

Mexico Cleantech Workshop.

The Potential of **Bioenergy** in Mexico as assessed by the **AMBB®***

Asociación Mexicana de Biomasa y Biogás, A.C. (AMBB®)

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President.**

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() Mexican Association of Biomass & Biogas, (AMBB in Spanish)*

Contents to be addressed:

- I. Background of the creation of the AMBB®.
- II. Mexico's relevant data related to energy.
- III. Waste management in Mexico.
- IV. Circular economy principles & public policies in Mexico.
- V. How the Biomass and Biogas Sector in Mexico is related to different Renewable Energy Sources.
- VI. Mexican regulatory framework for MSW & Bio-Hazardous Waste.
- VII. Business opportunities.
- VIII. Comments & conclusions



Fuente: Internet.

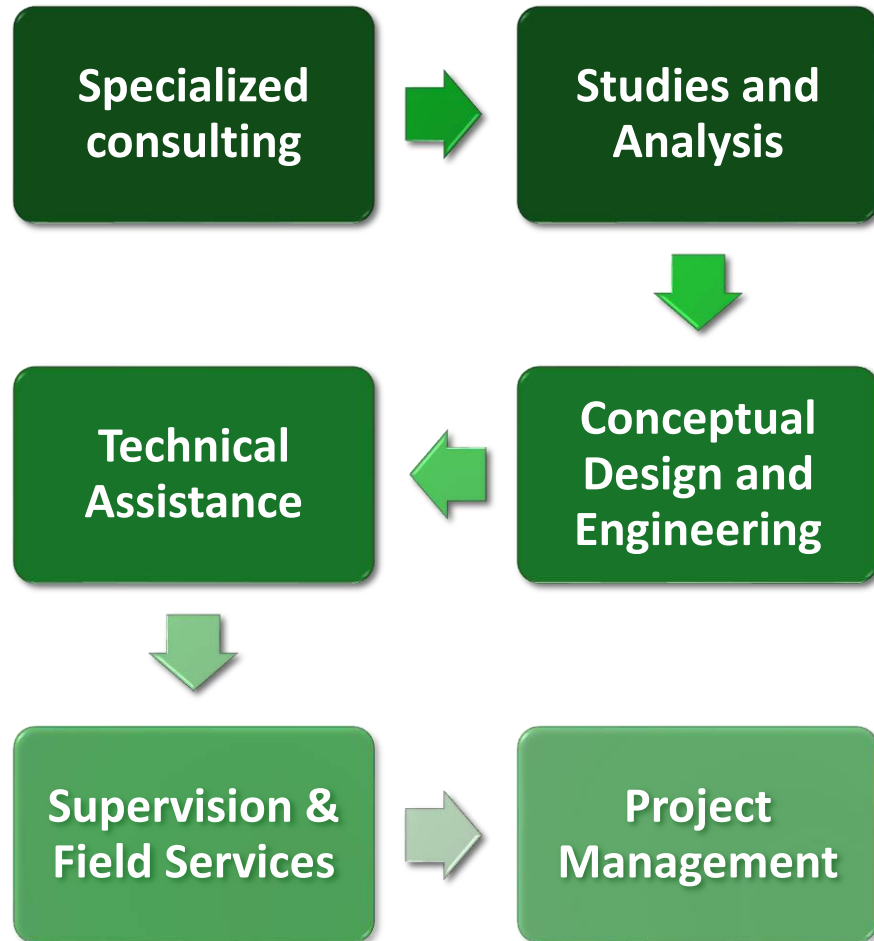
I. Background on the creation of the AMBB®.

In the context of **Global Warming**, as well as in the **Environmental crisis** that the world has been facing for the last years, and taking into account the assumption that we all must participate in being part of the solution of these problems that in a greater or lesser extent we all have created, **since 2006 a group of Mexican Professionals** gave themselves the task of **developing new techniques and strategies to rethink the final disposal of waste** from some diverse human activities in our country, in particular **Solid and Liquid Organic Waste, both urban and agro-industrial**, so that, additional to disposing of them in an **ecological and sustainable way**, **energy and other useful and environmentally friendly products** can be obtained from such waste.

This group, currently constituted as a **Non-Governmental Organization**, is called: **ASOCIACIÓN MEXICANA DE BIOMASA Y BIOGAS*, A.C.** (also known as **AMBB®**).



(*) Mexican Association of Biomass & Biogas, (AMBB in Spanish)



Based on the varied capabilities of the partners grouped at the **AMBB®**, the services that we can make available to interested parties are:

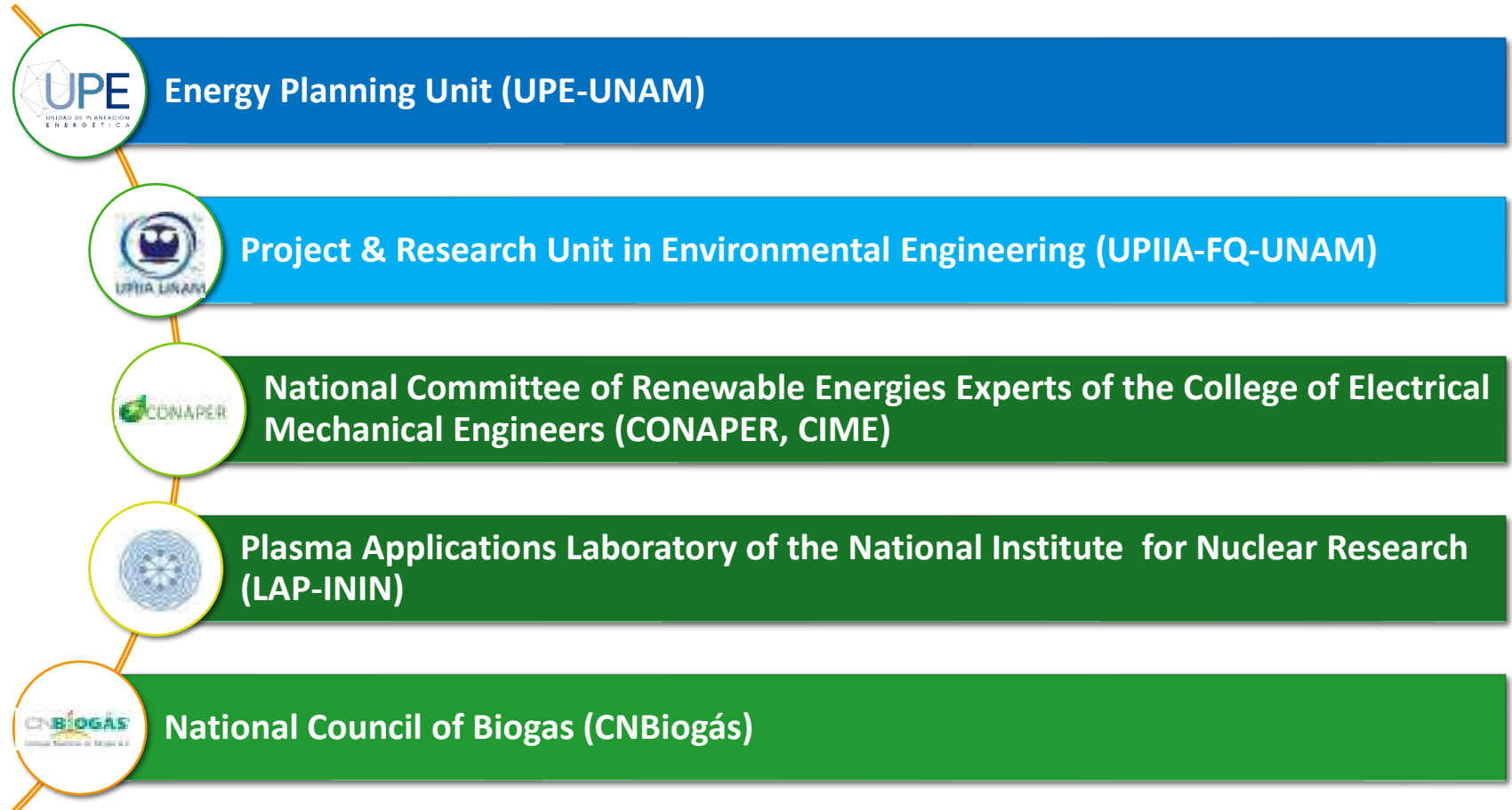
Consulting schemes and professional services aimed at providing support in:

1. Evaluation and technology transfer processes.
2. Field services, technical assistance, and specialized training.
3. Engineering (Conceptual, basic, detail, as built).
4. Development and management of industrial projects.
5. Project supervision.
6. Safety schemes and technical integrity of industrial projects.
7. Regulatory and environmental compliance.
8. Economic evaluation of projects.
9. Technical-financial feasibility of projects.
10. Energy and environment.

The following slides will show how the capabilities mentioned here are combined in regard of the expertise and information we have gathered on the integral management of Organic Waste, Biomass, Biofuels and Bioenergy.

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The AMBB® maintains professional working relationships and provide technical support to different local entities in Mexico related to Bioenergy such as:

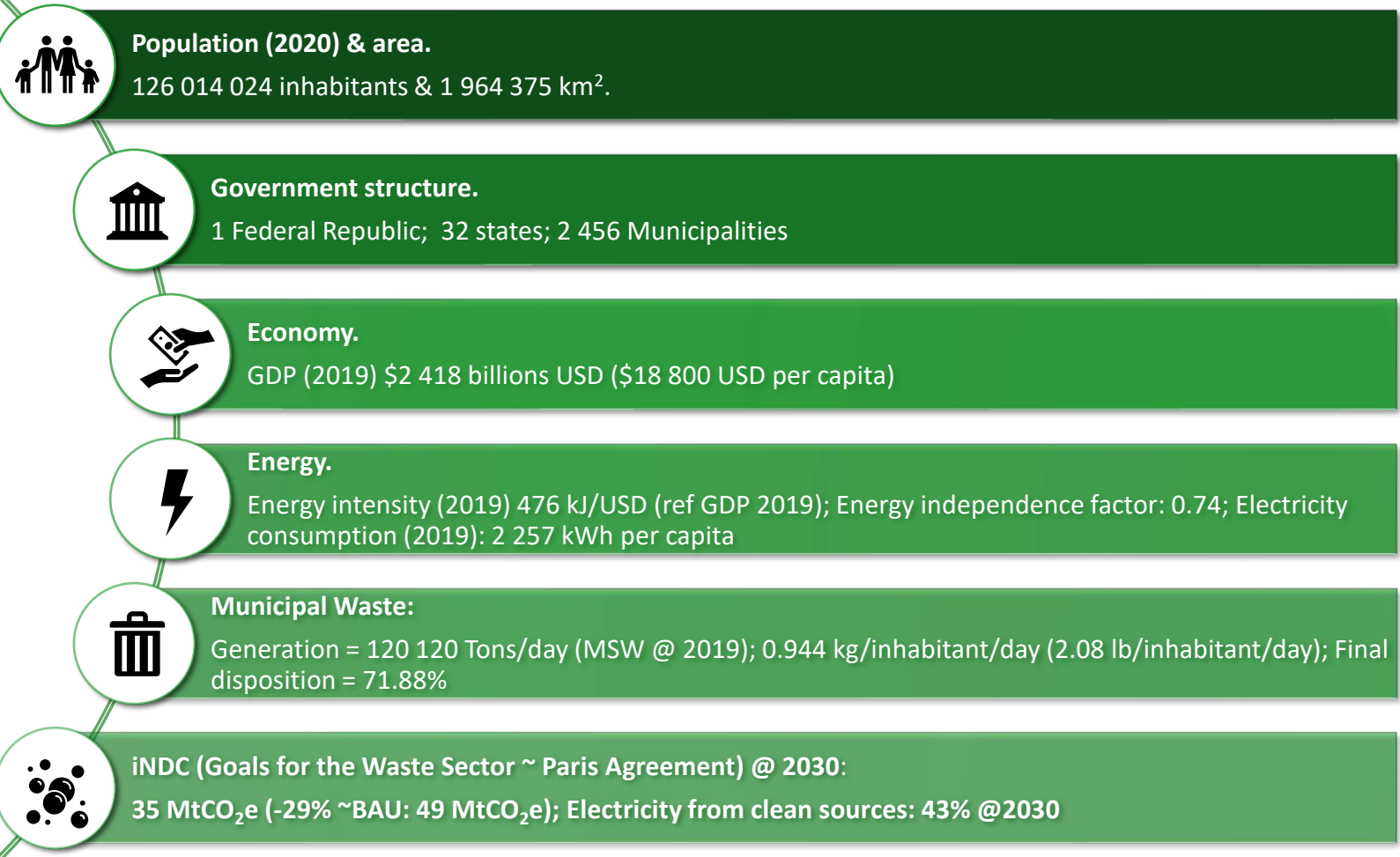


(*) Mexican Association of Biomass & Biogas, (AMBB in Spanish)

Mexican United States = Mexico.



II. Mexico's relevant data related to GDP*, energy & waste.

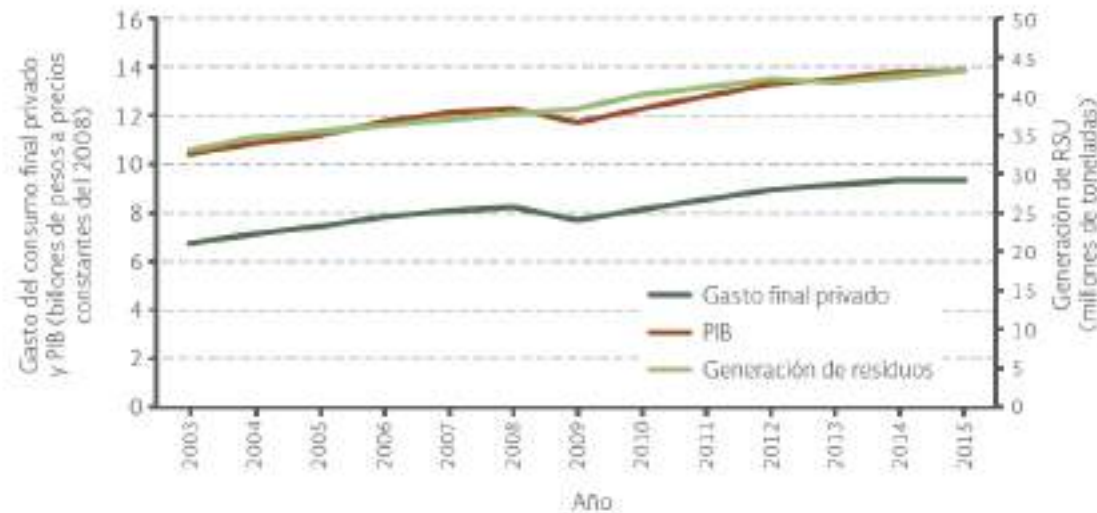


(*) GDP = PIB in Spanish),

Information Sources: SENER, SEMARNAT, INEGI

Generation of MSW, growth of GDP

Figura 7.2 | Generación de RSU, producto interno bruto (PIB) y gasto del consumo final privado en México, 2003 - 2015

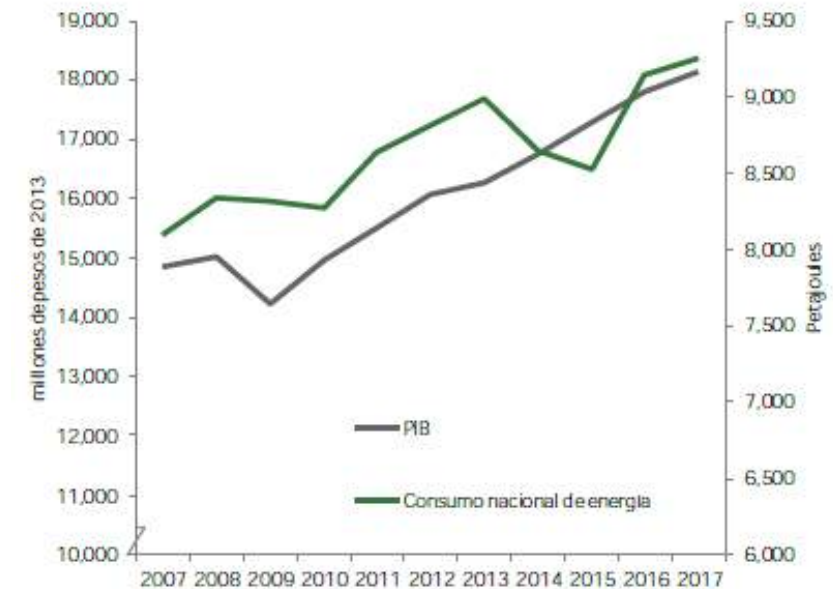


Fuentes:
Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas, Sedesol, México, 2013.
INEGI Sistema de Cuentas Nacionales de México, Banco de Información Económica, INEGI México, 2015, Disponible en: www.inegi.org.mx/est/contenidos/proyectos/cnv/, Fecha de consulta: diciembre de 2015.
Presidencia de la República, Tercer Informe de Gobierno 2014-2015, Anexo Estadístico, Gobierno de los Estados Unidos Mexicanos, México, 2015.

Source: Inform of the situation on the Environment in Mexico (2015). SEMARNAT

Growth of GDP vs. growth of energy consumption

Figura 10. Producto interno bruto vs. Consumo nacional de energía

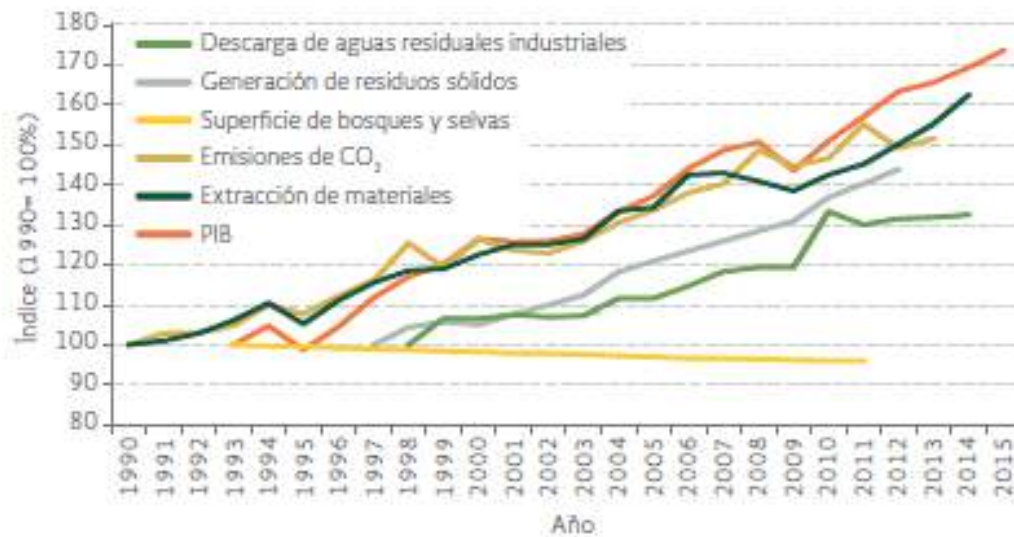


Fuente: INEGI, Sistema de Cuentas Nacionales de México y cálculos propios

Source: SENER, National Balance of Energy (2017).

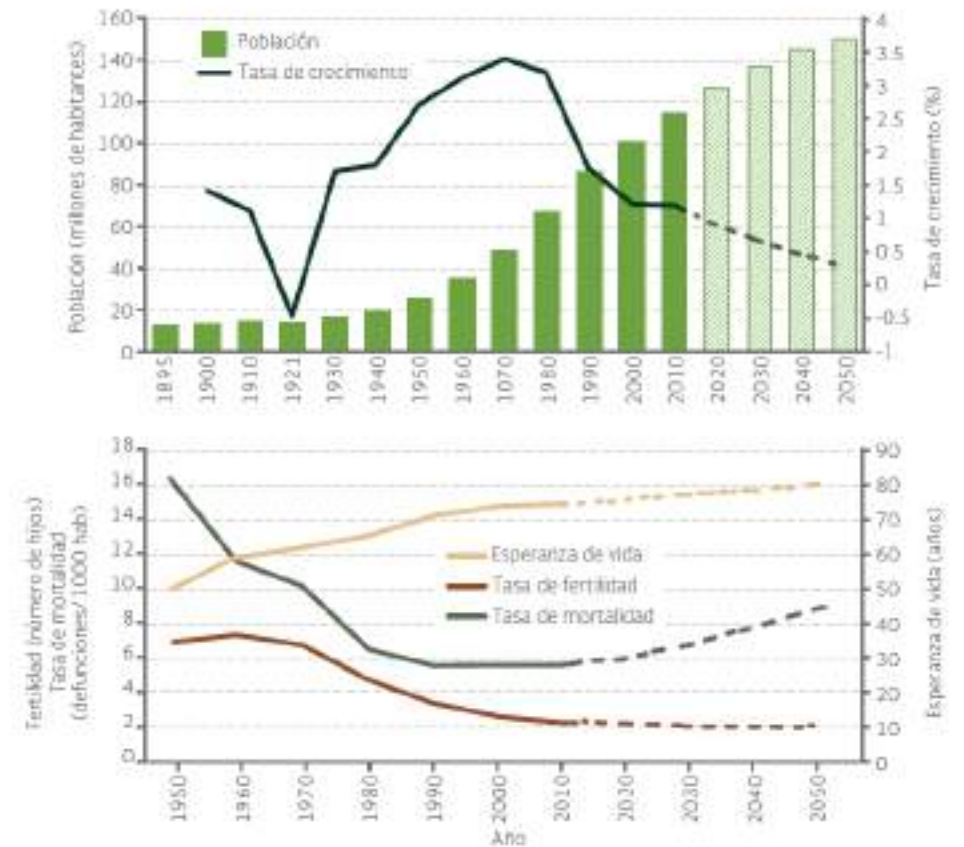
Evolution of different environmental indicators related to the growth of GDP

Figura 1.2 | Cambio de diferentes variables ambientales y PIB, 1990 - 2015



Gross Population and growth rate in Mexico

Figura 1.3 | Población total y tasa de crecimiento en México, 1895 - 2050¹



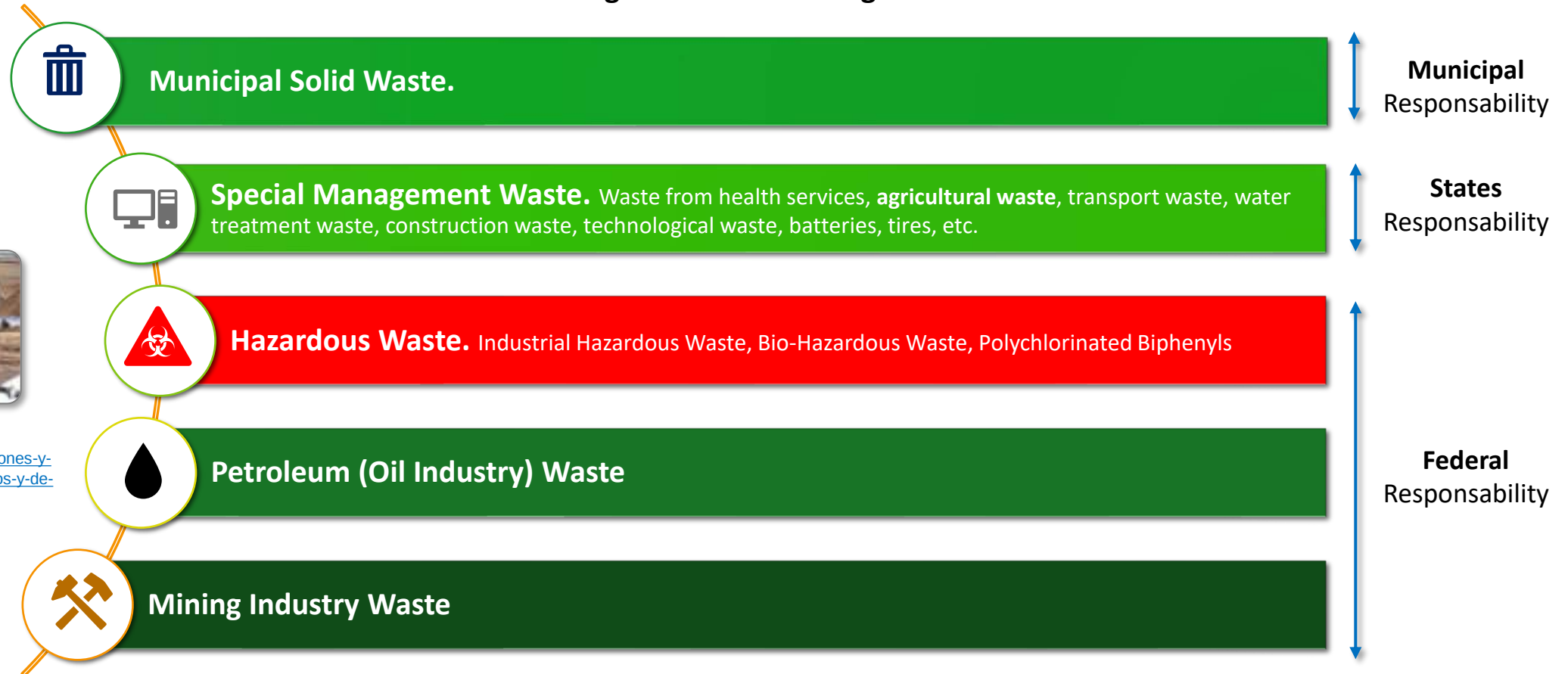
Source: Inform of the situation on the Environment in Mexico (2015). SEMARNAT

III. Waste management in Mexico.

Waste streams generated according to SEMARNAT.



Source:
<https://www.gob.mx/semarnat/acciones-y-programas/residuos-solidos-urbanos-y-de-manejo-especial>



Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

Management & disposal of Municipal Solid Waste (MSW) in Mexico.



Key information about MSW management in Mexico, National Level*, 2017



MSW Generation

- **120,128 ton/day**
0.944 kg/inhabitant/day
(2.08 lb/inhabitant/day)



Classification

- **31.5% recyclable inorganic waste**
- **46.42% organic waste**
- 22.03% other residues



Waste Collection Vehicles

- **16,615 Vehicles**
59.3% w/compaction system
29% Due lifetime, more than 24 yr. (<1995)



Transfer Facilities

- **127 facilities @ 112 Municipalities (23 States)**
49.61% @ Municipalities +100,000 inhabitants



Gathering centers

- **173 facilities @ 63 Municipalities (19 States)**
49.61% @ Municipalities +100,000 inhabitants



Final Disposition Sites

- **2,203 sites across Mexico w/exception of Mexico City**
(Average disposition: 86,352.7 ton/day)

Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

Sites used for final disposition of waste in Mexico.



In 2017, only **82*** sites located in 79 Municipalities of 28 States **fulfill the basic characteristics of the infrastructure & operation required by** the local regulations...whereas **685*** sites in 509 Municipalities of 27 States **do not comply any of the characteristics or regulations** they were supposed to.

Average costs* (National level) for:

Collected MSW: \$434 MXP/ton ≤ **\$21.92 USD/ton** (\$1 USD ~ \$19.80 MXP)

Disposed MSW: \$122 MXP/ton ≤ **\$6.1 USD/ton** (\$1 USD ~ \$19.80 MXP)

(*) Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

Non controlled disposition sites or dumps.

Controlled sites

Compost plants

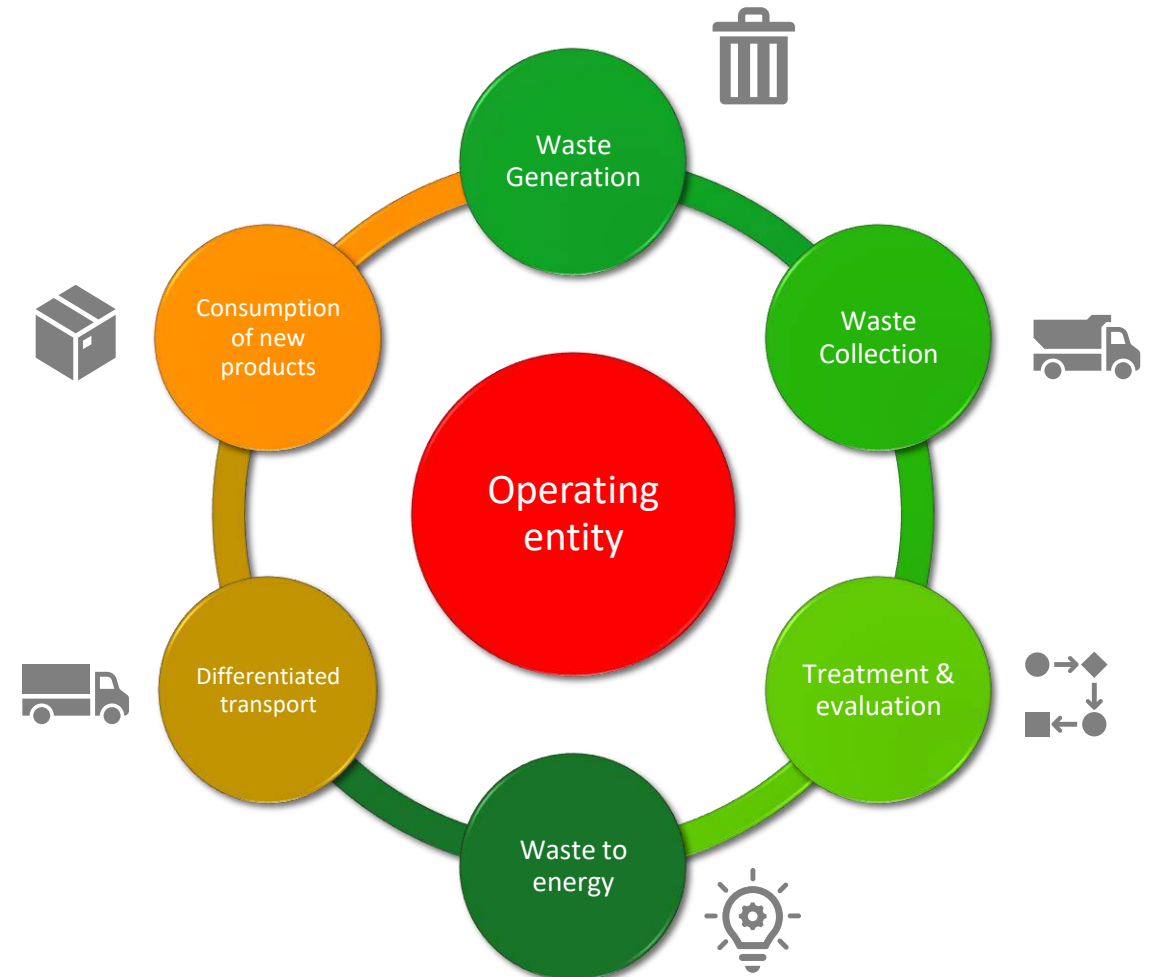
Landfills

Biogas Plants

Mechanical or Thermal processing plants

Source: AMBB ®

IV. Circular economy principles & public policies in Mexico



Information Source: SEMARNAT. Visión Nacional hacia una gestión sustentable.

V. How the Biomass and Biogas Sector in Mexico is related to different Renewable Energy Sources.

In **Mexico**, the **Biomass & Biogas** Sector is distributed in different application environments, all of them with different needs and requirements, but with a common potential: the energy and environmental use of waste.



A) Industrial Applications in the fields of:

- Paper.
- Sugar.
- Food production.
- Liquor production.
- Organic production.
- Waste.

B) Agricultural Applications in:

- Dairy farms.
- Farms for: cattle, pig, poultry, etc.

C) Municipal Applications with MSW in:

- Plants for urban solid waste management (organic).
- Landfills.
- Plants for generating electricity with biogas.
- Plants for the Improvement of Biogas (NGV/CNG).

D) Applications in the treatment of Wastewater in:

- Sludge treatment for biogas production.
- Energy efficiency.
- Anaerobic treatment.

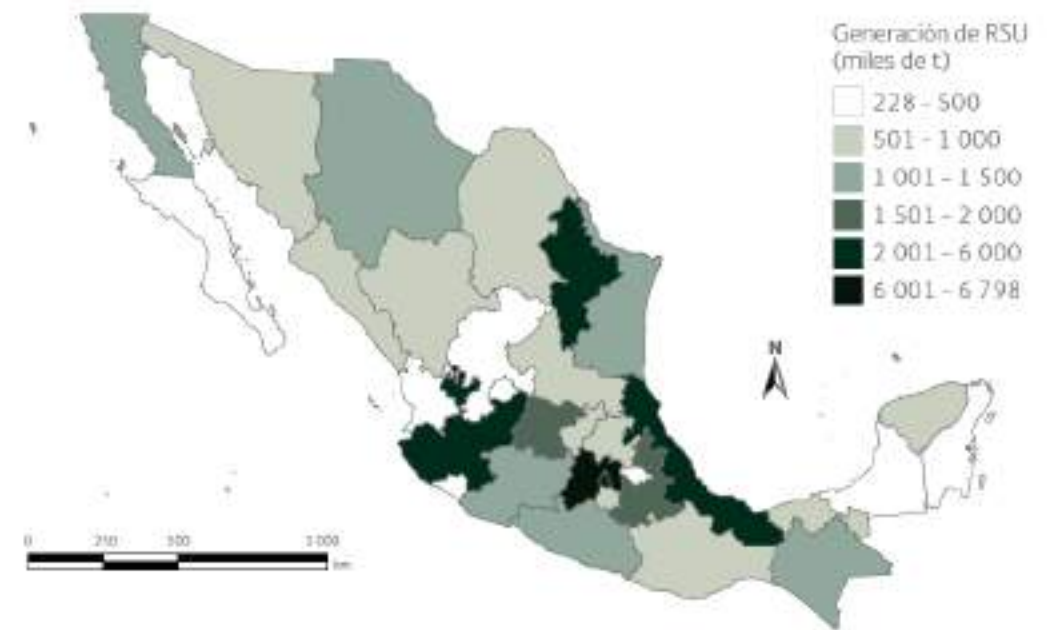
MSW generation patterns by Regions & States

Mapa 7.1 | Generación de RSU por región, 2012



Fuente:
Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas, Sedesol, México, 2013.

Mapa 7.2 | Generación de RSU por entidad federativa, 2012



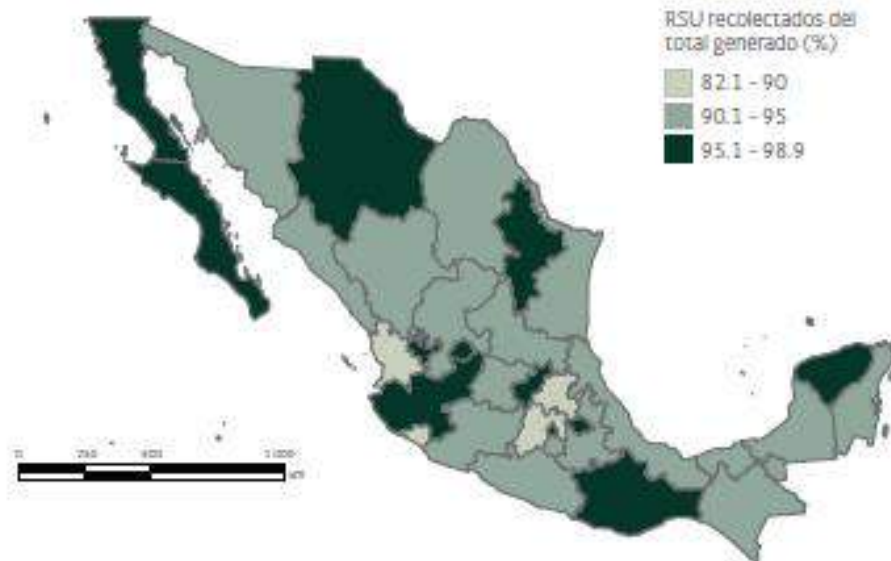
Fuente:
Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas, Sedesol, México, 2013.

Information Source: SEMARNAT. Informe de la Situación del Medio Ambiente en México 2015.

MSW collection patterns per State

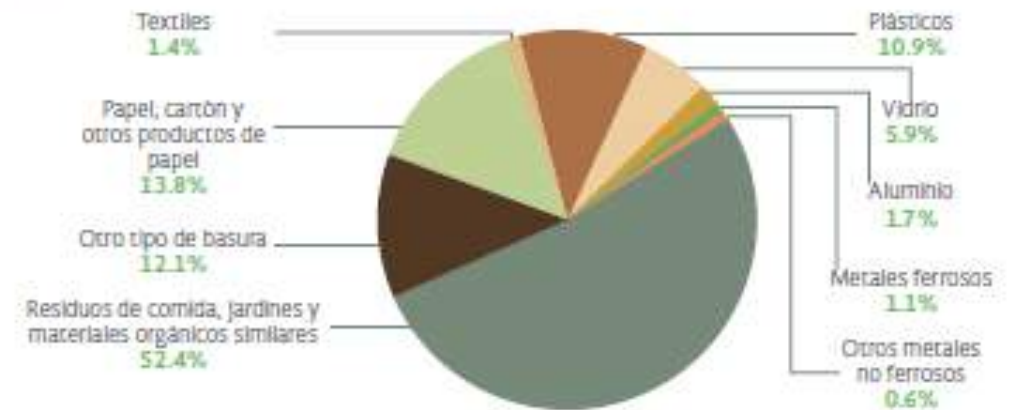
Typical composition of MSW at national level

Mapa 7.3 | Recolección de RSU por entidad federativa, 2012



Fuente:
Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas, Sedesol México, 2013.

Figura 7.5 | Composición de los RSU en México, 2012



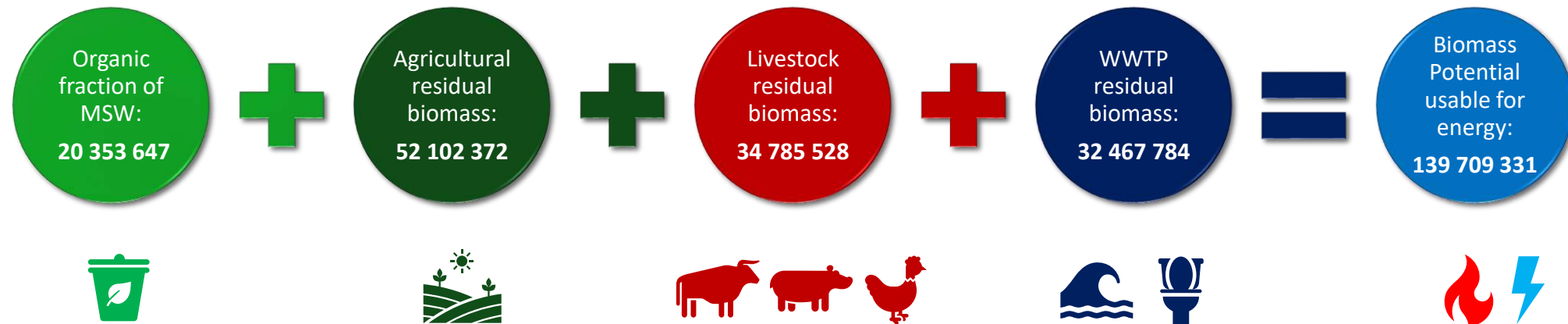
Fuente:
Dirección General de Equipamiento e Infraestructura en Zonas Urbano-Marginadas, Sedesol México, 2013.

438 Residuos

❖ About 52.4% of the residues are organic waste, whereas about 35.5% of the remaining residues can be recycled.

Source: SEMARNAT. Informe de la Situación del Medio Ambiente en México 2015.

Biomass produced during 2019 in Mexico* that could be useful for energy purposes (tons/year)



Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

VI. Mexican regulatory framework for MSW & Bio-Hazardous Waste

General Law for Prevention and Integral Management of Waste.

(Ley General para la Prevención y Gestión Integral de los Residuos, LGPGIR)

MSW & SMW

(Norms, Standards, Procedures & Regulations)

HMW

(Norms, Standards, Procedures & Regulations)

*NOM-083-SEMARNAT
*NOM-161-SEMARNAT-2011
(Management)

*NOM-098-SEMARNAT
(Incineration)

*NOM-087-SEMARNAT-SSA1-2002
*NOM-087-ECOL-SSA1-2002

(*) Partial list of Official Mexican Norms shown as examples of those that could be requested for compliance in specific application cases within Mexico

Main differences among SMW & HMW according to SEMARNAT

“The key step in COVID19 waste management is segregation of biomedical waste from solid waste. Waste generated from COVID19 patients is like any other infectious waste, therefore creating public awareness about the COVID19 waste hazards and segregation at source is highlighted in all guidelines as a recommendation”

Malini R. Capoor, Annapurna Parida, 2021

Special Management Waste** (SMW)

- Paper & Cardboard
- Clinical clothing
- Bedding & mattresses
- Plastics, wood & glass

Hazardous Management Waste** (HMW)

- Bio-hazardous waste
- Infectious waste
- Pathological waste

NOM-161-SEMARNAT-2011



NOM-087-SEMARNAT-SSA1-2002
NOM-087-ECOL-SSA1-2002

(*) Source: www.journals.elsevier.com/indian-journal-of-medical-microbiology

(**) Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

Relevant data about Bio-Hazardous Waste management in Mexico at National Level*, 2019



In Situ* On-Site Treatment of Hazardous Biological Infectious Waste

- Number of authorized companies: **6**
- Total installed capacity: **178,332 ton/yr.**
- States with this type of companies: **4**



Ex Situ* Off-site Treatment of Hazardous Biological Infectious Waste

- Number of authorized companies: **32**
- Total installed capacity: **215,322 ton/yr.**
- States with this type of companies: **16**

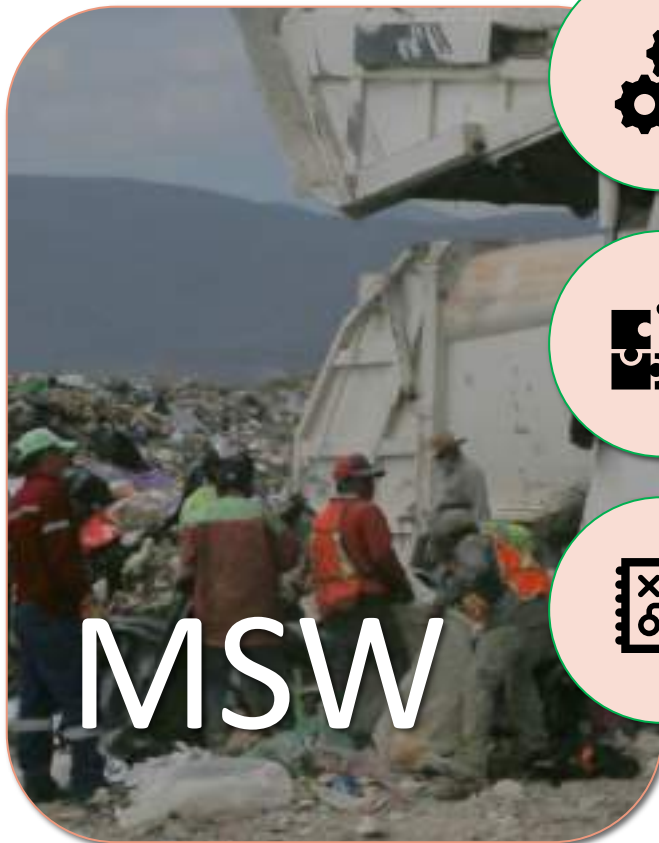


Incineration* of Hazardous Biological Infectious Waste

- Number of authorized companies: **19**
- Total installed capacity: **117,646 ton/yr.**
- States with this type of companies: **12**

(*) Information Source: SEMARNAT. [Diagnóstico Básico para la Gestión Integral de Residuos](#)

VII. Business opportunities.



MSW



Technologies

(Equipment, parts, components, power generation, etc.)



Supplies

(Clothing, personal protection devices, health care, containers, etc.)



Services

(Training, consulting, engineering, health care, financing, etc.)



BHMW



Technologies

(Equipment, parts, components, power supply etc.)



Supplies

(Clothing, personal protection devices, health care, containers, etc.)



Services

(Training, consulting, engineering, health care, financing, etc.)

VIII. Comments & Conclusions.

- ❑ As in other countries in Latin America, ***the situation faced in the Waste Management Sector*** in Mexico before the COVID pandemic, **was very bad due to lack of investment, planning & strategies, technology & equipment among other aspects. This situation became worst after the COVID 19 pandemic**, as many infected people (knowingly or unknowingly) *dumped their contaminated residues as usual without further notice to the collectors*; therefore, in many cases *they themselves became another source of infection* in many locations.
- ❑ In the countryside, ***there are too many non-controlled sites for final disposition opposed to the few disposition sites that fulfill all the regulations and standards related to MSW*** management. Besides, the age of ***a significant part of the fleet of trucks*** (collection & transportation) ***is too old and mostly based on hydrocarbons***, therefore ***its performance and operating expenses are too far away from the optimal, even far away from the budget granted*** to the local agencies for its operation.
- ❑ Considering the size of the Mexican Waste Management Sector, and taking into account the public policies that are being stressed by the current Federal Administration regarding ***circular economy, environmental cares and sustainable development***, there are a number of different ***niches still open for business opportunities to organizations looking for solutions in areas*** such as: ***environmentally safe waste processing and disposition; emissions reduction and decarbonization of the economy; social & environmental cares along with development of clean sources of energy***.
- ❑ For ***successfully grounding most of the business opportunities arising in Mexico***, they should be pursued by organizations that includes ***North American partners (Canadian, American and Mexican partners)***, taking advantage of their mutual skills and strengths while at the same time not losing sight that ***a financial alternative is always a must to consider into the equation***.



Fuente: Internet.

Thank you for your time and participation!



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