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Milestone Study on Post-Consumption Bioplastics Waste Management and Secondary Markets in Mexico

Transforming Recycling and Solid Waste Management in Mexico

Executive Summary

Table of Contents

***Photo credit – Cover:** Plants made from woven thread derived from residues of the automotive industry, artisans of Jalpan de la Serra, Querétaro, Mexico – With permission from Neaton Auto Mexicana.

List of Tables

List of Figures

Acronyms and Abbreviations

AMB	Asociación Mexicana de Bioplásticos, AC (Mexican Association of Bioplastics, AC)
Bio-PA	biopolyamide
Bio-PE	bio-polyethylene
Bio-PET	bio–polyethylene terephthalate
Bio-PP	bio-polypropylene
Bio-PVC	bio–polychlorure de vinyle
CEC	Commission for Environmental Cooperation
FDS	final disposal site for municipal solid waste or special-handling waste
kt	kiloton(s)
PAT	process analytical technology
PBAT	polybutylene adipate terephthalate
PBS	polybutylene succinate
PCL	polycaprolactone
PE	polyethylene
PEF	polyethylene furan-2,5-dicarboxylate
PET	polyethylene terephthalate
PHAs	polyhydroxyalkanoates
PLA	polylactic acid
PP	polypropylene
PS	polystyrene

1. Study Context and Scope

As part of the Transforming Recycling and Solid Waste Management in North America project of its 2021 Operating Plan, the Commission for Environmental Cooperation (CEC) commissioned studies on the recycling and management of paper and cardboard waste, plastics and bioplastics in Canada, the United States and Mexico. The objective of these studies was to accelerate the adoption of circular economy (CE) practices that would promote strategies for the sustainable management of these materials and generate economic and environmental benefits for the region.

This study focuses on bioplastic waste in Mexico. (Analyses of paper and cardboard, and plastic waste are presented in separate studies.) It provides, as comprehensively as available data allow, a snapshot of the current state of bioplastics waste management, as well as the barriers limiting its circularity and the opportunities to overcome them. This paper follows the recent publication of the similar series focusing on Canada and the United States together.[1]

The study was designed to gather useful information to foster collaboration and knowledge-sharing among stakeholders and to provide policy-makers with evidence-based recommendations for optimizing bioplastics waste management and circularity in Mexico.

To this end, we examine the situation along the bioplastics value chain; market trends in terms of production, imports and demand; current and recently adopted policies; and best practices and considerations for waste management of these materials.

In the context of this study, bioplastics are considered as a family of materials that can be bio-based or biodegradable, or exhibit both properties.

It is also recognized that there are bioplastics of fossil or petrochemical origin that are biodegradable and designed for mineralization in specific environmental conditions that foster this process, such as composting, marine environments or even anoxic environments such as biodigesters.

Based on the origin of the raw material and the biodegradability characteristics of the product, it is possible to identify three classes of plastics.

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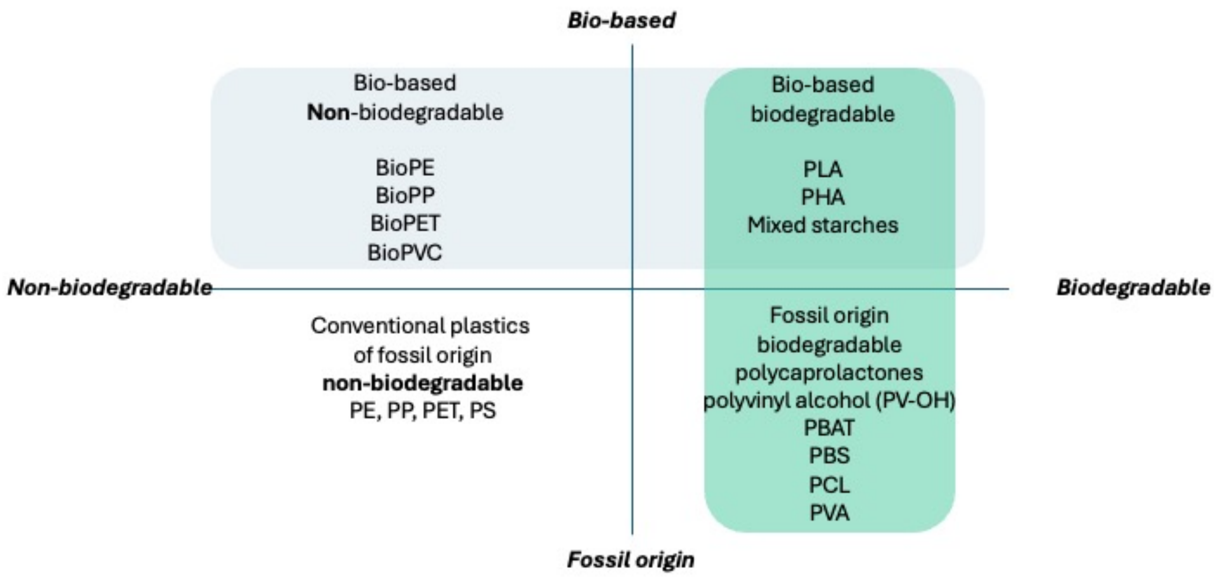
[1] See Commission for Environmental Cooperation, 2025, at:< https://www.cec.org/transforming-recycling-and-solid-waste-management-in-north-america/ >.

Figure 1. Distribution of plastic classes according to the European Environment Agency (EEA)



Source: Prepared by the authors based on data obtained from EEA (2020) and European Bioplastics (2024).

Figure 1 shows the types of plastics with which we interact in our daily lives: conventional plastics (all of them fossil-based) and those that, due to their capacity to decompose naturally in a reasonable time and generate harmless end products, are identified as biodegradable or compostable.

This report addresses three groups of bioplastics, which are described below.

Bio-based biodegradable. Bioplastics that are simultaneously bio-based and biodegradable include polylactic acid (PLA) and polyhydroxyalkanoates (PHAs). PLA is one of the most widely used bioplastics and is obtained mainly from resources such as corn. It has properties similar to those of polyethylene terephthalate (PET) (a conventional plastic of the polyester family), although it is less resistant to high temperatures. PHAs constitute a family of biopolymers whose properties can vary significantly depending on the specific type of polymer they are made of. These are obtained from plant cells or by biotechnology, through bacterial cultures.

Bio-based non-biodegradable. This group includes biopolyethylene (Bio-PE), with properties similar to those of conventional polyethylene, and Bio-PET, which has characteristics similar to polyethylene terephthalate (PET). Both bioplastics are mostly manufactured from sugar cane, from which bioethanol is obtained as an intermediate product. Biopolyamide (Bio-PA), a recyclable bioplastic with excellent thermal insulation properties, also belongs to this category.

Non-bio-based biodegradable. Biodegradability has to do with the chemical structure of the polymer and, therefore, biodegradable plastics can be obtained from petroleum with proper processing. Examples are polycaprolactone (PCL) and polybutylene succinate (PBS).

The most common bioplastics have diverse properties and applications and may be confused with so-called *oxo-degradable plastics*. The latter are conventional plastics that, through the addition of additives, have the ability to fragment into smaller particles, producing only the appearance of biodegradation.

In Mexico, expected management of post-consumption waste made from bioplastics is treatment in industrial composting plants. However, such facilities are not available today. Currently operating composting plants are mainly used for the treatment of pruning waste in open-air facilities.

Mexico City is the region that has made the most progress in terms of bioplastics regulation. An administrative procedure is in place to authorize the marketing of these products, complemented by the obligation for companies to submit management plans. In addition, a local enforcement rule has been implemented requiring the submission of semiannual reports on sales and recovery of post-consumption waste.

2. Research Method

The bioplastics market in Mexico is nascent, and the available information comes mainly from research using cybersources, supplemented with data obtained from some actors in the value chain who contribute to documenting the behavior of the national market. This information is in turn complemented by that in international databases related to the buying and selling of bioplastics, particularly in the European and North American markets.

Market data were obtained, in part, from Mexico's National Institute of Statistics and Geography (INEGI) and from raw material import platforms, which made it possible to draw up the Sankey diagram (Figure 4) showing import quotas for bioplastic resins.

The market analysis indicates that growth is mainly linked to the emergence of micro- and small companies dedicated to the production of bioplastics from agro-industrial waste, although no agricultural companies have been identified that use their biomass production exclusively for the manufacture of bioplastics.

Given the emerging nature of this sector, market information should be considered unconsolidated.

2.1 Material flow and waste management

Mexico is a net importer of PLA pellets, PHA, starch, PBAT, PBS and cellulose fiber from sugar cane bagasse or bamboo. According to information from the Mexican Bioplastics Association (AMB) shared via direct communication, although there are other raw materials that could be more efficient or of greater value in terms of biodegradability or compostability, their availability in Mexico continues to be limited, since Europe, the United States and emerging economies (in Asia) are the first consumers or markets served.

The main types of bioplastics imported into Mexico are listed in Table 1.

Table 1. Type of bioplastic imported, by country of origin and main applications

Type of bioplastic	Country of origin	Main applications
PLA	Germany, United States, China, The Netherlands	Packaging, filaments, cutlery
PHA	United States, China, South Korea, The Netherlands, Singapore	Compostable, biodegradable utensils
From starch	Corn: United States, Brazil, Turkey, France Potato: Denmark, The Netherlands, Germany, France, United States Wheat: United States	Bags, films, cutlery
PBAT and PBS	China, United States	Optimization of PLA or starch properties
Cellulose (vegetable fibers)	Partially domestic; also imported from the United States, Germany, China, Brazil, Sweden	Biodegradable films and packaging

Source: Prepared by the authors with data from European Bioplastics (2024), Data Bridge Market Research (2024) and Global Growth Insights (2024).

While Mexico does have vast areas of land for the cultivation of raw material used mainly for food or forestry, the use of part of this area for other applications, such as the cultivation of species for the production of materials reserved for the production of biopolymers and, therefore, for the manufacture of disposable products, is an issue that generates profound questions, both domestically and internationally, due to the change in land use.

Based on the above, the extraction of organic materials comes primarily from the use of agro-industrial waste that provides substances such as starch, cellulose or biomass in general, including avocado seeds, mango, sugar cane bagasse or even algae, to obtain the chemical bases necessary for the manufacture of bioplastics.

In this regard, the use of raw materials derived from waste is the result of constantly growing research and development projects led by academic institutions such as the *Universidad Nacional Autónoma de México* (UNAM), the *Universidad Autónoma Metropolitana* (UAM), the *Instituto Politécnico Nacional* (IPN), state universities and research centers, such as those housed at the *Universidad Autónoma del Estado de Hidalgo*, the *Centro de Investigación en Química Aplicada* (CIQA), the *Instituto Tecnológico de Estudios Superiores de Monterrey* (ITESM) and the *Universidad Popular*

Autónoma del Estado de Puebla (UPAEP), among others, whose research in this area includes the extraction of starches and other compounds from agro-industrial waste.

In Mexico, bioplastics production is highly sectorized and concentrated in small or recently created companies, each with installed capacity of less than 100 tons per month. Most of these companies use agro-industrial waste as raw material rather than crops planted exclusively for this purpose.

Table 2. Companies that market or produce raw materials for bioplastics in Mexico

Company	Stage	General information
Avani Eco-México	Producer and processor	Subsidiary of Avani Eco-Indonesia, headquartered in Mexico City.
BioSolutions	Producer and processor	Mexican company founded in 2013, dedicated to the production of bioplastic materials from cellulose or agro-industrial biomass, Polyagave brand.
Biofase	Producer, importer and processor	Company dedicated to the production and sale of bioplastic resins or biodegradable plastic from avocado pits. Resins can be processed by injection, extrusion or thermoforming.
Bioelements	Importer and processor	Commercializes and processes compostable PBAT and starch resins.
Ecoplaso	Producer	Produces bioplastics, from organic waste, in three formats in a plant. Daily production per facility: 300–400 kg of sheets, pellets and 3D filaments.
Green Loop	Producer and processor	Based in Querétaro, produces certified biopolymers and compostables.
Green Plastics (GPI Group)	Importer and processor	Imports PBAT to manufacture Ecosolutions brand compostable bags.
Xeiba Nutringredients	Producer	Micro-business.
Polybion	Manufacturer	Guanajuato-based company with a solar-powered bio-manufacturing plant with an installed capacity of 1.1 million square feet of Celium® biotextile per year.

Company	Stage	General information
Polyone México, DVA Plastics, Resirene	Importer and marketer	PBAT or PLA blends for processing by other companies.
Plastigreen and Green & Compostable Mexico	Importer and marketer	PBAT and PLA resins.
Plastinova	Producer	Linked to the Instituto Tecnológico de Tepic, manufactures biocomposites from agave residues and bioplastic matrices.
Tecnología Regenerativa Mexicana (TRM) (Mexican Regenerative Technology)	Importer and processor	Produces compostable plastics with a mixture of PBAT and starch.

Source: Prepared by the authors with data from INECC (2020).

Among the main international brands that produce resins and biopolymers on a large scale are Braskem Idesa, BASF, Novamont, NatureWorks, Dupont, FKUR Kunststoff GmbH, Arkema France and Corbion, some of which have marketing offices in Mexico.

Marketing and consumer market

Restrictions on the marketing of single-use plastics in Mexico, especially in the packaging and packing sector, have prompted the substitution of conventional plastics with materials such as paper, cardboard and bioplastics. This transition has generated diverse results and, in some cases, unforeseen effects, such as impacts on food preservation and transportation. Such substitutions can affect the shelf life of products such as bread and pastries, or cause problems in the shipment of fresh vegetables, including excess moisture.

In terms of commercialization, the value chain for bioplastics is very similar to that of conventional plastics. However, the main emphasis is on wholesale, where imports come directly from the manufacturer, its representatives or its national distributors, who supply raw material to processing plants. This raw material is mainly used for the manufacture of containers, packaging and packing for the market, with a special focus on fast-food and home delivery chains. Direct consumption in retail is practically nil due to the high cost of the final product and the fact that informal traders prefer to use low-cost and easily accessible traditional disposables.

2.1.1 Waste management and handling

Recovery of post-consumption waste made from bioplastics is still very limited. Generally speaking, these materials are collected together with conventional plastics largely because they appear similar to single-use plastics, even though they are marked and labeled as compostable and biodegradable.

The common practice for waste such as PLA-coated paper cups, clamshell containers made from natural fiber, and utensils (spoons, forks and knives) made from bioplastics is to handle them together with mixed waste and send them to final disposal.

However, according to the Mexican Bioplastics Association (AMB), there are initiatives aimed at encouraging differentiated recovery and large-scale composting at the two recognized composting plants in Mexico City, both of which have the capacity to accept bioplastics for processing.

In the case of PLA, this bioplastic is very similar in appearance to conventional polyethylene terephthalate (PET) plastic, but it is not entirely recyclable and, in principle, when both types of plastic are mixed in a recycling container, this content cannot be recycled as a whole but must undergo prior separation processes by type of material.

There is a fear that the increasing use of PLA may hinder measures already implemented to recycle plastics (Lifeder, <https://www.lifeder.com/bioplasticos/>). However, there are Mexican companies that have taken action aimed at accepting these materials and using them in the manufacture of filaments for 3D printing, or in the manufacture of panels or plastic wood.

3. Market Overview

According to Global Growth Insight (2024) estimates, in 2024 the global biodegradable plastics market reached a value of US$3.982 billion. Using 2023 as a benchmark, Data Bridge Market Research (2024) estimated a value of EU$2.482 billion in 2024, while The Brainy Insights (2024) reported that the biodegradable plastics market in 2022 reached EU$7.060 billion, with an expected growth rate of 20.03 percent between 2022 and 2030. As can be seen, the size of the world market differs depending on the source consulted.

The biodegradable plastics of greatest interest and consumption, by type, are:

- polylactic acid (PLA),
- starch mixtures,
- biodegradable fossil-based polyesters (PHAs), and
- others (cellulose, starch or sugar cane).

Applications of biodegradable plastics of greatest interest and consumption include:

- packaging and bags,
- consumer goods,
- agriculture and horticulture,
- textiles,
- medical, and
- other.

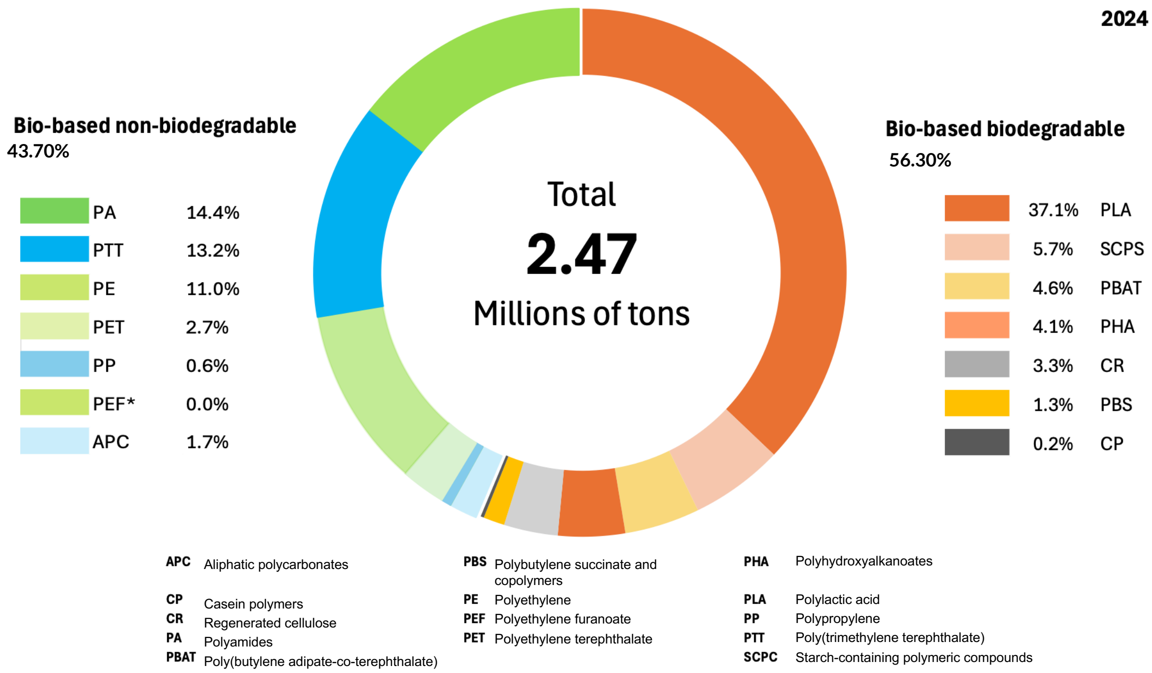
In addition to the above, bioplastics in general are compounds subject to degradation by bacterial action, hence their ability to be transformed into essential compounds such as water, carbon dioxide (CO_2) and other elemental compounds when processed via composting or biodigestion. However, this characteristic also poses challenges related to storage, distribution and shelf life.

Table 3. Commercial cost of different types of bioplastics, and biodegradation time

Bioplastic		Commercial cost (US$ per kilo)*	Biodegradation time
TPS	Thermoplastic starch	< 1	14–110 days (in soil)
PLA	Polylactic acid	2.90–3.15	Biodegradable in industrial compost
PHA	Polyhydroxyalkanoate	6.0–6.5	60–365 days (in soil); 14–90 days (in sea water)
Bio-PE	Bio-based polyethylene	1.50–1.70	Non-biodegradable
Bio-PET	Polyethylene terephthalate of biological origin	< 1	Non-biodegradable
PBAT	Polybutylene adipate terephthalate	1.55–1.75	Biodegradable in home compost: 90–365 days
PCL	Polycaprolactone	0.9–1.25	Biodegradable in home compost: 90–365 days
PBS	Polybutylene succinate	6.70–7.40	Biodegradable in home compost: 74–365 days

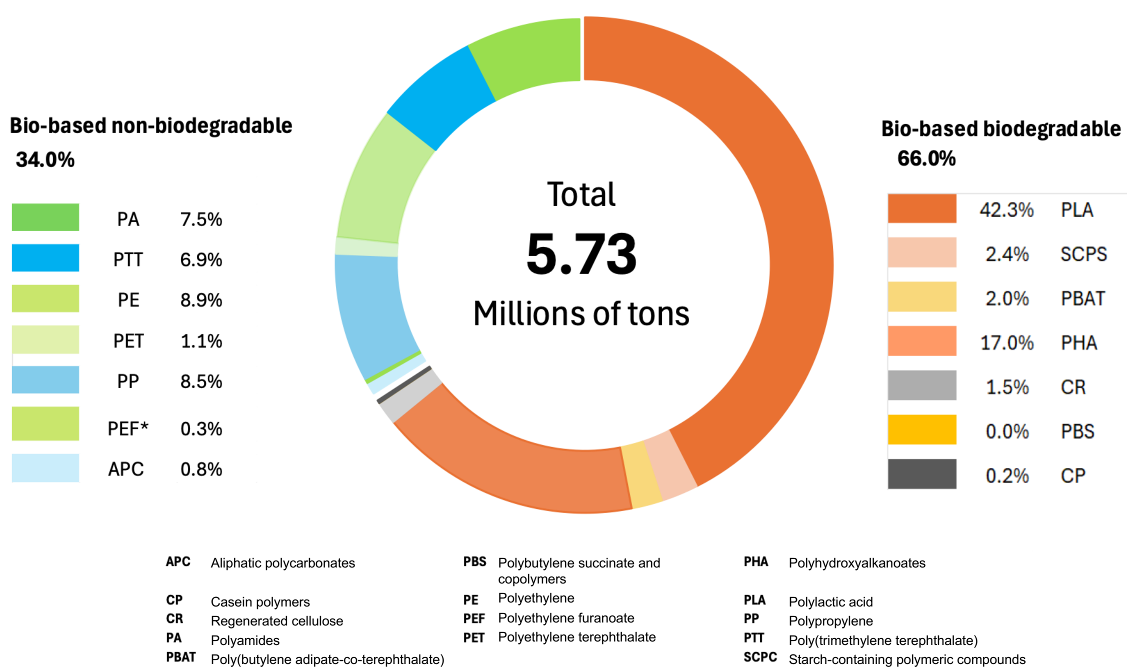
*Current prices for 2024.
Source: Adapted from M. Ghasemlou, C.J. Barrow and B. Adhikari (2024).

Figure 2. Global bioplastics production capacity, 2024



Source: Adapted from European Bioplastics (2024).

Figure 3. Projected global bioplastics production capacity, 2029



Source: Adapted from European Bioplastics (2024).

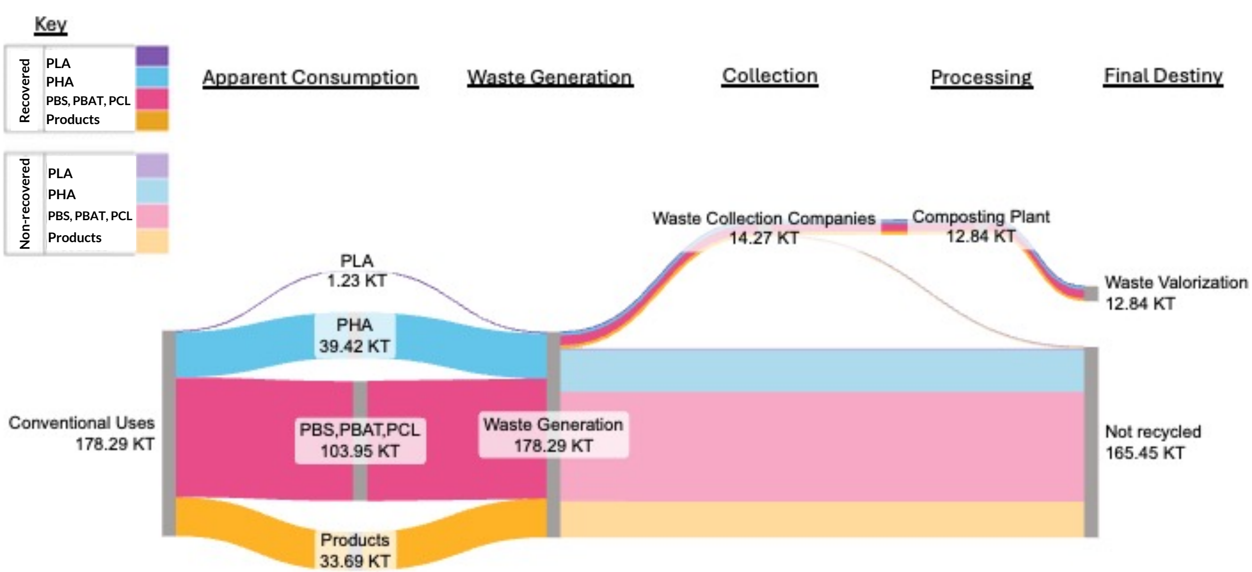
In Mexico, the manufacture of bioplastics is nascent (compared to petrochemical-based materials) and is being developed on a small scale. Figure 4 presents a summary of the flow of bioplastic resins and compostable bioplastic finished products in Mexico for 2022, illustrated with a Sankey diagram.

The design used data on the apparent consumption of bioplastics in Mexico, which is presumed to correspond to the country's trade balance, given the meager production of these materials in the national sphere. Import and export data for bioplastic resins correspond to the following Harmonized Commodity Description and Coding System codes obtained from the United Nations Commodity Trade Statistics Database (UN Comtrade Database):

- HS 390770 – Polylactic acid (PLA); in primary forms.
- HS 390791 – Other polyesters, unsaturated; in primary forms (this subset refers to polyhydroxyalkanoate [PHA]).
- HS 390799 – Other polyesters, saturated; in primary forms (this subset includes polybutylene succinate [PBS], polybutylene adipate terephthalate [PBAT] and polycaprolactone [PCL]).
- HS 392329 – Plastics; sacks and bags (including cones), for the conveyance or packing of goods, of plastics other than polymers of ethylene (this subset refers to compostable products).

According to estimates by the Mexican Association of Bioplastics, AC, 80 percent of net imports of these products remain in Mexico City, of which only 10 percent of the waste is recovered, although 1 percent of this was material that is not suitable for recycling.

Figure 4. Bioplastic waste streams, by type of resin and product, in Mexico, in 2022 (kilotons)



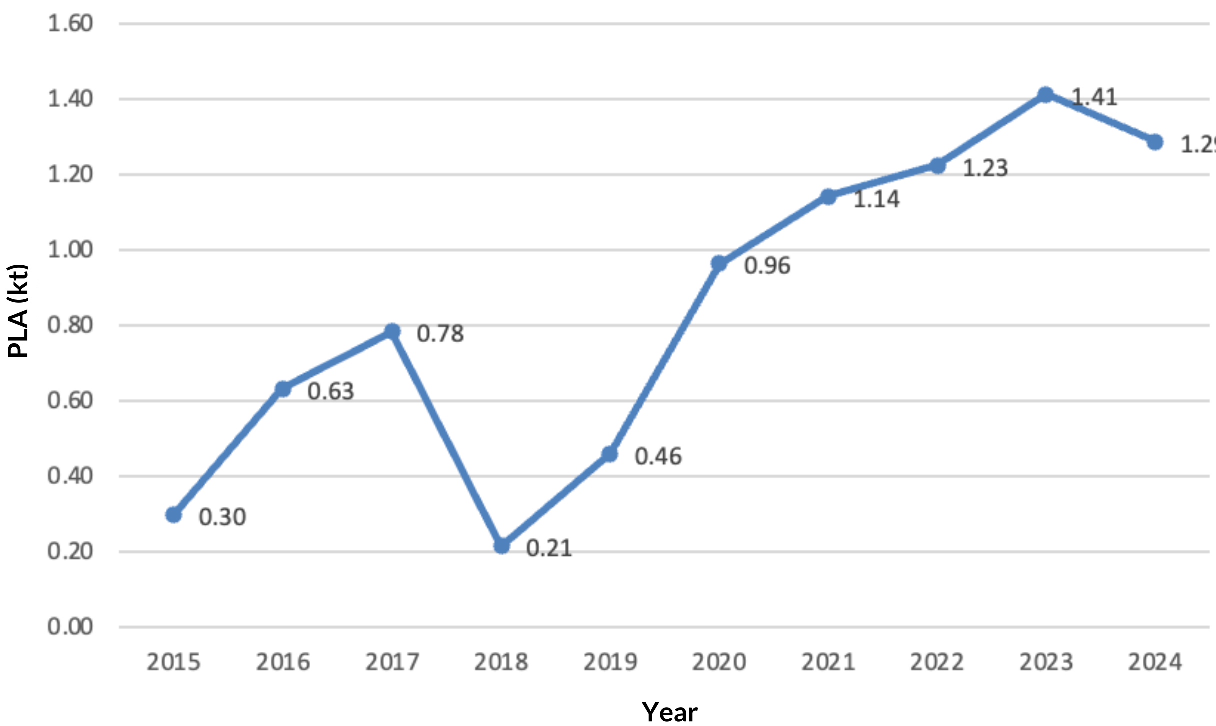
Source: Prepared by the authors with information from AMB (2025) and UN Comtrade (2024).

In 2022, in Mexico, 1.23 kilotons (kt) of PLA, 39.42 kt of PHA, 103.95 kt of PBS, PBAT and PCL, and 33.69 kt of finished products made from bioplastics were consumed. Taking these data as a reference, waste generation is estimated at 178.29 kt, of which 165.45 kt are not recycled, 14.27 kt are collected and 12.48 kt are recovered in recycling plants. The value of the bioplastics market in Mexico in 2022, in monetary terms, was EU$768,502,567, distributed as follows: PLA, US$3,640,520; PHA, US$110,216,283; PBS, PBAT and PCL, US$466,426,041; and finished products, US$188,219,723.

In order to analyze trends in apparent consumption by type of resin, the trade balance information reported by the UN Comtrade Database was analyzed over a ten-year period, from 2015 to 2024. In general, it was found that apparent consumption of bioplastics showed positive growth rates during the period.

The apparent consumption of PLA in Mexico between 2015 and 2024 shows an increasing trend, going from 0.3 kt in 2015 to 1.29 kt in 2024.

Figure 5. Apparent consumption of PLA in Mexico, 2015–2024 (kilotons)



Source: Prepared by the authors with information from UN Comtrade (2024).

Being biodegradable and compostable, bioplastics represent a suitable environmental alternative and contribute to reducing the impact associated with conventional single-use plastics. At the same time, legislation promotes the sending of such materials for composting or, in the case of bags, their application in the containment of organic waste and their disposal through local cleaning systems.

However, recovery of these materials, due to their low caliber, does not interest garbage pickers: it takes a large number of units collected to amass one kilo of material, and the market price is low or zero.

Also, the government does not have industrial composting plants, and the production of these materials is not of interest to the private sector, given its high cost and that the sale of compost is not very attractive as a business.

In academic institutions, however, composting initiatives are gaining increasing interest as a technical training strategy, although these institutions lack certified or recognized facilities as industrial plants for processing post-consumption waste with compostable or biodegradable materials.

Although the Mexican Bioplastics Association has taken action to recover materials and send them for composting, which would complete the expected cycle for bioplastics, there are still no reports available on the volumes processed under this scheme.

In Mexico, post-consumption waste bioplastics are destined for composting facilities as a first option. Internationally, the destination of these materials seeks to ensure that, if released into the environment, they degrade in less time than conventional plastics, which would reduce the impact on wildlife and marine ecosystems.

These conditions constitute the frame of reference in which the management of post-consumption bioplastic waste is carried out. This waste is not recovered because it is not of economic interest for either the garbage pickers or the collection centers, which generally do not accept these materials. Furthermore, in Mexico there are no certified industrial composting plants (public or private) that receive this type of waste on a continuous basis.

In other words, there is no secondary market for the recycling of post-consumption bioplastic waste. Therefore, these materials are handled together with mixed waste and sent to final disposal, which, in the best case, is a sanitary landfill. Depending on the region of the country, they may also be sent to a controlled disposal site (FDS-C) or to an uncontrolled FDS (FDS-NC).

3.1.1 Recycling and recovery of bioplastic waste

The biodegradability and compostability characteristics of bioplastics are one of their main attributes, enabling consumers to use them as an alternative that reduces the environmental impact associated with conventional plastics.

In Mexico, current regulations state that bioplastic waste can be disposed of through the cleaning system, incorporating it into the organic waste subset. This waste is sent for treatment to industrial composting plants, where it undergoes either aerobic processes or anaerobic digestion (AD) processes, where the material is transformed into carbon dioxide (CO_2), water and biomass. In the case of anaerobic digestion, organic material is degraded to methane (CH_4) and other compounds that make up the biogas produced.

4. Regulatory Framework

The regulations applicable to bioplastics in Mexico are usually framed within the regulations governing conventional plastics and, occasionally, in provisions related to municipal solid waste (MSW) or special handling waste.

The formulation of new public policies has an impact (direct or indirect) on the shaping of a regulatory framework for bioplastics, since restrictions on the use of single-use plastics have an impact on a more widespread application of bioplastics or additives that accelerate their degradation in the environment. As a desirable material to replace conventional plastics in some applications, the private sector sees it as an alternative that allows the sector to continue its economic activities.

In Mexico, the regulation of plastics is closely related to public policies and international trends in the circular economy. Driven by the Ellen MacArthur Foundation, agreements have also been signed on plastic pollution (including marine pollution), such as the Global Alliance for Action Against Plastics and agreements with Mexican entities, as well as various initiatives of the United Nations Development Program (UNDP) on the environment, resilience, sustainability and, of course, plastics. All these elements have influenced the shaping of national public policies regarding the prohibition and restriction of single-use plastics.

However, this new national policy structure needs to be supported by instruments that provide certainty to the private sector, for which action related to plastics and their impact on the environment and public health must be clearly defined.

5. Findings and Recommendations

During the preparation of this study, findings were identified in each stage, section and subsection that enable us to detect areas of opportunity and improvement in the different elements that involve both the public and private sectors.

The identification of these findings is not intended to be taken as value judgments or qualification of the facts found, but only to describe those elements that provide information and knowledge on the current conditions of handling and management of bioplastic waste in the country.

Finding 1

In Mexico, bioplastics are mainly used in the manufacture of single-use products. These products are often used as alternatives in response to bans or restrictions on conventional plastic. The food sector is the largest user, followed by the healthcare sector and, in recent years, by the agricultural, automotive and textile sectors. However, in all cases there is a lack of clear mechanisms for bioplastics recovery, management and recycling.

Recommendation 1. Strengthen the legal framework to cover the complete life cycle of bioplastics manufactured in Mexico, especially when their raw material comes from crops. This aspect is of considerable importance, since the production, import and use of bioplastics is a regulatory-driven activity, and the implicit obligation is associated with a ban, but not with a sustainable production approach.

Recommendation 2. Focus production of bioplastics on the recovery and management of waste from the agro-industrial sector, in order to promote the management and recovery of large volumes of waste, which would also generate new economic opportunities for the country.

Recommendation 3. Formulate a legal framework at the national or state level that encourages the production of bioplastics from waste, provides certainty for investments and fosters the growth of this market.

Recommendation 4. Design and implement specific economic instruments that promote the production of goods from waste, strengthening the market for bioplastics, biomethane and biomass, while contributing to the management of post-consumption agro-industrial waste.

Recommendation 5. Establish a national policy framework that provides guidelines for waste disposal, expands mechanical recycling and thermal recovery options, and facilitates clear communication of these options.

Finding 2

In Mexico there is no specific infrastructure for handling bioplastic waste, which ends up mixed with municipal solid waste and is handled through the conventional infrastructure available.

Recommendation 1. While the separation of organic and inorganic waste is a step forward, it is not enough for a circular economy. In the case of compostable bioplastics, their recovery together with organic waste represents a viable alternative. It calls for communication and awareness campaigns aimed at ensuring their proper implementation. This measure would make it possible to recover compostable bioplastics separately from conventional plastics.

Recommendation 2. Given that the minimum management of post-consumption waste of bioplastics in Mexico lies in composting, the construction and operation of industrial composting and biodigestion plants for the treatment of organic waste, including bioplastics, should be promoted. This should be complemented with the promotion of compost commercialization as an economic instrument that encourages the creation of infrastructure built to receive bioplastics.

Finding 3

Parties involved in the bioplastics value chain show little motivation to invest in post-consumption waste recovery and handling facilities. Recovery through composting generates little economic value, which limits the preparation of management plans and a robust secondary market.

Recommendation 1. Design management plans at national and state levels for the management and handling of bioplastic waste, including economic incentives and competitive prices for recovered materials. These are essential conditions for making recycling viable and implementing the principles of extended producer responsibility and circular economy.

Finding 4

The level of public awareness of bioplastics is very limited, which results in the waste generated being managed in the same way as plastics with no market value. This situation significantly reduces their potential for recycling, whether material or thermal.

Recommendation 1. Promote information campaigns that involve both government and private initiatives, on the properties, advantages, disadvantages, uses and proper management of bioplastics.

Recommendation 2. Implement technical training programs to train personnel specialized in the manufacture, composting, biodigestion and recycling of bioplastics.

Finding 5

Mexico is a net importer of bioplastic resins. PLA has recorded the highest growth in apparent consumption over the last ten years (35.61 percent), followed by PHA (11.34 percent) and, to a lesser extent, PBS, PBAT and PCL (5.16 percent).

Recommendation 1. Promote access to foreign exchange hedges that enable producers to plan costs and mitigate the impact of exchange rate volatility on the domestic production of goods made from bioplastic resins.

Recommendation 2. Establish clear labeling and encourage the recovery and differentiated management of this waste for recycling. If the trend continues, the consumption of PLA and PHA and, to a lesser extent, PBS, PBAT and PCL is expected to increase substantially in the near future.

Recommendation 3. Encourage startups in the domestic market and strengthen links between industry and academia in order to accelerate innovation and consolidate the bioplastics value chain.

6. Conclusions

The consumption of bioplastics poses significant challenges related to their availability in the market, cost competitiveness and the perception of those who consume these materials. Localizing the sourcing and raw material production, using economies of scale and fostering demand for recycled bioplastics can positively influence market dynamics. It is also essential to dispel misconceptions about their degradability, through appropriate labeling and the use of innovative marketing and communication strategies that strengthen the consumer's perception of the mechanical and environmental performance of these materials.

Factors that directly affect bioplastics production costs include the availability of natural raw materials such as starch, cellulose or vegetable fat, and limited access to machinery and technology. Therefore, the production of conventional plastics presents a better economic balance than that of bioplastics, a situation that limits the competitiveness of this material in the primary and secondary markets.

The industrial production of bioplastics requires biomass in order to obtain inputs such as starch and cellulose, and this can generate competition with the production of food, feed and bioenergy, an additional challenge in terms of sustainability.

Environmental regulations are the main driver for a change in raw materials and the large-scale use of bioplastics. Without this impetus, market growth would be limited, as production costs are passed on to the end consumer.

In Mexico, although there are regulations for the commercialization of biodegradable plastics that establish their handling and disposal in industrial composting plants, the lack of infrastructure in the country prevents uniform and effective application of these regulations in all states.

Recycling post-consumption bioplastics is not currently a viable activity. The low market value discourages recovery or recycling under circular-economy criteria. Consequently, its greatest benefit lies in the substitution of fossil-based raw materials and in its shorter biodegradation time compared to conventional plastics.

6.1 Shared Conclusions on Bioplastics Waste Management in Canada and the United States

In December 2024, CEC released a bioplastics management study and executive summary for Canada and another for the United States.[2] Both documents contain a section dedicated to the

[2] The executive summary in Spanish and the complete technical study in English can be viewed at: <www.cec.org/es/publications/oportunidades-en-relacion-con-el-manejo-de-residuos-de-plastico-en-canada-y-estados-unidos/>, <www.cec.org/publications/milestone-study-on-plastics-waste-management-in-the-us-and-canada-2/> and <www.cec.org/es/publications/oportunidades-en-relacion-con-el-manejo-de-residuos-de-plastico-en-canada-y-estados-unidos/>.

obstacles that hinder the recycling of bioplastic waste. With respect to Mexico, it can be concluded that these barriers have significant similarities and are shared with those identified in the other two countries.

In Mexico, the production of bioplastics is concentrated in micro-businesses that use waste from the agro-industrial sector, more as a strategy for the disposal of such waste than as a response to consolidated demand for resins in the domestic market. Production activity in the country is focused on the import of consumer goods and the acquisition of resins (especially PLA and PHA) for the manufacture of consumer goods.

In Canada and the United States, the market has production schemes that include extended producer responsibility (EPR) mechanisms, as well as differentiated collection systems with built-in fees. In Mexico, even though management plans exist, they are only implemented in some states or municipalities and do not always include rate schemes.

Despite these differences, the main barrier to the production and application of bioplastics is the high cost of production compared to conventional plastics, coupled with limited or non-existent infrastructure for the proper degradation of recovered waste. This situation leads to improper disposal, which could neutralize the environmental benefits of using bioplastics.

Another major challenge is the absence of a specific category to identify bioplastics within the recycling stream. This lack of sorting causes these materials (particularly the biodegradable ones) to be mixed with the recycling streams of conventional materials, resulting in their contamination. In Europe and the United States, recycling associations have expressed concern about this problem, pointing out that bioplastics affect the use of materials such as PET bottles or flexible plastic films.

Figure 6. Barriers to circularity of bioplastics in the three countries, and solutions

Barrier to circularity	Possible cause	Suggested solution	Action for policy-makers
Misleading labeling	Misleading claims are not prohibited. Lack of national policies.	Establish regulatory provisions to ensure proper labeling of products, clearly indicating whether they are compostable in industrial facilities or in home composting systems.	Prohibit the use of misleading labels. Conduct research and define appropriate criteria and means of evaluation.
Single-use plastics policy remains inconsistent at the national level.	Lack of a national policy restricting or banning single-use plastics.	Standardize policies in this area throughout the country.	Determine the materials to be restricted as unnecessary single-use plastics, and the conditions under which other materials can be marketed.
Lack of infrastructure to recover and recycle recyclable and compostable plastics.	Low market volumes and economies of scale.	Separate bioplastics from conventional plastics.	Promote the use of improved separation technologies. Make federal investment funds available.
Limited capacity for food waste treatment	Lack of composting infrastructure or limited food waste processing capacity.	Invest in infrastructure for the treatment of organic and food waste.	Improve access to organic waste management infrastructure by providing federal grants for organic waste management on agricultural lands.

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