is to "[...] make sure that all people everywhere have the relevant information and awareness of sustainable development and a lifestyle in harmony with nature."

Therefore, it is necessary for people, adequately informed about the impact their consumption choices may have, to change their habits to increase the sustainability of those choices.

Appropriate information could certainly induce consumers to choose the most sustainable goods and services in the market, thus stimulating an increasing supply of products and services with such characteristics.

Consumer information, therefore, plays a central role.

In fact, to contribute to the achievement of sustainable development goals, consumers must, first and foremost, receive adequate information that enables them to become aware of the impact that their consumption choices can have in terms of sustainability.

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Information undoubtedly takes on an educational function that can be conveyed to consumers in multiple ways, for example, by institutions through awareness campaigns or in school settings.

Consumers also need specific tools designed to identify products with sustainability characteristics in the market.

In this regard, recent studies show that the concept of sustainability is now familiar to most Italian consumers. In fact, in recent years, consumers have become increasingly aware of the importance of sustainability, and conversely, companies have been called upon to respond to this need by adopting sustainable production policies.

Raising consumer awareness and education about sustainability also guards against the now increasingly frequent phenomena, on the part of companies, of greenwashing, the attempt by companies to "dye themselves green," claiming to be sustainable to create a positive image of their activities and products, or to conceal harmful behaviour toward the environment.

Greenwashing is nothing more than a communication strategy aimed at sustaining and enhancing the environmental reputation of the company using environmental references which are not supported, however, by real and credible results in terms of improving the production processes adopted or the products made, with the ultimate goal of diverting the consumer's attention from the activities of the company as a whole.

Improving the quality of the information provided reduces communication asymmetries, leading to better market outcomes on the ecological and social levels.

The European Parliament is an active participant in developing and strengthening EU consumer protection legislation, aiming to pursue a balance between market and consumer interests.

Protection measures are contained in the **New Consumer Agenda for 2020-2025,** as well as the **New Deal for Consumers**, the **European Green Deal**, and the **Circular Economy Action Plan.**

ADOC has in its *mission* a commitment to protect the rights and interests of consumers and users from the perspective of **economic, social, environmental, and consumerist sustainability** and overall improvement of the quality of life.

ADOC's commitment to the promotion of sustainability is constant both to adolescents, to bring them closer to healthy eating habits and active lifestyles, and to the over-65s for the adoption of a suitable lifestyle, which is essential as we age.

For years ADOC has been paying attention to the issue of safeguarding and improving the conditions of the environment, which is placed at the centre of the UN 2030 Agenda through the definition of the Sustainable Development Goals. **Goal 12** focuses precisely on the ability to ensure sustainable patterns of production and responsible consumption through **the 5 "R's" of waste - Reduce, Reuse, Recycle, Re-Collect, Recover** - as well as encourage **circular economy** practices and the shrewd and rational use of natural resources. All this is in order to **decrease waste** and **reduce existing inequalities** (**Goal 10**). It is from these foundations that ADOC has set out to pursue initiatives with the aim of promoting sustainable and responsible consumption and stimulating consumers to a culture of sustainability with consequent social, environmental, and economic benefits, and inviting virtuous behaviour by reducing waste. Among the initiatives carried out is the *GenerAzioni Sostenibili* project, which promotes the formation of a culture of sustainability through an awareness-raising phase on the proper use of natural and food resources to be carried out through

educational workshops in schools with young people and meetings in community centres with the elderly.

For the past few years, ADOC has also entered the European scene by implementing the project ***Empowering Consumer Organisations: towards a harmonized approach tackling dual quality in food products" - ECO (2020),*** funded by the REC (Right, Equality and Citizenship) Program of the European Commission. The project's goal was to limit the practice of *dual food quality* (a practice in which companies sell food products in different EU countries with identical appearance but different qualities) by informing consumers and creating a network of associations and organizations (at national and EU level) that, through research activities and analysis of food products, can alert and provide the competent authorities with a complete and accurate assessment of the phenomenon.

Finally, another particularly sensitive issue that is the focus of Adoc's attention is plastic waste and packaging. Plastic packaging is harmful to the environment, and reducing it is one of the goals of the European Union. Plastic is doubly harmful to the environment both because it requires large amounts of fossil fuels for production (13.4 million tons of Co2 are emitted annually in the EU for this reason-EA Report on the Circular Economy of Plastics, "Plastics, the circular economy, and Europe's environment - A priority for action" - 2021), and because of the difficulties of disposal, as it takes a very long time for the plastic to decompose.

In 2020, 55 million tons of plastics were produced in the EU, and packaging dedicated to containing and protecting products accounts for 40.5 percent of plastic demand in the EU. And 37,7 percent of all plastic packaging is currently recycled in the EU.

2. The SusPack Project

By improving consumer knowledge about the level of sustainability of food and takeaway packaging, the project activities have aimed to promote sustainable consumption habits.

Packaging is considered by companies of all commodity types to be a very important element in consumer brand perception, with a positive impact on its value and recognizability. Its function goes beyond the purely practical aspect of protecting and transporting the product and has the task of differentiating it and making it highly attractive.

Until recently, there was no concern at all about the sustainability and recyclability of packaging, but today, also starting from the attitude of consumers who are becoming more and more sustainability-conscious, something is changing.

According to the survey conducted by the U.S. market research firm Research and Markets, consumer demand is gradually directing companies toward sustainable packaging. People's critical and increasingly sensitive attitude to the social and environmental effects of the entire product life

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cycle also extends to packaging and is proving to be crucial in the purchasing decision-making process.

The Coop Report 2021 "Economy, Consumption and Lifestyles of Today's and Tomorrow's Italians" brings out different food styles and lifestyles than in the past, with an eye always on sustainability. Sustainable choices are now made even when going to the supermarket and buying food and beverages, as 88 percent of respondents claim. And the choice starts with packaging.

For one in three consumers, in addition to environmentally friendly production methods, packaging plays a key role in determining overall judgment. Packaging is no longer seen as a marginal or deferrable element in defining the overall sustainability of products. 'Plastic free' has become the buzzword, and the use of environmentally friendly materials and, in any case, not more than what is really needed, cannot be ignored. Only 7 percent of Italians do not care about the packaging material when buying a product.

These premises show a positive scenario with a view to the dissemination and development of the circular economy model, but unfortunately, it is necessary to point out that, despite consumers' good intentions, they often have misconceptions about sustainability in general and even more so about a specific issue such as packaging.

In fact, consumers often do not have a clear idea of what sustainable packaging means and are unable to identify it.

This leads to making wrong choices, often forced by unclear and misleading communication strategies; there are brands that aim to assume that behind the production of a product or service, there are activities that are respectful of principles of environmental sustainability, without this being matched by real concrete and tangible initiatives.

This is true for all commodity sectors, but food packaging has become a crucial issue, especially in this recent period. During the pandemic, the takeout and food delivery phenomenon tripled, and it is very likely that this trend will remain even after the emergency.

In addition, a positive legacy of the current pandemic emergency is the growth of environmental awareness and recognition of the close link between human health and the health of the planet.

Working together, the three participating organizations, therefore, intend to foster the exchange of ideas and transfer useful knowledge and information on packaging sustainability.

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2.1. Objectives and activities

The SusPack project has assumed that the development of sustainable systems requires efforts in every field, including consumer education and awareness, in order to adopt changes in their daily habits.

Based on these assumptions, the concrete objectives that the project has aimed to achieve are:

- to promote the exchange of ideas and transfer of useful research and information on the durability, acceptability, and usage experience of packaging between Finland and Italy;

- to make consumers aware of what sustainable packaging means by combating the misconceptions that still exist on the topic of sustainability by directing their daily habits toward "green" consumption.

The core activity of the project has been the implementation of an educational course for a total of twenty Finnish and Italian consumers in order to provide information and improve knowledge on the topic of sustainability of fresh and takeaway food packaging from the environmental, consumer, and business perspectives.

Implementation of info/training sessions on sustainability in the packaging industry and best practices on innovative and sustainable packaging solutions.

As mentioned in the introduction, it is crucial to provide correct information to consumers on what sustainable packaging is and how to recognize it, how more sustainable behaviour can impact their habits or their lives, and what the repercussions are on society.

The idea is, therefore, to hold info/training sessions with experts in the field while also involving companies already engaged on the subject matter of the project that can provide useful information to consumers, show best practices that already exist and what behaviours need to be adopted to be truly "sustainable" without being misled by commercial strategies.

This project activity has represented a learning experience that has enabled consumers to develop knowledge and skills on the general concept of sustainability and, in particular, how to apply it to takeaway and food delivery.

The results of this activity include:

1. Increased awareness in everyday life about what choices to make among different packaging options involving fresh supermarket food and delivery;

2. Increased awareness of the benefits that small everyday gestures, such as paying attention to the sustainability of packaging, can bring within the entire ecosystem;

3. Knowledge of the real sustainability of takeaway and delivery packaging and knowledge of the information needed to identify a truly sustainable product without being misled;

4. Knowledge of new technologies for creating more environmentally sustainable packaging solutions.

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2.2. Partner organizations

ADOC

Adoc - Association for the Defense and Orientation of Consumers is a consumer organization founded in 1988 in the wake of UIL, one of Italy's largest trade unions. Adoc carries out information, training, and education activities aimed not only at its members but also at citizens/consumers.

The main objective is the protection of consumer rights. In the last 5 years, this institutional activity has been enriched by work dedicated to raising awareness on issues of environmental and social sustainability of products and services. The fundamental role of the Association is, therefore, "**Orientation**" of consumers to provide citizens/consumers with all the knowledge and information that will enable them to freely make consumption choices with respect for the environment and the social component.

Relying mainly on the voluntary work of its members, ADOC carries out activities and initiatives aimed at the promotion and dissemination of consumer culture, **responsible and critical consumption, and sustainable development**, both towards businesses and institutions and towards consumers and users, also to improve the quality of life and to protect, in every form, the right to health of citizens.

Package Testing & Research Ltd

PTR is a private consulting and research agency specializing in packaging consumer testing. The agency caters to players in the entire packaging chain, from manufacturers of packaging materials to recycling organizations.

The main activities are project management, lectures at university and professional levels, packaging testing services (visual image, usability) and advice on labelling and packaging technology, product development, and regulatory aspects of food packaging. Both Virpi Korhonen and Heli Nykänen have 25 years of personal experience in food packaging research.

Virpi Korhonen specializes in consumer-packaging interactions, and Heli Nykänen has extensive experience in food packaging technology, food technology, and regulatory aspects of food processing and packaging labelling.

Martat

The MARTHA (Marttaliitto) Organization is a home economics consulting organization that promotes a sustainable daily lifestyle and well-being at home for all families. The main areas of expertise are home economics and consumer issues, food and nutrition, environment, home gardening, and housekeeping. The vision is to change the world by doing small everyday things in a big way. The activities implemented address global and local challenges such as climate change and mitigation of its impacts (extreme weather and human displacement), fragmentation of democracy and civil society, the transformation of the commonality, diversification of society due to the ageing population, and increased immigration.

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3. Packaging of fresh food

Topics for discussion or reflection

How often do you buy ready-prepared food from the grocery store?
When shopping for ready-prepared food, how often do you pay attention to packaging material?

Have you seen restaurant-packaged food in stores?
What kind of thoughts did their packaging evoke?

How often do you buy ready- or semi-prepared food at the service counter?
Have you asked the staff about alternative packaging?

Have you bought food in your own containers?

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3.1 Basic functions of food packaging

Packaging is the protection around the product, which ensures that the product remains undamaged throughout its logistic chain and storage. The most important function of packaging is to protect the product from the environment and the environment from the product in all situations to avoid food loss. The packaging facilitates the handling of the product both in the logistic chain and on the way from the store or restaurant to the consumer. In addition, packaging has an important task of providing the consumer with information about the product as well as with convenience adding to the total value of the food by supporting the user experience.

This training material focuses on fresh food and takeaway packaging, i.e., fresh food sold in retail stores or from dining restaurants as takeaway.

Protection and preservation

Food production consumes resources. Thus, food is valuable and should be eaten, not wasted. The most important function of packaging is to protect the food from its environment, i.e., spoilage, contamination, physical damage, drying and pests. If protection fails, it usually results in shorter shelf-life and food loss.

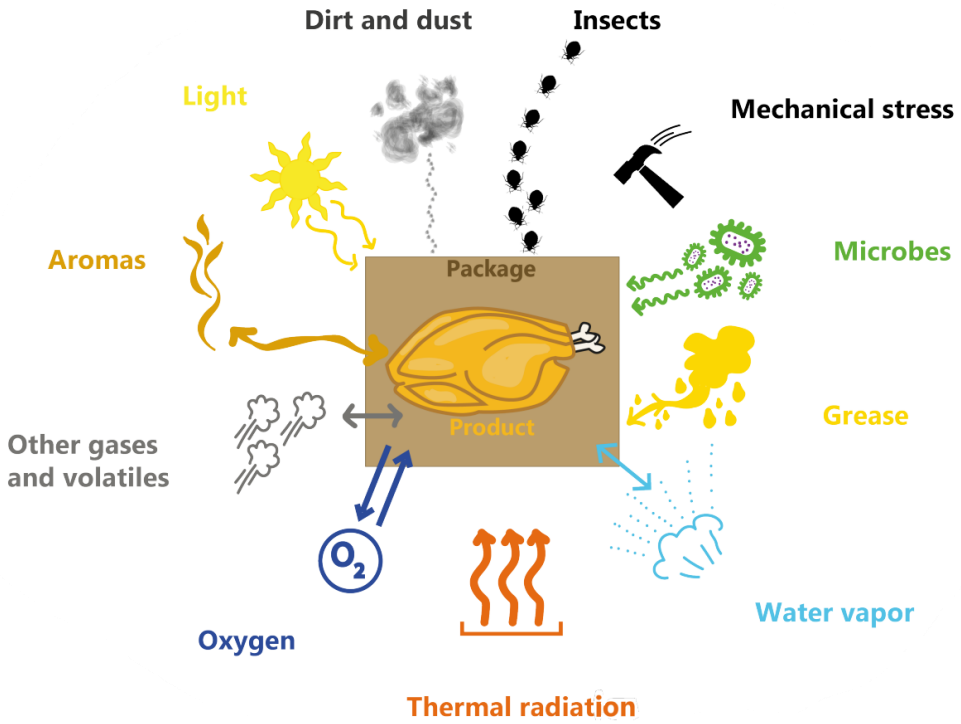

Figure 1: Sources of damage for food that are prevented by packaging.

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Examples of the need for packaging to protect and preserve fresh food

Example 1: Transportation of peaches using foam nets significantly decreases food losses; smaller crops are needed.

Sasaki, Y. et al. (2021) The international journal of life cycle assessment. [Online] 26 (4), 822–837.

Example 2: A slice of ham forgotten in the back of the fridge has a higher environmental impact than a plastic packaging & its disposal.

Williams, H. & Wikström, F. (2011) Journal of cleaner production. [Online]

Example 3: A slice of bread gone mouldy has a higher environmental impact than a plastic bread bag & its disposal.

Silvenius, F., Grönman, K., Katajajuuri, J.-M., Soukka, R., Koivupuro, H.-K. and Virtanen, Y. (2014), The Role of Household Food Waste in Comparing Environmental Impacts of Packaging Alternatives. Packag. Technol. Sci., 27: 277-292.

Example 1: A plastic wrap of 1.5 grams keeps a cucumber fresh for at least 14 days. Without packaging, it dries quickly (96% water).

Example 2: A vacuum pack slows down the spoilage of fresh fish because aerobic microbes do not multiply in the absence of oxygen.

Example 3: A modified atmosphere slows down the spoilage of the product, eg. pre - packaged salads.

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Communication

If a fresh food product (or one of its components, e.g., a small bag of salad dressing) is pre-packaged outside of a grocery store or restaurant and sold to the end consumer as such, it requires labelling such as presented in Figure 2. Compulsory packaging markings include legal name of the product, net quantity, ingredient list, nutrition declaration, expiration date and food batch number. Recycling instructions are not required by law.

Figure 2: Mandatory packaging labelling in food packaging.

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Mandatory labelling texts by the legislation (EU1169/2011):

- The legal name of the food product
- List of ingredients with allergens (bolded OR in ALL CAPS Net quantity (= weight OR volume)
- Date of minimum durability ('best before' date OR 'use by' date)
- Food batch number
- Nutrition declaration
- Name, business name OR auxiliary name, and address of the responsible food business operator
- Country of origin, in other words, the country of manufacture or production of the food product, OR the product's place of provenance, if necessary
- Actual alcoholic strength by volume, for beverages containing more than 1.2 % by volume of alcohol, and for solid foods exceeding 1.8 vol-%
- Product-specific requirements for certain categories of food
- Instructions for storage, if necessary
- Special labelling for quick-frozen and frozen food
- Conditions of use (including a warning label if necessary)
- Indication of use of packaging gases, if necessary
- Indication of use of sweeteners, if necessary
- Indication of high salt content, if necessary
- Identification mark on foodstuffs of animal origin produced at a food establishment
- Labelling of genetically modified food
- Indication of ionising radiation treatment

Food contact material

- Food packaging materials must support food safety and hygiene
- Materials that come into contact with food are required to be safe
- This label in packaging proves packaging material compliance with legislation

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Facilitation of efficient production and logistics

The function of the packaging is to enable efficient product logistics from production to the consumer. Figure 3 demonstrates the product journey from production to consumers buying food either in a store or in a restaurant. Before this, the food or its raw materials have been packed in the factory and transported via a wholesaler to a store or restaurant. In large factories and logistics centres, packaging is usually handled mechanically, but at the latest in a store or restaurant, the products are unloaded from the pallets by hand, in which case they must keep the products in good condition until the time of sale. If the packaging fails its task, the broken and unsold packages will result in product loss.

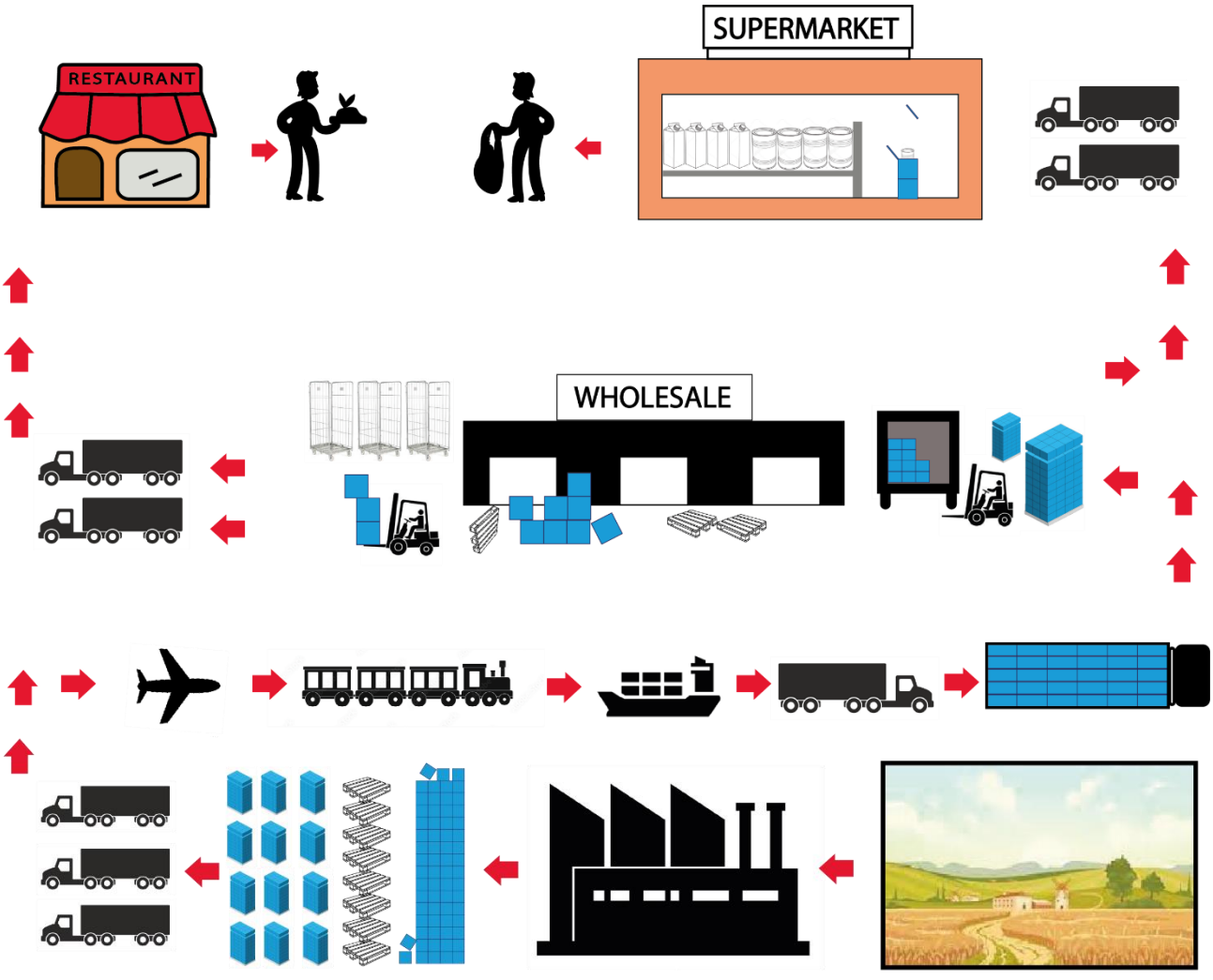

Figure 3. Food logistic chain from production to end-user.

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Convenience and user experience

When the package ends up in the store and at the consumer, it should support the user experience and value of the product. The packaging should stand out from the shelf so the customer can easily tell what the packaging contains from its appearance. In takeaway packaging, the packaging should display the portion served as in a restaurant. For example, fine dining portions should be packaged so that they still look delicious at home, or the customers should be provided with serving instructions on how to assemble the components.

Examples of convenience packaging

The pictures demonstrate three examples of consumer packages that are quick and easy to use.

Example 1: Top opens to a handy pouring spout.

Example 2: Portable, reclosable, non-messy snack for small kids.

Example 3: Oven ready meal.

1. Easy-opening and reclosing porridge packaging (could be also used for muesli or granola). The packaging has an opening spout for pouring, which makes it easy to use. You won't spill the product, might not even need a cup to measure it, and you'll get the muesli or grains in the right place.

2. Flexible stand-up pouch for baby food which are easily portable and re-closable. The children can eat the food by themselves, and it doesn't mess even if they have it in their hands. If they don't feel like eating it all, it can be re-closed, and you can save it later. The package empties also well, which results in minimal food loss. The package is highly appreciated by parents and gives them more time, as the children don't need to be fed.

3. Oven-ready casseroles such as lasagnes are convenient and easy to use, and you can have an oven-baked meal without the preparations and dishwashing.

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3.2. Basic types of packaging

Packaging can be categorized as primary, secondary, or tertiary packaging.

Primary packaging

The first wrap of containment of the product, often a synonym to consumer packaging.

Secondary packaging

The exterior packaging of the primary packaging that groups packages and further protects or labels the product. Multi-packs, trays and product displays are regarded as secondary packaging.

Tertiary packaging

Tights multiple secondary packaging together. Tertiary packaging, e.g., pallets or trollies are usually transported by machinery or wheels.

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3.3. Basic materials for fresh food packaging

Plastics

Fossil and biobased plastics such as PE, PP, PET, and PLA

Benefits: inexpensive, lightweight, protects food from moisture, can be breathable, tolerates liquids, can be easily formed and sealed, widely available with a large variety of packaging formats

Drawbacks: plastic food packages contain often multilayer structures which are difficult to recycle

What are bioplastics?

Consumers have several misconceptions related to bioplastics. Bioplastics can mean either plastics made from bio-based raw materials or biodegradable plastic. Figure 4 demonstrates the difference between bio-based and biodegradable plastic. It is important to understand that all bio-based plastics are not biodegradable, i.e., they should be reused, recycled, or incinerated for energy. There are also fossil-based plastics that can biodegrade. It is also important to note that not all biodegradable materials are compostable, i.e., can degrade into nutrients at home or in an industrial compost.

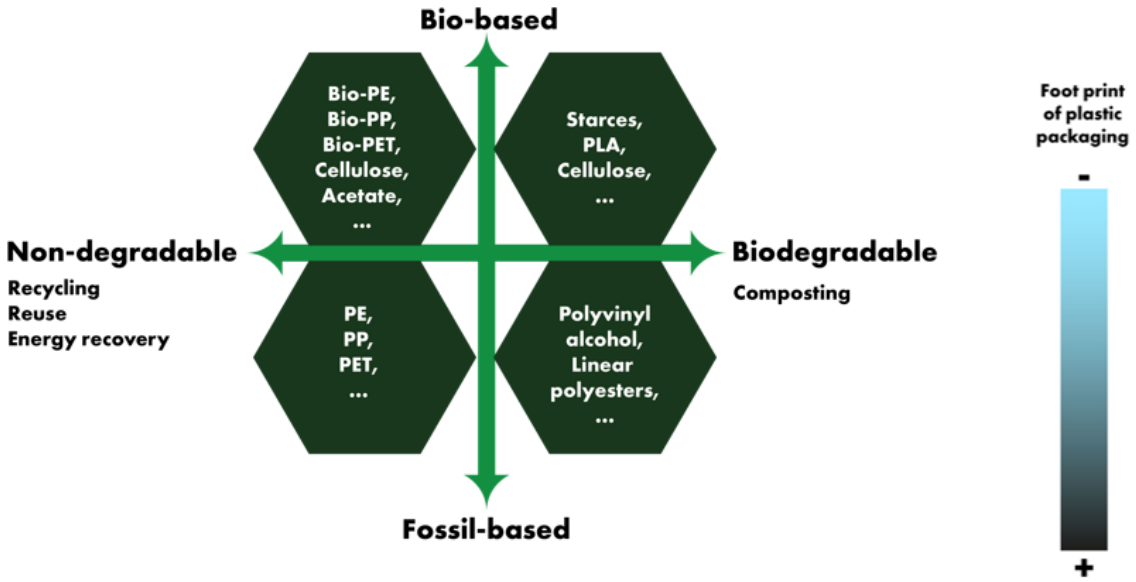

Figure 4. Classification of plastics.

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Plastic recycling

Plastic recycling saves energy in the production of plastic and reduces the need to use oil. Plastic packaging waste collected from consumers is delivered to plastic refineries, where it is sorted and converted into raw materials or finished products. Non-recyclable plastic can be used with mixed waste as fuel at waste-to-energy plants.

Recycled plastic is turned into, for example:

- various consumer goods, such as dish brushes, toilet brushes and clothes brushes, shoehorns, flowerpots, watering cans, spray bottles
- furniture such as chair components
- plastic shopping or trash bags
- composite materials for construction

Picture of the bottle: https://www.evian.com/en_int/our-sustainability-actions/bottles-made-from-bottles/

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Paper, paperboard, cartonboard, corrugated cardboard

Paper, paperboard, liquid paperboard, cartonboard, corrugated cardboard

Benefits: Strong, insulating, protects food from light, absorptive, breathable, tailorable, renewable, and easily recyclable

Drawbacks: Permeable, absorptive, sensitive to moisture/liquids without a coating, opaque, takes only short or moderate heat treatments

Paperboard recycling

Paperboard from eco take-back points is transported to warehouses for baling. The bales are transported to carton mills for use as raw material, and carton fibre as well as plastic and aluminium coatings are separated from the carton. The coating removed from carton fibre is mainly plastic, which is dried and taken to power plants for energy production. The aluminium coating in the carton packaging is separated and recycled as raw material for new products.

Recycled paperboard is turned into, for example:

- material for corrugated cardboard
- packaging cardboard
- envelopes
- laminated paper
- various types of cores (e.g., for toilet paper)

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New plant-based materials

Molded pulp packaging

- Sugarcane bagasse
- Grass
- Agricultural fibre side streams

Other side streams as raw materials

- Lignin
- Peels
- Hulls

Edible packaging that can reduce the protective needs of consumer packaging, for example

- Chocolate coating on ice-cream
- Edible drink capsules at London marathon
  http://www.oohowater.com/

Recycling of new plant-based materials

Most plant-based materials without coating are biodegradable, so they are advised to be composted. Many of the materials are suitable for recycling along with cardboard if they are clean and contain no food residue. See the instructions of your local waste collection operator.

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Metal

Aluminium and steel

Benefits: Excellent protection, strong, durable, tolerate and transfer heat

Drawbacks: Opaque, may need coatings

Metal recycling

The quality of metal does not deteriorate in the recycling process, so it can be recycled forever. Metal taken to eco take-back points is transported to reception terminals, where it is sorted and stored. From the terminals, metal waste is transferred to crushing plants. Crushed metal waste is delivered to foundries where scrap metal is turned into new raw material for the metal industry.

Recycled metal is used, for example, in:

- new metal packaging
- bicycle frames
- spades
- car parts

https://www.mepak.fi/en/metallin-kierto/

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Glass

Clear, green, and brown glass

Benefits: non-reactive, excellent for preservation, strong, tolerates heat treatments

Drawbacks: heavy & rigid, sensitive to breaking, needs other materials for closure mechanisms

Glass recycling

Glass packaging waste from eco take-back points is transported to terminals. From the terminals, glass waste is delivered to glass processing plants. Deliveries abroad are transported by sea in large batches. Glass packaging waste is processed in the processing plants. Impurities are sorted out, glass waste is cleaned and sorted by colour. After processing, it becomes raw material for glass packaging factories where new glass bottles and jars are manufactured from the material.

Glass packaging waste is turned into:

- mostly new glass packaging, i.e., glass bottles and jars.
- part of the glass packaging waste is also turned into construction products, such as foam glass and building blocks.

Bottles: https://www.ekopartnerit.fi/lajitteluohjeet/lasi/
Vase: https://www.iittala.com/fi-fi/sisustus/maljakot-ja-kukkaruukut/maljakot/alvar-aalto-kokoelma-maljakko-160mm-kierratyslasi
Glass: https://www.iittala.com/fi-fi/kattaus/juomalasit-ja-mukit/kaikki-juomalasit-ja-mukit/raami-juomalasi-26cl-2kpl-kierratyslasi-1052443

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Key takeaways

• Protection from spoilage is the most important function of fresh food packaging

• The functions required by fresh food may contradict each other – the package is usually the best possible compromise to fulfil them

• Each material has different benefits and drawbacks – the optimum choice for packaging material is strongly dependent on the food system

Learning task 1

Based on your learning and own experience, fill in the table the benefits and drawbacks of each packaging material in relation to the basic functions of packaging.

	Plastics	Paper and paperboard	New plant fibre-based	Metal	Glass
Protection from the environment					
Preservation (shelf-life)					
Communication of the product					
Facilitation of handling & delivery					
Convenience and user experience					

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3.4. Special characteristics of restaurant takeaway packaging compared to retail food packaging

The pandemic changed consumer habits permanently:

- Remote work lunch ordered out and eaten at home
- Ordering restaurant food for home delivery, i.e., eating at home became a new way of eating out
- In addition to traditional fast food, dining and casual dining takeaway food is estimated to have created 30%- 50% of new business for restaurants with over 20% of annual growth

Takeaway is a new concept for dining restaurants. Dining in a restaurant is an important part of the total food experience. If a meal includes a starter, main portion, and dessert, it will require totally new packaging solutions.

Watch the SusPack training video on restaurant takeaway packaging:

https://youtu.be/GkXqCla87aI

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Special requirements for restaurant takeaway packaging

Functionality (i.e., protection, facilitation of logistics and convenience, see Figure 5) of takeaway packaging is of key importance throughout the food's journey from several viewpoints:

- Restaurants
  - storage and packing are a major problem, as there is no space for packaging in small restaurant kitchens -> solution: neat to store, quick and easy to fill
- Delivery companies
  - careless handling, long waiting times, food gets cold -> solution: leak-proof packaging with good insulation properties
- End-customer/consumer: reality does not meet expectations for the dining experience -> solution: wow effect created by packaging that becomes associated with restaurant brand

Figure 5. Logistic chain of restaurant takeaway food.

The sustainability of takeaway packaging needs to be improved, as 95% of takeaway packaging is not recycled or reused but ends up in mixed waste and incineration.

Reasons for poor recycling rate of takeaway packaging

- Food leftovers and soaked packaging materials prevent recycling
- There are no separate recycling bins available/close by when eating outdoors or on-the-go
- Reluctance to sort, question of convenience

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Characteristics of sustainable takeaway packaging

- manufactured from renewable sources
- manufactured by certified packaging producers to ensure safety in food contact
- recyclable after use containing adequate recycling instructions

Alternative options for takeaway packages

Bagasse, sugar cane based materials
•Renewable
•Recyclable
•Poor liquid barrier

Plastic packaging
•Fossil-based
•Non-renewable raw material
•Recyclable
•Excellent functional properties

Wood fibre-based materials
•Renewable
•Recyclable
•Need a grease/water barrier lining

www.smartset.fi

Wood fibre materials with removable water/grease plastic lining

www.jospak.fi

Formed wood fibre materials
•One of the latest packaging raw-material developments based on wood fibre foam
•Renewable
•Recyclable

www.storaenso.com

Plastic packaging / reusable
• Reusable packaging used for less than 10% of all takeaway packaging
• Works best in closed surroundings, e.g., university campus restaurants
• Use expected to increase in future

www.circlepack.fi

SusPack

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Cloud kitchen – a new restaurant takeaway concept

- A new business model solving take-away restaurants' food production problems
- Large well-equipped catering kitchen serving several restaurants and often also having its own restaurant brand food production
- No eating-in, only home delivery
- Locations are close to consumers, covering certain geographic areas
- Food is cooked and delivered under restaurants' own brands, and cooking is run and managed by restaurants' own dedicated chefs
- Consumers' orders digitally placed to restaurant is automatically directed to cloud kitchen
- Deliveries are conducted by delivery companies only

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Key takeaways

- Choice of ecological packaging should be based on proven, reliable sustainability and social responsibility
- Recyclability / reusability of packaging should be considered
- Renewable materials should be preferred
- Food safety and food waste minimization should not be compromised by high degree of sustainability' packaging
- Skilfully designed take-away packaging with carefully made raw material choices guarantees a great consumer experience

Learning task 2

Based on your learning and own experience, fill in the table the special requirements of retail and restaurant food packaging in relation to the basic functions of packaging.

	Retail fresh food packaging (i.e., ready-packed meals purchased from grocery shops)	Restaurant takeaway packaging (i.e., a three-course meal ordered from a restaurant)
Protection from the environment		
Preservation (shelf-life)		
Communication of the product		
Facilitation of handling & delivery		
Convenience and user experience		

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Topics for discussion or reflection about personal experiences with takeaway packaging

Do you pick up or order restaurant food at home?

Have the packages functioned properly?

Did the portion look delicious in the package?

Have you come across reusable takeaway packaging?

What kind of examples of good or bad takeaway packaging solutions can you think of?

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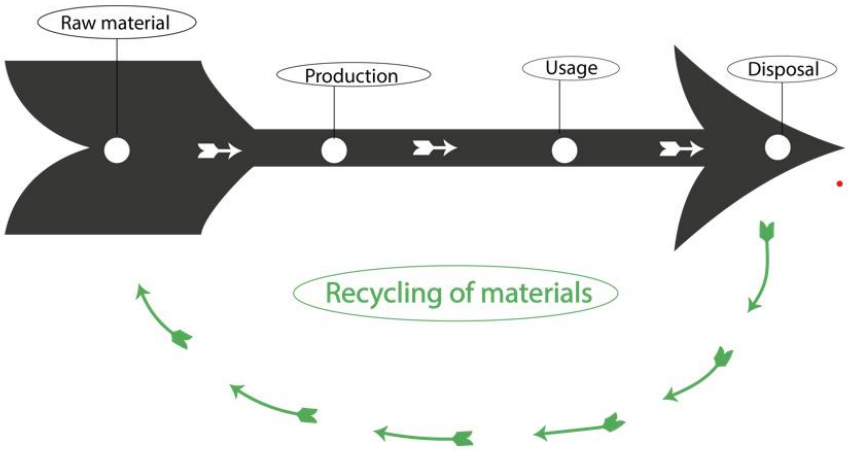
4. Drivers for sustainable takeaway and fresh food packaging

4.1. Circular economy

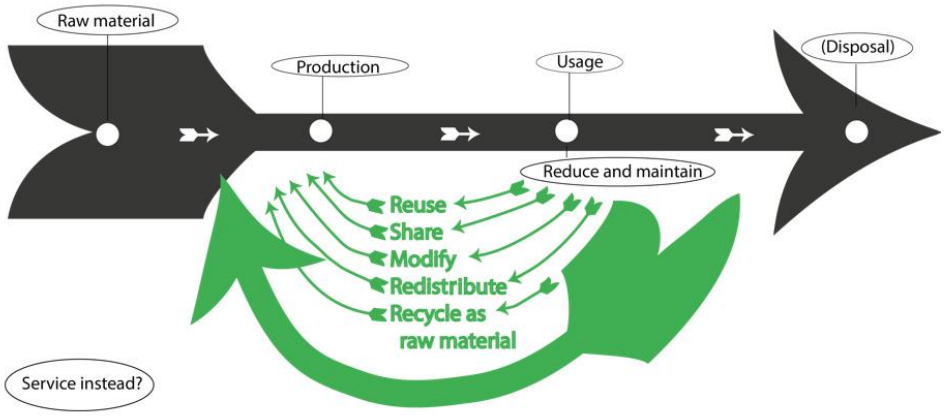
Earlier: Linear thinking

In linear thinking raw materials are sourced from the ground for manufacturing products, which are used and disposed of. Some of the materials are recycled but most of them end up in the landfill or incineration.



Now: Cyclic thinking

In cyclic thinking raw materials are sourced for making products. When the products are at the end of their life, they should be reused, shared, modified, redistributed, or recycled as raw material. The main idea is to reuse raw materials and at the same time to maintain the quality of the products we are using. In cyclic thinking of circular economy, the material does not enter the disposal step at all.



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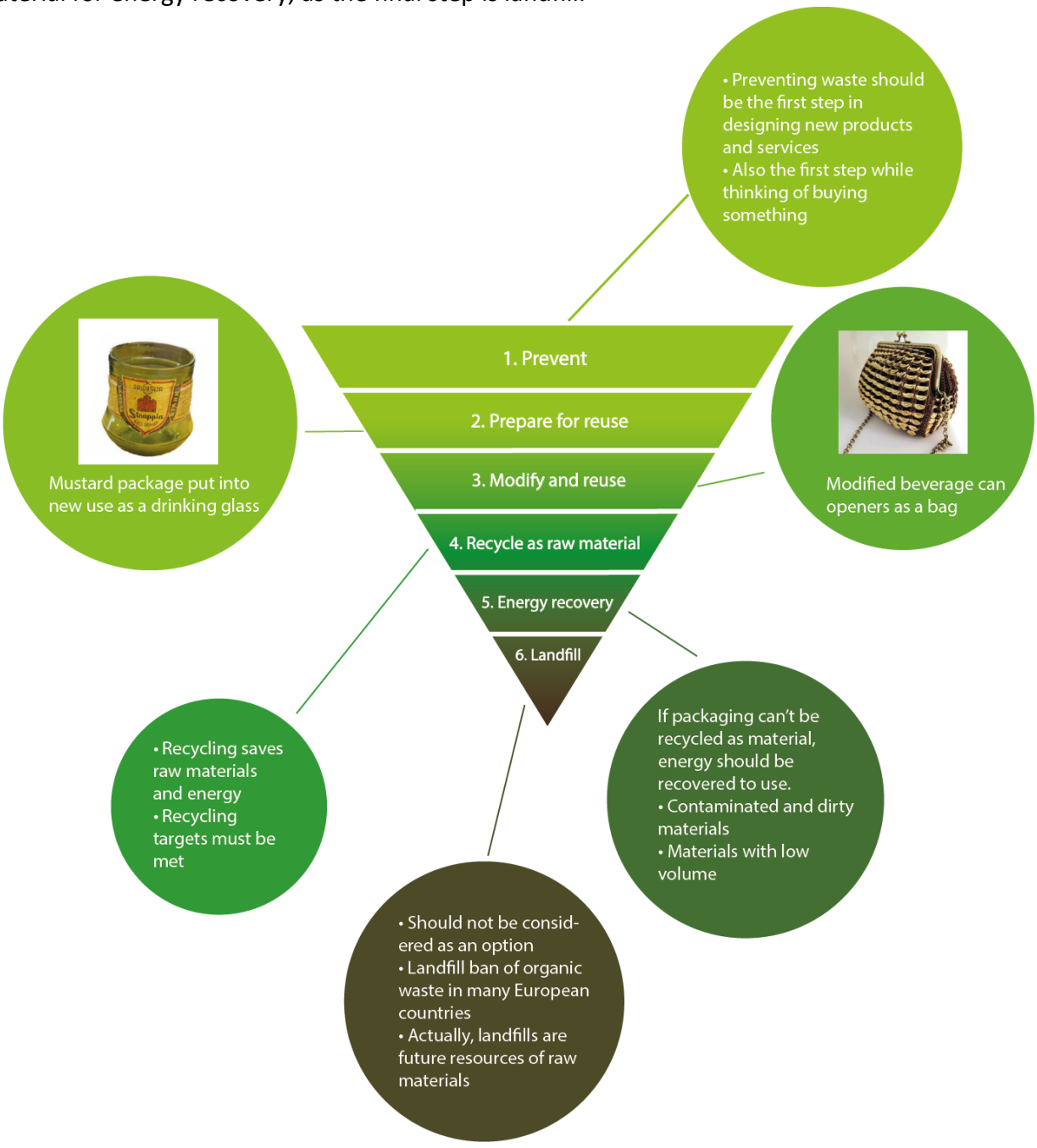
Waste hierarchy

Waste hierarchy promotes circular society. At the first step, when producing something, we should first consider how to prevent generating waste. The second step would be to prepare it for reuse. The third step would be to modify and reuse it. The first three steps support circular economy.

Step four is not considered to support circular economy, as at this point we are losing something from the product because we are only using the material of the product. Step five is to burn the material for energy recovery, as the final step is landfill.



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4.2. Extended producer responsibility (EPR)

Producer responsibility means that a company must by law take care of the collection and recycling of the packaging of its products, as well as informing companies and consumers on packaging waste collection and sorting. In Finland the EPR is administered by Finnish Packaging Recycling RINKI Ltd.

Packaging extended producer responsibility (EPR) in Finland

- Companies that are members of RINKI Ltd only need to report their packaging materials and pay fees based on the reported volumes.
- RINKI together with the producer organisations takes care of all the rest: collection, recycling, reporting to the authorities, as well as communication obligations.

RINKI Eco take-back points

- RINKI Ltd is responsible for the maintenance of the collection network for households.
- There are appr. 1 850 RINKI eco take-back points for carton, glass, and metal packaging across Finland. Almost 700 RINKI eco take-back points accept plastic packaging.
- Consumers can use the interactive eco take-back point map on RINKI's website to search for the nearest eco take-back point.

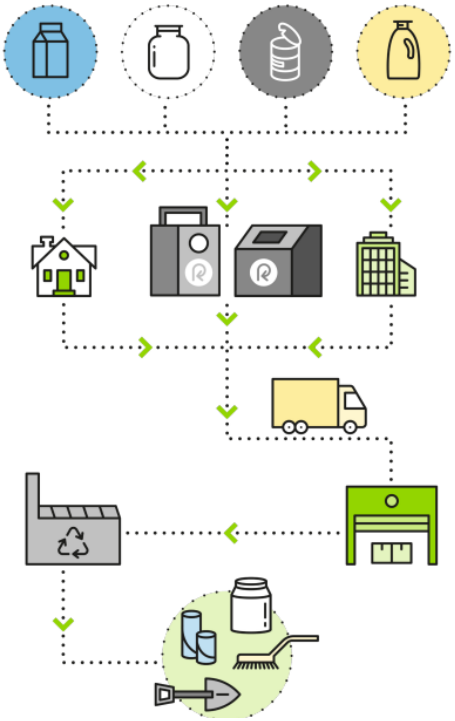

Figure 6. RINKI's 1850 eco take-back points are free of charge for the consumers to recycle consumer packaging waste.

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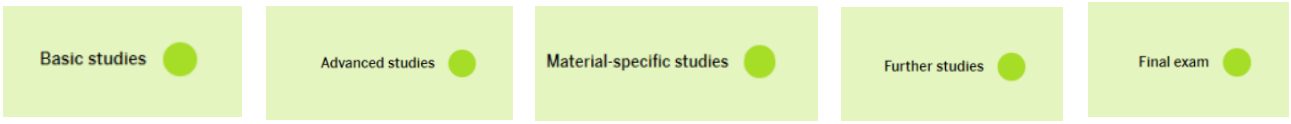
How to increase a positive attitude toward recycling? Case: RINKI'S SORTING SCHOOL



Welcome to Rinki's sorting school! Let's make sure that packaging is recycled!

Almost all products are packaged in some kind of packaging. Packaging protects products from the environment and also the environment from the products. Empty packaging must be recycled, of course. This way, it can then be used as a raw material for the manufacture of new products, which saves energy and natural resources and mitigates climate change. Sorting and recycling are part of sustainable consumption; they are eco actions we can all include in our daily routines.
But do you know how to sort used packaging? All right, time to get your pens and notepads out – let's get started!

Visit the school website: https://rinkiin.fi/en/sorting-school/

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4.3. EU's Plastics Strategy

The EU's Plastics Strategy, launched by the European Commission in 2018, aims to transform the way plastic products are designed, produced, used, and recycled. With regards to plastic packaging, the EU strategy foresees that by 2030 all plastic packaging should be reusable or recyclable in a cost-effective manner, a goal that was expanded to all packaging materials with the adoption of the **European Green Deal** and the new **Circular Economy Action Plan**. The Directive on the reduction of the impact of certain plastic products on the environment (**Single-Use Plastics Directive**) was adopted in 2019 and is one of the elements of the EU's Plastics Strategy. (https://www.europen-packaging.eu/policy-area/single-use-plastics-directive/)

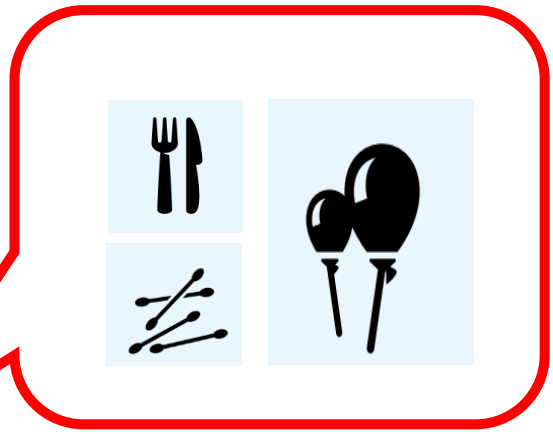
European Green Deal for reducing the environmental impact of packaging

- Decreasing packaging waste
- Increasing reusable packaging
- Recycled content in packaging
- Compostable packaging

Circular Economy Action Plan

Increasing EU recycling targets from 2020 to 2030:

- all packaging from 50 to 70%
- plastics from 22,5 to 55%



Single-use plastics directive

- Ban on certain single-use-plastics
  - cutlery (forks, knives, spoons, and chopsticks)
  - plates
  - straws and cotton bud sticks
  - beverage stirrers
  - sticks to be attached to and to support balloons and their mechanisms
  - food containers made of expanded polystyrene
  - products made from oxo-degradable plastic
  - beverage containers made of expanded polystyrene, including their caps and lids
  - cups for beverages made of expanded polystyrene, including their covers and lids.
- Collection and design requirements for single-use-plastic bottles
- Waste management and clean-up obligations for producers
- Rules for green claims
- Labelling requirements to inform consumers about the plastic content of products

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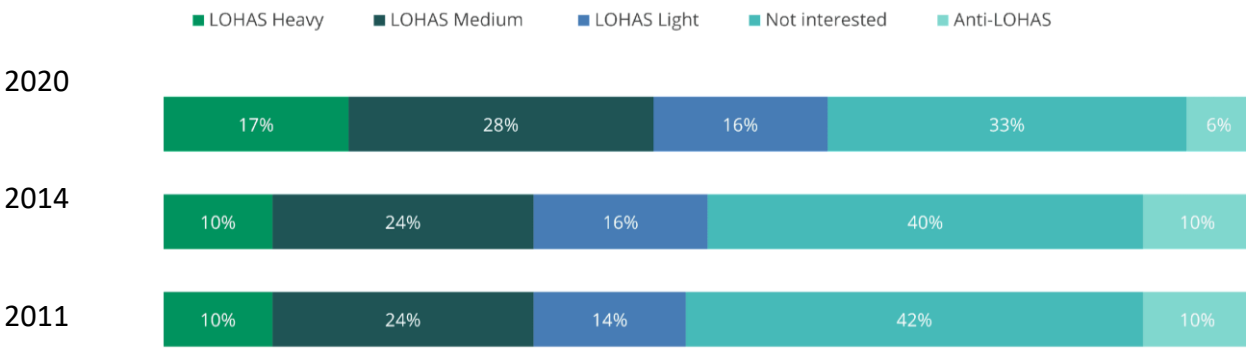
LOHAS (Lifestyles of Health and Sustainability)

Since 1999, Lifestyles of health and sustainable development has been spreading from Japan and America around the world as a common way of describing responsible consumers whose consumption patterns are affected not only by ecological and ethical issues but emphasizing considerations of social responsibility as well as health and well-being.

In the LOHAS2020 survey conducted in February 2020, one thousand Finnish consumers were distributed into five LOHAS groups based on Tripod's LOHAS classification. In addition to well-being and responsibility related consumer behaviours, the LOHAS classification considered participation in volunteering and charity.

In the sample representing the population of mainland Finland, 45 percent of the belonged to LOHAS Heavy or Medium groups, while in the LOHASPACK project surveys conducted in 2011-2014, these groups only accounted for one third of the sample (Figure).



LOHAS-groups in Finland during years 2020, 2014 and 2011 (N=1000-1967).

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LOHAS consumer types in Finland

LOHAS HEAVY

17 percent of Finns represent LOHAS Heavy consumers, compared to only one in ten in 2014. Of the LOHAS Heavy group, 60 percent were women and about one half had a Bachelor's or Master's degree. LOHAS Heavy consumers prefer environmentally friendly products and recycled materials and regularly buy Fair Trade products. Most of them support charity and actively seek to influence the buying behaviour of their family or friends to promote sustainable development.

LOHAS MEDIUM

The LOHAS Medium group, which represents slightly over a quarter of Finns, is also interested in products and services that promote health and sustainable development. There were 57 percent women in the LOHAS Medium group, and just over one in three had a Bachelor's or Master's degree. Members of the Medium group are more active than average as volunteers and donors for charities, and they prefer ethically produced products.

LOHAS LIGHT

About one-sixth of consumers belong to the LOHAS Light group. This group is interested in LOHAS values but are not systematically guided by them in their consumption behaviour. In many respects, the Light group represents the average Finnish consumer and contains equal numbers of men and women. In terms of education, the LOHAS Light group corresponds to the Medium group, i.e., more than a third have a Bachelor's or Master's degree.

NOT INTERESTED

The Not-Interested group covers about a third of Finns. For them, LOHAS values do not act as a motivation for purchase, but on the other hand these types of sales arguments do not prevent them from purchasing a product if it appeals in other respects. In the Not-Interested group, 54 percent are men.

ANTI-LOHAS

Anti-LOHAS consumers are mainly negative about product marketing based on LOHAS values. Most of the group, 77 percent, are men. Anti-LOHAS consumers do not volunteer or donate to charity. In both the Anti-LOHAS and Not-Interested groups, 30 percent have a Bachelor's or Master's degree, so their level of education is slightly lower than the other groups.

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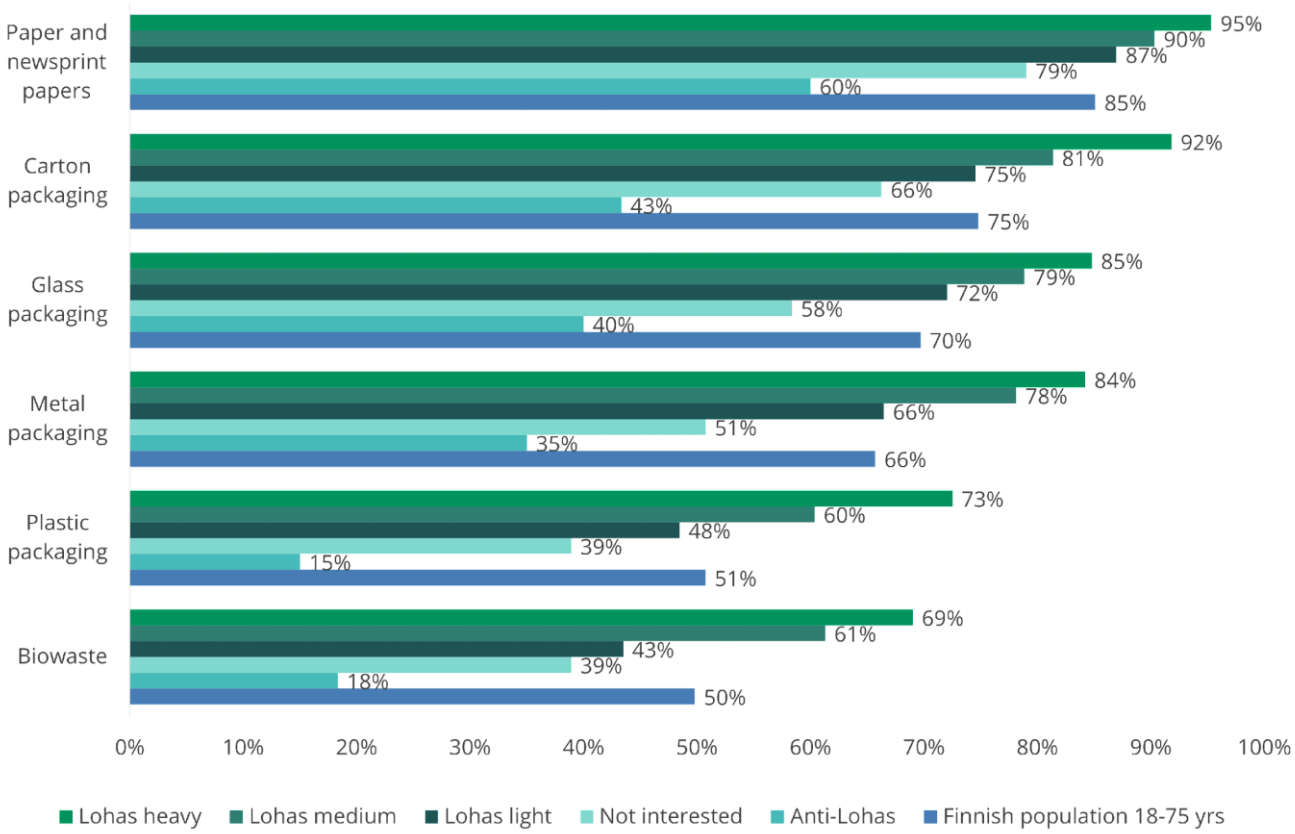
LOHAS consumer is a meticulous recycler

In addition to recycled paper, Finns recycle packaging board, glass, and metal most regularly. Plastic was reported to be recycled regularly by every second respondent. LOHAS consumers are more diligent recyclers than average. Of the LOHAS Heavy group, 73 percent of consumers regularly recycle plastics and 69 percent recycled biowaste. One half of all respondents regularly recycled their biowaste.

Do you recycle regularly…?



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5. Highlights and recommendations: the main project findings

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5.1. Results of the pre- and post-survey

The participants of the training took part in a pre- and post-survey measuring e.g., perceptions about sustainable packaging and different takeaway packaging materials. Figures 7 and 8 present the top five properties of sustainable packaging mentioned by Finns and Italians both before and after the training. The results show that both groups valued recyclability at the top of the list. Finns valued renewable materials highly, as well as functions reducing food waste. On the contrary, Italians valued biodegradability and eco-labels high. In both groups, the perceived importance of renewable raw materials reduced along the training as the importance of a low carbon footprint increased. This might suggest that instead of material renewability the carbon footprint of the full packaging life cycle might be more of consumers' interest.

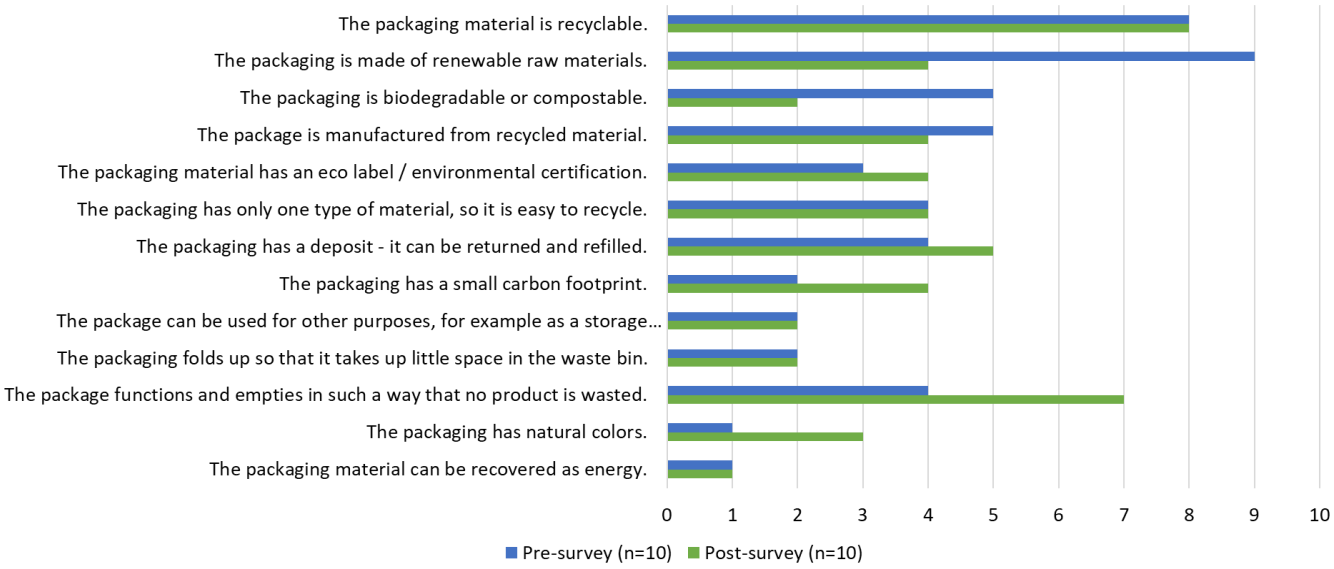

Figure 7. Top five characteristics of sustainable packaging by Finnish participants.

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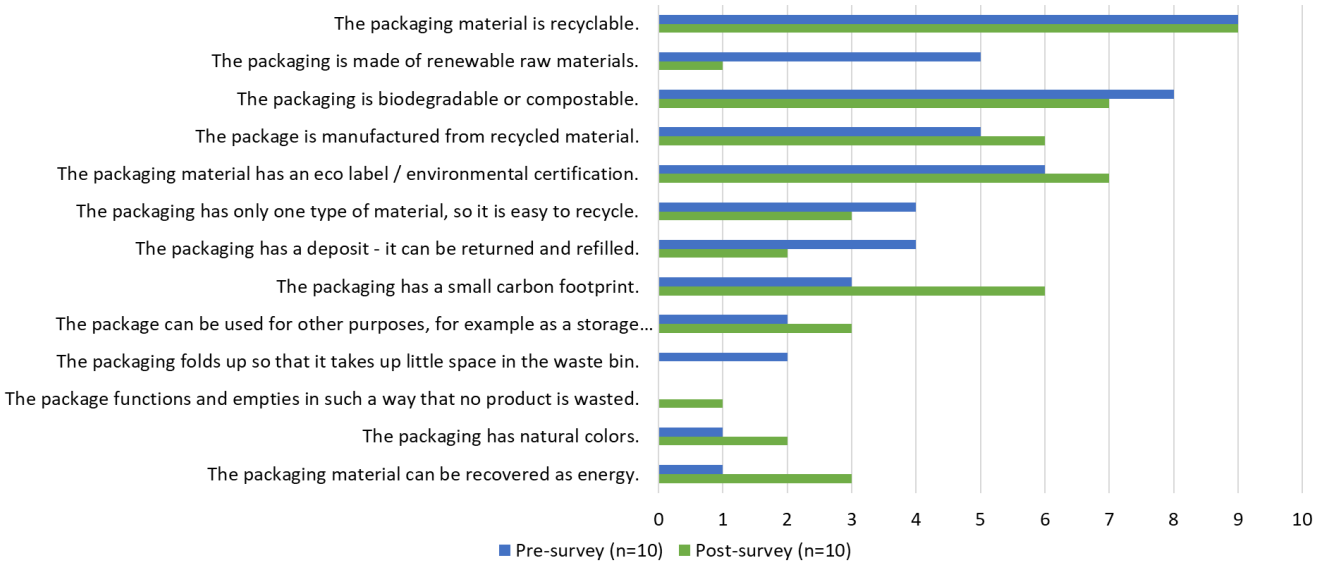

Figure 8. Top five characteristics of sustainable packaging by Italian participants.

In the pre-survey, the participants also evaluated ten most common materials for takeaway packaging on a rating scale of 1-7. The packaging materials were evaluated on the following dimensions:

- Old-fashioned - Modern
- Everyday - Premium
- Inexpensive - Expensive
- Ordinary - Beautiful
- Unnatural - Natural
- Unhygienic - Hygienic
- Unsafe - Safe
- Environmentally harmful - Environmentally friendly

In the post-survey, the participants were asked to evaluate the packages according to sustainability on a rating scale of 1-7.

The results are presented in Figure 9, where the midpoint of the scale is marked with a blue line. All the bars exceeding the blue line indicate a positive perception according to the bar label. Overall, all the plant-based and wood-based materials yielded a positive perception. Formed fibre, PLA, barrier paperboard, and bioPE-coated carton were ranked as the most sustainable of the packages.

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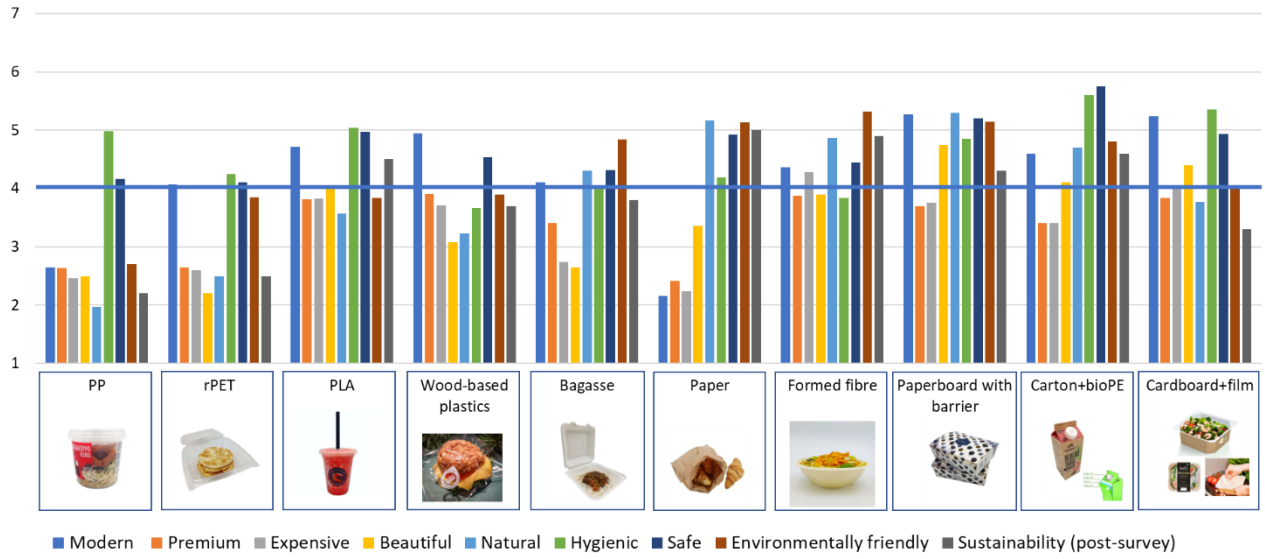

Figure 9. Material perceptions of the most common takeaway packages (n=20).

5.2. Value of dining restaurant takeaway food packaging

The aim of this task was to measure the consumer value of Smart Set takeaway packaging for ordering food from a dining restaurant compared to a PP tray. The data was collected through two focus group discussions in April 2022 with SusPack participants based on a video.

Of the participants, 8 were Finnish and 9 Italian consumers. All Finnish participants were female, and their ages ranged from 22 to 65 years, the average age being 45 years. The Finnish participants were informed that the typical price for the evaluated meal was around 45 euros.

Of the Italian participants, 66% were female. The ages of the Italian participants ranged from 22 to 44 years, the average age being 31 years. The Italian participants were informed that the typical price for the evaluated meal was around 25 euros.

Research procedure

The task included the following steps:

- First, the participants were introduced to the evaluated concepts by displaying a video of ordering, preparing, packaging, delivering, and eating a meal in two alternative packages.
- Next, the participants were asked to state their preference and maximum willingness to pay for each concept, based on their first impression.

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- This was followed by packaging evaluation where the participants were presented with countering attributes and asked to match one or neither attribute with each takeaway packaging.

- After the evaluation, the participants were asked to state their preference, maximum willingness to pay, and the likelihood of purchase based on the second impression.

The evaluation was followed by a discussion about each concept. After this, additional questions about the Smart Set packaging concept were posed, covering suggested improvements for the prototype.

The packaged menu contained glazed celery, stewed cod and white bean puree, and carrot cake.

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Results of packaging evaluations

Evaluation of SmartSet packaging

TOP ATTRIBUTES, n=17

Easy-to-recycle	100 %
Easy-to-use, Aesthetic, Appropriate, Natural, Ecological	94 %
Tidy, Safe	88 %
Innovative, Appealing, Ethical	82 %
Handy, Delightful, Authentic, Humane	71 %
Imaginative, Elegant, Reliable, Confident	65 %
Distinguishable, Prestigious, High-value	59 %
Durable	53 %

Open feedback from the participants on SmartSet

High-class, contemporary, tasteful, and designed. –Woman (Fin), 39

Looks nice, but how do you eat from those deep boxes? The high edges ruin the feeling of dining when you must dig for your food. –Woman (Fin), 52

This does not flatter the food, but the feeling is a lot more environmentally friendly. –Woman (Fin), 36

On the positive side, there is certainly the fact that it can be recycled more easily, maybe the aesthetics are not the best. –Woman (Ita), 38

It looks more expensive, both the package and the food. It also seems like it has been packaged with more care. –Woman (Ita), 32

It pays attention to the care of the environment and to the health of consumers. –Man (Ita), 27

More premium-restaurant and premium-food, more consideration for health/environmental issues. –Woman (Ita), 44

The food seems to be of quality; an innovative restaurant. –Woman (Ita), 28

High quality and more sustainable. –Male (Ita), 25

Fresh and good quality food. Environmentally friendly. –Woman (Ita), 28

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Evaluation of PP packaging

TOP ATTRIBUTES, n=17

Standard value	94 %
Easy-to-use, Bland, Everyday, Unnatural	88 %
Unappealing, Unecological	82 %
Unimaginative, Unesthetic	76 %
Indistinguishable	76 %
Boring, Inelegant	71 %
Cost-efficient, Reliable, Technical	65 %
Appropriate	53 %

Open feedback from the participants on the PP tray

The package looks like an ordinary, everyday lunch package. –Woman (Fin), 28

Meals look delicious, but the overall feeling is a bit cheap or maybe the restaurant does not care about the changing values around it. –Woman (Fin), 36

I wouldn't want to eat it. A festive meal should be on a plate-like surface. It should feel like it's an actual plate when you eat from it. –Woman (Fin), 52

Basic. A bit old school. –Woman (Fin), 36

It evokes an image of a restaurant that it's not environmentally friendly. –Woman (Ita), 28

Dirty and unhygienic. –Man (Ita), 22

It's a standard package that makes the food look cheaper and of lower quality. –Woman (Ita), 32

Disregards the environment; low quality of the food. –Woman (Ita), 38

Old and boring. –Man (Ita), 25

5.3. General feedback on the training

The feedback on the training was generally very positive (Figure 10). The most valued sessions were Session 1 (Packaging of fresh food) and Session 4 (Future of food packaging).

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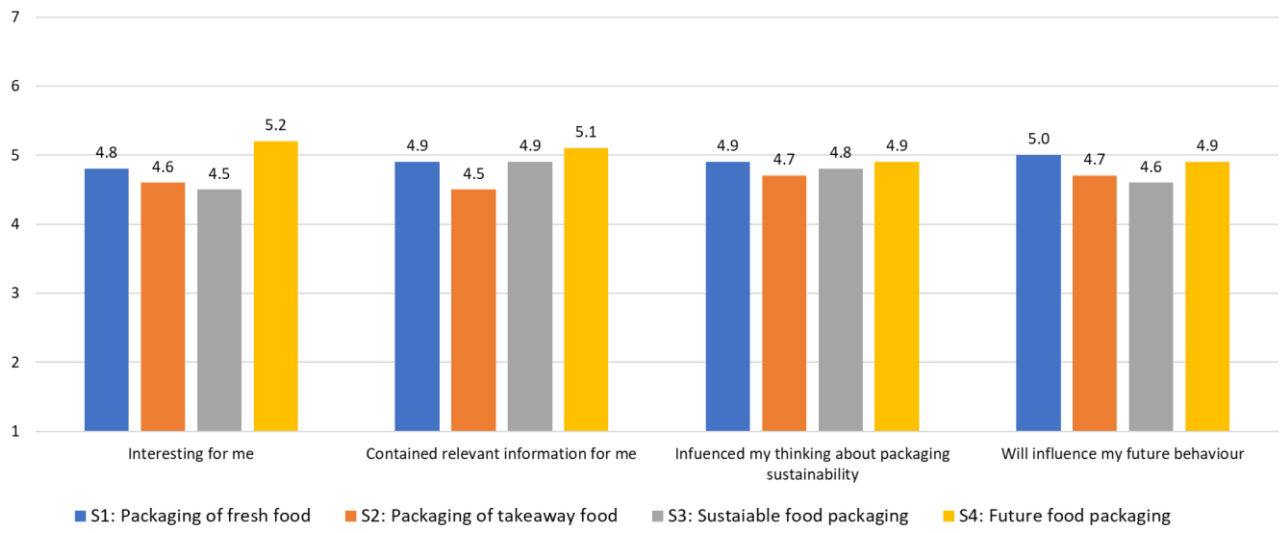

Figure 10. Feedback on SusPack training, scale 1-7 (n=20).

Many of the participants stated that the training changed their perception of plastics and the environmental significance of food loss:

“The first thing that came to mind is that consumers are being blamed for plastic, that it’s terribly bad. At the beginning of the training, I learned how much worse food loss is. I thought to myself that we should get out of this guilt somehow. I live in a rural area where there is no plastic recycling. The sense of guilt is usually awful when you start talking about plastic recycling. Considering food waste is important how the packaging is made so that there is as little waste as possible.”

"My understanding of plastic has become more versatile. There is not just "bad plastic" or “good plastic”. Plastic clearly has its place and there are different types of plastics. When plastic is said to be "biodegradable" or "bioplastic", I know now that it can mean quite a few different things."

The participants also said that they had a lot of misconceptions about packaging and the training provided several new perspectives:

“I think the training really gave me some new perspective about some things that I thought I knew (but I was wrong) and things that I didn't even think about. It was also interesting to hear about Finland and the differences there are between our countries. I really liked the practical example of the two different packages from the same restaurant which made me realize how I see the quality of the food based on the packaging. I also found interesting the presented statistical data.”

“The training covered every argument way better than I expected, it was necessary because I think that food packaging has lots of viewpoints and divided arguments. This training was able to explain every part with a high level of knowledge.”

Some participants were worried about the technicality of the subject, but found the training easy to follow:

“I was expecting more technical lessons and I was a bit worried that I might not be able to follow along. However, even though we did see some technical aspects (both legal and of the materials), I found the lessons very well explained and accompanied by some more practical examples.”

Some participants said that they already had a lot of information about the subject areas of the training, but they will still pay attention to the packaging in a different way in the future and change their behaviour:

"I think my purchasing behaviour is in good shape, but I will still pay more attention to the packaging. I'll probably take a closer look at the markings on the labels. This kind of additional information is always good and makes you look at things a little differently."

“I'll pay more attention to the type of packaging used by delivery services. I'll also check more the symbols I see now that I have more knowledge about them.”

“I'm sure that it will influence my everyday decisions, choice of packaging materials, and paying more attention to reusable materials.”

5.4. Recommendations for sustainability communication

Country-specific recycling infrastructures have a major impact on the choice of food packaging raw materials. In this project, the Finnish and Italian consumers' perceptions of sustainable packaging reflected their country-specific recycling infrastructures to a great extent. Thus, functional and effortless recycling plays a significant role for the consumer as part of sustainable everyday life.

Yet, the development of the recycling infrastructure is often driven by the local/regional packaging industry and the development of new materials.

Italy is the cradle of the industrial development of biodegradable/ compostable bio-based plastics, as the most significant companies in the field are in Italy. Thus, composting/industrial composting is the predominant way of disposing of food packaging in Italy.

Another extreme example is Finland, where a strong integration of the forest and packaging industry has influenced the development of the paperboard recycling infrastructure.

The development of recycling infrastructure and consumer communication can provide the keys for strengthening consumer involvement and participation in packaging recycling to promote circular economy. The main learnings from the training were:

- Sustainability of packaging is a multi-dimensional and technical concept for consumers. The retail and food industry must choose the most sustainable packaging solutions, considering

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the entire product life cycle and logistics. The retail and food industry should communicate these decisions clearly to consumers to increase their trust.

- Renewability and recyclability are difficult concepts for consumers. Especially in takeaway packaging, not all packaging is recycled, even if there is an opportunity to do so. A carbon footprint calculation that considers the prospected life cycle of the packaging and the shelf life of the product could be more understandable to support decision-making. On the other hand, the sustainability labels should be standard and comparable with each other.

- The development of new sustainability labels requires a lot of communication and cooperation between the retail and food industry. Sustainability labels should make everyday life easier for consumers and support sorting and recycling.

- The concept of bioplastics should be clarified for consumers so that they would know how to sort packaging correctly and learn to recognize different types of plastic.

Topics for discussion or reflection

Consider the environmental sustainability of packaging. Did the training material change your understanding of the importance of packaging from a sustainability perspective?

Did you learn a new term from the material related to packaging sustainability?

Think about the sustainability of packaging, especially in terms of recyclability. What kind of expectations do you have for packages?

What kind of images and feelings do different packaging materials evoke in you?

-Plastic

-Carton

-Other plant-based packaging materials

-Metal

-Glass

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6. Vocabulary

Bagasse - Fibrous material that remains after crushing sugar cane or sorghum stalks to extract their juice.

Barrier coating / material - The purpose of barrier coating / materials is to block molecules from passing through packages. They have an important function to protect products from getting wet, drying, and oxidation.

Bio-based - Material made from a renewable raw material, i.e., biomass, for example wood and other plant-based materials such as sugar cane or corn starch.

Bio-composite - A material in which natural fibres are mixed with plastics from fossil or renewable sources.

Biodegradable - Material that decomposes through biological processes under appropriate conditions (heat, humidity, oxygen content and acidity) to carbon dioxide or methane, water, and biomass. Biodegradable materials do not necessarily degrade in nature. In the case of biodegradable materials, it is very important to determine the environment in which biodegradation is to take place.

Bio-plastic - A plastic material that is either bio-based or biodegradable, or sometimes both at the same time.

Cardboard – A generic term for heavy wood fibre-based products.

Cartonboard – A multi-layer paper with three or more layers or plies of cellulose fibre (pulp) derived from wood. Different raw materials can be used in the (barrier/coating) layers to achieve desired properties in packaging.

Circular economy – A circular economy follows the 3R approach: reduce, reuse and recycle. Resource use is minimized (reduce). Reuse of products and parts is maximized (reuse). Raw materials are reused (recycled) into new products.

Coating - Added to the surface of cardboard packages to help them stay more durable (e.g., waterproof) and to expand suitability for various types of fresh food.

Compostable - Decomposition of material into humus in industrial or household compost under specified conditions over a specified period of time. All packaging materials labelled as compostable do not necessarily degrade in home compost, but only in industrial composting. All compostable materials are biodegradable, but not all biodegradable products are compostable.

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Corrugated cardboard – Material made of three layers of paper that include an inside and outside liner, and fluting with a ruffled shape, which runs in between the two.

Deposit system - Organized returnable packaging handling method.

Disposable packaging - Packaging that cannot be re-used.

Energy recovery – A packaging waste treatment process that generates energy in the form of electricity, heat, or fuel.

Landfill - Waste that is not recycled or recovered as energy usually ends up at a landfill.

Life-cycle - Includes all actions relating to the manufacture, use and disposal of a product.

Linear economy - A linear economy traditionally follows the "take-make-dispose" step-by-step plan: raw materials are collected, then transformed into products that are used until they are finally discarded as waste. Value is created in this economic system by producing and selling as many products as possible. (Ref: https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/)

LOHAS – Lifestyle of Health and Sustainability. A segmentation to describe consumer orientation to consumption.

Material recovery - Recovery of material after use and processing into new products or energy.

Package/packaging - The protective covering of products. A packaging system contains all parts of the packaging, from packaging to storage, transport and selling.

Package design -Includes structural design, measurements, packaging method, material choice and graphic design.

Pallet - The base for tertiary packaging, which can be handled with forklift.

Paperboard - A thick paper-based material. Paperboard can be easily cut and formed, it is lightweight, and because it is strong, it is used in packaging. Another end-use is high quality graphic printing, such as book and magazine covers or postcards. Paperboard is also used in fine arts for creating sculptures. Sometimes it is referred to as cardboard, which is a generic, lay term used to refer to any heavy paper pulp–based board.

PE - Polyethylene or polythene (PE) is the most common plastic in use today. It is a thermoplastic polymer, primarily used for packaging (e.g., plastic bags, plastic films, bottles).

PLA - Polylactide (PLA) is a biodegradable thermoplastic material made from renewable raw materials such as corn starch or sugar cane. PLA plastic has become more common as a material for food packaging due to its compostability. For example, it is used to make drinking cups as well as windows and coating films for paperboard takeaway boxes.

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Plastic - Polymeric and synthetic, non-naturally occurring material. The most common plastics used in food packaging are, for example, polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET).

PP - Polypropylene (PP) is a thermoplastic polymer. Thermoplastic materials are easily recycled and do not show any chemical property changes when they are heated or cooled multiple times. PP is used for many purposes in fresh food packaging, such as food trays.

Primary packaging - The first wrap of containment of the product, often a synonym to consumer packaging.

Raw material - A natural resource or semi-finished product from which finished products or materials are processed. Examples of raw materials include iron, forest resources and oil.

Recycling - Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products.

Recyclable packaging - Any packaging that can be modified to new materials or optionally processed to new products that are not used as a source of energy.

Renewable material - Materials that can be manufactured or generated relatively quickly, for example by regenerating. Not all naturally occurring materials are considered renewable. For example, petroleum, sand, or dolomite lime formed by corals regenerate so slowly that they are not considered as renewable materials.

rPET - recycled PET (polyethylene terephthalate). Almost glass clear, non-toxic, no characteristic odour. PET also acts as a good CO2 barrier and has good heat resistance. The best-known use of PET is in soft drink bottles.

Primary/retail packaging - The packaging that is in direct contact with the product itself.

Secondary packaging / tray - The exterior packaging of the primary packaging that groups packages and further protects or labels.

Tertiary packaging - Bulk or transit packaging consisting of secondary packaging.

Thermoplastic material - Materials that are easily recycled and do not show any chemical property changes when they are heated or cooled multiple times.

Virgin material - Material that does not consist of recycled matter.