INSTITUTO DE INGENIERÍA UNAM

Red Mexicana de Análisis de Ciclo de Vida

El Análisis de Ciclo de Vida como base para la producción y el consumo sustentable

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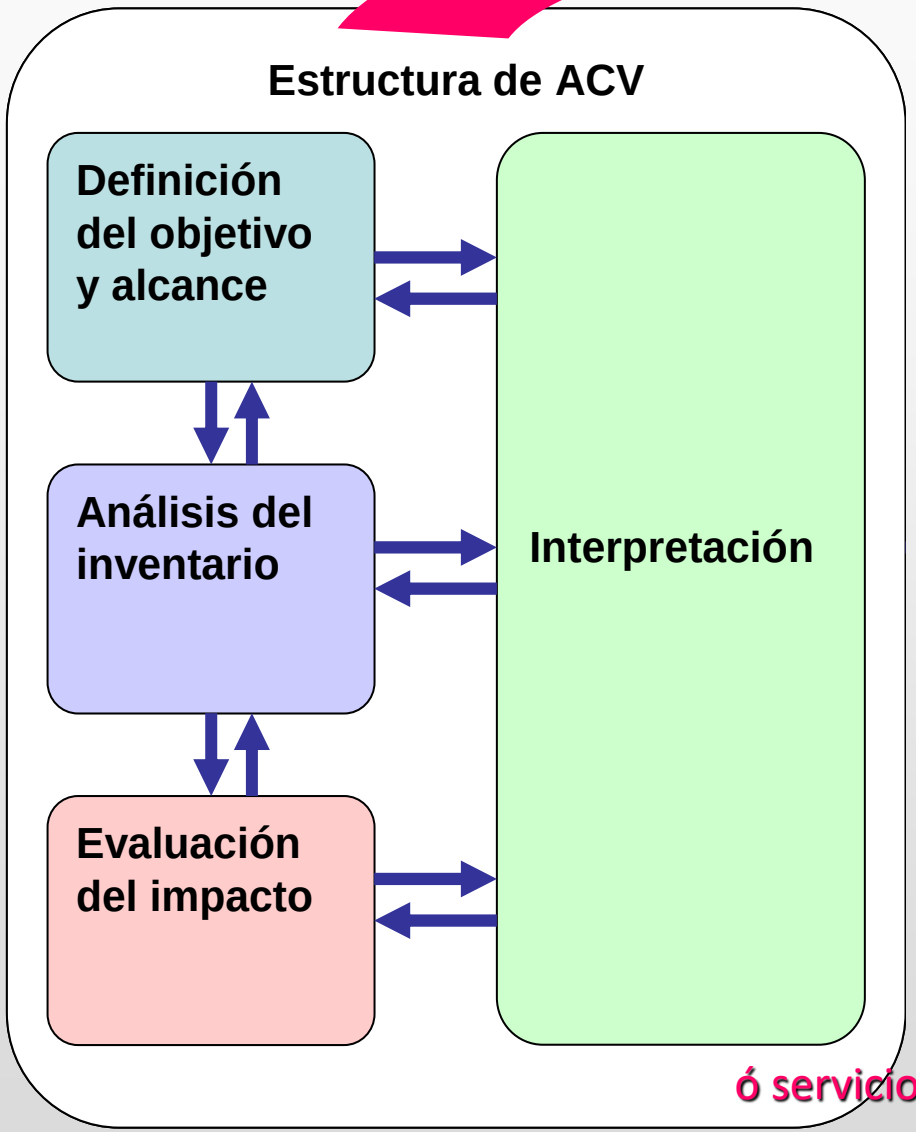
Presidenta de Cambio Climático de la Asociación Interamericana de Ingeniería Sanitaria y Ambiental

10 de octubre de 2017

¿Cuál prefieres?

- Banar Mufide and Cokaygil Zerrin, 2008. A Comparative Life Cycle Analysis of Two Different Juice Packages. Environmental engineering science 25(4): 549-555

- Environmental Engineering Department Anadolu University, Eskisehir, TURQUIE
Résumé / Abstract
- The main purpose of this research was to investigate the life cycle environmental impact of glass bottles and beverage cartons. The LCA was performed depending on a consumer who lives in Eskisehir city. Considering the impact categories of climate change, ecotoxicity, acidification, eutrophication and fossil fuels. The environmental load of glass bottles is higher than beverage carton's load for all the impact categories.

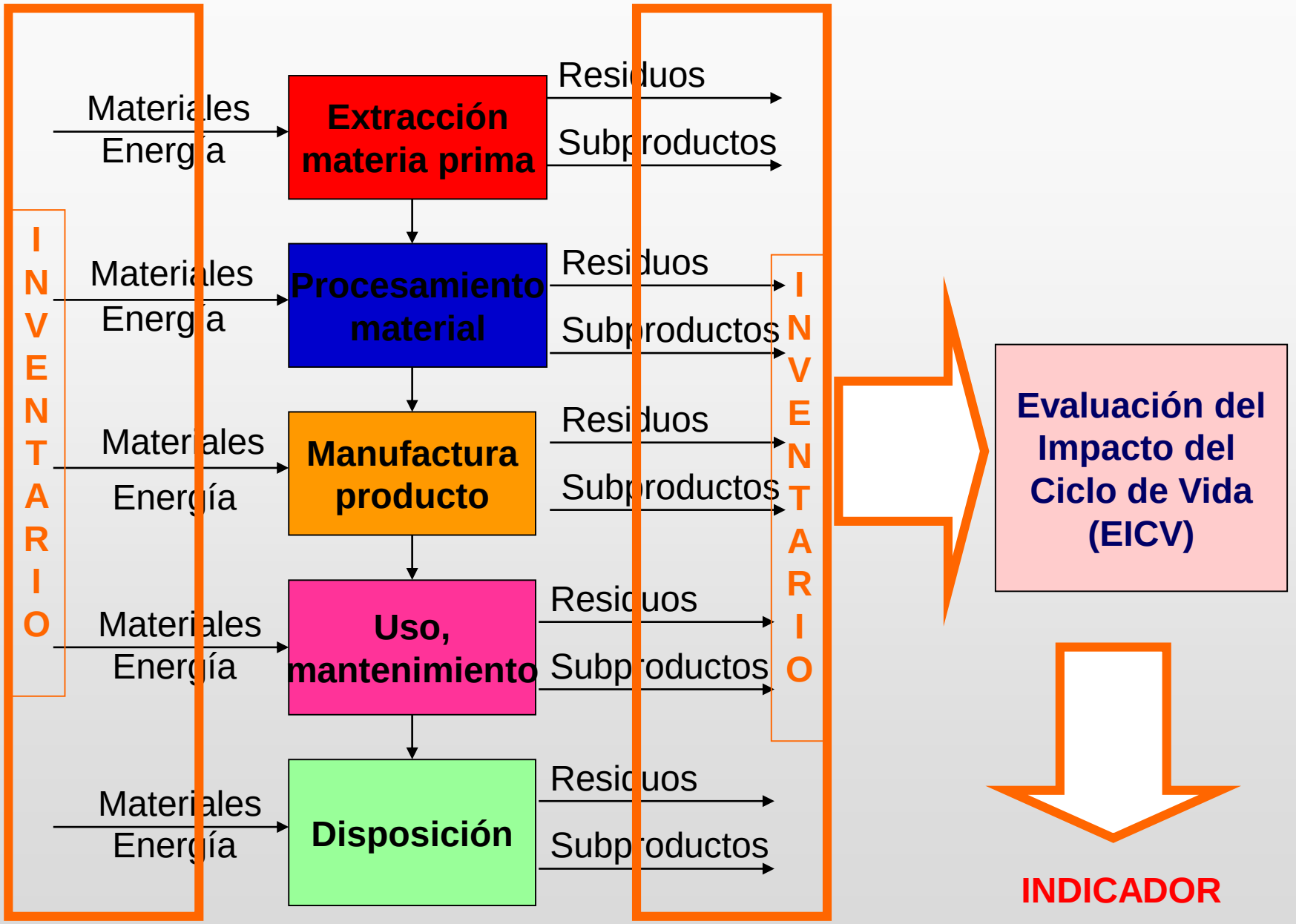


El Análisis del Ciclo de Vida es una herramienta metodológica que permite evaluar los potenciales impactos ambientales asociados a un producto o servicio, desde la extracción de las materias primas hasta su disposición final, tomando en cuenta todos los medios involucrados.

¿Qué?
¿Cómo?
¿Para qué?
¿Para quién?
¿Para dónde?
¿Para qué período?

Unidad funcional:

Cantidad de productos
ó servicios, necesarios para cumplir la función
que se compara.


INVENTARIO
Materiales
Energía
Extracción materia prima
Residuos
Subproductos
Materiales
Energía
Procesamiento material
Residuos
Subproductos
Materiales
Energía
Manufactura producto
Residuos
Subproductos
Materiales
Energía
Uso, mantenimiento
Residuos
Subproductos
Materiales
Energía
Disposición
Residuos
Subproductos
INVENTARIO
Evaluación del Impacto del Ciclo de Vida (EICV)
INDICADOR

ACV de Clínker producido con dos tipos de combustibles

Journal of Cleaner Production 107 (2015) 741–748

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Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The co-processing of municipal waste in a cement kiln in Mexico. A life-cycle assessment approach

Leonor Patricia Güereca*, Nathalia Torres, Claudia Roxana Juárez-López

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Waste co-processing
RDF
Life Cycle Assessment
Clinker production
Cement industry
Mexico

ABSTRACT

A growing population and a high level of consumption generate increasing municipal waste, which requires integral and environmentally efficient waste management systems. In contrast, the cement industry has an inherent need for fuel with a high heat of combustion. Thus, municipal solid wastes with high calorific value are desirable as Refuse-Derived Fuel for thermal processes in the cement industry, which is an opportunity for both the waste sector and cement industry. However, the environmental viability must be objectively, systematically and holistically evaluated. For the last trait, a comparative Life Cycle Assessment was developed to evaluate the environmental impact from clinker production for two fuel scenarios: one considering a 100% petroleum coke and the other a 20% Refuse-Derived Fuel and 80% petroleum coke co-process. This study considers real operating data from waste management systems and the cement industry in Mexico. Both scenarios considered the impact of the raw material extraction, manufacture and transport of fuels, electricity generation and use air emissions, discharge and wastewater generated during the life cycle of the analyzed fuels. The evaluated impact categories were the abiotic resource depletion, acidification, eutrophication, global warming, stratospheric ozone depletion, photochemical smog and terrestrial toxicity based on the CML IO Baseline V3.01. The results indicate the co-processing scenario exhibited a lower environmental impact than using only petroleum coke as a fuel for all categories. Therefore, using Refuse-Derived Fuel from municipal waste in Mexican cement plants mitigates environmental impacts and could be a strategic alternative for waste management.

Metodología

Unidad funcional

- **1 t de clínker**

Límites

- Residuos inorgánicos con alto valor calorífico: plásticos, papel, cartón, textiles y madera
- Temporal – Años 2010 y 2012
- Geográfico – Tepeaca

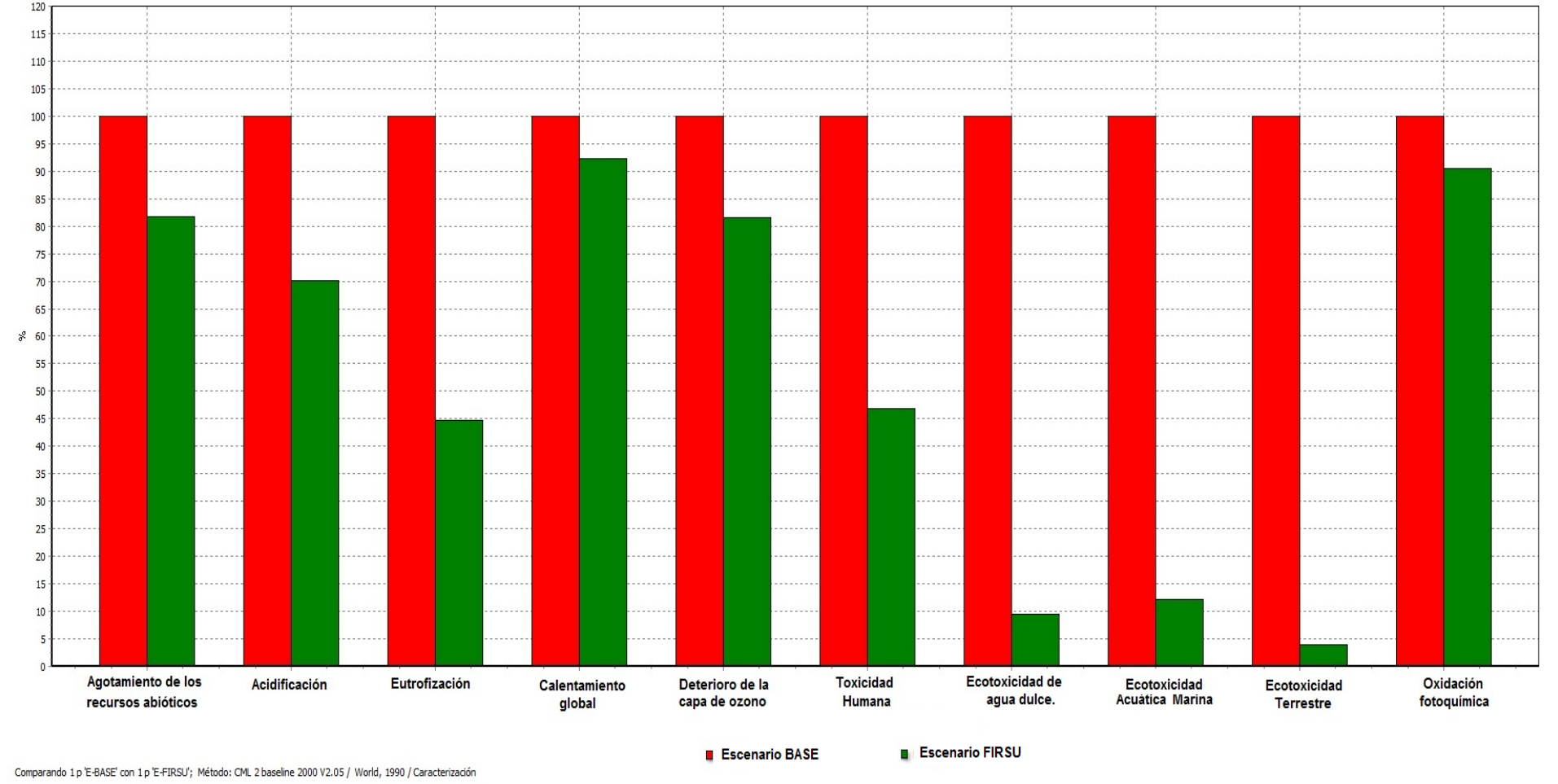
Comparación

- Escenario BASE + Relleno Sanitario
  100% coque (93 kg) + 47 kg de residuos Inorgánicos en relleno sanitario

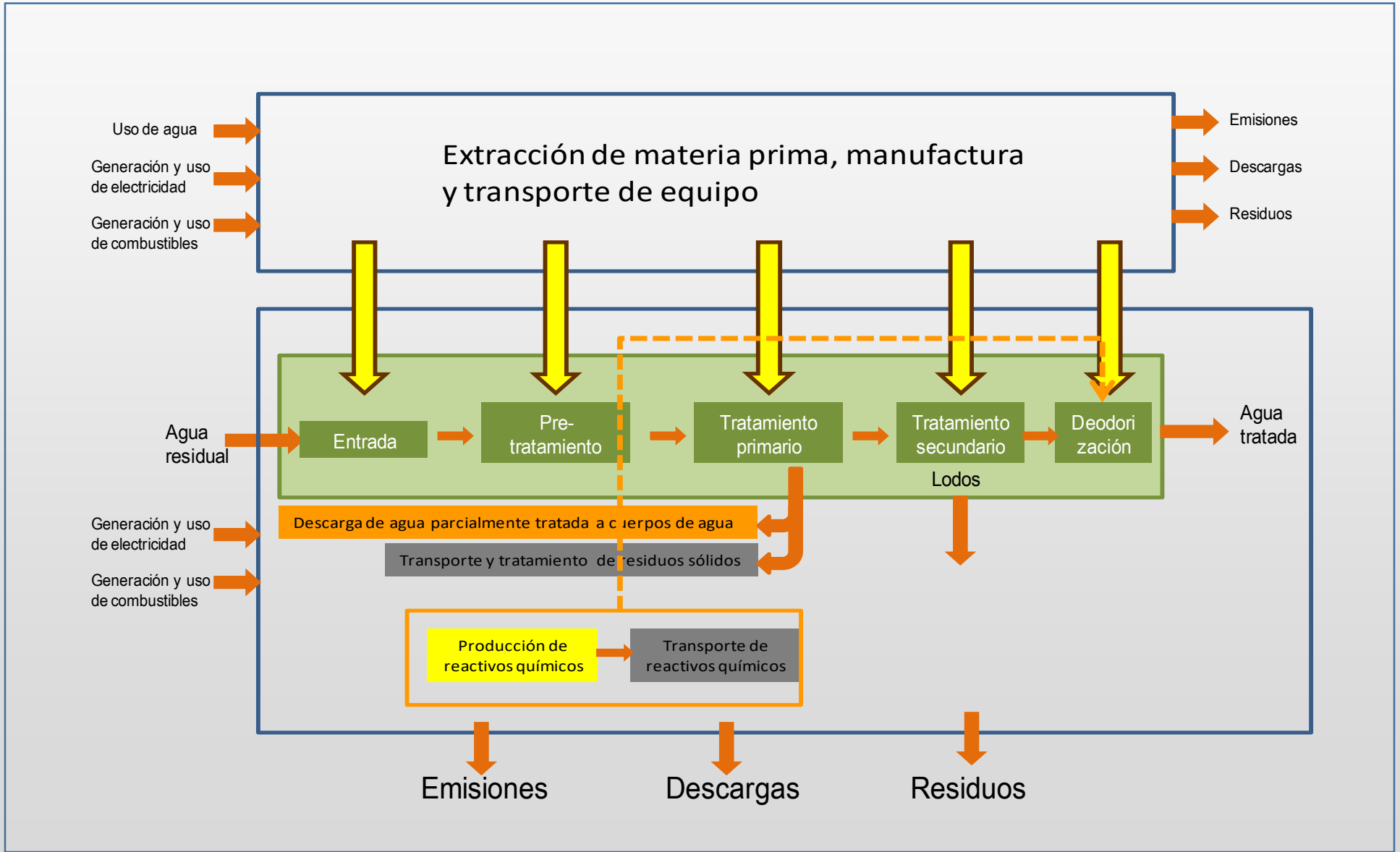
- Escenario FIRSU (Co-procesamiento)
  80% Coque (74 kg) + 20% FIRSU (47 kg)

RESULTADOS, IMPACTOS NORMALIZADOS

Escenario Base (100% coque + Relleno) **vs. Escenario firsu** (80% coque + 20% firsu)



ACV de PTAR


Uso de agua
Generación y uso de electricidad
Generación y uso de combustibles
Extracción de materia prima, manufactura y transporte de equipo
Emisiones
Descargas
Residuos
Agua residual
Entrada
Pre-tratamiento
Tratamiento primario
Tratamiento secundario
Deodorización
Agua tratada
Lodos
Generación y uso de electricidad
Generación y uso de combustibles
Descarga de agua parcialmente tratada a cuerpos de agua
Transporte y tratamiento de residuos sólidos
Producción de reactivos químicos
Transporte de reactivos químicos
Emisiones
Descargas
Residuos

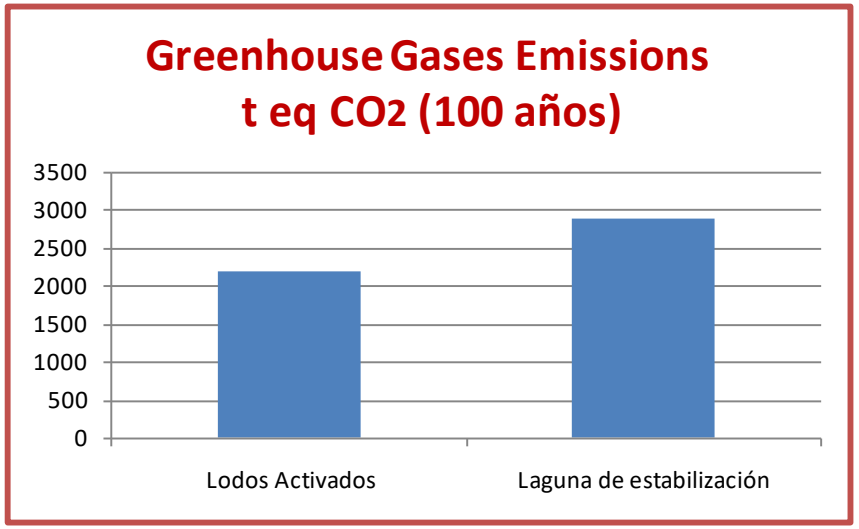
Tecnologías analizadas

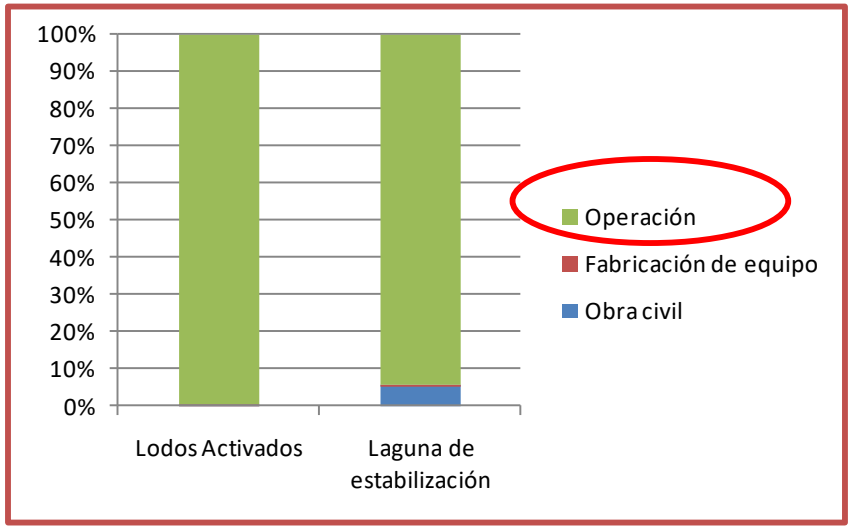
Tecnologías:

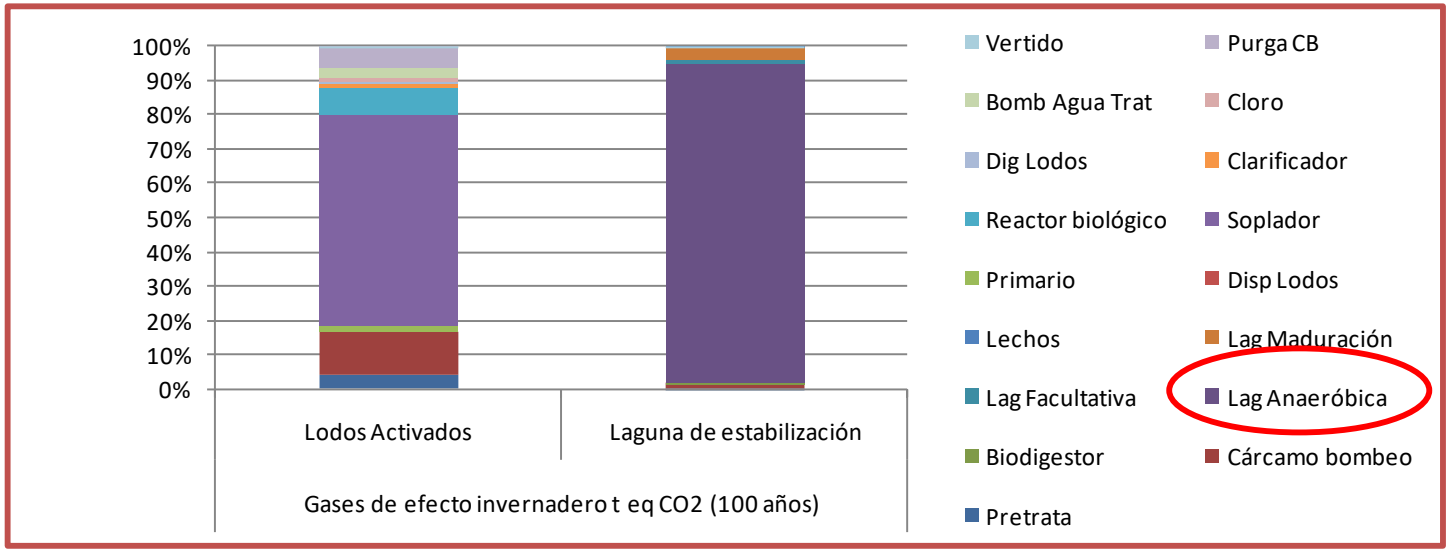
- Aerobia = Lagunas(Distrito Federal)
- Anaerobia = Lodos (Estado de México)

- Tamaño:
  - 12 y 18 l/s (chicas)

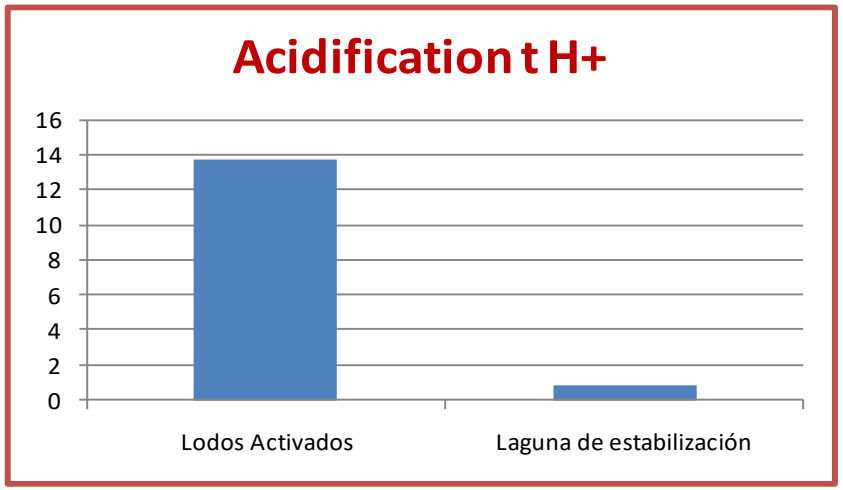
Cambio Climático

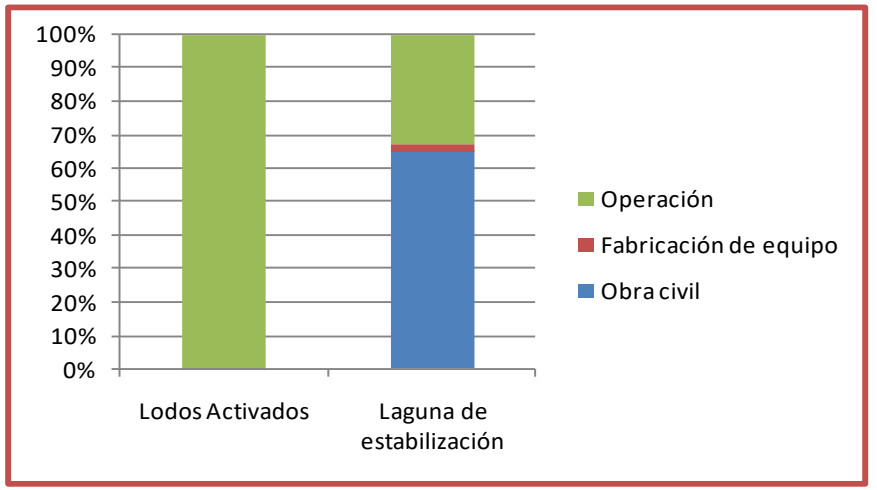


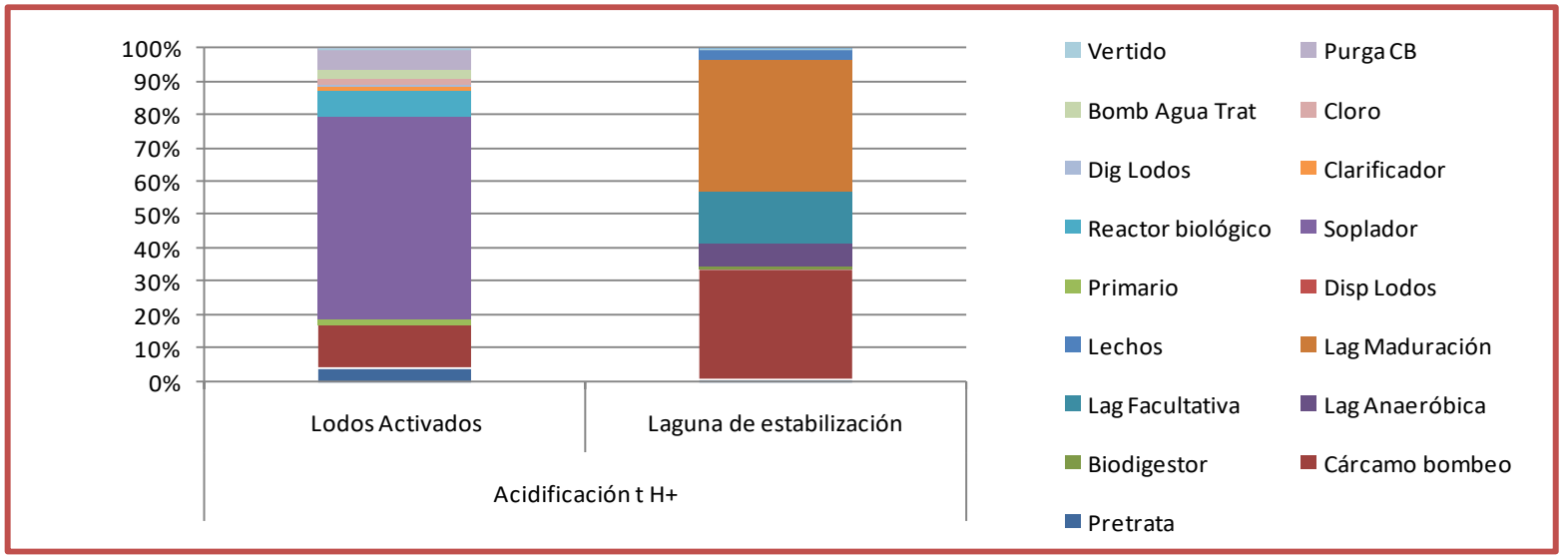




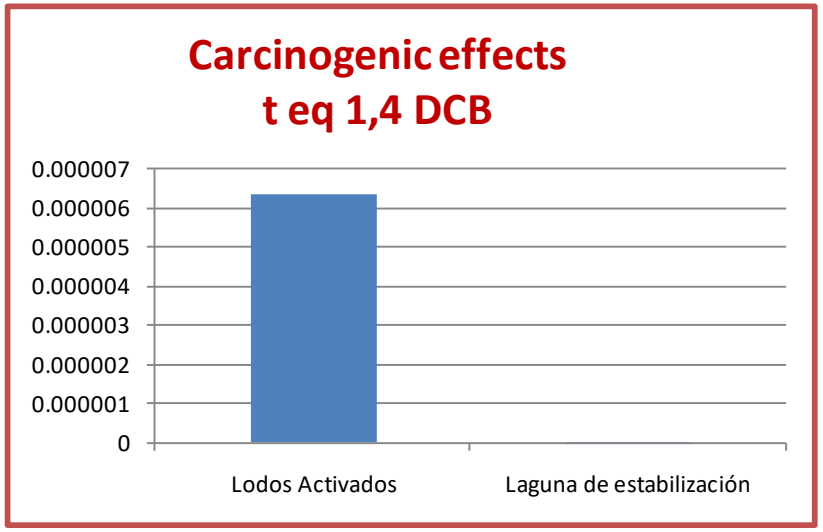
Lluvia ácida

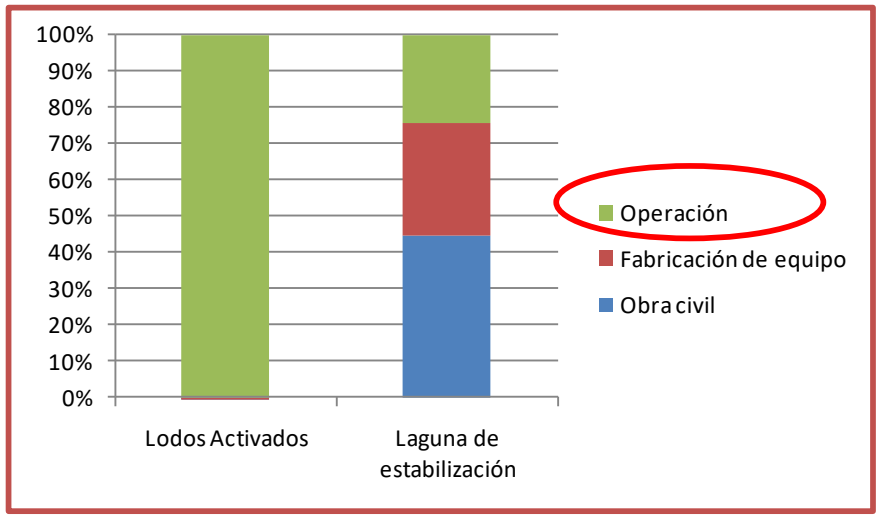


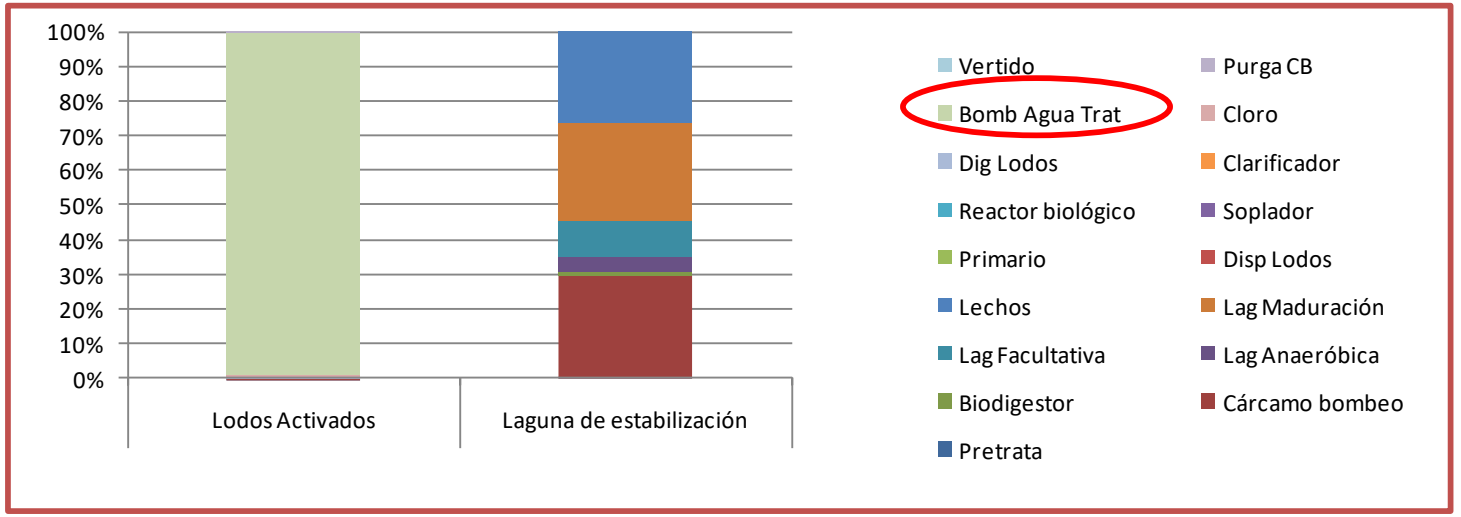




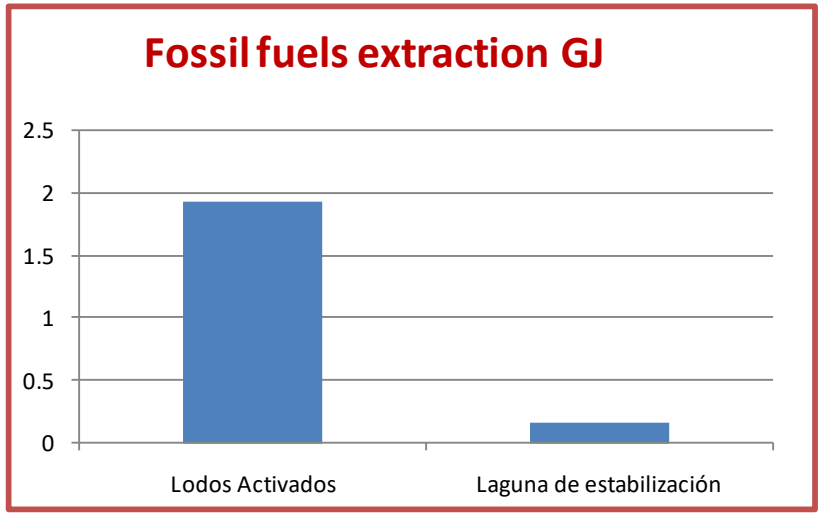
Efectos carconogénicos

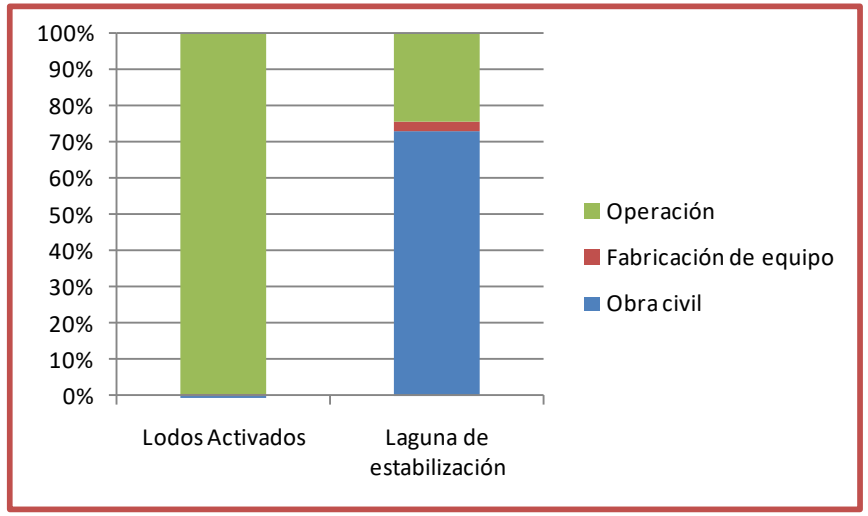


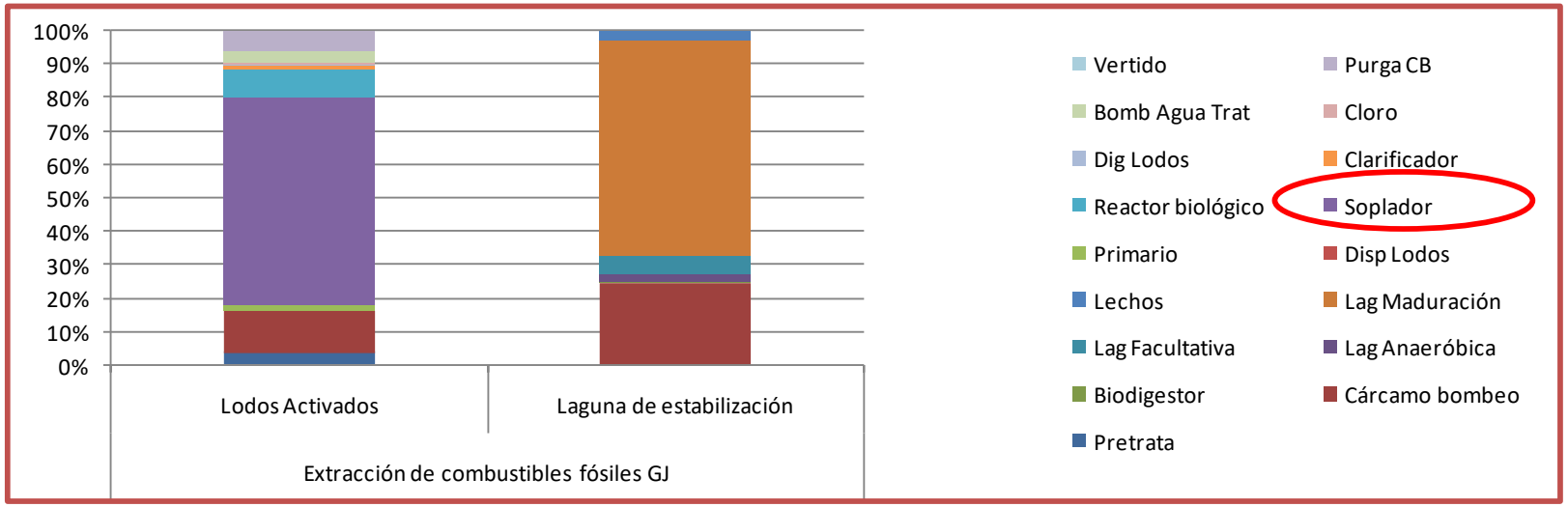




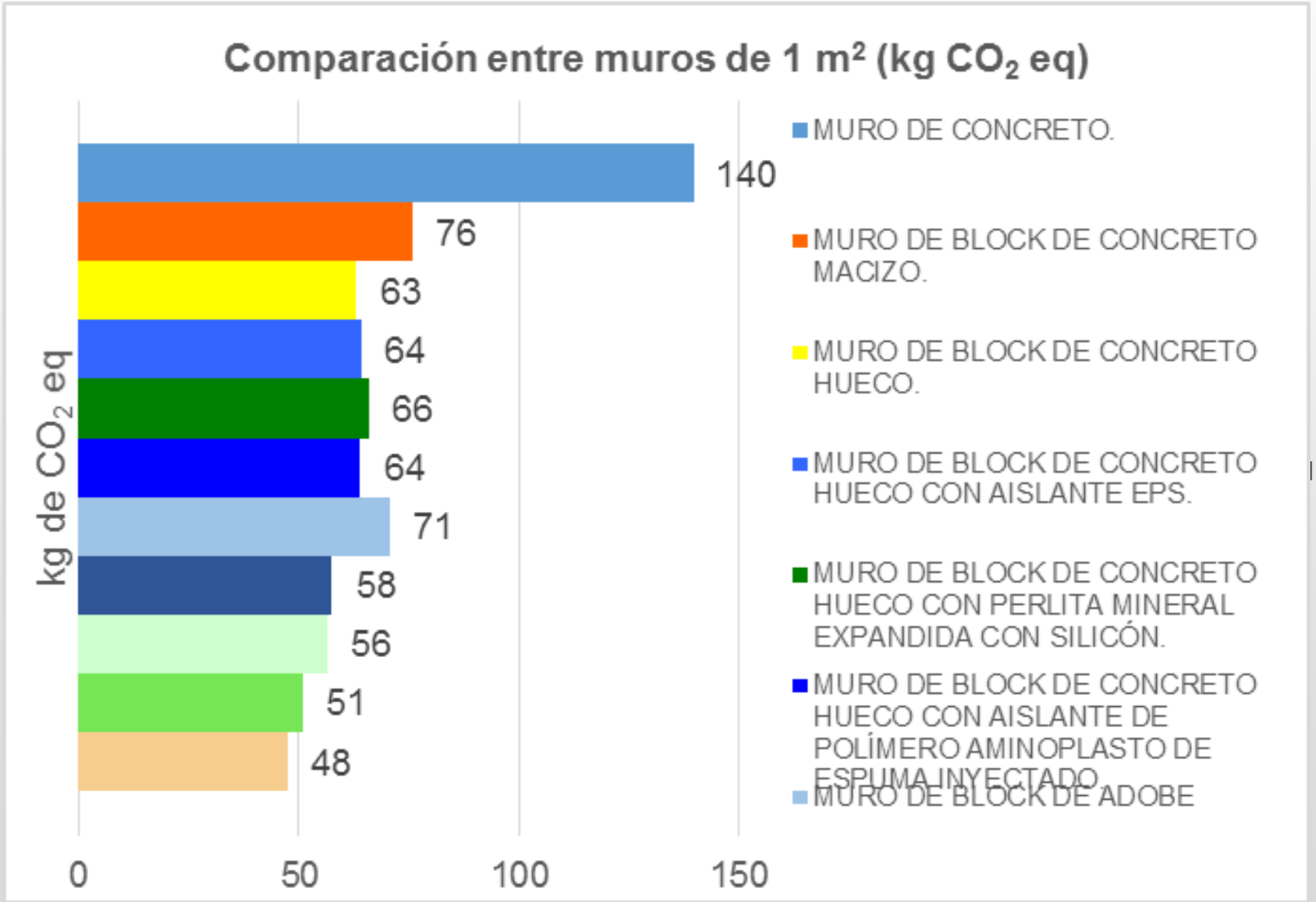
Uso de combustibles fósiles

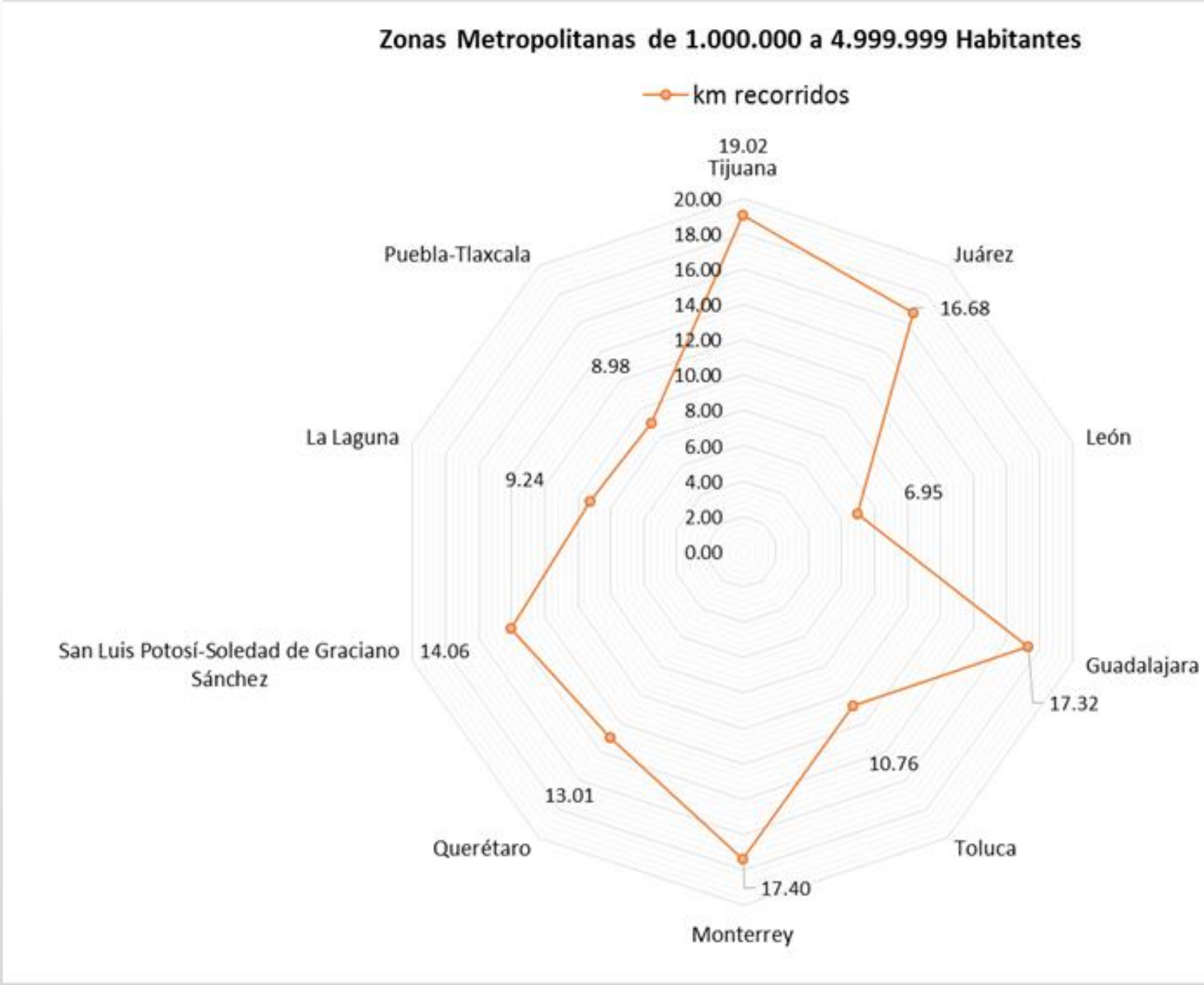






ACV materiales (BID-SHF)




Zonas Metropolitanas de 1.000.000 a 4.999.999 Habitantes
km recorridos
19.02
Tijuana
Juárez
16.68
León
6.95
Guadalajara
17.32
Toluca
10.76
Monterrey
17.40
Querétaro
13.01
San Luis Potosí-Soledad de Graciano Sánchez
14.06
La Laguna
9.24
Puebla-Tlaxcala
8.98
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00

ACV de 1 kg de carne de res

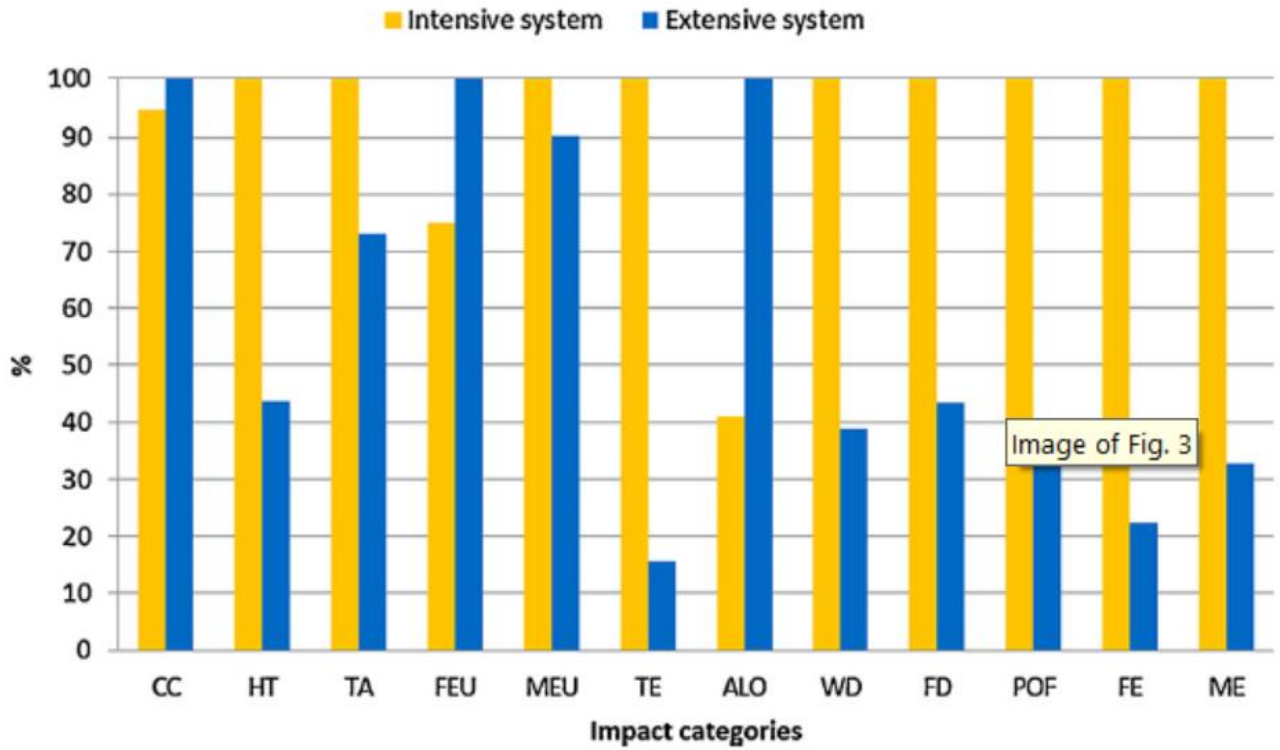


Fig. 3. Impact category (percentages) comparison for intensive and extensive systems. Comparison per 1 kg of meat. CC = Climate change, HT = Human toxicity, TA = Terrestrial acidification, FEU = Freshwater eutrophication, MEU = Marine eutrophication, TE = Terrestrial ecotoxicity, ALO = Agricultural land occupation, WD = Water depletion, FD = Fossil , FE = Freshwater ecotoxicity, ME = Marine ecotoxicity.

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Resources, Conservation and Recycling

journal homepage: www.elsevier.com/locate/resconrec

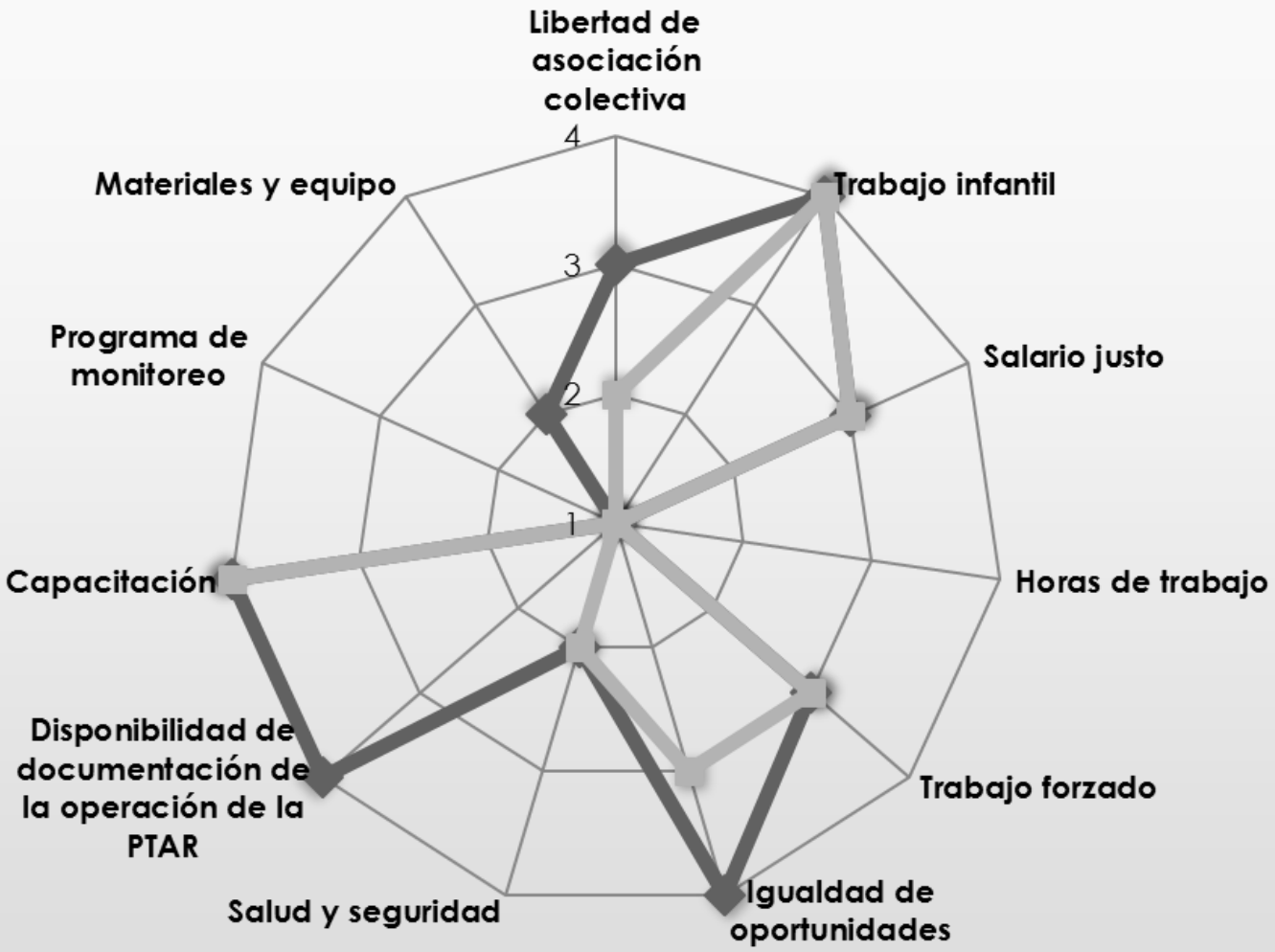
Full length article

Environmental impact of beef production in Mexico through life cycle assessment

Adriana Rivera Huerta[a], Leonor Patricia Güereca[b], María de la Salud Rubio Lozano[a,*]

[a] Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Av. Universidad 3000, Coyoacán, Ciudad Universitaria, 04510, Mexico City, Mexico
[b] Instituto de Ingeniería, Universidad Nacional Autónoma de México, Coyoacán, Ciudad Universitaria, 04510, Mexico City, Mexico

Análisis de Ciclo de Vida Social en PTAR



Environmental Impact Assessment Review 57 (2016) 101–113

Contents lists available at ScienceDirect

Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar

Addressing social aspects associated with wastewater treatment facilities

Alejandro Padilla-Rivera, Juan Manuel Morgan-Sagastume, Adalberto Noyola, Leonor Patricia Güereca *

Instituto de Ingeniería, Universidad Nacional Autónoma de México, Coyoacán, 04510 Mexico City, Mexico

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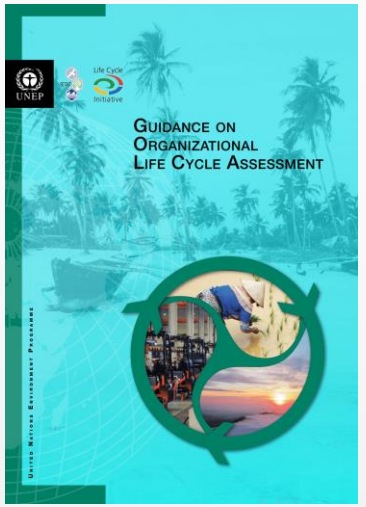
Available online xxxx

Keywords:
Wastewater treatment
Social aspects
Management systems
Sustainability
Social indicators

ABSTRACT

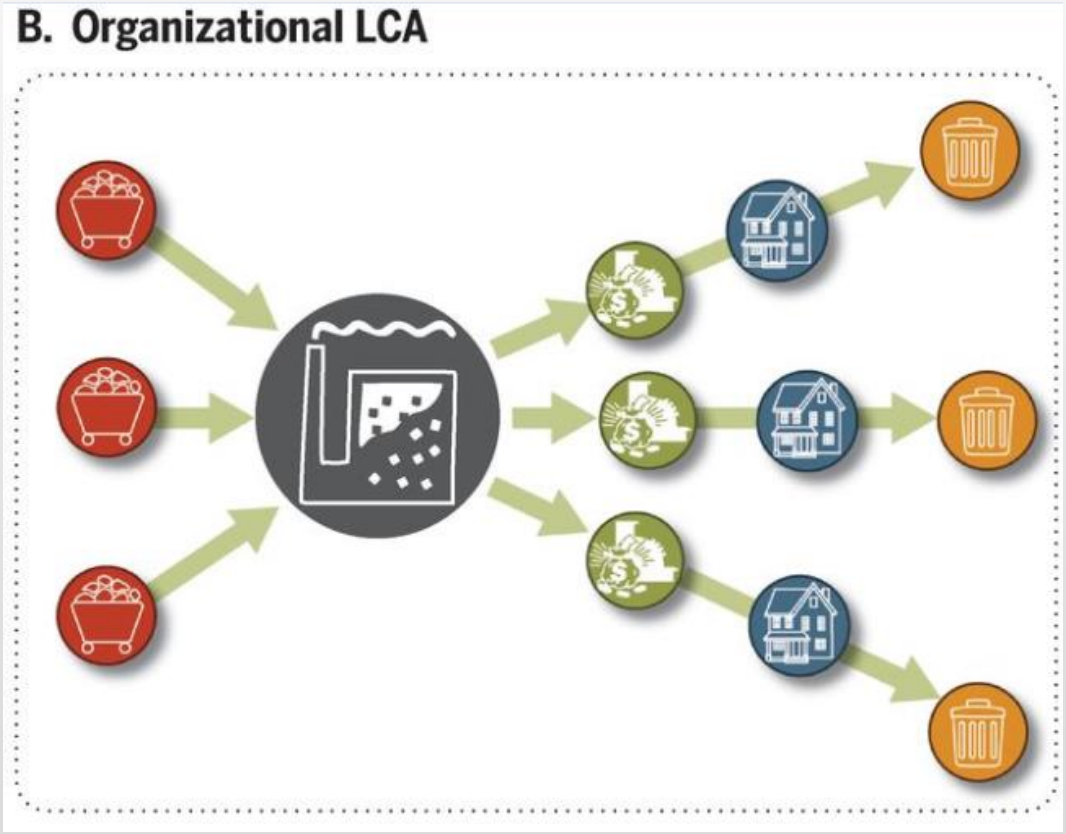
In wastewater treatment facilities (WWTF), technical and financial aspects have been considered a priority, while other issues, such as social aspects, have not been evaluated seriously and there is not an accepted methodology for assessing it. In this work, a methodology focused on social concerns related to WWTF is presented. The methodology proposes the use of 25 indicators as a framework for measuring social performance to evaluate the progress in moving towards sustainability. The methodology was applied to test its applicability and effectiveness in two WWTF in Mexico (urban and rural). This evaluation helped define the key elements, stakeholders and barriers in the facilities. In this context, the urban facility showed a better overall performance, a result that may be explained mainly by the better socioeconomic context of the urban municipality. Finally, the evaluation of social aspects using the semi-qualitative approach proposed in this work allows for a comparison between different facilities and for the identification of strengths and weakness, and it provides an alternative tool for achieving and improving wastewater management.

Análisis de Ciclo de Vida Organizacional



Fuente: UNEP (2015)

Regulado por la ISO 14072:2014



Fuente: Hellweg y Canals (2014)

Fuente: Life Cycle Initiative (2017)

Aplicaciones

- Diseño o rediseño de productos
- Mejora ambiental
- Ecoeficiencia
- Responsabilidad social corporativa
- Aspectos ambientales para ISO 14001
- Evaluación de Políticas Públicas
- COMUNICACIÓN/IMAGEN/ECOETIQUETADO

INFORMACIÓN AMBIENTAL

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Clinker production
Cement industry
Mexico

ABSTRACT

A growing population and a high level of consumption generate increasing municipal waste, which requires integral and environmentally efficient waste management systems. In contrast, the cement industry has an inherent need for fuel with a high heat of combustion. Thus, municipal solid wastes with high calorific value are desirable as Refuse-Derived Fuel for thermal processes in the cement industry, which is an opportunity for both the waste sector and cement industry. However, the environmental viability must be objectively, systematically and holistically evaluated. For the last trait, a comparative Life Cycle Assessment was developed to evaluate the environmental impact from clinker production for two fuel scenarios: one considering a 100% petroleum coke and the other a 20% Refuse-Derived Fuel and 80% petroleum coke co-process. This study considers real operating data from waste management systems and the cement industry in Mexico. Both scenarios considered the impact of the raw material extraction, manufacture and transport of fuels, electricity generation and use air emissions, discharge and wastewater generated during the life cycle of the analyzed fuels. The evaluated impact categories were the abiotic resource depletion, acidification, eutrophication, global warming, stratospheric ozone depletion, photochemical smog and terrestrial toxicity based on the CML IO Baseline V3.01. The results indicate the co-processing scenario exhibited a lower environmental impact than using only petroleum coke as a fuel for all categories. Therefore, using Refuse-Derived Fuel from municipal waste in Mexican cement plants mitigates environmental impacts and could be a strategic alternative for waste management.

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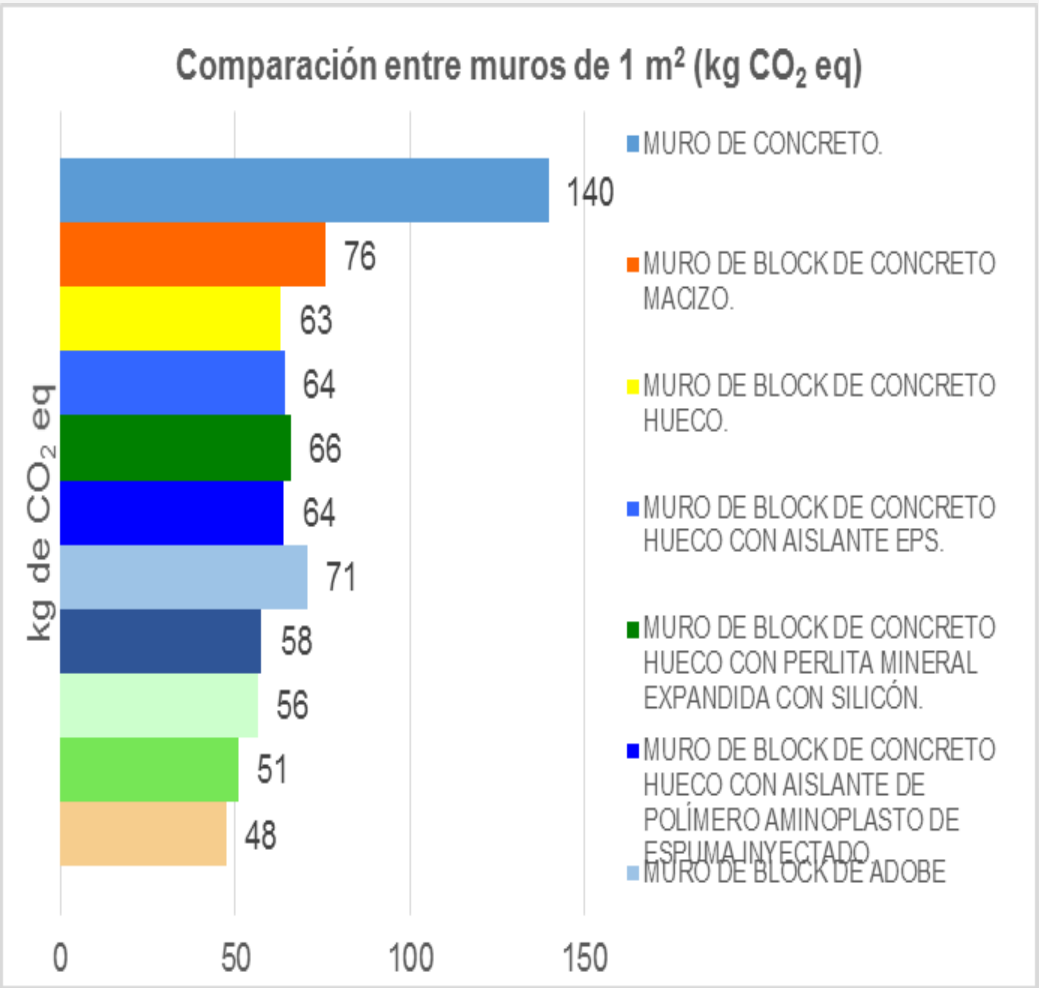
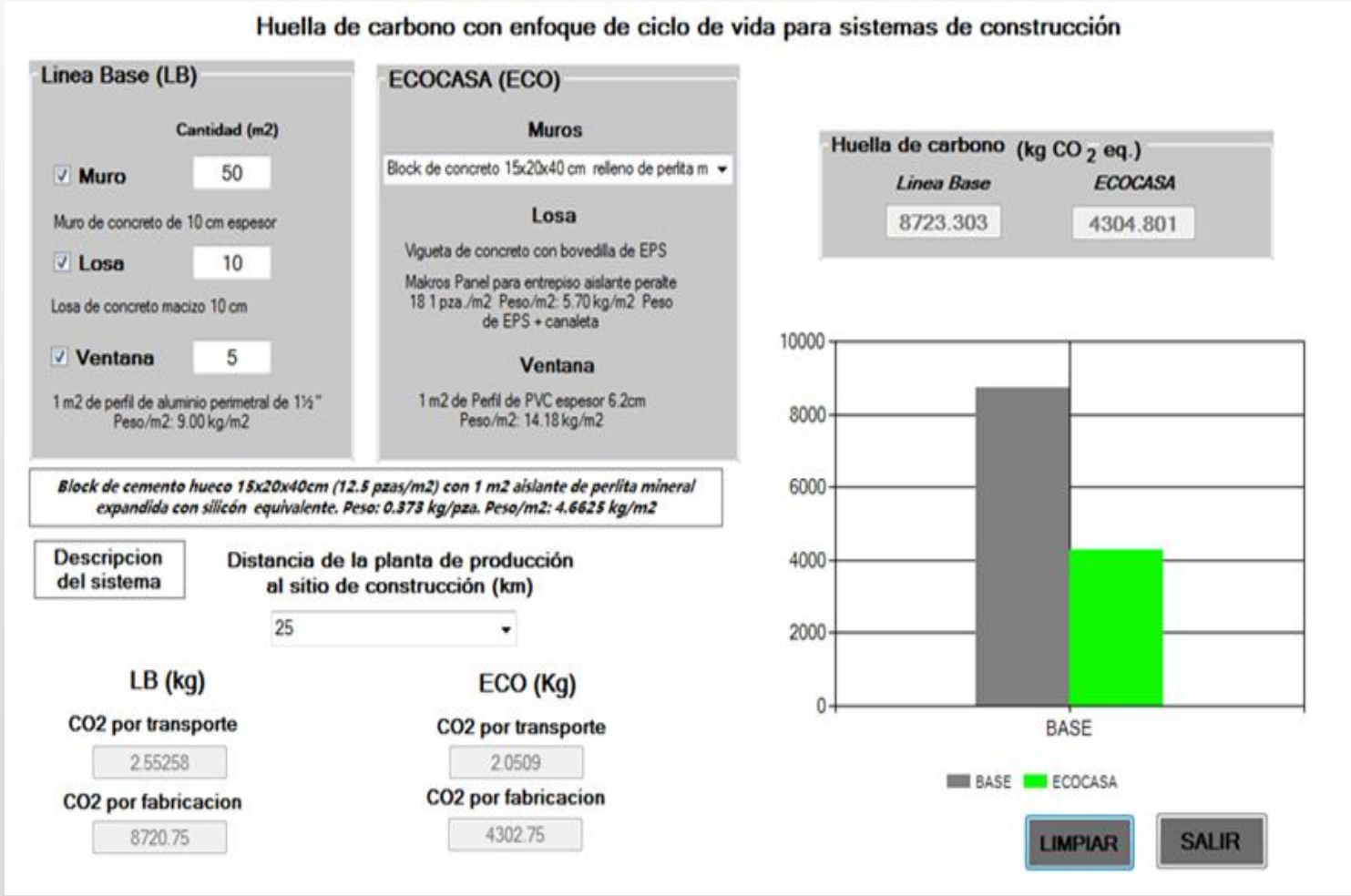
Desarrollo de software

SOCIEDAD HIPOTECARIA FEDERAL





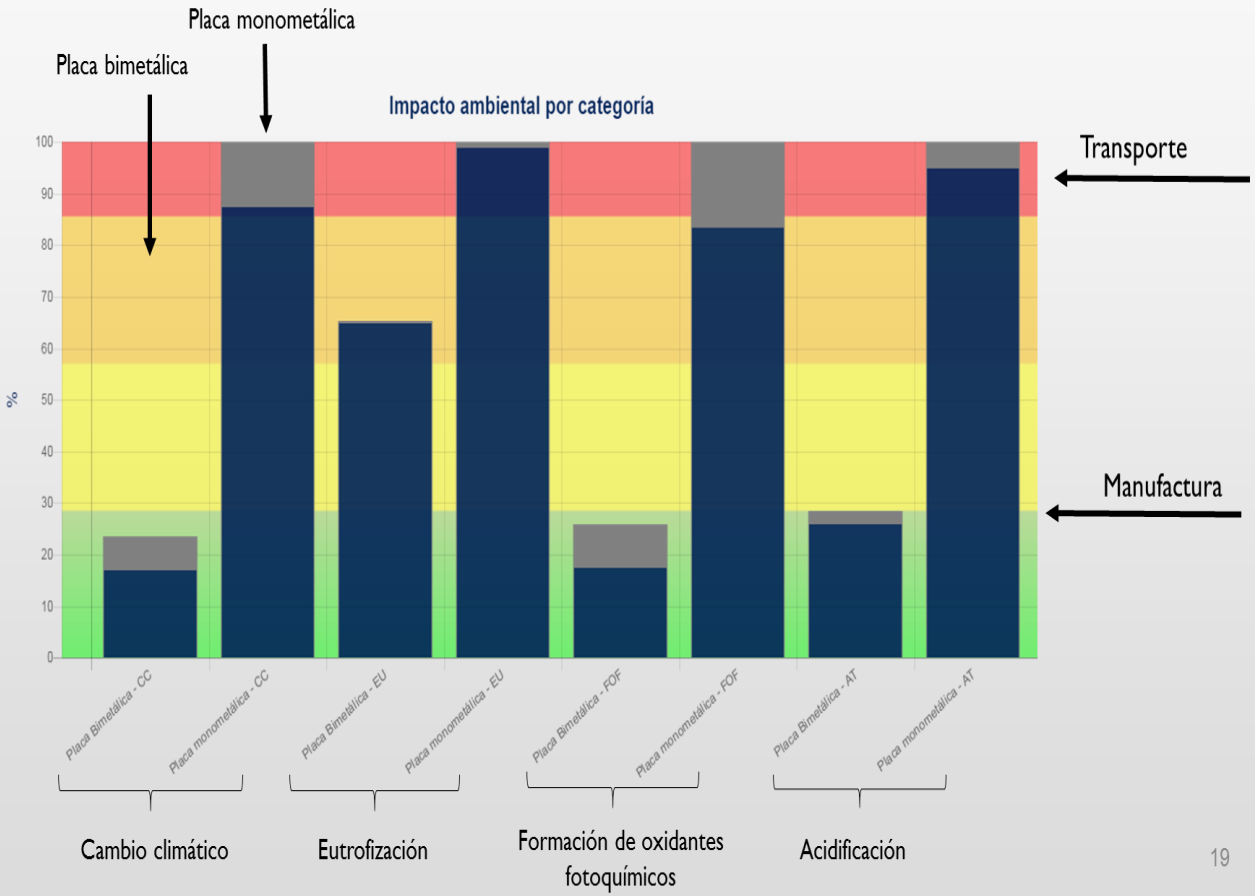
Pantalla 4

Desarrollo de software

Detergente Perfoc

Componente	Cantidad	Unidad
Auxiliar		
Carboximetil celulosa		kg
Ácido sulfúrico		kg
Blanqueadores		
Etilendiamina		kg
Silicato de sodio		kg
Percarbonato de sodio		kg
Fuente alcalina		
Cloruro amónico		kg
		kg
Surfactantes		
Aceite de alga		kg
Alquinbenceno sulfonato		kg
Suavizantes		
Trifosfato de sodio		kg
Alcohol etoxilado		kg
Enzimas		kg

Herramienta para la evaluación del impacto ambiental de insumos adquiridos por una organización v 10



Fuente: Health News, 2016

- Los consumidores se han comenzado a interesar en conocer los atributos ambientales de los productos que usan

- En respuesta, los fabricantes han empezado a proporcionar información de los aspectos ambientales de sus productos empleando etiquetas o declaraciones en sus productos y publicidad

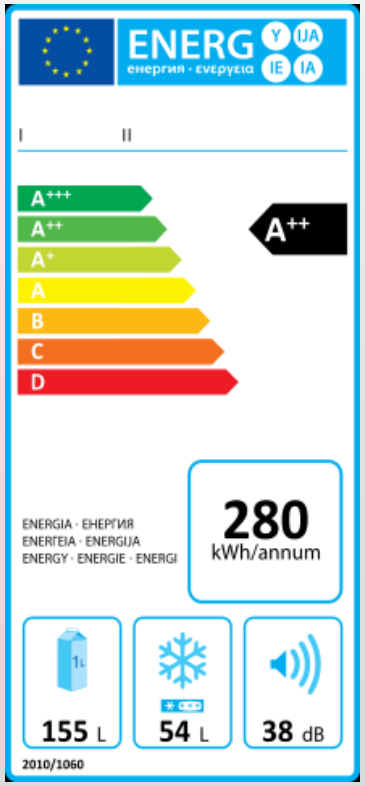
Esquemas de información ambiental

- **Información ambiental:** Cualquier información (limitada o detallada) de los atributos ambientales o desempeño de productos o servicio, en:

- declaraciones escritas
- tablas,
- etiquetas,
- logos
- reportes anuales

Fuente: IHOBE, 2017

Fuente: Grupo Carso, 2014



Fuente: EU energy label

Fuente: http://ecodisenouandina2.blogspot.mx/2015/10/papel-ecologico.html

Fuente: OECD, 2012


ENERGY STAR
FSC
HUMANE
RAISED & HANDLED
Soil Association
GREEN SEAL
CERTIFIED
DER BLAUE ENGEL
JURY UMWELTZEICHEN
PREMIUM
Organic
PRODUCTS
bio
FUEL
USDA
ORGANIC
BIO
Green IT
bluesign
ORGANIC
ALL NATURAL
mixed
recycling
christian
aid
CAFÉDIRECT
AMNESTY
INTERNATIONAL
Friends of
the Earth
NATURAL
HISTORY
MUSEUM
MEDECINS
SANS FRONTIERES
pdsa
for pets in need of vets
THE RAINFOREST
FOUNDATION
Ecology
Building Society
OXFAM
paper
clean and dry
no food contact
plastic
bottles and jugs only
compostables
food and food-related paper
compostable dishware
BuiltGreen
avogreen
BIO HELLAS
CERTFOR
Corporation
Bioland
SAFE
ENVIRODESIC

Esquemas de Información Ambiental de Productos

SERIE DE NORMAS ISO 14020		
14020: 2000. Etiquetas y Declaraciones ambientales –Principios Generales	Type-I ISO 14024 (1999)	Etiquetas ambientales (e.g. EU-Flower, Blue Engel, White Swan)
	Type-II ISO 14021 (2016)	Auto-declaraciones ambientales
	Type-III ISO 14025 (2006)	Declaraciones Ambientales (e.g. EPD® System)

Ecoetiquetado

- **Tipo I:** Programa de etiquetado voluntario
- Organismos reguladores (países europeos)
- Países en desarrollo (Brasil, China, Tailandia) se han encaminado a tener sus propios esquemas de eco-etiquetado
- Las empresas voluntariamente acuden a acreditarse bajo los esquemas establecidos por ellos
- Basado en ACV

Ecoetiquetado

Tipo II: Autodeclaraciones hechas por fabricantes

***Riesgo de greenwashing**

- Generalmente no incluyen información cuantitativa

Ecoetiquetado

- **Tipo III: Declaraciones Ambientales de Productos (Environmental Product Declaration, EPD)** proporcionan información ambiental que permite la comparación del impacto ambiental de productos. Basada en ACV.

¡Gracias!