Packaging after consumption of the product
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1. Introduction

Letter from the Chairman

"Packaging after consumption of the product"

Empty packaging that fly or float are visible and highly mediatised stains in our modern developed societies. This poorly managed packaging very regularly adds to the schizophrenic side of our consumerism: I love the products that I use and I hate their empty packaging after consumption.

A conflation is usually made in national media "plastic continent floating in the Pacific- poor management of empty packaging in France". A conflation that is by no means justified because the situation in France is not comparable at all to what is happening in Asia. This shortcut simply ignores that the system put in place 25 years ago has gradually brought excellent results that have increased the recycling rate of household packaging in France from 18% in 1992 to 68% in 2017.

Does this mean that everything is going well in our country and more broadly in Europe? No, of course not. Even if the waste of empty packaging is generally under control there is still room for improvement, and possible avenues for progress have now been identified (large city centres/vertical housing/consumption outside homes, without forgetting the citizen's essential role).

Room for improvement but also adaptation, as consumption patterns change quickly and disrupt the systems in place, for example, increasing consumption outside the home and the boom in e-commerce. Beyond the European official targets, the overall official 69% of household waste recycling by weight is clearly no longer enough, especially for materials that have a lower than average recycling rate.

The French Packaging Council (CNE) through its collective work and its resulting documents has made it clear that the eco-design of products and their packaging must address what once was called "the end of life of products". This 6th and last part of a successful eco-design is important to remember and should serve as a basis for further reflection on behalf of the marketers.

Furthermore, beyond the priorities listed in Directive 94/62 "packaging waste", I would like to add that Europe (and France) should quickly decide that the disposal of empty packaging is no longer tolerated. Empty packaging may as well be used as resources and we must recycle them in a well understood circular economy.

Finally, the consumer citizen who does not do the right thing must be heard and understood because in the end, everything starts with the consumer. Once the product has been consumed, this is the first action that concerns the empty packaging which becomes fundamental. Why does this citizen do (or doesn't do) something that he would not accept from someone else?

The goal of this new working group at the CNE is to understand and explain the obstacles to good management of empty packaging after consumption. Then, to show the avenues for progress that everyone desires.

Michel Fontaine
Summary

This document describes the second life of packaging after consumption/use of the product.

It reviews, through facts and figures, all the measures carried out for more than 20 years both ahead of the realisation of the packaged product (in particular eco-design) as well as after, in order to value the packaging after consumption (recycling, composting, energy recovery).

In the framework of a circular economy, the entire chain of players is reviewed; every link in this chain has an important role to play (the marketers, distributors, citizen-consumers, public authorities, the eco-organization Citeo and recycling companies).

A focus is carried out on important needs in terms of education: some actions are proposed in order to further increase management effectiveness of the end-of-life of the packaging.

This document offers a geographical (where does the recycled packaging go) as well as quantifiable (what happens to the materials) review.

Finally, to conclude, the CNE puts into perspective all the progress made up to present and all that remains to be done, all together with the packaging value chain players.
Context

Packaging is an integral part of the daily lives of consumers/users. It provides protection for the product, provision of its content, its preservation, information and use of the packaged product.

As soon as the package is emptied of its content, it is given a second life; it is still necessary to know all the steps.

Packaging is evolving in a regulatory context that has undergone significant changes recently at European and national levels to take into account more and more of its end of life: the adoption of the circular economy package at the end of May 2018, and the publication on 23 April 2018 of the French Circular Economy Road Map (FREC)\(^1\).

Regarding packaging, the FREC in figures:

- Reduce by 50% the amount of landfilled non-hazardous waste in 2025 compared to 2010.
- Move towards 100% recycled plastic by 2025.
- Save 8 million additional tons of CO\(_2\) every year thanks to the recycling of plastic.
- In 2022, all sorting centres will be upgraded.
- The Triman pictogram will be required on packaging from 2021.
- Produce by the end of 2018 a review of the most relevant environmental labels.
- Mobility at European level to ban the use of o xo-fragmentable plastics and polystyrene containers for on-the-go consumption as well as plastic microbeads.

Finally, many players have decided to seize the fate of these "packaging after consumption" to put their own agenda and define targets in the short or medium term.

Objectives

The objectives of this document are:

- to recall the fundamentals in terms of management of household, industrial and commercial end-of-life packaging;
- to understand the challenges of good management of empty packaging after consumption of the product;
- to popularise all actions for as many as possible in order to achieve good management of packaging;
- to instruct all the players in the value chain;
- to explain existing obstacles whether it is relevant to household packaging or industrial and commercial packaging;
- to show all the possible avenues for progress.

\(^1\) [https://www.consultation-economie-circulaire.gouv.fr/la-feuille-de-route-economie-circulaire](https://www.consultation-economie-circulaire.gouv.fr/la-feuille-de-route-economie-circulaire)
2. Key facts and figures

Foreword
In 2015\(^2\), the production of waste in France represented 324.5 million tonnes, including 227.6 million tonnes for the construction sector, 62.5 million tonnes for economic activities outside of construction, 30.6 million tonnes for household waste and 3.8 million tonnes for the communities. Note that agricultural waste that is reused on farms is not taken into account.

Waste production in France in 2015

2.1 Packaging put on the market

In 2016, 12.7 million tonnes of packaging were put on the market, of which 4.9 million tonnes contributed to the EPR (Extended Producer Responsibility) scheme for household packaging.

Below, the tonnages put on the French market in 2016 presented by the nature of the material: the upcycling of these packaging is governed by different devices after the use of the packaged product, by the end user (B to B, under service contracts) or the final consumer (B to C, in the context of the EPR scheme).

Tonnage of packaging introduced in 2016

\(^2\) Déchets édition 2017- Key figures – ADEME.
Stability of packaging tonnages in relation to growth in consumption since 2001

Until 2000, there has been an increase in the consumption of products packed per capita which, coupled with the increase in the French population, led to an average annual growth of 2.7% of the tonnages of packaging put on the market.

Since 2001, the ratio of consumption of packaging (any type of packaging) per capita has stabilised to around 200 kg per inhabitant per year (see graph below).

This stabilisation is explained in particular by efforts to reduce the amount of packaging used (see catalogue of prevention cases on the CNE website on http://conseil-emballage.org/les-cas-de-prevention/ and the catalogue of prevention cases of Citeo on http://reduction.ecoemballages.fr/catalogue).

It is also related to the steady progression of lighter materials.

2.2 Actions carried out for the right packaging

For many years, economic players have been committed to optimising the product/packaging pairing by carrying out measures that are summarised below.

As for household packaging, for example, the result is a decoupling observed with household consumption, confirmed by studies made by the sector:

The fact that the overall deposit of household packaging remains broadly stable while demographics and consumption increase highlights the effect of the choice of packaging design by manufacturers. The reduction at the source of reducing the weight and/or volume of the packaging for the same service rendered by the packaging (preservation, protection, transport of the product, etc.) has continued.

At the same time, we are witnessing changes in household consumption patterns that reflect changes in lifestyles. Food nomadism is growing and the share of meals consumed outside the home, especially fast food, is increasing, deporting part of the consumption of home packaging to out-of-home consumption.

Source: ADEME, Eco-Emballages

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3 Industrial, commercial and household packaging, 2011 ADEME data.
4 Source Ademe: the amount of household packaging in France: From 1994 to 2012 evolution
2.2.1 Reuse of packaging

A fair amount of packaging is designed for re-use, for example glass packaging for the beverage sector used in cafés, hotels and restaurants. In B to B, there are many examples of packaging with this approach of re-using (pallets, crates, etc.): the CNE recalls in its paper⁵ "packaging and deposit systems : overview of of re-use systems" all the necessary conditions for successful re-using of industrial and commercial packaging.

2.2.2 Eco-design

Eco-design is a packaged product development activity that includes the environment in the process of marketing products.

In its methodological guide⁶ of the eco-design of packaged products, the CNE suggests that product marketers investigate 25 issues to consider for a successful eco-design, grouped into 6 key points that are recalled below:

- Integrate from the beginning all internal and external players involved in the product
- Integrate the use by the consumer
- Consider the whole packaging system in order to avoid transferring impact
- Optimise the weight and/or volume of packaging for a defined use of the product
- Optimise the use of resources from the production of packaging
- Take into account the end-of-life of packaging

2.2.3 Prevention by cutting down at the source⁷


Since 1998, the CNE disposes of an analytical methodology for cutting down on the source, which constitutes a frame of reference for preventive action cases.

The CNE recalls that the prevention of packaging is incorporated into a whole which needs to be analysed taking into consideration the complete life cycle of the packaged product. It is thus necessary to take into account the following rules of prevention:

- the complete packaging system (primary, secondary and tertiary)
- the complete life cycle of the packaged product
- the same usage value of the packaged product for the user
- indicators on the product-packaging pairing.

The CNE recalls that reduction based only on weight is not always synonymous with environmental benefit. It can lead to a loss of functionalities of the packaging, and even generate a loss of the product. It is thus a question of reaching the optimal critical point, or critical point according to the EN 13428 standard, while preserving the functionalities of the product-packaging pairing and the practical value for the consumer.

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⁷ http://conseil-emballage.org/les-indicateurs-cles-de-prevention/ (in French)
Below are some examples showing the development of packaging weight of during the years highlighting the optimisations carried out.

Reducing the weight of plastic bottles and their tops is a reality, the bottles of still water for example went from more than 40g in 1994 to currently weighing 25g on average (see example of the 1.5l still water bottle opposite)

Reducing the thicknesses of the steel for packaging as well as the optimisation of its mechanical properties made it possible to reduce the weight of steel packaging by 40% in the last 30 years (see example of the beverage can opposite)

The reader will find other examples in the CNE’s preventive action cases catalogue on http://conseil-emballage.org/les-cas-de-prevention/ and the catalogue of cases of prevention of Citeo on http://reduction.ecoemballages.fr/catalogue.

2.3 Recovery methods

The packaging, once emptied of its contents, will have a second life according to various recovery methods:
- material recovery (recycling or composting)
- energy recovery (incineration with energy recovery)

Below diagram of packaging recovery in France according to household packaging or industrial and commercial packaging (non-household), according to recovery method (only recovery through recycling and energy recovery by type of packaging material are represented).
2.3.1 Recycling of packaging

Definition of recycling:
"Any recovery operation by which waste, including organic waste, is reprocessed in substances, matters or is produced for purposes of their initial function or for other ends. The operations of energy recovery from waste, those relating to the conversion of waste into fuels and backfilling operations cannot be qualified as recycling operations."

Recycling includes different stages, from the collection and preparation of waste into recycled primary materials up to the incorporation of these materials in the manufacturing of new products.

Recycling is both a waste treatment method and a means of generating resources. It comes in third position after prevention and re-use in the hierarchy of treatment methods (French Environmental Code).

Recovery and recycling of packaging go through actions for each stage of the product life and require the implication of several actors:

- the consumer, thanks to the user’s waste sorting it allows for well planned management of the end of life of packaging,
- manufacturers and distributors contribute while putting recyclable products and packaging on the market. They take part by conceiving less complex and easier-to-recycle packaging,
- operators of waste management ensure the collection and treatment of this packaging,
- recyclers who transform the collected packaging for a second life,
- the role of communities is essential in organising the collection and raising awareness of waste sorting among citizens.

Below synthetic diagram of the process of recycling packaging

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Development of recycling rates for all materials
Over the ten last years, the stabilization of the tonnages marketed and the progression of the recycled quantities has led to a significant increase in the rate of recycling for all materials.

Recycling rate of packaging by material
(% of materials sent to recycling compared to the deposit) from 2005 to 2015

2.3.2 Composting of packaging
Aerobic organic recovery (composting) or anaerobe (methanisation) of bio-waste (garden and household waste) to return to the ground is one of the recovery methods envisaged by the waste Directive 2008/98/EC, but the packaging Directive 94-62 EC also integrates this recovery method for biodegradable and compostable packaging.

In 2018, the share of packaging composted in industrial composting sites was approximately 1%. This slim percentage must increase in order to meet the new European requirements.

Thus, the necessity of selective sorting at the source of biowaste (25 to 35% in household waste) and of their recovery by 2025 in France, and as of the end of 2023 in Europe, will lead to the development of organic recovery and of the industrial composting sites on French ground.

Today, the most significant example of compostable packaging available on the market is the 40% organic based and compostable single use plastic bag.

The Energy Transition Act for Green Growth banned single use plastic bags from checkout counters as of 1st January 2017. Other types of single use plastic bags, commonly known as “fruit and vegetable bags”, are still authorised under the condition that they are compostable in household composting and with organic contents of at least 30% in 2017, 40% in 2018, 50% in 2020 and 60% in 2025. Their biological breakdown in household composting is provided by the NF T51-800 standard which ensures the total biological breakdown of the product.

See Appendix concerning composting standard
Industrial composting sites in France
To date, France has approximately 700 sites that compost mainly organic waste (garden waste). About fifteen of them also treat organic waste from sorting from the source and in a separate collection. Some so-called composting units are part of mechanical-biological sorting facilities (MBS).

Mechanical-biological sorting (MBS)
Mechanical-biological sorting facilities are used in France to treat mixed household waste, i.e. waste which was not collected separately in order to be recycled or composted. In these facilities waste is separated into 4 parts: organic, strong energy capacity, recyclables and the inert part. The organic part is then to be recovered by composting or methanisation (then with a possible composting of the digestate). MBS compost is made up of uneven quality; compost from sorting at the source is better accepted by farmers who promote a quality return to the soil. This is why the Energy Transition Act discourages using this technology which is therefore no longer subsidised.

Just as non-compostable plastic packaging must not be disruptive in sorting for the organic waste recovery, biodegradable and compostable plastics should not be disruptive in classic chains of plastic recycling. This way, all of the plastic packaging, compostable or not, will still be able to be used for different purposes, first and second, while each having their own chain of recycling, organic or material.

2.3.3 Packaging recovery through energy recovery
Recovery by energy recovery is a method to be used when the re-use of material is no longer possible, it is listed in the waste directive as a waste recovery approach.

In 2014, 1.2 million tonnes were also energetically recovered or incinerated in incineration plants with energy recovery (including plastics, paper-cardboard, wood and metals, aluminum films less than 50 micrometres thick).

This upcycling is done in municipal waste incineration plants equipped for energy recovery as electricity and steam, as well as in solid recovered fuel (SRF) which prepares waste with a strong combustion value for cement factories, lime kilns and industrial boiler rooms.

It is however necessary to specify that CSR by law is of co-incineration with a main objective to produce heat or electricity to answer an identified need, while the objective of the incineration consists of the elimination of waste flows, energy recovery being a co-benefit.

In the field of household packaging, concerning the implementation of the sorting instructions outreach program for all plastic packaging, Citeo encourages local authorities and operators to systematically recover as energy the waste of sorting centres. The goal is to associate sorting with a “Zero discharge” objective, by ensuring that waste sorted by the consumer is entirely recovered, with a priority in recycling, and additionally as energy.

Foreword

It seems that packaging jobs have always suffered from a lack of communication that has led to different stakeholders not being familiar with the subject and they have communicated very little with each other. Mr. Papillon was one of the first vectors for raising citizen awareness, but it is clear that a substantial effort of exhaustive INSTRUCTION is fundamental in order to SHARE the issues and best practices to be implemented:

- teaching marketers so that they take on a real eco-design, use recycled materials and ensure they do not introduce disruptive sorting or recycling material,
- teaching the citizen-consumer whose role is to carry out the the first level of sorting,
- teaching public authorities and environmental organisations so that they guide, facilitate and accompany the implementation of best practices for collecting and sorting,
- instructing recyclers so that the quality of the products provides a real reusable resource just like virgin materials.

The overall success of a second life for packaging materials requires co-operation and synergy of all the actors implied in this chain. The overall effectiveness and performance is created by each link that is involved in this chain.

3.1 All involved in prevention by cutting down at the source

As recalled in 2.2.3, prevention by cutting down at the source is regulated and registered in the French Environmental Code. The CNE points out the rules of its reference frame:

it is a method of analysis and measurement of the impacts according to the following principles:

- taking into account the product-packaging pairing
- analysis with a practical use value of the identical product for the consumer
- assessment of the complete packaging system (primary, secondary, tertiary)

The CNE has identified eight levers of prevention:

- change the design of the product,
- change the packaging process,
- design packaging differently,
- simplify the packaging system,
- optimise packaging dimensions,
- benefit from technical material developments,
- improve the implementation of materials,
- optimise the palletizing of products.

The CNE recalls the packaging waste prevention lessons

- Economic interest and environmental benefits often go hand in hand,
- Preventive action is the fruit of the work of a whole chain of partners,
- Optimising packaging dimensions is the most common solution,
- The simplification of packaging is an approach that should be privileged,
- Reducing packaging leads to transport and energy savings,
- Developments in materials and their implementation techniques offer opportunities,
- Changing the product design leads to chain reactions,
- Cutting down at the source and marketing can go hand in hand,
- Prevention is a permanent quest.

The preventive actions are indexed in the CNE and Citeo’s prevention catalogues (non-exhaustive)

3.2 All together to promote packaging eco-design

The eco-design\(^\text{11}\) of all packaged products (and not only of packaging) is a process that takes into account the whole life cycle of the product-packaging pairing so as to reduce the environmental impact of the latter. Packaging does not exist separately but is interdependent of the product which it preserves, transports, etc. and thus limits waste and loss of the product\(^\text{12}\).

The CNE recalls that its partners have worked for more than 20 years on integrating eco-design in their development approaches for product-packaging pairing.

The benefits

Eco-design allows:

- To act for a lesser environmental impact of the developed products.
- To reconsider the existing products, their mode of distribution or use.
- To identify and control the risks/costs inherent in the complete life cycle of the product.
- To be a source of optimization/reduction of transport costs, raw materials and packaging.
- To incorporate raw materials coming from the recycling process in products favoring the sectors of recycling of the latter or other products developed with the same material.

The eco-design also brings profits in terms of strategy on medium and long term for the image:

- To pre-empt the weak signals emitted by stakeholders acting as contractors, consumer associations, associations for the protection of the environment or public authorities.
- To anticipate any changes in regulations and to be prepared.
- To consider the environment like an internal management lever in innovative and creative processes.
- To give a sense of direction by bringing a positive image both internal to the company (pride of employees) and external (image of the company in the civil society) once the approach is sincere and robust.
- To make of it a true source of differentiation and innovation in a competitive environment and to recruit both new customers as well as attract new markets.

The CNE can only encourage the economic actors of the packaged product to adapt to its eco-design methodological guide\(^\text{13}\) for packaged products by pointing out the importance, in particular, of developing packaging with an end-of-life that is compatible with sorting plants and recycling facilities.

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\(^{11}\) See definition in appendix.
3.3 All aware of sorting

To increase the rate of material re-use, we have to collect more. This can be done not only by technical means that suffice for collecting but also by an effort to simplify, to teach and to extend the importance of sorting both to the user (in B to B) and the final consumer (in B to C). Throughout the flow of packaging, each actor has an important role to play, which are summarised below in some key points.

The role of the user, the consumer
The user/consumer’s commitment needs to be developed via the following actions:

- propose the “tools” already available and to give information about the subjects below:
  - how does a sorting centre work explained simply by Citeo with videos: [http://www2.ecoemballages.fr/suivezmoi/](http://www2.ecoemballages.fr/suivezmoi/)
  - teaching about future resources: explain what sorting is used for to the citizen and what happens to recycled packaging, what happens to these resources?
  - explain that the “yellow dustbin” is the gate to the second life of the packaging.
- recall the role of the consumer according to their consumption choices (sustainable/responsible consumption);
- promote sorting by marketers from the moment of consumption;
- put the citizen back in the centre of the system, in particular by sorting while tackling the subjects below:
  - messages to be reinforced to consumers/users;
  - mobilising the citizen (particularly in urban environments where sorting is rather weak): try to approach the borders between sociology (for example, demography) and the means placed at the disposal of the consumers;
  - cleanliness is everyone’s responsibility: citizens should want to participate in sorting;
  - “raise awareness” on the consequences related to litter;
  - reminder of the sorting instructions 2022 (extension instructions for sorting all plastic packaging).

The role of the marketers
To raise awareness and inform citizen consumers by posting, to the best extent possible, on packaging, or by off course measures (communication off-pack) on good sorting habits of the various elements constituting the product-packaging pairing.

The role of the “public actors”
- To standardise and simplify sorting instructions
- To standardise dustbin signs for:
  - collection of household waste (registered in the Grenelle Act)
  - urban property (station, airport) and to ensure effective collection in these places.
- Points of voluntary contribution and sorting by inhabitants: to carry out an inventory of good practices in terms of European cities.

The role and missions of the eco-organisation Citeo
- Organise and increase collection, sorting and treatment of paper and packaging to increase the rate of recycling at the best cost, by mobilising all actors
  - Support the extension of the sorting instructions of all household packaging (and especially all plastics): educational effort during the phase of transition = support to avoid demobilisation
  - Accompany the progression towards a standardisation of collections schemes at a national level

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14 For example, Citeo advertising 2018: *you sort, we recycle* (in French)
• Pilot research programs and help companies to develop eco-design, including packaging waste prevention, raising awareness and taking into account the environmental impact of their packaging and paper
• Inform and educate citizens to take on the habit of sorting, a prerequisite for the growth of collection and recycling in France

3.4 All concerned with recycling

As soon as the preceding stage is effective, packaging is forwarded to sorting centres. This stage which can manual, semi-automated or automated, aims at separating packaging according to the nature of the materials (plastic, cardboard, steel, aluminium, etc). To facilitate the transport of materials re-sorted in this manner, they are transported to recycling channels.

Since 1992 the end-of-life of household packaging has been registered, in line with extended producer responsibility (EPR) (see regulation 5.2). Recyclers are at the heart of this system, intended to develop recycling of household packaging, to financially support local authorities in charge of the household waste management and to internalise the costs of end-of-life in the new products to encourage eco-design.

Producers of packaging pay a contribution to an eco-organisation which transfers it as a means of support for local communities which ensure household waste management (“financial” EPR).

Regarding industrial packaging waste, the holders of waste must ensure their recycling. Equipment is provided and removal is ensured by recycling companies. Also, the companies are subject to the obligation of sorting of 5 flows (see regulation 5.2) including plastic and cardboards flows.

Beyond the preventive actions and waste reduction (see 2.2.2), as sorting of packaging is assumed by the users, consumers, recycling will be more and more developed.

The recycler takes back the collected recyclable waste to transform it into recycled raw material (RRM). The activity makes it possible to prepare this new raw material that is sold on a competitive material market with virgin materials. According to whether it is plastic or cardboard packaging, the stages and the operation differ:

From plastic packaging waste collected to plastic granules and flakes

Initially limited to flasks and bottles, the EPR for household packaging is extending gradually to all plastic packaging waste and will affect the entire population by 2022.

Among plastics used for packaging, those which are mainly recycled are: polyethylene (PE), the polypropylene (PP), polystyrene (PS), ABS, PVC, PET and certain technical plastics.

The source of plastic packaging to be recycled could be:
- Selective collecting (packaging) with the assistance of the local communities
- Sorting of ordinary industrial waste (OIW)

Collected flows are then sorted in household packaging sorting centres to separate, in one or more stages, the various materials (such as cardboard, plastic resins). The sorting and baling of the materials, separated in flows from various resins, make it possible to prepare the material so that it is sent to the second stage of plastic recycling: regeneration factories. Here, waste is crushed into flakes, then washed, rinsed, wrang, dried and filtered and finally regenerated to obtain granules. These can be substituted for virgin resin in the producers’ process.
From cardboard packaging waste collected to cardboard bales

Although recycling of professional papers began as early as the 19th century, the collection of household cardboard is much more recent with the arrival of EPR packaging.

Cardboard consists of cellulose fibres and is the result of the treatment and preparation of wood or paper-cardboard to be recycled. The main differences are in terms of grammage, composition and structure.

Recyclable cardboard packaging waste can have different origins:

- Department stores, logistics and industry (cardboard box).
- Selective collection of household waste by local communities.
- Sorting of ordinary industrial waste (OIW)

After prior sorting by citizens and collection, the next step is the preparation of the materials so that they can be reintroduced into the on-premises channel/circuit of consumption, particularly stationary shops. It concerns sorting and baling of materials, separated in different types and qualities of flow.

The qualities of fibres resulting from recycling correspond to various uses of industry stationary and are defined by a European standard\(^{15}\).

Recyclers thus allow the supply of raw material from recycled stationary and cardboard makers to recreate paper or cardboard.

RRM flows prioritise their supply to industrial stationary in France. The growing worldwide demand for fiber recycling guarantees the surplus flow.

From wooden pallets to particle boards

Pallets are packaging, the used material is the wood A. Recyclers collect pallets, these are then crushed and particles of metal are eliminated. According to the size grading written in the specifications of the customers, recyclers make boards. A part of the wood is also used to feed the boiler of boards factory.

3.5 All involved in the use of recycled material

Within the framework of the circular economy, increasing the use of recycled material has environmental benefits.

The integration of recycled material makes it possible to maximise the effectiveness of using the resource, whatever the product made with these materials.

This integration is possible by using some levers: for example, the TGAP is a lever for the collection and the orientation of flows towards sectors of recycling, if it is incentive enough.

Indeed, the recycled material can be reintegrated into the "packaging" loop, for example:
- Making cardboard packaging from recycled fibers
- Make PET bottles from recycled PET from bottles.

The limits of reintegrating the recycled material in the same packaging loop can include:

- The price (financial incentives for the use of the recycled raw materials in particular by financial mechanisms to be competitive on the market)
- a lack of material to be recycled (metal and glass packaging)

\(^{15}\) Standard NF EN 643 Mars 2014: paper and cardboard - European List of standard kinds of paper and cardboards for recycling.
• Constraints of a technical nature
  o the suitability for food contact with food: lawful criteria, for example, in the field of plastics, only recycled PET is currently suited to be in contact with food in France.
  o The nature of packaging and the possibility of joining a given process.

The recycled material can also be reinstated in broader loops beyond the packaging sector, for example, material resulting from recycling of aluminium packaging which can be used to market car parts.

The CNE invites the reader to refer to their document\textsuperscript{16} “Packaging & the Circular Economy: an emblematic case study of the Circular Economy” to find out more on synergy between the value chain actors of the packaged product.

4. From sorted packaging to materials

Material recycling as an economic activity helps primarily on a local scale.

Recycling packaging is also a local activity. Material resources are mostly reused locally (in France) and potentially, to a lesser extent, regionally (in Western Europe).

4.1. Where does sorted packaging go?

4.1.1 Industrial and commercial packaging

Collection channels for industrial and commercial packaging are directly managed by the companies selling their packaging waste on the marketplace.

Case of cardboard packaging (cf. map below)
France is a net exporter of recycling papers and cardboards. 74% of waste papers and cardboard packaging collected and sorted out are recycled in France. The recycling is so operated near the places where waste is generated. For that purpose, cardboard waste to be recycled is bought by the paper-makers for an amount furthermore of 400M€, in particular to communities, contributing to the financing of the circular economy.

The balance (26%) is exported, at 80% rate in Europe (that is 20,8% of the collected and sorted out quantities) and in 18 % rate in Asia (that is less than 5% of the collected and sorted out quantities).

French recycling paper and cardboard packaging trading in 2016
Main flows

Source: Copacel
4.1.2 Household packaging

China’s recent decision to close its borders to importations of poorly sorted waste highlighted the urgency to improve local and European recycling channels and make them more durable.

This stance has been that of the French channel for household packaging since the beginning. The vast majority of materials coming from selective collection sorting centres are being recycled in France (88%), in Europe (9%) and only in minority in Asia (3%).

For instance, see the chart below concerning the geographical destinations of household packaging recycling materials as part of Citeo.

Destination (in tonnage percentage) of recycling materials from the CITEO system\textsuperscript{17}

\begin{center}
\begin{tikzpicture}
\begin{axis}[
    ybar stacked,
    enlargelimits=0.15,
    legend style={at={(0.5,-0.15)},
                  anchor=north,legend columns=-1},
    symbolic x coords={Steel, Aluminium, Paper - cardboard (including cartons), Plastics, Glass, Total},
    xtick=data,
    nodes near coords,
    nodes near coords align={vertical},
]
\addplot [fill=blue,draw=black] coordinates {
    (Steel,83) (Aluminium,96) (Paper - cardboard (including cartons),63) (Plastics,76) (Glass,100) (Total,88)
};
\addplot [fill=red,draw=black] coordinates {
    (Steel,15) (Aluminium,4) (Paper - cardboard (including cartons),29) (Plastics,19) (Glass,0) (Total,9)
};
\addplot [fill=gray,draw=black] coordinates {
    (Steel,2) (Aluminium,8) (Paper - cardboard (including cartons),8) (Plastics,5) (Glass,0) (Total,3)
};
\legend{France, Europe (outside of France), Asia}
\end{axis}
\end{tikzpicture}
\end{center}

Source: Citeo 2016

\textsuperscript{17} Source: Material Information Committee 2016, Eco-Emballages & Adelph
4.2. What happens to materials?

4.2.1 Industrial and commercial packaging

Find a non-exhaustive list of industrial and commercial packaging below: these types of packaging represent approximately 7 million tonnes brought to the market per year, many of which part of a circular circuit of reuse. If you would like to find out more about industrial and commercial packaging reuse, the French Packaging Council provides information on the upcoming publication of an Ademe study\(^{18}\) on the subject.

<table>
<thead>
<tr>
<th>Material</th>
<th>Metal</th>
<th>Paper/cardboard</th>
<th>Plastic</th>
<th>Glass</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples</td>
<td></td>
<td>Crates, trays, boxes, bags, GC, containers, dunnages interlayers, edge protectors, pallets, etc.</td>
<td>Barrels, crates, pallets, palletizing films, etc.</td>
<td>Bottles (cafés, hotels, restaurants)</td>
<td>Pallets, crates, etc.</td>
</tr>
<tr>
<td>Barrels</td>
<td></td>
<td>IBC (intermediate bulk container)</td>
<td>IBC (intermediate bulk container)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IBC (intermediate bulk container)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel containers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{18}\) Publication of October 2018
Industrial and commercial plastic packaging

Almost 2 million tonnes of flexible plastic packaging is consumed in France yearly:
- 55% of household packaging;
- 45% of industrial and commercial packaging.

Plastic industrial and commercial packaging is divided on the market as follows:

<table>
<thead>
<tr>
<th>Flexible and Plastic</th>
<th>Rigid Packaging</th>
<th>Hollow Rigid Bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Films: 447,000 tonnes</td>
<td>Trays, Boxes: 107,000 tonnes</td>
<td>317,000 tonnes</td>
</tr>
</tbody>
</table>

The average recycling rate of plastic industrial and commercial packaging reached 25% in 2014. Note that, depending on the type of packaging, many activities apply reuse techniques (cf. French Packaging Council document on industrial and commercial packaging reusing).

Some recovery examples

The graphs below summarise the upcycling circuits followed by two different types of packaging:
- buckets, containers, barrels and IBC;
- films and bags.

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• Industrial and commercial paper/cardboard packaging

Industrial and commercial packaging makes up 80% of all paper/cardboard packaging products. The French Environment & Energy Management Agency (ADEME) estimates that 98% of them are recycled. On average, the integration rate of recycled fibre incorporated to paper/cardboard packaging amounts to 91%, recycled cardboard being mainly used to produce corrugated paper (PPO). The remaining share is made up of new fibres coming from sustainably managed forest as well as other production materials (starch, pigments, etc.).

Generally, paper/cardboard packaging products belong to a closed circuit. With nine packaging products recycled out of ten, paper/cardboard packaging is transformed anew using an effective material reuse system. Cellulose fibres are thus reused 8 times on average, reducing the environmental impact of paper/cardboard packaging while guaranteeing a sustainable supply in materials.

Paper/cardboard packaging is sorted by companies, industries, and retailers. After being compacted and baled, they are either directly sold to a paper mill or a waste management facility.

In the paper mill, retrieved paper and cardboard pieces are first put in a pulper. Mixed with water, this helps separate cellulose fibres from one another and splits them apart from the remaining particles they may contain. Next step is the purification process, which separates the fibres from the elements associated to them: glue, varnish, staples. The fibres then join the regular paper and cardboard manufacturing process. They are transferred on a moving blanket where they are left to drain so as to form a sheet, which will then be rolled and dried using steam-heated metal cylinders. This is how a new sheet of paper or cardboard is manufactured. (source: http://www.lepapier.fr)

• Industrial and commercial wood packaging

In 2017, it was estimated that the volume of collected wooden waste packaging easily upcycled accounts for 0.8 million tonnes in France yearly. This makes a significant share of the 3.8 million tonnes of non-hazardous wooden waste. These 800,000 tonnes of pieces come from wooden packaging products that followed a metal separation process (metal separation uses simple magnetisation; the metal is then reoriented to its own recycling facility). They are sorted and calibrated. Commonly called A-class wood, these woodchips currently undergo a upcycling process in the panel (25%) and wood furnace (75%) industries in France every year. For these industries, this kind of fuel is the main source of average energy at 15 to 20%, and up to 50% for some installations.

It is worth mentioning that wood represents 42% of renewable energies in France, packaging stocks being the main source of industrial wood to supply the most demanding local boiler houses (ICPE 2910-A). The 24/07/14 decree, published in the French Official Journal on 08/08/2014, rules the criteria of end-of-waste status for wooden packaging straw stemming from wooden packaging.

Wood in three packaging families: wooden pallet, light wooden packaging, and industrial packaging

The example of wooden pallets

The pallet stock in France has been estimated to 250-300 million items. In 2015, 52 million of brand new pallets were sold and 106 million pallets were renovated.

21 Source: Industrial, commercial and household packaging - Data 2012 - French Environment & Energy Management Agency ADEME
Wooden pallets are easily repairable: deteriorated or broken elements are dismantled and replaced without any particular constraints by new, working elements (cubes, planks, etc.). Repairs are made following the existing reference documents, bills of specifications and standards: EPAL-EUR, VMF, NF EN ISO 18613, etc. This repair activity for reuse purposes plays a major social (employment) and economic role in galvanising territories.

The example of light wooden packaging

They represent a smaller part of the stock with less than 150,000 tonnes. Over 350 million wooden light packaging products are produced in France yearly. Some others also enter the market through food product imports, especially fruit and vegetable imports.

Part of the wooden crates is sent back to vegetable growers while others are given to consumers for them use for their barbecues, fireplaces, and as storage units.

For the remaining 90% crates, there are currently 3 main ways to recycle the wood they are made out of:

- materials recovery;
- energy recovery;
- composting.

**Materials recovery**

By recovering materials, wood that has previously undergone a metal separation process, has been crushed and often riddled can be recycled through different ways:

- manufacturing of process and composite product panels;
- wood carbonisation for coal manufacturing;
- mulching manufacturing.

**Energy recovery**

The wood quality and cleanliness of trays make them a suitable stock for the end-of-waste status procedure and is used to a great extend for the supply of A-class boiler houses. It is the main outlet.

**Composting**

To work properly, the biowaste mechanical composting process needs to be completed with carbonaceous waste. Wooden trays play this role. They supply gardeners and farmers with 100% natural soil conditioners.
4.2.2 Household packaging

Household packaging in France is covered by packaging EPR (Extended Producer Responsibility). Please find below some elements on what materials that are a part of the recycling circuit become.

- Household plastic packaging

  - Recycled PET is either used in the packaging industry (bottles, thermoformed sheets), where its incorporation rate reaches 20 to 30%, or in the fibre industry;
  - PEHD and PP are recycled in other industries, including in the construction industry (pipes).

Example of PET materials from PET bottle recycling\(^{23}\)

Out of 300 to 350,000 tonnes of PET bottles brought to the market each year, approximately 170 to 200,000 tonnes are recycled.

This tonnage can be divided between 130 and 150,000 tonnes of clear PET plastic and 40 to 50,000 tonnes of dark PET plastic.

Find below the repartition of recycled PET plastic in terms of how it can be used:

<table>
<thead>
<tr>
<th>Material</th>
<th>Category</th>
<th>Tonnage (in thousands of tonnes)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear PET</td>
<td>Fibre</td>
<td>60</td>
<td>43</td>
</tr>
<tr>
<td>Clear PET</td>
<td>Bottle</td>
<td>60</td>
<td>43</td>
</tr>
<tr>
<td>Clear PET</td>
<td>Sheet</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Clear PET</td>
<td>Other</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dark PET</td>
<td>Fibre</td>
<td>42</td>
<td>93</td>
</tr>
<tr>
<td>Dark PET</td>
<td>Other (strapping, sheet, etc.)</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

- Plastic packaging recently sorted out in the "yellow bin"

France modifies its instructions of sorting for the household packaging and in 2022, all the French population will sort out its cups and trays, its plastic films in recycling bin. So many materials will be sorted out in sorting facilities. These still have no flow of recycling well installed, some applications already exist and allow to recycle flows but numerous opportunities remain to build.

The action of sorting of these packaging is the first essential stage to develop their recycling: it allows to sort out in sorting facility and to concentrate flows of these resins.

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\(^{23}\) CITEO assessment (2016)
• **Household paper/cardboard packaging**

Household packaging makes up 20% of all paper/cardboard packaging products. This type of packaging has a recycling rate of 67%. The recycled fibre integration rate in paper/cardboard packaging averages 91%. As virgin fibres are needed for certain uses, the recycled fibre integration rate in household packaging is slightly lower. The remaining share is made up of new fibres stemming from sustainably managed forest as well as other production materials (starch, pigments, etc.).

Like industrial and commercial packaging, household paper/cardboard packaging are a part of the closed paper/cardboard circuit.

Papers and cardboards are selected through a first sorting process by the consumer, who throws the waste in the recyclable rubbish bin. They are then sorted in the waste sorting centre and baled before being sent to paper mills to be recycled. The process there is similar to that of industrial and commercial packaging (see above).

• **Food beverage cartons**

Food beverage cartons are recycled using paper mills equipped with the appropriate pulper (a large barrel filled with water). Through mechanical action, pulpers can separate the food cartons’ components meant to protect them and keep the products fresh. Cellulose fibres (73%) are separated from thin polyethylene (23%) and aluminium (4%) layers.

Food cartons brought onto the French market are recycled:

- at 60% in France by two paper mills;
- at 40% by paper mills located in neighbouring countries (mainly Italy, Spain, Germany).

The paper pulp resulting from the process is used to manufacture hygiene products for individuals and companies (kitchen towels, toilet paper, tissues) or to manufacture other types of packaging.

The polyethylene and aluminium (PolyAl) mix is retrieved through floating, aggregated in granules by a French plastic converter, then treated with extrusion and injection to obtain bars and profiles;

this new raw material is used to manufacture street furniture, vine posts, or pallets.

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24 Source CITEO: food cartons recycling  [https://www.youtube.com/watch?v=o3XDfn14DI0](https://www.youtube.com/watch?v=o3XDfn14DI0)
• Household metal packaging

The example of aluminium packaging

Collected aluminium packaging products are always immediately recycled; whether it be through sorting in the recycling rubbish bin, the waste bin or after incineration. It is however recommended to sort them in the recycling bin since this way, compared to the other two options, ensures the best collection for this type of packaging.

Aluminium packaging is either classified as rigid or semi-rigid (beverage cans, aerosols, food cans and trays) or flexible (thin aluminium sheets used to wrap cheese, chocolate, bottle caps, coffee capsules, champagne caps, or other flexible packaging items made out of multi-layered products from aluminium as a major component associated with either plastic or paper, or both). Recycling methods are different depending on these two types of products.

• Recycling process of rigid packaging

The products leaving the waste sorting centre are delivered in bales (see below):

![Aluminium packaging bales](image)

Rigid packaging ‘delaquering’ rotary furnace

Original photograph: Regal Affimet

The bales made out of sorted rigid aluminium packaging are sent to refining factories. The refining process consists in melting the products in a rotary furnace.

Once the material has been melted, it is transferred to a holding furnace. This enables to balance the amount of alloying metals (copper, nickel, etc.) in order to manufacture a type of metal that can be used to remake **canned drinks**, or to make **aluminium bars, which are used as raw material when manufacturing car parts**.

• Recycling process of flexible packaging

A pyrolysis process needs to be performed in order to retrieve aluminium components, since waste generated by this type of packaging come in a significant part from organic products (plastic, paper, food traces, coffee, etc.).

![Flexible aluminium packaging](image)

Aluminium after pyrolyse process

The pyrolysis process consists in heating packaging to a temperature between 500 and 550°C in an atmosphere deprived of, or with little oxygen. The products go through containers. In order to degrade gas or oil organic materials, which are going to be used as fuel to heat up the system, the surface exposed to these temperatures is expanded.

**The aluminium thus obtained becomes raw material to manufacture moulded aluminium pieces, which are then used in the car industry.**
Example of the steel packaging

The steel packaging (cans, sprays, food boxes not can of food, capsules, etc.) collected are sorted out in sorting facilities thanks to a magnetic conveyor belt, so using the specific property of steel.

Packaged in packs (see below), these steel packaging are put in a converter in steelworks either only, or added by some cast iron, to produce a new steel which will serve for the car industry, the household electrical appliances, the construction and of course the packaging.

![Packages of steel ready to be put in the oven in steelworks](image1.jpg)

![Converter in steelworks for the production of new steel](image2.jpg)

The new liquid steel solidifies into slabs which will be flattened according to the specifications of the customer.

![Production of a reel of steel produces with recycled scraps.](image3.jpg)

In the case the steel packaging goes in household waste, it is incinerated and extracted from ferrous clinkers after an operation of grinding before going to steelworks.

The steel industrial and commercial packaging follow relatively identical processes of sorting and treatment - either by a sorting and a conditioning as in the case of the sorting facility, or incinerated in the case of packaging having contained dangerous products.

Permanent material, steel can be recycled infinitely, without losing its intrinsic properties, in complete safety. Hence the importance to collect in order to contribute to the economy of resources and energies produced by its recycling.
Household glass packaging

As of today, more than 7 bottles out of 10 are recycled. Cullet (recycled glass) is now the main raw material in the glass-making industry with a larger percentage than 65%. Some glass furnaces operate with over 90% of cullet. In 2012, more than two million tonnes of glass were collected and recycled. All collected glass packaging is meant to manufacture packaging in turn. Such upcycling process enables:

- to save energy: recycling 10% of glass components instead of using virgin raw materials helps saving 3% of energy;
- to reduce CO2 emissions: recycling one tonne of glass components avoids emitting more than 500kg of CO2 (CO2 emissions were cut by 17% between 2005 and 2011 by tonne of glass);
- to reduce natural resources depletion: every kg of cullet used instead of raw materials enables to save 1.2 kg of virgin materials;
- to optimise logistics, thus minimising the carbon footprint linked to haulage. Recycled glass batches come from local collection sites situated near factories.

Evolution of the recycling rate in France

Note: 2015 recycling rate: 74.8% (source: ADEME)

Source: Verre Avenir
5. Conclusion

This document is meant to draw a picture of the current situation, as situations change rapidly. Fluctuation in raw material prices, technologic innovations, new packaging materials, environmental pressure, regulations, financial incentives, the share taken by each upcycling mode, as well as sorting instructions are many of the elements that need to be taken into account by stakeholders.

The French Packaging Council reiterates that packaging must be able to achieve the functions intended for the product itself (protection, transport, traceability, etc.) as well as the functions destined to the consumers/users (in particular regulation-wise) such as acceptability, facility of use, information, etc.

In terms of evolution, the French Packaging Council\(^{26}\) points out that evolutions in consumption patterns (on-the-go consumption, etc.) and distribution channels (e-commerce, drive-through supermarkets, etc.) have consequences on the percentage of the different materials used in packaging. The proportions of collected, sorted and recycled waste will to change.

The marketers are attentive to users’ needs and put innovation at the centre of their effort to develop packaged products. This effort must include sustainable design as a prerequisite. Eco-design is a key factor of the product’s successful new life after consumption. As such, it is taking a growing stance in companies’ strategies.

Successful and efficient circular economy packaging techniques are required to meet the French national and European Commission objectives set by regulations.

An awareness campaign has been followed by all stakeholders along the packaged product chain, so that the packaged products’ life after consumption can be as efficient as possible and with the smallest environmental impact possible.

Teaching methods to all stakeholders, implementing new collection means in order to recycle more, upstream innovating to make sure packaging has been designed to be recyclable as well as downstream innovating for industrial sorting and recycling systems to invent sharper tools that can especially manage plastics in the context of extended sorting instructions.

6. Appendix

6.1. Definitions

6.1.1. Circular economy

Definition of the French Environment & Energy Management Agency (ADEME):
“Economic system of trade and production that aims to improve material efficiency at all stages of the life of a product (goods and services) and reduce its impact on the environment while enabling individuals’ well-being. Holistically, circular economy must strive to cut resource waste radically so as to detach GDP growth from resource consumption. At the same time it also aims to reduce environmental impacts and improve well-being. The idea is to do more and better with less.”

Definition of circular economy applied to packaging

For the packaging industry, circular economy isn't limited to recycling. It covers all the life stages of packaged products, i.e.: design, production, distribution and use, as well as the different packaging upcycling modes. Circular economy helps reducing environmental impacts, in particular by making sure resources (materials) are used efficiently and ensuring that renewable resources are used sustainably.

Circular economy includes the concepts of locality and presence in the territories.

Resource savings (materials, water, energy) are included in circular economy as well, thanks to:
- eco-designing both the product and its packaging;
- optimising the use of all resources;
- reusing packaging, especially in B to B;
- avoiding packaging waste;
- avoiding product loss, especially by avoiding waste;
- avoiding waste by improving recyclability;
- looping materials streams by reusing materials.

All initiatives for behavioural and/or market codes changes for the best of packaging are also involved in the concept of circular economy.

It ensures collaboration between the various stakeholders during all stages of the packaging chain, partly thanks to industrial ecology.
6.1.2. Packaging

Packaging\textsuperscript{27} shall mean all products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from the producer to the user or the consumer. ‘Non-returnable’ items used for the same purposes shall also be considered to constitute packaging.

“Packaging\textsuperscript{28} consists only of:

\textbf{1° Sales packaging or primary packaging (I),} i.e. packaging conceived so as to constitute a sales unit to the final consumer at the point of purchase;

\textbf{2° Grouped packaging or secondary packaging (II),} i.e. packaging conceived so as to constitute at the point of purchase a grouping of a certain number of sales units whether the latter is sold as such to the final user or consumer or whether it serves only as a means to replenish the shelves at the point of sale. It can be removed from the product without affecting its characteristics;

\textbf{3° Transport packaging or tertiary packaging (III),} i.e. packaging conceived so as to facilitate handling and transport of a number of sales units or grouped packagings in order to prevent physical handling and transport damage. Transport packaging does not include road, rail, ship and air containers.”

For more information, please refer to directive 2013/2/EU\textsuperscript{29}.

Editor’s note:

- Primary packaging can be composed of several elements. It protects the product and its characteristics throughout the chain and up until the product’s consumption (e.g.: packaging bag, bow, and wrap).
- An article is a primary sales unit or a consumption unit.
- A group is the merging of a number of primary sales units.

The packaging system\textsuperscript{30} usually combines all three packaging types but primary packaging can, in some cases, fulfil the functions of the other two types. The packaging system should be capable of performing all the function characteristics of these subsystems.

Regarding their end of life management responsibilities, packaging products can also be differentiated depending on their final users and as follows:

\textsuperscript{27} French Environmental Code (Book V, Title IV, Chapter III, Section 5, Article R543-43).
\textsuperscript{28} Directive n°94/62/EC on packaging and packaging waste.
\textsuperscript{30} The complete packaging system is composed of primary, secondary and tertiary packaging. French Packaging Council - December 2010
Household and similar packaging (municipal channel)
All the packaging products that are discarded by households after the product in unpacked and consumed.

Non-household packaging
All the packaging products that do not belong to the household packaging channel: packaging linked to industrial activities (B to B packaging, multi-pack and transport packaging, packaging used in group catering channels or by cafés, hotels, and traditional restaurants).

6.1.3. Eco-design

Regulatory definition

"The integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle." In the interest of sustainable development, continuous improvement in the overall environmental impact of those products should be encouraged, notably by identifying the major sources of negative environmental impacts and avoiding transfer of pollution, when this improvement does not entail excessive costs.

The eco-design of products is a crucial factor in the Community strategy on Integrated Product Policy. As a preventive approach, designed to optimise the environmental performance of products, while maintaining their functional qualities, it provides genuine new opportunities for manufacturers, consumers and society as a whole.

In order to maximise the environmental benefits from improved design, it may be necessary to inform consumers about the environmental characteristics and performance of energy-related products and to advise them on how to use products in an environmentally friendly manner.

ADEME’s definition:

Eco-design is a corporate approach which consists in taking the environment into account from the product’s design stage. It aims to cut the negative impacts a product can have on its environment throughout its life cycle (raw material depletion, production, distribution, use and end of life) while retaining its functional qualities (same performance and/or effectiveness).

6.1.4. Prevention by source reduction

Definition:

“Process helping, for identical required functions, to reduce the weight and/or volume of primary and/or secondary and/or tertiary packaging as much as possible without altering its required functions or user’s acceptability, thus minimising its impact on the environment.”

Note: “Substituting a packaging material with another packaging material is not considered technique that can achieve source reduction.”

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31 Extracts of Directive 2009/125/EC of 21 October 2009 establishing a framework for the setting of eco-design requirements for energy-related products
32 Extract from standard EN 13428
6.2 Regulations and standards

European Directive 2008/98/EC on waste

The directive defines the following waste management hierarchy for all types of waste (packaging and other products); prevention is determined as the preferred action to undertake in legislation and waste management policies:

- prevention;
- preparing for re-use;
- recycling (chemical, mechanical, organic);
- other recovery, e.g.: Energy recovery;
- disposal.

It also defines prevention, which can be read in article L541-1-1 of the French Environmental Code:

"Prevention: all measures taken before a substance, material or product has become waste, when these measures reduce at least one of the following items:

- the quantity of generated waste, including through the re-use of products or the extension of the life span of substances, materials and products;
- the adverse impacts of the generated waste on the environment and human health;
- the content of substances harmful to the environment and human health in substances, materials and products."

European Directive 94/62/EC on packaging and packaging waste

Packaging waste prevention is defined as: "the reduction of the quantity and harmfulness for the environment of:

- materials and substances contained in packaging and packaging waste;
- packaging and packaging waste at production process level and at the marketing, distribution, utilisation and elimination stages."

The directive rules essential requirements and specifies that only the packaging products following these requirements can be brought on the European market. These requirements concern both prevention, by reducing packaging at source, and upcycling, by considering the recycling process of used packaging from their design on.

The directive anticipates policies that aim to reduce packaging waste generation and promote recycling, re-using and other forms of upcycling for this type of waste. Final disposal shall be considered as a last resort solution.

The European circular economy legislative package

The objective is to provide a single legislative framework for all Member States on waste in general, and more specifically on packaging and packaging waste.

The package is composed of four texts. These texts particularly highlight municipal waste recycling, with the following objectives: A minimum of 44% of recycled waste from 2018/2019, 55% by 2025 and 65% by 2035. 65% of all packaged products should be recycled by 2025 and 70% by 2030. The legislative project also reduces the share of municipal waste sent to landfill to a maximum of 10% by 2035: landfilling should become an exception.

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34 Directive amended by Directive 2004/12/EC.
The four texts were formally adopted by the European Parliament on 18 April 2018 and the European Union State Members approved the circular economy package on 22 May 2018.

**French law n° 2009-967**

This law gives priority to waste generation prevention. Extract of article 46 paragraph 2:

"[...] As such, national objectives are defined as follows:

a) Reducing household and similar waste generation by 7% per capita over the next five years;
b) Increasing organic and material recycling in order to attain a household and similar waste rate in said recycling systems of 35% in 2012 and 45% in 2015 versus 24% in 2004; this rate is defined at 75% from 2012 for household packaging waste and company common waste, with the exception of construction and public works industries, agriculture, agro-industries and specific activities.

More specifically, organic waste management should be improved by supporting first and foremost local handling, with domestic and local composting, methanation and composting of fermentable household waste, and especially that of mass-producers that are collected separately. This aims to ensure the environmental, health and agronomic quality of compost as well as its traceability when it is brought back to the soil."

**Article L.541-1 of the amended French Environmental Code**

This article provides the guiding principles of the French waste management policies and introduces a legislative framework for the notion of second life cycle:

"1° The following I is added at the beginning:
« I. – National policy for waste management and prevention is a fundamental lever to transition to a circular economy. Their objectives were approved in accordance with the waste management hierarchy modes defined in II, i.e.:

1° Prioritising prevention and waste generation reduction by cutting the volume of household and similar waste by 10% per capita and by reducing the volume of waste generated through business activities per unit of value, particularly for the construction and public works industries and in 2020 compared to 2010 [...].

4° Increasing the volume of waste treated through a material recovery process, including organic waste, by sending respectively 55% in 2020 and 65% in 2025 (measured in mass) of non-hazardous non-inert waste to these recovery channels.

5° Expanding progressively the sorting instructions to all plastic packaging in the whole country before 2022 and as a priority to recycle this type of waste while taking into account the prerequisites from the 2011 experiment on expanding sorting instructions for plastic packaging.

7° Decreasing by 30% the volume of non-hazardous non-inert waste accepted in storage facilities in 2020 compared to 2010, and by 50% in 2025.

8° Reducing the volume of non-recyclable manufactured products brought to the market by 50% before 2020 [...]

36 French Law of 3 August 2009 known as the Grenelle I Law.
37 Article 46.
II. – The intent of the provisions of this chapter and of article L.125-1 are:

1° First and foremost, to prevent and reduce waste generation and harmfulness by working on the design, manufacturing and distribution of substances and products and by promoting reuse purposes, as well as to decrease the global repercussions of resource use and to improve their end-use efficiency;

2° To implement a waste management hierarchy, which prioritises, in order:

   a) Preparing for re-use;
   b) Recycling;
   c) Any other recovery, e.g. energy recovery;
   d) Disposal […]

4° To organise waste transport and to limit the distance and volume that can be transported following a proximity principle […].

The Principle of Extended Producer Responsibility (EPR)

In France, any economic stakeholders, manufacturers, and suppliers bringing products that generate waste to the market are held accountable for the management of part or all the waste generated. This stands in article L.541-10 of the French Environmental Code:

"In accordance with the extended producer responsibility principle, the producers, importers, and suppliers of these items or of the elements and materials used in their manufacturing may be required to provide for or contribute to managing the waste they generated."

The extended producer responsibility principle is one of the means to support product design and manufacturing using processes that fully consider and facilitate the efficient use of resources throughout their life cycle; including for repair, reuse, disassembly and recycling purposes and without compromising the free movement of goods in the domestic market.

Law n°2015-992 of 17 August 2015 on energy transition to support green growth:

Article 96 codified by article L.541-21-2 of the French Environmental Code which introduces the five waste streams principle and requires to implement a sorting system at source for paper, plastic, metal, glass, and wood waste.

Implementing decree 2016-288 of 10 March 2016 on waste management and prevention as part of the circular economy, which provisions were transferred in:

- The French general code for local authorities regarding paper, plastic, metal, glass, and wood household packaging and more specifically packaging waste manufactured using these materials and discarded by households. Article R2224-26-I of the French general code for local authorities entitles mayors to set by decree the collection methods for the different categories of household waste;
- The French Environmental Code for all other waste predominantly composed in mass of these materials.
Composting standard

Standard NF EN 13432
This European standard determines the conditions of the biological breakdown of a product under industrial composting conditions. Products that comply with NF T51-800, i.e. compostables in household composting are necessarily in conformity with standard NF EN 13432. A product that is compostable in household composting will biodegrade even faster in industrial composting, insofar as the compost management and its increase in temperature (higher, 70°C in order to allow the hygienisation of the compost) are much more stable, effective and always controlled. The label “OK Compost” certifies the product’s compliance with standard NF EN 13432.

Standard NF T 51-800 (November 2015) for the French market
“Plastics. Specifications for plastics suitable to household composting”

It concerns a French standard which specifies that the period of biological breakdown of the product should last from 6 to 12 months depending on the effectiveness of the composter and weather conditions (temperature and humidity). The biological breakdown implies a decomposition of various elements deprived of toxic effects on the natural environment. Household composting is a slower process than the one under industrial conditions. The increase in temperature of household compost is much lower and the stability of the temperature is much more random because it is influenced by several types of factors such as climatic factors (seasonal variation, geography) and human factors (compost management, frequency of mixing, etc). The label “OK Compost-Home” certifies the product’s compliance with standard NF T 51-800.
6.3. Functions of packaging

- **Containing and conserving the content**
  It aims to protect:
  - the external environment from the contained product (limiting risks of leaks, preventing evaporation of solvents to protect the user’s health, forbidding hazardous uses for children, etc.);
  - the content from external constraints (limiting deteriorations due to mechanical shocks, decreasing unwanted flavour and odour transfers, protecting from air and oxygen alterations, barring the development of any germ, insect or undesirable product, preventing content theft or consumption before the buying act, optimising the life-span of perishable goods, etc.).

- **Providing information**
  - on general and legal matters (expiry date, storage temperature, using instructions, unit dosage, composition, suspected allergens, price, quantity, weight, etc.);
  - on manufacturing conditions (Ecolabel, Label rouge, fair trade, “Appellation d’Origine Contrôlée” or controlled designation of origin, etc.);
  - on the product’s specifics and in consideration of its market sector (brand, claims regarding nutrition/health, recipes, cooking method, product’s history, etc.).

- **Regrouping**
  - gathering several consumption units accordingly to the product consumption and to the frequency at which it is bought (packs of yoghurt pots, packs of beer bottles);
  - gathering the products in units easy to handle (bags containing several biscuits) to provide for various consumption patterns (on-the-go consumption, etc.);
  - ensuring product promotion (promotion pack);
  - guaranteeing that the product can be handled and transported by the consumer;
  - facilitating shelving and any other operations of handling for operators.

- **Transporting/Storing**
  - ensuring delivery from the manufacturing site to the selling site without damage (protect against mechanical damage both the product and its packaging) using wooden pallets, corrugated cardboard tops, edge protectors, metal or plastic links, stretch and shrink films, etc.;
  - protecting against malevolent acts;
  - informing logistic centres about the content of transport crates (logo, brand, content, bar code, etc.);
  - ensuring the portability of products by consumers to their place of residence;
  - enabling storage possibilities at the consumer’s place.

- **Facilitating use**
  Using the product goes together with using its packaging as both are usually inseparable:
  - easy or facilitated opening system designed for various groups of users (seniors, children, mobile teenagers, sportsperson, etc.);
  - resealing system designed for a later consumption of the product;
  - multi-portion packaging designed for divided and on-the-go consumption patterns;
  - acceptable handling capacity by insuring an optimal balance between weight, height, shape and frequency of use;
  - precise dosage to avoid any loss;
  - product restitution: empty the packaging of its content as much as possible;
  - ability to use both the container and content together for any conservation (freezing) and preparation methods (regular oven, microwave oven, double boiler, etc.).
● **Facilitating the product’s packaging process**
  - meeting the needs of mechanisation processes;
  - ensuring the safety of the employees operating on product packaging and preparation production lines;
  - resisting to unitary operations of packaging (shocks, heat, throughput, vibration, fastening, hygiene, canning, etc.).

● **Making the product visible and convey the product’s and/or the brand & company values**
  - encouraging buying acts through packaging, which represents a marker on a shelf display (the consumer only spends a few seconds in the store section) with its referential colours, the product’s shape, the material used and the ideas that are being developed, its graphic and typographic design meant to recognise the product immediately;
  - conveying the brand’s assets and values as well as those of the company (corporate social responsibility);
  - ensuring the consumer’s acceptability during the purchase and consumption stages of the product.38

38 “Packaging acceptability for the product, consumer and user”, French Packaging Council, October 2010.
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