Ecodesign and Circular Economy

Biodegradable and compostable packaging in Quebec

A status report
April 2021

Éco Entreprises Québec

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Éco Entreprises Québec (ÉEQ) is a private non-profit organization that represents companies who place containers, packaging and printed matter on the market in Quebec in their responsibility to finance the costs of effective and efficient municipal curbside recycling services.

As an expert, ÉEQ optimizes the curbside recycling value chain and implements innovative approaches with a view to sustainable development and circular economy.

SOLINOV_

SOLINOV is a consulting firm specializing in waste management and provides a full range of services, from collection and transportation to processing and marketing. SOLINOV sets itself apart through its specialized knowledge of biological treatment and organic waste recycling, as well as through know-how and expertise acquired over the course of 30 years in the field.

Acknowledgements

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Table of Contents_

Summary_

Due to great pressure to reduce or even eliminate plastic packaging, so-called biodegradable and compostable packaging have become increasingly popular in recent years. Consumers now see those as being THE solution to plastic pollution. This report deals with that topic by providing an objective overview of the situation in Quebec regarding the environmental issue linked to biodegradable and compostable packaging end-of-life. In short:

1. Unlike biodegradable plastics, which have a wide range of breakdown times, compostable plastics should break down at the same rate as food and green waste (organic material). The near absence of controls regarding the use of self-declared environmental claims and the differences between laboratory conditions to certify compostability and conditions in the field indicate that the framework is imperfect and incomplete.

2. Speeding up the implementation of organic material recovery services and deployment of the composting and anaerobic digestion industry, which are planned for the next five years, will lead to a significant increase in quantities of organic material recovered and processed. We should also see increased volumes of compostable packaging in the three municipal collection routes (recyclable materials, organic material, household garbage). Therefore, the issue of compatibility with processing streams should be addressed now, as the Policy does not define the preferred end-of-life management method for this type of packaging.

3. Given that provincial guidelines governing the industrial composting and anaerobic digestion stream's activities do not specifically address compostable plastic packaging (except for the collection bags for organic material), it is up to each individual facility to decide whether or not to accept it. Overseeing the return of compost to the soil through control measures to find foreign matter is intended to minimize the presence of plastic. However, plastic residues remain, and that source of soil contamination is a concern for more and more experts.

4. The mission of the composting and anaerobic digestion industrial stream is not to manage packaging or sort materials, but to produce quality compost that can be returned to the soil. To achieve this, undesirable materials (including plastics) must be removed as much as possible. However, plastic packaging generally looks the same as conventional plastic packaging, and methods used to remove unwanted materials do not distinguish between unwanted materials and compostable packaging. Ultimately, removed plastic packaging (including compostable packaging) will be sent to landfill.

5. Ecodesign is a lever that integrates analysis based on several environmental, social and economic criteria to support innovation in packaging. This preventive approach helps participants make trade-offs and weigh the importance of the different actions. Ecodesign aims to meet a product's specific requirements regarding protection and preservation in order to avoid losses and food waste along with significant impacts. It also means that right from the design stage, producers think about a package's recyclability or compostability based on existing streams, where the packaging is likely to end up at the end of its lifecycle. "Life Cycle Thinking" provides an overview of the possibilities for reducing impacts, but also of the use of resources in order to keep them circulating in the system and prevent the extraction of new raw materials. Finally, ecodesign ensures responsible sourcing by tending towards transparency and traceability.

Issues and recommendations_

This overview of biodegradable and compostable plastic packaging highlights certain important issues. These come with recommendations that aim to address the problems identified in order to improve the situation:

A. **Consumers are confused** when it comes to biodegradable and compostable plastic packaging: they seem to believe that it prevents the negative environmental impacts of packaging while being an alternative to single-use plastics, which influences their buying choices and sorting actions. **The use of the terms "biodegradable" and "compostable"is subject to oversight, but it is imperfect and incomplete:**

a. The terms "biodegradable" or "compostable" that appear on packaging are an **environmental claim that is not verified by a third party** (unless the packaging is certified): one can therefore reasonably doubt the biodegradability or compostability of packaging identified as such by its manufacturer.

b. Although there are **certifications** to the effect that a product is suitable for composting, these are **voluntary and carried out in a laboratory under specific and controlled conditions** (time, temperature, humidity, etc.), that are different from those in the field.

c. **Compostable plastic packaging is difficult to differentiate** from other plastic packaging, which makes it more challenging for consumers to make purchasing decisions and sort their waste.

Recommendation 1: Ensure a better framework for environmental claims and better alignment of laboratory conditions for compostability certification and those used in the field in the composting and anaerobic digestion industry, in order to limit the use of unverified self-declarations.

B. In the near future, **we can expect a significant increase in the amount of compostable packaging** on the market as well as in the composting and anaerobic digestion industrial stream:

a. The Quebec government's new recovery strategy for organic material, ***Stratégie de valorisation de la matière organique*** (MO) (MELCC, 2020a), with its goal of managing 100% of the OM from the residential and industrial, commercial and institutional (ICI) sectors by 2025, **will lead to an increase in the amount** of organic material recovered and, consequently, the amount of **compostable packaging**.

b. **Bans** on single-use plastic products and packaging, often related to agri-food, **are driving innovation towards so-called compostable solutions.**

Recommendation 2: Implement tracking of this progress (quantities and end-of-life streams) by including compostable packaging as an actual category in province-wide characterization studies.

C. With respect to the Quebec government has clearly stated the management method to be prioritized for organic material (OM): recycling (by composting and anaerobic digestion). **For compostable packaging, the situation is not defined:**

a. As a result, **compostable packaging ends up in all three collection streams** - recyclable materials, organic material and garbage - **and, therefore, in all three processing streams** with their own specific issues:

- Recycling: Contamination of other recyclable materials
- Composting/anaerobic digestion: Packaging is likely to be removed with other unwanted materials (and sent to disposal) or not sufficiently broken down by the end of the composting/anaerobic digestion process.
- Disposal: In a landfill or incinerator, they are deprived of the required conditions for decomposition to occur.

b. There is **no harmonized list of materials accepted** in organic material collections in Quebec. It is currently up to each facility to decide whether or not to accept compostable packaging.

Recommendation 3: The government must take a firm position in favour of recycling in a circular economy perspective so that fiber and plastic packaging is recycled and transformed into new products.

Recommendation 4: A charter for organic material and a unified list of accepted/rejected materials/packaging, including control measures in the field, would clarify the application of the 3R-RD hierarchy in the end-of-life management of compostable packaging.

Issues and recommendations_
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D. In practice, **the journey of compostable packaging** through the industrial composting and anaerobic digestion stream **is closely tied to the management of unwanted materials:**

a. The **mission** of the industrial composting and anaerobic digestion stream **is not to manage packaging or to sort materials**.

b. The industrial composting and anaerobic digestion stream aims to produce quality compost or digestate that can be returned to the soil. To do this, **unwanted materials (including plastics) are removed** as much as possible.

c. Plastic packaging (compostable or not) removed from other unwanted materials is **sent for disposal**.

Recommendation 5: As some organizations have done[1], identify specific applications where compostable packaging might be preferred (e.g., to facilitate food waste collection) and clarify the management method to be prioritized for these.

Recommendation 6: Biodegradable and compostable plastic packaging should be included in extended producer responsibility (EPR) and be subject to eco-modulation measures linked to their impact in end-of-life management. The worst signal to give to companies is to imply a lack of financial responsibility for packaging placed on the market.

Recommendation 7: Provide a clear legal framework so that packaging being marketed is reusable, recyclable or made of recycled content.

E. **The purpose** of composting/anaerobic digestion **is to return organic material into its production cycle**, i.e. in the form of compost and digestate (to contribute to soil structure and nutrient supply for plant growth):

a. Packaging that is truly compostable does not harm but **does not add value** to compost.

b. Even if plastic packaging is largely removed upstream and/or downstream of the composting/anaerobic digestion process, small fragments may remain in the compost or digestate. **The environmental impact of these residual microplastics as a source of soil contamination is of increasing concern to experts**.

Recommendation 8: Document the impact of compostable packaging on the quality of compost/digestate used in soil conditioner and study the environmental impact of residual microplastics - from composting/anaerobic digestion - on soils.

F. **Not all forms of innovation are a source of progress.** Ecodesign allows companies to have a comprehensive view of the factors to be considered regarding design choices, procurement choices, as well as end-of-life management scenarios for packaging, without compromising product protection and preservation. Applying "Life Cycle Thinking" and life cycle analysis, when necessary, means that companies can assess various impact scenarios for a package and make better environmental choices. The key factors of ecodesign allow to:

a. **Meet the specific needs of the product** to protect it (avoid product loss) and preserve it (avoid and reduce food waste).

b. **Think about the end of life right from the design stage**, based on the management systems and channels in place where the packaging is likely to end up.

c. **Reduce impacts and use of resources:** In a circular economy approach, ecodesign aims to integrate "Life Cycle Thinking" that takes into account the full profile of a product's environmental impacts (life cycle analysis), but also the reduction of resource consumption by keeping the products in circulation in the system (reduction at source, reuse, recycling).

d. **Ensure transparency and traceability right from the time of procurement** regarding choice of materials and suppliers (methods of extraction of raw materials, worker conditions, origin, transportation methods, etc.), but also in the choice of the packaging's end of life.

Recommendation 9: Democratize access to ecodesign for companies that place packaging on the market.

[1] Ellen MacArthur Foundation, 2016 and 2020; SPC, 2021; WRAP and The UK Plastics Pact, 2020.

1. Background_

1.1 The rise of biodegradable and compostable packaging

The tangible effects of plastic pollution can be seen in vivid images of plastic continents floating in the oceans, the recurring presence of packaging washed up on beaches, and the harm done to animals and biodiversity. Adding to this are the many upheavals in the recycling industry (closure of international markets, search for new outlets, low resale value of sorted materials, etc.). In short, we are now witnessing an in-depth rethinking of packaging and, more specifically, of plastics.

In response to the situation, environmental and consumer groups are urging governments and companies to act quickly to change practices. With pressure to reduce or eliminate plastic packaging (particularly single-use or short-life packaging), so-called biodegradable and compostable packaging has gained in popularity in recent years. For example, surveys show that U.S. consumers expect more compostable packaging to be introduced into the market (Feber et al., 2020), but also that 77% to 92% of European consumers view biodegradable and compostable packaging as being better for the environment than other types of packaging (CITEO, 2018; Green Alliance, 2020; INCPEN and WRAP, 2019). In addition, more and more large companies are migrating to fiber packaging (paper, cardboard, molded pulp, etc.) or so-called biodegradable or compostable plastic packaging, making commitments such as the Canadian Plastics Pact, which aims to make 100% of plastic packaging reusable, recyclable or compostable.

Moreover, the Government of Canada held consultations last fall on its "Proposed Integrated Management Approach to Plastic Products to Prevent Waste and Pollution" (ECCC, 2019). The scientific assessment of plastic pollution (ECCC and Health Canada, 2020) conducted by the Government of Canada in preparation for this consultation concluded the following:

"Overall, there is a lack of sufficient evidence that biodegradable, compostable, bio-based, and oxo-degradable plastics will fully degrade in natural environments (UNEP 2015; European Commission 2018, 2019). Further studies would assist in understanding the environmental impacts of [these] different types of plastic" (ECCC and Health Canada, 2020: p. 29).

The consultation sought to answer specific questions on this issue:

"Should innovative or non-conventional plastics, such as compostable, biobased or biodegradable plastics be exempted from a ban or a restriction on certain harmful single-use plastics? If so, what should be considered in developing an exemption that maintains the objectives of environmental protection and fostering a circular economy for plastics?" (ECCC, 2019: p. 16)

Similarly, the Quebec government is working on a government strategy to reduce the use of plastics and single-use products, which is expected to be unveiled in 2021 (MELCC, 2020b: p. 10).

See the lexicon ››

1.2 Éco Entreprises Québec's Findings

Éco Entreprises Québec (ÉEQ) is a private non-profit organization representing businesses that place containers, packaging and printed matter on the market in Quebec in their responsibility to fund the costs of efficient and effective municipal curbside recycling services.

As an expert, ÉEQ optimizes the curbside recycling value chain and implements innovative approaches with a view to sustainable development and circular economy.

ÉEQ was the first producer responsibility organization in North America to adopt an Ecodesign and Circular Economy Plan (ÉEQ, 2020a) and has been training and coaching companies in ecodesign for 10 years. With more than 600 players in the packaging field (companies, manufacturers, design agencies, distributors, etc.) who have attended training sessions and over 100 coaching sessions completed in 2019 and 2020 alone, ÉEQ has identified the needs and questions of companies and works with them on an ongoing basis to provide the tools they need to improve the environmental performance of their packaging through the implementation of ecodesign. Among these tools is the new version of the Ecodesign Portal (ÉEQ, 2020b).

In addition to being present in the field, ÉEQ conducts an ongoing literature review to monitor new packaging trends. Over the past 12 months, ÉEQ has seen a marked increase in the number of news stories related to biodegradable or compostable packaging worldwide. ÉEQ also contributed to the research report Less Food Loss and Waste, Less Packaging Waste (Gooch et al., 2020) released in June2020 by the National Zero Waste Council, in partnership with RECYC-QUÉBEC and PAC Packaging Consortium, with funding from Vancity, RECYC-QUÉBEC and ÉEQ. Like the Government of Canada's

1. Background_
(cont'd)

Science Assessment of Plastic Pollution (ECCC and Health Canada, 2020), this report urged caution about marketing claims around "biodegradable", "compostable" and "biobased" plastics, as their use can result in unintended environmental and economic impacts.

Guidance of companies, combined with monitoring of new trends and research partnerships, allows ÉEQ to possess a very thorough understanding of the packaging ecosystem and of the curbside recycling of recyclable materials.

For the research and writing of this report, ÉEQ called on the Quebec consulting firm SOLINOV, which specializes in waste management.

For more than 20 years, SOLINOV has been involved in all sectors of waste management and stands out for its vast experience and specialized skills in the collection, processing and recycling of organic and other fertilizing residual materials. Over the past decade, SOLINOV has contributed to the emergence of new municipal and private composting facilities in Quebec[2]. Not only is it involved in the design of treatment facilities, but it also provides technical and professional assistance for their operation and towards the marketing of quality composts. With its know-how in the field, SOLINOV also contributes to the publication of reference works in Quebec (RECYC-QUÉBEC, MELCC), in Canada and internationally (Compost Council of Canada, Environment and Climate Change Canada, ADEME in France), and its experts participate in committees for the advancement of the organic material processing and recovery industry (Bureau de normalisation du Québec [BNQ], Réseau Environnement).

This report stems from the need to clarify the situation of so-called biodegradable and compostable packaging as a result of these two findings:

1. Within the framework of its packaging ecodesign guidance works, ÉEQ is in a position to field questions from companies faced with the growing number of so-called biodegradable and compostable packaging that are offered to them.

2. The Compensation plan[3] administered by ÉEQ covers all materials used in containers and packaging, whether flexible or rigid. ÉEQ therefore wishes to carry out a specific assessment of the impact of biodegradable and compostable packaging on the residual materials management system as a whole. Through its service to assist in the reporting of containers, packaging and printed matter (C, P & PM) placed on the Quebec market, as well as in the context of consultations regarding the Schedule of Contributions, ÉEQ reminds contributing businesses that biodegradable or compostable packaging placed on the market is subject to the Schedule of contributions and must be included in their reporting:

[Traduction]

"The Regulation aims to make businesses responsible for the designated products they put on the market by requiring that they assume the costs of managing these products at the end of their life, whether or not they are compatible with curbside recycling. Otherwise, companies may be tempted to market products that are not compatible with curbside recycling." (MELCC, 2019).

"Compostability, or incompatibility with the curbside recycling system, does not imply any exemption from paying a contribution with respect to containers or packaging placed on the market" (MELCC, 2019).

[2] SOLINOV is an independent company with no direct or indirect commercial interest in any technology or company providing collection or processing services.
[3] For more information: http://legisquebec.gouv.qc.ca/en/showdoc/cr/Q-2,%20r.%2010?langCont=fr

1. Background_
(cont'd)

Important information to know before you start reading this report:

1. For the sake of brevity, **the term "packaging" includes containers and packaging**.
2. Since fiber packaging is generally compostable and poses fewer challenges (if it does not have coatings or packaging components that can compromise biological breakdown and affect compost quality), this analysis focuses primarily on **biodegradable and compostable plastics**.
3. The focus is also on the (large-scale) composting and anaerobic digestion industrial stream as the main processing route for biodegradable and compostable packaging at the end of its useful life.
4. In this report, the expression **"biodegradable and compostable plastic packaging" includes all fiber packaging that has plastic coatings or components, whether biodegradable, compostable or not** (barrier layers, coatings, varnishes, labels, caps or other opening devices, etc.).

1.3 End-of-life management of biodegradable and compostable packaging

1.3.1 Consumers' sorting habits

The growing range of biodegradable and compostable packaging, as well as the multiplicity of names and logos, generates incomprehension and confusion among consumers when it comes to sorting. As a result, biodegradable and compostable packaging can be found in all three municipal collection streams:

> **In the recyclable materials bin:**

- Consumers instinctively put packaging in the recyclable materials bin, without noticing whether a biodegradable or compostable claim is present or not.

> **In the organic material bin:**

- If the packaging is labelled biodegradable or compostable (or any other word with the prefix "bio"): consumers rely on that claim and dispose of the packaging in their organic material bin.

> **In the garbage:**

- The packaging is labelled biodegradable or compostable: consumers are led to believe that it will decompose and disappear, even if they place it in the garbage can.
- Consumers are confused and are not sure where the packaging goes. When in doubt, they may put it in their garbage.

Note: This perception that biodegradable and compostable packaging will decompose naturally, quickly and without harm to the environment, contributes to littering, abandoning packaging in nature.

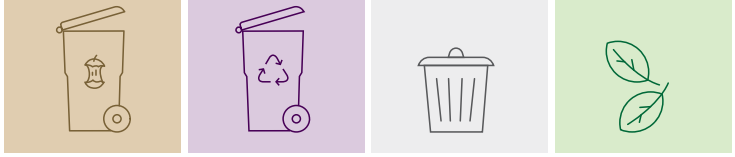
1. Background_
(cont'd)

1.3.2 Compatibility of biodegradable and compostable packaging with processing streams

The presence of biodegradable and compostable packaging in the three municipal collection streams means that biodegradable and compostable packaging will be sent to materials recovery facilities, composting or anaerobic digestion facilities, and landfills or incinerators. However, biodegradable and compostable packaging is not compatible with or suitable for all of these processing streams:

What happens with compostable packaging placed in:

Organic materials bin	**Recyclable materials bin:** (containers, packaging and printed matter)	**Garbage**	**Litter**
Very difficult to differentiate from other plastics that are removed in order not to affect the quality of the compost — If it does not break down fast enough, **it will be removed and sent to landfill.**	Very difficult to differentiate from other plastics. — **If sorted, it is removed and sent to landfill.** — If not sorted, it is a source of contamination for conventional plastics.	At landfill, it is compacted and not exposed to the conditions required for composting, so it is treated as any other trash.	**As it is not designed to turn into compost directly in nature, it becomes litter.** — It needsspecific conditions and processing steps to be able to break down.



> **Recycling stream:**

- Packaging made of **fibers** is recyclable (unless heavily soiled with food). In a circular economy perspective, recycling keeps material in the production system to prevent the need for new virgin resources. Recycled materials are used in the manufacture of other products or packaging in the form of recycled content.
- **So-called biodegradable and compostable plastic** packaging is generally not recyclable. It is difficult to identify and properly sort them without technology like optical scanners - equipment that is not available in all Quebec MRFs - to avoid them contaminating conventional and recyclable plastic resin bales. When sorted by MRFs or recyclers, biodegradable and compostable plastic packaging is removed, then landfilled or incinerated. There are recurring costs for MRFs, including equipment, labor, transportation and waste management. Compostable plastic packaging leads to a loss of production for MRFs, but also for plastic recyclers who must watch for possible contamination during their cleaning, shredding and transformation processes of conventional plastic resins.

> **Composting and anaerobic digestion industrial stream:**

- Packaging made from fibers is generally compostable, but coatings (barrier layers, coatings, varnishes, etc.) or other packaging components (labels, caps or other opening devices, etc.) can compromise the biological decomposition and affect the quality of the compost (or digestate) produced.
- Compostable plastic packaging is theoretically compostable, but its actual compostability depends on methods, conditions (oxygen, temperature and humidity) and composting (or anaerobic digestion) time.
- Biodegradable plastic packaging is not necessarily compostable.
- Confusion about biodegradable and compostable plastics, the rapid appearance of new plastic packaging on the market and the difficulty in differentiating one plastic from another are all factors that lead to an increased presence of all kinds of plastics (compostable or not) in the composting and anaerobic digestion industrial stream.

> **Disposal channel:**

- Biodegradable or compostable packaging ends up in incinerators or landfills, where it is compacted and deprived of the conditions necessary for decomposition (oxygen, temperature and humidity).

1. Background_
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1.4 Analysis proposed by ÉEQ

To answer the questions raised due to the growing presence of biodegradable or compostable packaging on the market, ÉEQ proposes an objective analysis based on the following points, which will be discussed in the next sections of this document:

> Environmental Claims: Definitions and Framework

> Framework for the recovery and recycling of organic material.

> The journey of biodegradable and compostable packaging in the composting and anaerobic digestion industrial stream.

> Ecodesign: A framework for packaging innovation.

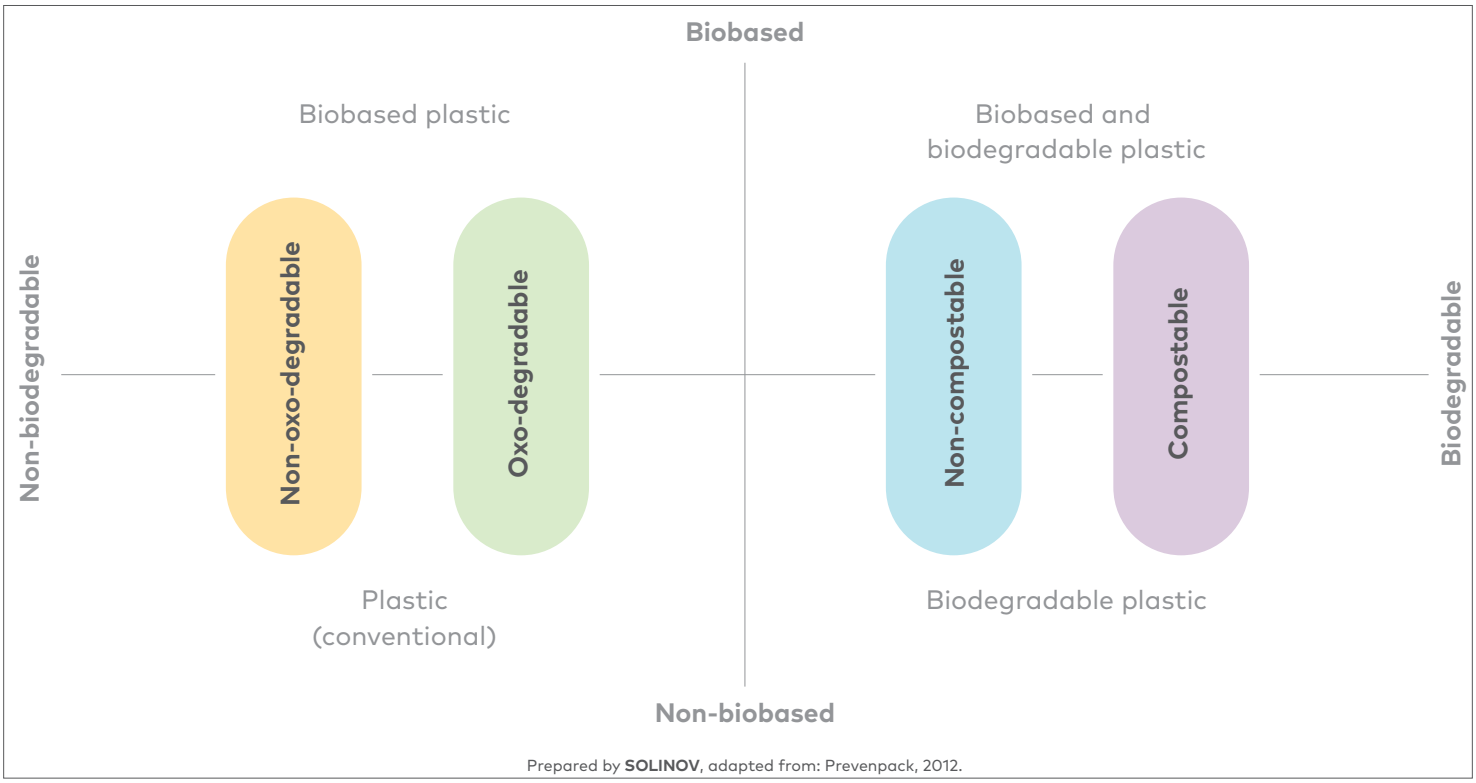
2. Environmental Claims: Definitions and framework_

2.1 Definitions

A literature review on the subject highlights the multiplicity of environmental claims ("bioplastic", "biosourced", "degradable", "oxodegradable (or oxofragmentable)", "biodegradable" and "compostable"), as well as terminological disparities and variations in the definitions according to countries, organizations, and industries. This situation contributes to the general confusion of businesses and consumers.

The following diagram helps to clarify and differentiate the vocabulary used in the field of biodegradable and compostable plastics.

Figure 1: Types of plastic



Prepared by **SOLINOV**, adapted from: Prevenpack, 2012.

The following definitions were created from various sources:

Plastic (conventional):	[*Traduction*] A synthetic material, derived from petrochemicals or fossil resources (petrosourced), that can be shaped or molded, usually using heat and pressure (Le Petit Larousse illustré, 1998; de Villers, 2009).
Bioplastic:	[*Traduction*] Sometimes used in the sense of "biosourced" or "biobased" to designate the origin of the plastic, and sometimes used in the sense of "biodegradable" to designate its end-of-life (ADEME, 2020). ***Note: The use of this term is increasingly contested as it leads to confusion (ADEME, 2016; CNE, 2019c; Ellen MacArthur Foundation, 2020; Zero Waste France, 2020).***

2. Environmental Claims: Definitions and Framework_
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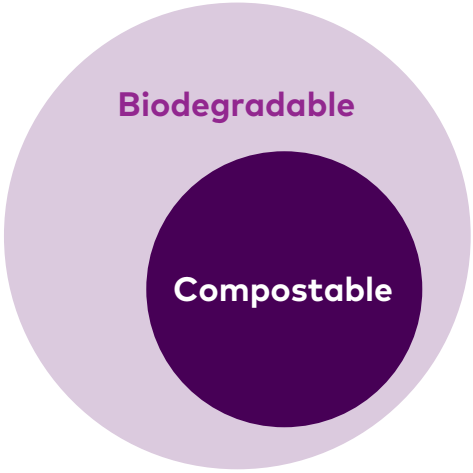
Biobased plastic:	[*Traduction*] Derived in whole or in part from biomass (wheat, sugar, corn, starch, algae, etc.) from agriculture or forests (as opposed to "conventional plastic," which is derived from petrochemicals or fossil resources) (Roignant et al., 2019; Lapointe, 2012.) ***Note: The term "biobased" does not necessarily imply lesser environmental impacts (CITEO, 2019; CNE, 2019a).***
Degradable plastic:	[*Traduction*] Decomposes (a process involving a change in its structure, characterized by a loss of properties and/or by a loss of properties and/or fragmentation) under specific conditions to a certain point in time (CSA, 2008; RECYC-QUÉBEC, 2020b).
Oxo-degradable (or oxo-fragmentable) plastic:	[*Traduction*] Which undergoes fragmentation (breaking into small pieces) caused by additives, added to conventional plastics (from petrochemicals or fossil resources), under the effect of sunlight, heat or mechanical stress, generating a plastic residue (RECYC-QUÉBEC, 2005).
Biodegradable packaging/ plastic:	[*Traduction*] Which undergoes degradation caused by biological activity that relies on adequate oxygenation, humidity and temperature conditions. The effects on the environment and the time of degradation vary greatly depending on the object and its composition (RECYC-QUÉBEC, 2005 and 2020b). ***Note: The use of the term "biodegradable" on packaging could foster littering (ADEME, 2016; CNE, 2019b) and is prohibited in France (République française, 2020).***
Compostable packaging/ plastic	Which undergoes degradation due to biological activity during composting, producing CO2, water, inorganic compounds and biomass. Also relying on adequate oxygenation, moisture, and temperature conditions, this process occurs at a rate comparable to the decomposition (or composting) of other known compostable materials (food waste and green waste), without leaving visible, recognizable, or toxic residues (ASTM International, 2019b; BNQ, 2010; CSA, 2008; ISO, 2012).



Compostable plastics are biodegradable, but not all biodegradable plastics are compostable.

2. Environmental Claims: Definitions and Framework_
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In short:

- Biodegradable or compostable plastics are classified according to their origin (biobased or not) and end of life (biodegradable or not, compostable or not).
- The differentiation between biodegradable and compostable plastics is based mainly on the degree of decomposition and the time needed to obtain this breakdown: the biological breakdown of biodegradable plastics varies greatly (it can be very slow), while that of compostable plastics occurs over a more limited period (relatively fast), which should ideally match the time needed to compost food residues and green waste.
- Compostable plastics are biodegradable, but not all biodegradable plastics are compostable.

2.2 Framework

Any statement or symbol that refers to the environmental aspects of a product is an environmental claim. For biodegradable and compostable packaging, two types of environmental claims are used: self-declarations and certifications (CSA, 2008).

2.2.1 Self-declaration

> A self-declared environmental claim is made **by the product manufacturer or other entity promoting the product**.

> A self-declared environmental claim **does not require independent third-party verification**.

> A self-declared environmental claim must be based on verifiable, accurate and meaningful data that can be provided to the public.

Canadian legislation[4,5] prohibits making false or misleading claims about a product to the public. CAN/CSA-ISO 14021 Environmental labels and declarations - *Self-declared environmental claims (Type II labelling)* (CSA, 2008) sets out the general requirements for self-declared environmental claims and provides detailed instructions for using self-declared environmental claims, such as recyclable, biodegradable and compostable.

However, compliance with the requirements of this standard is not systematically assessed. It is primarily, if not exclusively, following complaints to the Competition Bureau that self-declared environmental claims may be reviewed.

2.2.2 Certification

> A certification attests that a product meets **pre-established requirements** (usually set out in a standard) under a program.

> A certification is **verified by an independent third party**.

> A certification gives the public an idea of the environmental performance of a product.

CAN/BNQ 0017-088 Specifications for Compostable Plastics[6] define the criteria that must be met for a plastic product to be suitable for composting and not to affect the quality of composts. It also establishes the marking that a compostable product must communicate to be recognized as such.

[4] The Competition Act, R.S.C. 1985, c. C-34, the Consumer Packaging and Labelling Act, R.S.C. 1985, c. C-38, and the Textile Labelling Act, R.S.C. 1985, c. T-10, all of which are enforced by the Competition Bureau, contain provisions prohibiting false or misleading representations.

[5] In Quebec, the Environment Quality Act provides namely that the government may, by regulation, govern the labelling or marking of containers, packaging, printed matter or other designated products, inter alia, to prescribe or prohibit the use on them of terms, logos, symbols or other representations intended to inform users of the advantages or disadvantages they present for the environment (section 53.28, paragraph 4). However, there are currently no regulations adopted under this provision.

[6] Other standards for biodegradable or compostable products exist internationally (ISO 17088 and ISO 18606), in Europe (EN 14995 and EN 13432), in Australia (AS 4736) and in the United States (ASTM D6400 and ASTM D6868).

2. Environmental Claims: Definitions and Framework_
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The BNQ[7] manages the compostable plastics certification program in accordance with CAN/BNQ 0017-088[8]. To be certified as compostable, a plastic product[9] must be evaluated according to the rules of procedure set by the program (test methods, conditions such as temperature, duration, etc.) and meet the requirements of the program, including:

- Decay: Rate of conversion into carbon dioxide (CO_2), water, and biomass over a given period of time (BNQ, 2010: section 6.2).
- Biodegradation: Rate of residual particles after sieving following a given composting period (BNQ, 2010: section 6.3).
- Ecotoxicity: heavy metal content and absence of negative effects on the compost's ability to promote plant growth (BNQ, 2010: section 6.4).

Once certified as "compostable" by the BNQ, a plastic product can bear the following compliance mark:

It is important to remember that certification is not a legal requirement. It is voluntary, and costs must be assumed by the manufacturer of the product for testing, initial certification and renewal, if applicable (certification is issued for a limited period of two years).

For example, a plastic product may meet the CAN/BNQ 0017-088 standards without being certified. However, in order to carry the BNQ "compostable" logo, the plastic product must be certified by the BNQ.

Although certification ensures that a package is compostable, this compostability has been verified in a laboratory under specific and controlled conditions, different from field conditions (for example, processing time can vary from as little as two weeks to as much as a year depending on the composting facility, while the laboratory biodegradation test is conducted over a period of up to 180 days).

Currently, products used in the packaging of 15 companies10 are certified compostable by the BNQ. In the Quebec market, due to our proximity to the United States, there are also several plastic products certified as compostable by the Biodegradable Products Institute (BPI), a U.S. certification body that relies on ASTM D6400 and ASTM D6868 standards (ASTM International, 2019a and 2019b).

In short:

- Despite the requirements for self-declaration (including the use of a term such as "compostable"), the fact remains that, with an almost non-existent monitoring, verification and control process, it is fair to question the compostability of a package identified as such by its manufacturer.
- Although certification assures that a package is compostable, this compostability has been verified in a laboratory under specific and controlled conditions, different from conditions in the field.

[7] The BNQ is accredited by the Standards Council of Canada (SCC) as a standards development organization and as a certification body.
[8] The BNQ 0017-988 certification protocol is currently under review. The BNQ certification program will in future be based on ISO 17088:2012 and no longer on CAN/BNQ 0017-088. The expected date of the new edition was January 2021, but it had not yet been published at this writing.
[9] It should be noted that the composition of compostable products covered by the certification program is not limited to plastics. Other products may be considered compostable if the program requirements are met.
[10] Certified companies: https://www.bnq.qc.ca/fr/normalisation/environnement/plastiques-compostables.html.

3. Framework for the recovery and recycling of organic material_

In recent years, the management of residual materials has been a particular focus of the Quebec legislator, especially regarding the management of organic material. Indeed, the public's collective awareness of the end-of-life of packaging and the ever-increasing pressure on businesses to demonstrate greater social responsibility have prompted the Quebec government to put in place legal incentives that provide a tighter framework in this area.

Thus, the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) has various legal, regulatory and administrative tools to supervise organic material recovery and recycling activities.

3.1 Objectives and means

The ***Environment Quality Act*** **(EQA) defines the hierarchy of waste management methods** that are most beneficial to the environment and sustainable development (commonly referred to as the 3R-RD hierarchy) (EQA, 2020: section 53.4.1), namely:

1. Prefer reduction at the source

And respect, in the processing of these materials, the following order of priority:

2. Reuse;
3. **Recycling, including biological treatment (composting or anaerobic digestion) or land application;**
4. Any other recovery operation by which residual materials are treated to be used as a substitute for raw materials;
5. Energy recovery;
6. Disposal.

The Quebec Residual Materials Management Policy (the Policy) (MDDEP, 2011a), adopted in 2011 by the Quebec government, adheres to the 3R-RD hierarchy and specifically targets the management of organic material[11]. Organic material, which accounts for approximately 60% of the waste disposed of in Quebec (MELCC, 2020a), has a number of harmful impacts on the environment, including greenhouse gas emissions in landfills.

The Policy proposes to ban organic material from disposal sites, and the accompanying 2019-2024 Action Plan (MELCC, 2020b) aims, among other things, to recycle 60% of organic material by 2023[12].

In order to **divert organic material from disposal**, the Policy emphasizes recycling by **biological treatment** (composting or anaerobic digestion) of food and green waste collected through brown bins, with a view to fertilizing the soil (return to the soil in the form of compost or digestate). Compostable packaging is also likely to end up in brown bins, but the Policy does not define the preferred end-of-life management method for this type of packaging.

In July 2020, the Government of Quebec released its *Stratégie de valorisation de la matière organique* (MELCC, 2020a), outlining the path forward. The ambitious targets and solutions proposed in this Strategy will undoubtedly **accelerate the implementation of organic material** recovery services (food and green waste collection) and **the deployment of the composting and anaerobic digestion industry in the coming years**.

The targets of the Strategy are as follows:

Implement organic material management across 100% of the municipal territory by 2025.
Current situation: nearly 57% of the Quebec population resides in a municipality served by a collection (brown bins) of food and green waste (MELCC, 2020a)[13].

Manage organic material in 100% of industry, commerce and institutions (ICI) by 2025.
Current situation: organic material collection in ICI is poorly implemented, particularly in the regions and in small businesses (MELCC, 2020a).

Recycle or recover[14] 70% of the organic material targeted in 2030.
Current situation: 31% of food and green waste from the municipal sector (citizens) is recovered; 5% for the ICI sector (RECYC-QUÉBEC, 2020a)[15].

[11] The broad category of organic material includes food and green waste, but also municipal biosolids, paper biosolids, and paper, cardboard and wood.
[12] The first action plan of the Policy (Action Plan 2011-2015) (MDDEP, 2011b) aimed to achieve the same intermediate quantitative objective.
[13] Baseline year: 2018.
[14] As the broad category of organic material includes wood, the target is not only for recycling, but also for recovery (for food and green residues, paper and cardboard, municipal biosolids and paper biosolids, the preferred processing method is recycling).
[15] Baseline year: 2018.

3. Framework for the recovery and recycling of organic material_ (cont'd)

The management of organic material, which accounts for nearly 60% of the residual materials disposed of in Quebec, is a central issue of the Policy. In short, the main points are:

- The Quebec government will implement several incentives in the coming years to accelerate the implementation of organic material recovery services and the deployment of the composting and anaerobic digestion industrial stream.
- The significant gap between current performance and the government's service and recovery objectives (Strategy) implies that we should see a significant increase in the quantities of organic material recovered and processed within the next five years.
- In this context, it can be expected that compostable packaging will be increasingly present in all three municipal collection streams (recycling, composting/anaerobic digestion, and disposal). Therefore, the issue of compatibility with processing streams needs to be addressed now as the Policy does not define the preferred end-of-life management option for this type of packaging.

3.2 Requirements

Under the EQA, activities likely to have an impact on the quality of the environment must be subject to an **environmental authorization** issued by the MELCC (EQA, 2020: section 22). In this regard, two key stages of the composting and anaerobic digestion industrial stream in Quebec are subject to MELCC supervision:

> The processing of organic material by composting or anaerobic digestion;

> The recycling of the compost and digestate resulting from this treatment (use as an organic soil conditioner).

3.2.1 Framework for the processing of organic material: composting or anaerobic digestion

The *Guidelines for the beneficial use of fertilizing residual materials* (MDDELCC, 2018b) and *Biomethanisation Facility Requirements Guidelines* (MDDELCC, 2018a) specify the criteria that apply to the implementation and operation of a composting or anaerobic digestion facility[16].

There is no mention of compostable packaging in these two documents, apart from the **compostable plastic bag** as a **collection tool** for food and green waste. In short, the MELCC considers that food and green waste in plastic bags, even if compostable, have a high odour potential due to the anaerobic conditions that are likely to develop inside the bag. For example, **to avoid the risk of odour nuisance in the neighbourhood** around composting and anaerobic digestion facilities, the *Compost Facility Requirements Guidelines* and the *Biomethanisation Facility Requirements Guidelines* include specific requirements for food and green waste collected in plastic bags[17]. However, the compostability of plastic bags is not addressed.

3.2.2 Framework of compost and digestate recycling

The *Guidelines for the beneficial use of fertilizing residual materials* (FRM Guide) (MDDELCC, 2015) determines the quality criteria that apply to the recycling of fertilizing residual materials (FRM), including composts and digestates, for different uses (agriculture, silviculture, horticulture, etc.). FRMs are classified according to their chemical contaminants and pathogens content, and according to their odor characteristics and foreign matter content.

[16] Composting and anaerobic digestion activities are also covered by the *Regulation respecting the regulatory scheme applying to activities on the basis of their environmental impact* (REAFIE, 2020). It sets out the applicable terms and conditions and the information to be submitted for applications for authorization and declarations of compliance.

[17] It should be noted that these requirements do not apply to food and green waste collected in paper bags, with or without cellulose film, as these residues are considered to be collected in bulk.

3. Framework for the recovery and recycling of organic material_
(cont'd)

The criteria for **foreign matter** in compost and digestate are directly related to compostable packaging:

> If a piece of plastic packaging, compostable or not, with a size greater than 2 mm, is present in the compost or digestate, it will be considered as foreign matter.

> If a piece of plastic packaging (rigid), whether compostable or not, greater than 5 mm in size and with a sharp edge or point capable of cutting or puncturing the skin, is present in the compost or digestate, it will be considered a sharp foreign matter.

Foreign matter and sharp foreign matter **restrict the use** of the compost or digestate in which they are found.

The criteria in the FRM Guide are intended to limit the presence of foreign matter in composts and digestates **mainly for esthetic reasons**. The primary objective is to promote **the acceptability** of composts and digestates by consumers and, more generally, the social acceptability of their return to the soil. However, it is possible that small plastic fragments remain in the composts or digestates, even if they are not visible to the naked eye. **The environmental impact of these residual microplastics, as a source of soil contamination, is of growing concern**, particularly in the research community (Meixner et al., 2020; Weithmann et al., 2018).

The criteria in the FRM Guide that apply to foreign matter are, to a large extent, harmonized with those in ***CAN/BNQ 0413-200 Organic Soil Conditioners - Composts*** (BNQ, 2016)[18].

The BNQ can certify a compost's compliance with this standard. The CAN/BNQ 0413-200 standard is voluntary, but the FRM Guide provides tolerance for composts certified by the BNQ. In fact, the advantage of these composts is that they can be spread (returned to the soil) without requiring environmental authorization from the MELCC.

In short, the main points are:

- The Guidelines, which govern composting and anaerobic digestion activities in Quebec, are silent on whether or not a processing facility can accept compostable plastic packaging (only plastic bags, as a collection tool, are specifically targeted).

The decision whether to accept compostable plastic packaging is therefore left to each individual composting or anaerobic digestion facility, hence the differences in the lists of materials accepted/rejected in organic material collections in Quebec.

- The FRM Guide, which governs the return of composts and digestates to the soil, limits the size, number, and content of foreign matters (including plastic pieces) in composts and digestates. The FRM criteria are intended to reduce the presence of plastic; they do not claim to be zero plastic.

Also, plastics smaller than 2 mm are not included in the FRM criteria. These particles are generally not visible to the naked eye and are not likely to pose aesthetic problems (acceptability). However, their environmental impact as a source of soil contamination is of increasing concern to experts.

- Moreover, even with the best technologies to process organic material and refine composts and digestates, plastics cannot be completely removed. Reducing them at the source remains the safest approach.

[18] It should be noted that CAN/BNQ 0413-200 does not cover digestates from organic waste processing. Work is ongoing to develop a quality standard for these products.

4. Journey of biodegradable and compostable packaging through the composting and anaerobic digestion stream_

4.1 Mission of the composting and anaerobic digestion industry

Before examining the journey of compostable packaging through the composting/anaerobic digestion industrial stream, it is necessary to understand the mission of this industry, especially since it is very different from the mission of the recycling industry. The following table outlines the fundamental differences between the two streams.

Table 1: Fundamental differences between the recycling and composting/anaerobic digestion streams

	Recycling stream	Composting and anaerobic digestion stream[19]
Actions	**Collect and sort** containers, packaging, printed matter and newspapers into different **categories of recyclable materials** and prepare them for reuse.	**Transforming** food and green waste[20] into **compost or digestate** through an accelerated and controlled biological decomposition process.
Objective	**Reintroduce** the recyclable material into the manufacturing process of a new packaging or product.	**Return** organic material to the soil, using compost or digestate as a conditioner.

Specifically, with respect to the composting and anaerobic digestion industry:

4.1.1 Transforming food and green waste into compost or digestate through an accelerated and controlled biological decomposition process

> The composting and anaerobic digestion industrial stream **manages food and green waste**, not packaging.

> The composting and anaerobic digestion industrial stream **processes organic material without sorting them into different categories** (if the process requires, for example, that food residues and green residues not be treated together, it is the collection method for these materials that will be adapted to recover both types of residues separately).

4.1.2 Return organic material to the soil, using compost or digestate as soil conditioner

> The composting and anaerobic digestion industrial stream **produces compost and digestate which**, when returned to the soil, contribute to the improvement of soil quality and to plant fertilization.

Compost and digestate (as is or after an additional composting phase) can be spread on agricultural land, used for landscaping, for the restoration of degraded sites, for erosion control or for tree planting.

> The composting and anaerobic digestion stream **involves one or more steps to remove as much as possible of the undesirable material** that can affect the quality of the compost or digestate.

The more undesirable materials (e.g., plastic, glass, metal, concrete) are present in the organic material to be processed, the more likely the compost or digestate produced will contain foreign matter, which will restrict the use of the compost or digestate (see Section 3.2).

> The composting and anaerobic digestion industry removes unwanted materials from organic material, but does not attempt to sort them into different categories[21]. Thus, the **unwanted materials removed are generally sent for disposal, without distinction** (including compostable packaging that could be removed with the other unwanted materials, packaging that could have been processed through the recycling stream, etc.).

[19] Anaerobic digestion also produces biogas.
[20] Biosolids can also be managed in the industrial composting and anaerobic digestion stream,but have not been included in the table since they are recovered directly at the point of generation and are unlikely to contain compostable packaging.
[21] Except for ferrous metal which is managed separately (magnetic sorting) and sent for recycling, in certain composting or anaerobic digestion facilities.

4. Journey of biodegradable and compostable packaging through the composting and anaerobic digestion stream_
(cont'd)

4.2 Removal of undesirable materials

In practice, the journey of compostable packaging in the composting and anaerobic digestion industrial stream is closely linked to the management of unwanted materials.
In fact, compostable packaging will go more or less far in the composting and anaerobic digestion industrial chain depending on when the removal of unwanted materials is carried out, i.e. mainly upstream or downstream of the processing of organic material.

4.2.1 Upstream removal of unwanted materials

Industrial composting and anaerobic digestion facilities that use this approach advocate removing unwanted materials as early as possible, in part to avoid fragmenting unwanted materials with equipment during processing, increasing their number and making it more difficult to remove them later.

Upstream removal is also intended to protect equipment that may be damaged or clogged by undesirable materials.

However, plastic packaging generally looks the same as conventional plastic packaging, and methods used to remove unwanted materials do not distinguish between unwanted materials and compostable packaging:

> On the one hand, compostable plastic packaging generally looks the same as conventional plastic packaging, they are hard to tell apart.

  Also, even if it is certified, marked with a logo or color, **compostable plastic packaging is embedded in a much larger proportion of organic material** (see section 3.1). **It would be implausible to sort all materials to isolate packaging and separate compostable plastic packaging from non-compostable packaging.**

> On the other hand, the actual time, and conditions of composting or anaerobic digestion may not match the conditions required for decomposition of the compostable packaging. If this is the case, the pieces of plastic packaging, like other foreign matter in the compost or digestate, will be measured against the quality criteria. For this reason, composting and biogas facilities seek to remove unwanted material, including compostable plastic packaging.

Ultimately - and regardless of whether the facility accepts compostable plastic packaging - a large proportion of plastic packaging (even compostable) will be removed and sent for disposal with other unwanted materials.

In addition, it is likely that organic material adhered to or contained in the removed packaging will also be sent for disposal.

4.2.2 Downstream removal of unwanted materials

The majority of composting and anaerobic digestion facilities perform more or less extensive removal of remaining unwanted material after processing in the following cases:

> There was no removal of unwanted material upstream;

> Unwanted material remains despite an upstream removal step (the methods and equipment used to remove unwanted material are never 100% effective).

With this approach, compostable plastic packaging is likely to decompose during the composting process, but the actual composting time and conditions[22] may not match the conditions required for decomposition of the compostable packaging[23].

Furthermore, in anaerobic digestion systems, where the decomposition process takes place in the absence of oxygen, compostable plastic packaging is unlikely to decompose during the process.

In all cases, plastic packaging (including undecomposed compostable packaging) will largely be removed with the other remaining unwanted materials and sent for disposal.

Finally, in a composting facility (especially at outdoor sites), plastic packaging - both compostable and non-compostable - is lightweight, does not incorporate well with the organic material, flies away and scatters around the site (and potentially into the wild), and contributes to littering. They are collected and then sent for disposal.

[22] Furthermore, composting conditions vary from facility to facility, depending on the processing technologies, methods and equipment used, etc.; there are as many composting conditions as there are composting facilities.
[23] This is especially true in the case of immature composts from shortened processing.

4. Journey of biodegradable and compostable packaging through the composting and anaerobic digestion stream_

(cont'd)

In short:

- The mission of the composting and anaerobic digestion industrial stream is not to manage packaging or sort materials.
- The composting and anaerobic digestion industry aims to produce a quality compost or digestate that can be returned to the soil. To achieve this, unwanted materials must be removed as much as possible.
- The management of unwanted materials is the responsibility of each processing facility, depending on its technologies, methods, equipment, and the intended uses of the compost or digestate produced.
- Beyond the compostability of plastic packaging, its journey through the composting and anaerobic digestion industrial stream is primarily dependent on the processing facility's management of unwanted materials (removal upstream and/or downstream of processing).
- Plastic packaging (compostable and non-compostable) that is removed among other unwanted materials is sent for disposal (where conditions are not conducive to the decomposition of compostable packaging).

5. Ecodesign: To oversee innovation in packaging_

This report highlighted the fact that biodegradable or compostable packaging is overwhelmingly landfilled, as current composting and anaerobic digestion facilities are designed to process organic material, not packaging. To avoid such false good ideas, it is important to take a step back and make an analysis based on several criteria. To oversee innovation in packaging, ecodesign is a lever to achieve this objective.

Ecodesign is a preventive approach that is characterized by the consideration of environmental, social and economic criteria from the design phase of a packaging, while preserving its use value. It helps to make trade-offs and to weigh the importance to be given to different actions. To make better choices, ecodesign relies on Life Cycle Thinking, which leads to a complete analysis of the packaging, from the extraction of raw materials used in its manufacture to its management at the end of its useful life. To go further, Life Cycle Assessment (LCA) is a tool that allows for an exhaustive evaluation of the environmental footprint of a packaging, product, or service. It is also possible to make a greenhouse gas (GHG) assessment, the important thing being to consider all the stages of the packaging's life cycle.

Ecodesign brings together different strategies, such as responsible sourcing, design optimization, end-of-life management and communication, to guide packaging innovation. It allows us to think about important concepts, such as the packaging/product pairing, the packaging system (primary, secondary and tertiary packaging) and the consumer experience.

Ecodesign is based on the following actions:

a. **Responding to the specific needs of the product:** packaging exists to protect and preserve a product, in order to avoid product loss and food waste. For all consumer products, it aims to protect the integrity of the contents during the many stages of transportation and handling. In the food sector, packaging also acts as a barrier to light, air, moisture, bacteria, etc., to preserve nutrients, extend shelf life and avoid contamination. Product losses and food waste result in significant impacts (Gooch et al., 2020), as the resources, energy, and materials used to manufacture them or grow and distribute them do not make it to the consumer.

   Measuring the effectiveness of the role of packaging requires an understanding of the characteristics and properties of each material to select the most appropriate alternative. Before choosing a material substitution, one must question the added value of the substitution in terms of product preservation and protection, as well as the overall environmental footprint (sourcing, processing, transportation, marketing, etc.).

b. **Thinking about end-of-life from the design stage**: Any packaging design leads to defining what the end-of-life scenario will be, whether the packaging is durable, single-use or short-lived. It is essential to design a package with a better understanding of the systems and streams in place where it is likely to end up at the end of its life, be it recycling, composting, anaerobic digestion or landfill. LCA is useful to re-establish certain perceptions on the value of the different options: if recycling is desired, it is necessary to ensure the real recyclability of the packaging by the existing facilities and technologies; if the industrial stream of composting and anaerobic digestion is preferred (which should be reserved for specific applications in food packaging), it is necessary to verify that the latter is able to adequately manage the packaging and that it will not be withdrawn and sent to the landfill with unwanted materials. It is also important to keep in mind that end-of-life processing streams, such as recycling, are changing and that packaging that poses challenges today (flexible packaging, multi-layers, etc.) may no longer be tomorrow.

c. **Reducing impacts and resource use:** in a circular economy approach and according to the hierarchy of waste management methods (or 3R-RD hierarchy), ecodesign advocates the reduction of resource consumption by keeping them in circulation in the system (reduction at source, reuse, recycling, etc.). It relies on a systemic approach to assess the environmental impacts related to the different stages of a product's life cycle (procurement of resources, manufacturing, distribution, use and end of life). LCA quantifies the potential environmental impacts of a package over its life cycle. The results of a LCA can help prioritize actions to be taken while avoiding that an improvement in one stage of the packaging life cycle does not lead to a shift of impacts to another stage.

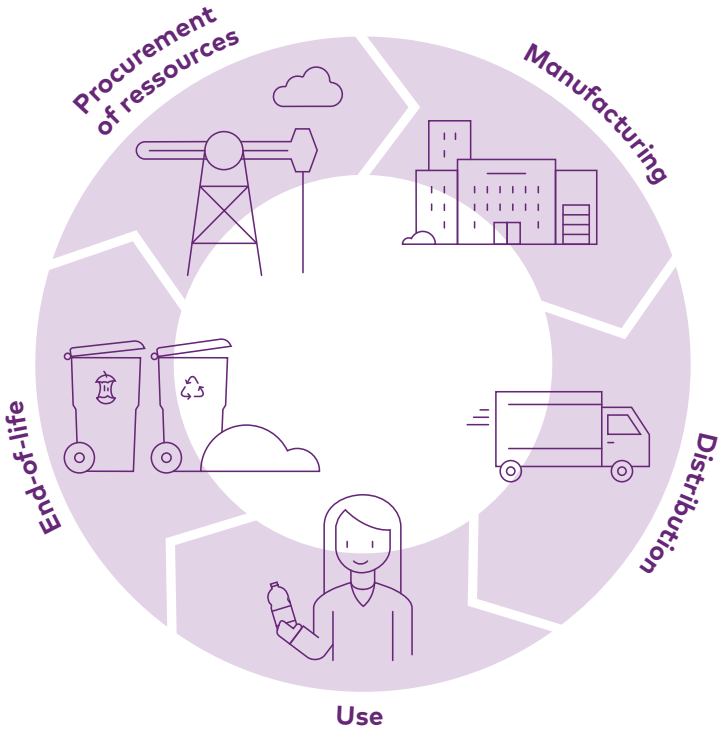
   LCA can be used to evaluate several environmental indicators, such as the impact on climate change (increase in global temperatures), on the quality of ecosystems (e.g. reduction in biodiversity due to toxic emissions into the environment), on resource consumption (e.g. non-renewable fossil resources) and on the impact on human health (e.g. carcinogenic effects caused by pollutants).

5. Ecodesign: To oversee innovation in packaging_ (cont'd)

d. Ensure transparency and traceability right from the time of procurement regarding choice of materials and suppliers. This selection must be made while taking into account the methods of resource extraction, the conditions of the workers, the origin of the raw or recycled materials, the types of transport used, etc. Bio-based, biodegradable or compostable plastic packaging must also meet these criteria. To ensure the transparency and traceability of packaging, sourcing choices and their environmental and social consequences must be analyzed, documented and communicated transparently to avoid confusion and false communication through greenwashing. This concept includes hidden trade-offs, lack of proof, vagueness, false statements or labels, irrelevance, the lesser of two evils and fibbing (Terra Choice, 2007)[27].

Innovation is based on the development of ecodesign reflexes: ensuring the compatibility of packaging with the end-of-life management streams to which they are likely to end up; minimizing resource consumption and impacts; ensuring transparency and traceability from the moment of procurement. Overall, this will make it possible to optimize the environmental performance of packaging while meeting the needs of the product, to avoid food losses and waste.

Figure 2: Life cycle of a packaging item



For more information

To learn more on packaging ecodesign, visit ecoconception.eeq.ca.

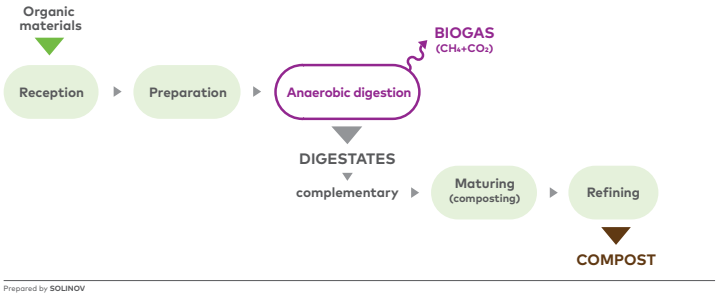
[24] TerraChoice is now under the management of UL.

6. Lexicon_

Aerobic
[*Traduction*]"Refers to microorganisms that can only grow in the presence of oxygen" (RECYC-QUÉBEC, 2020b).

Anaerobic
[*Traduction*]"Refers to microorganisms that normally develop in an environment without air or oxygen" (RECYC-QUÉBEC, 2020b).

Anaerobic digestion
A controlled biological process by which organic material is broken down under anaerobic conditions (in the absence of oxygen). The result is digestate, a solid or semi-solid product which must undergo additional treatment (by composting) to be considered as biologically stable and hygienized, as well as biogas (Environment Canada, 2013; RECYC-QUÉBEC, 2020b).



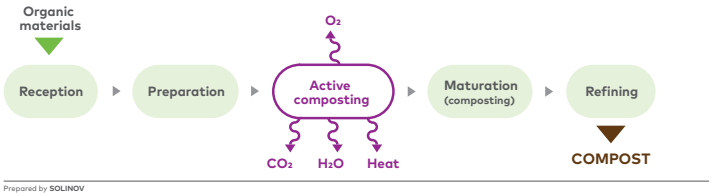
Biomass
"All organic material of plant or animal origin" (Actu-Environment, 2019).

Characterization
[*Traduction*]"Detailed and quantified description of each of the elements that constitute residual materials" (RECYC-QUÉBEC, 2020b).

Compensation Plan
[*Traduction*]"Based on the principles and orientations of the Québec Residual Materials Management Policy, which aims to make producers who market the targeted products more accountable, the Compensation plan requires that entities marketing containers, packaging, printed matter and newspapers of all kinds incur the greater part of curbside recycling costs. The purpose of this compensation plan is to compensate municipalities for the costs they incur in providing recovery and reclamation services for the designated products" (MELCC, 2021).

Compost
[*Traduction*]"Mature solid product resulting from the composting of organic waste. Compost is a stable product, rich in humid compounds, which is mainly used as soil conditioner. It generally has the appearance of humus-rich potting soil and is low-odor" (RECYC-QUÉBEC, 2020b).

Compostage
A controlled biological process by which organic material is broken down under aerobic conditions (in the presence of oxygen). The result is compost, a stable and sanitized product (Environment Canada, 2013; RECYC-QUÉBEC, 2020b).



Curbside recycling
[*Traduction*]"A method of recovery by which residual materials are collected in a way that they can be developed. Curbside recycling is carried out by voluntary drop-off at deposit points (point of sale, bell, container, ecocenter or recycling center) or by door-to-door collection" (RECYC-QUÉBEC, 2020b).

Digestat
[*Traduction*]"Crude "digested" residue in either liquid, semi-solid or solid form, produced by anaerobic digestion of organic material. It is made up of organic material that is partially deodorized and broken down. To be recycled, it can be spread as soil conditioner (as is) or undergo subsequent treatment (e.g.: composting, dehydration, drying, granulation) before being recycled" (RECYC-QUÉBEC, 2020b).

Ecodesign
Ecodesign is an approach whose specificity is that it takes into account environmental, social and economic criteria during the design phase of a packaging item, while keeping its practical usage value (ÉEQ, 2020b).

Extended Producer Responsibility
"Principle and approach that extend the obligations of producers with respect to the products they manufacture or market to the end of their life cycle. Thus, producers are responsible for ensuring the recovery and reclamation of their products at the end of their life cycle through a recovery system that they set up themselves or through an association that does so for its members" (MDDEP, 2008)

Fertilizing residual materials (FRM)
[*Traduction*]"Residual materials whose use is intended to maintain or improve, separately or simultaneously, the nutrition of plants, the physical and chemical properties and the biological activity of soils" (MDDELCC, 2015).

6. Lexicon_
(cont'd)

Food waste
[*Traduction*]"Residual plant or animal organic material resulting from the preparation and consumption of food (peelings, table scraps, apple cores, etc.), generated by citizens at home or at work or in institutional and commercial sectors (restaurants, hotels, academic and healthcare institutions, etc.)" (RECYC-QUÉBEC, 2019).

Foreign Matter
"Any material present in compost with a dimension greater than 2 mm, of organic or inorganic nature, such as metal, glass, synthetic polymers (including plastic and rubber), which results from organic material that is partially deodorized and broken down. To be recycled, it can be spread as soil conditioner (as is) or undergo subsequent treatment (e.g.: composting, dehydration, drying, granulation) before being recycled" (RECYC-QUÉBEC, 2020b).

Green waste
[*Traduction*]"Plant material produced during gardening, horticulture, landscaping or land clearing. Green waste includes dead leaves, grass and other grass clippings, tree and shrub trimmings, and miscellaneous horticultural waste from the residential, municipal, institutional and commercial sectors" (RECYC-QUÉBEC, 2019).

Materials Recovery Facility
[*Traduction*]"Company that sorts residual waste materials, specifically recyclable materials and waste from construction, renovation and demolition sites, with a view to recycling or reclaiming them" (RECYC-QUÉBEC, 2020b).

Organic soil conditioner
[*Traduction*]"Product of plant or animal and plant origin, applied mainly to improve the physical properties and biological activity of soils (BNQ 0413-200/2005). Some organic soil conditioner (e.g. composts, digestates, biosolids) are derived from the treatment of organic residues" (RECYC-QUÉBEC, 2020b).

Organic waste
[*Traduction*]"Fraction of living material (plant material, animal material or microorganisms) that can decompose through the action of microorganisms" (RECYC-QUÉBEC, 2020b).

Schedule of Contributions
The Schedule of Contributions is a legal document (Government of Quebec, 2020) that allows companies to assess their obligations in regard to the EQA and to see applicable rates for each designated material marketed in their packaging (ÉEQ, 2021).

Sharp Foreign Matter
"Any foreign body greater than 5 mm in size which has a sharp edge or point capable of cutting or piercing the skin of both humans and animals, during or after use of the compost" (BNQ, 2016).

7. References_

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