

# **Life Cycle Inventory Data Collection Process and Template**

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# Contents

- Statement of Need
- LCI Data Objectives
- Role of GreenBlue/SPC and Contractors
- Role of EPA
- Data Collection Process
- Data Use
- Template

# Statement of Need

- Much of existing life cycle inventory (LCI) data that is publicly available in the U.S. is dated, limited in scope and/or does not provide the level of detail and transparency necessary to perform useful analysis.

# Data Objectives

- Transparency:
  - underlying assumptions, data cut-offs, process boundaries, and methodologies associated with underlying data and aggregation procedures.
- Data validation through an established QA/QC process
- Compliance with relevant LCI/LCA ISO standards

# Data Objectives cont.

- Adaptability of data and data format to support:
  - Wal-Mart scorecard, EPA WARM, MERGE, and US LCI database or other relevant databases or LCA
- Verification/validation of comparable unit process boundaries
- Establish a system that allows for future updates of data

# Role of GreenBlue/SPC

- GreenBlue/SPC MERGE redevelopment project
- Facilitate data collection of major packaging materials
- Only industry average information
- LCI data collection template developed with support from Dr. Greg Norris (Sylvatica)
- LCI data collection QA/QC by ICF

# Role of EPA

- As part of its update for the WARM tool, EPA will process energy data for calculation of GHG emission factors through ICF.

# Life Cycle Inventory Data

## GOAL:

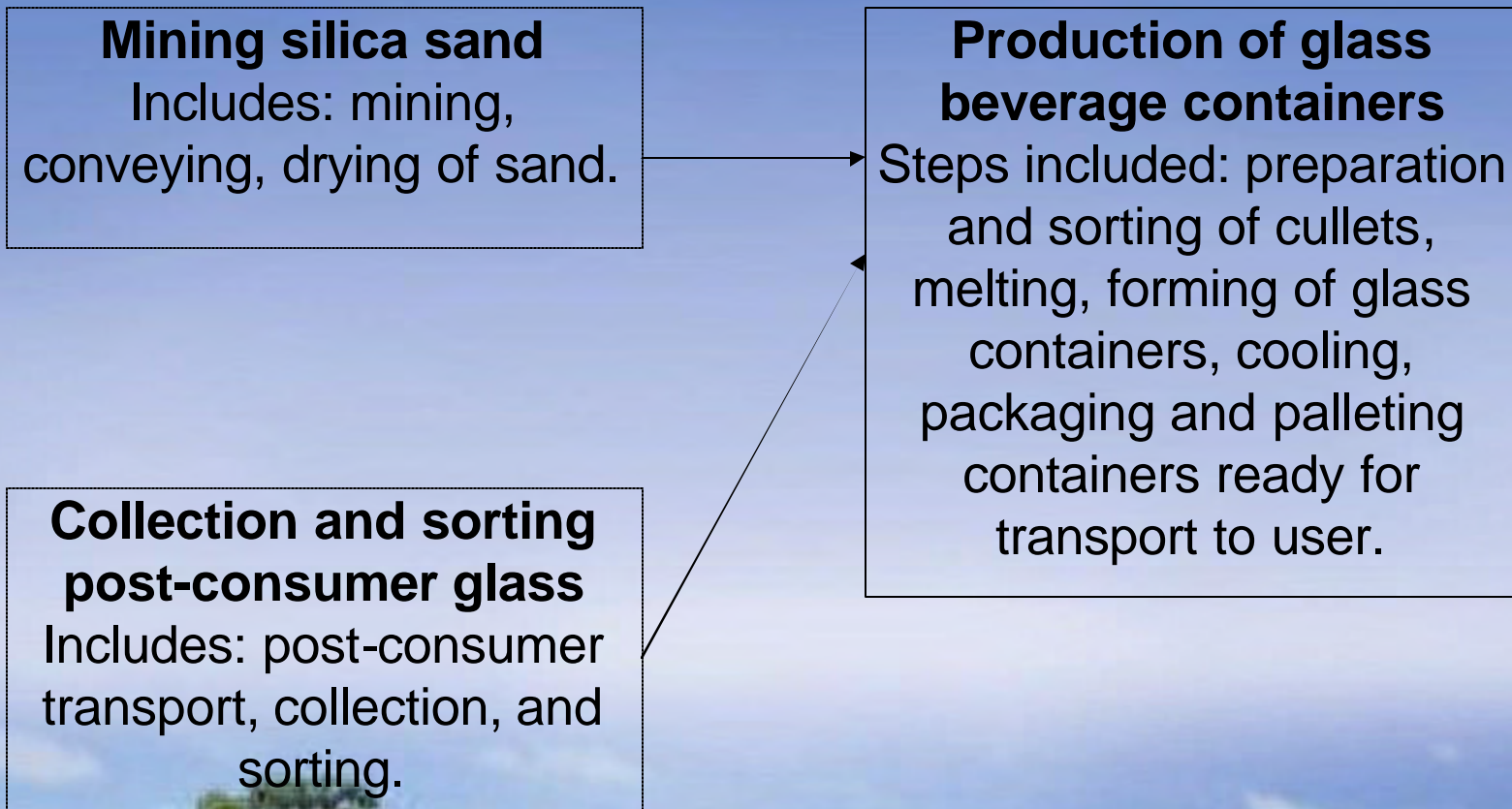
Collect complete input and output data by unit process for all major packaging materials.

- **Phase 1:** cradle to base material, and collection to recycled material
- **Phase 2:** converted forms of base material

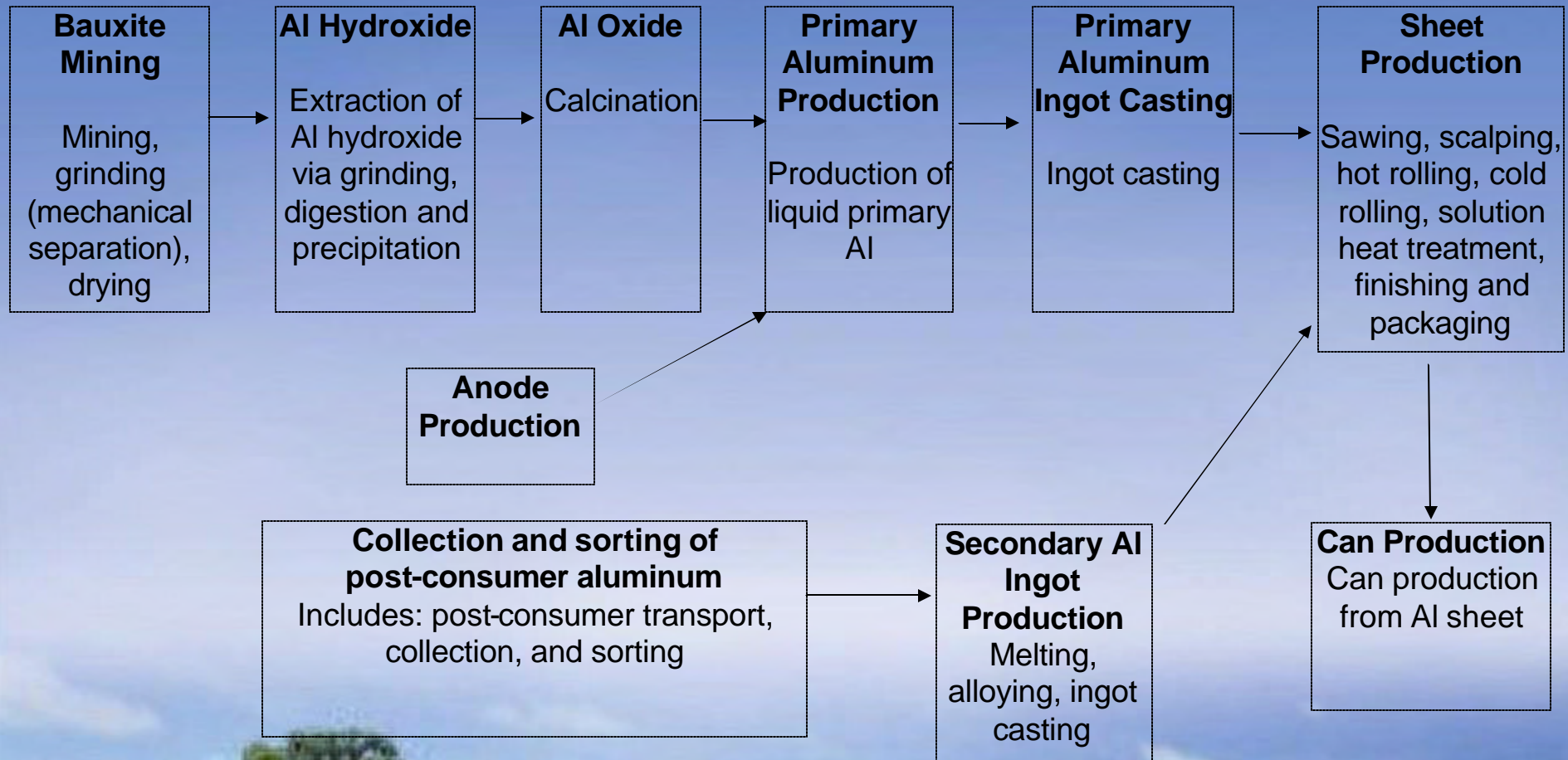
Note: Unit process is defined as the level at which data is collected. Important for transparency and ultimate scalability of data.



# Unit Process Flow Diagram: Glass Beverage Containers



# Unit Process Flow Diagram: Aluminum Cans



# Data Use

- Energy data supports Wal-Mart scorecard, EPA WARM and MERGE
- Energy data supports development of GHG emission factors for use in WARM, Wal-Mart scorecard and MERGE
- Emission data to air, water, and waste supports Material Health and Safety metric for Wal-Mart scorecard and other MERGE metrics

# Data Use cont.

- Data will be made publicly available through the NREL US LCI database and EPA if it meets appropriate QA/QC requirements
- Will provide important data for the supply chain to facilitate environmental analysis and benchmarking

# Schedule for Data Collection

- Materials with readily available unit process data fill out the data collection template and submit data to GreenBlue by June 30, 2007 or asap.
- Materials with unaggregated data, submit industry averaged, production-weighted data by Aug 15, 2007.
- Materials without data provide an estimate when data will be submitted.

NOTE: Data processing will require several months.

# Sole Producers of Materials

- Materials manufactured by a sole producer may choose to submit LCI data as representative of industry average.
- If so, they must agree to make this information publicly available.
- Material should be commercially available

# Facility Level Template

- If an industry group needs to collect facility level data, a facility-level template is available to facilitate data collection.
- In this case, we suggest industry associations or some other third party should perform the role of coordinating the data aggregation and production weighted averages.
- GreenBlue will not be accepting facility level templates.

# No Data

- If no data is available and EcoInvent (representing EU data) data is available for that material, EcoInvent data may be used as a placeholder until better data is available.
- Alternatively, if no data is available for a material and older US sources of data are available, those data may also be substituted if needed.



# LCI Data Template

- Compatible with US LCI Streamlined EcoSpold format and allows ISO compliant LCA
- Will result in data acceptable to LCA tools
- Asks for data by unit process:
  - Inputs direct from the Environment (Nature)
  - Inputs from Technosphere
  - Outputs directly to the environment (air, water, soil)
  - Outputs as products and co-products of beneficial use, to recycling, or to other waste treatment

# Pre-Population of Template

- Quality assurance step
- Role of EcoInvent data base
  - Identify unit processes
  - Identify constituents/flows of relevance
  - Normalize units & nomenclature
- Cut offs for Inputs
- Cut offs for Outputs
- Role of trade associations in validating unit process and inputs/outputs

# Introductory Page

## Welcome to the Life Cycle Inventory (LCI) Template

Material Type (100% Virgin or Max% Recycled) : Unit Process

Environment/Nature (biosphere)

1. Inputs from Environment

3. Outputs to Environment

Unit Process

2. Inputs from Technosphere

4. Product/Co-Product Outputs

Industry (technosphere)

# Process Information

**Material Type (100% Virgin or Max% Recycled)**

**Unit Process**

## Process, Data Source & Contact Information

Enter process, data source and contact information below. Use the notes box to provide additional information as needed.

Please indicate if the material type is for 100% virgin or maximum % recycled. Please use Standard International (SI) units.

### Process Information

**Material Type:**

Material Type (100% Virgin or Max% Recycled)

**Unit Process:**

Unit Process

**Brief engineering description of unit process:**

**NAICS Code for process:**

**Main Product Output:**

**Amount:**

**Unit:**

**Included Processes:**

**General Comments:**

**Data Years:**

**Geographic Representation:**

**Technological Representation:**

**Energy Value Type:**

Choose one...

**Data Extrapolations:**

**Representative Supply %:**

**Representative Production %:**

**Uncertainty Adjustments:**

# Data Source & Contact Information

Data Source Information	Study #1	Study #2	Study #3	Study #4
Source Type:				
First Author:				
Additional Authors:				
Year:				
Title of Study:				
Place of Publication:				
Publisher:				
Journal:				
Volume/Issue:				
Copyright:				
Access Restrictions:	Choose one...	Choose one...	Choose one...	Choose one...
Contact Information	Contact #1	Contact #2	Contact #3	Contact #4
First & Last Name:				
Title:				
Organization:				
Telephone:				
Email:				
Address:				
City:				
State:				
Country:				
Zip Code:				
Date:				
Notes				

# Inputs from Environment

Material Type (100% Virgin or Max% Recycled)

Unit Process

## Inputs Directly from Environment

Enter the type, amount and mass of inputs that come directly from the environment for this unit process. 'Inputs from Environment' include materials or fuels that come directly from the earth and are NOT purchased; for example, water input to process directly from a lake or river, coal extracted in a mining process, logs harvested from the forest as part of a harvesting process. If the input is paid for, then it is not coming from nature, but from another process. Please provide additional descriptions in the appropriate column. Also, provide the basis for the data and any details or source information as appropriate. Insert rows and data as needed. Use notes box at the bottom of the page as needed. Please use Standard International (SI) units.

Input from Environment	Amount	Units (mass)	Additional Description of Input	Basis for Data	Details or Source Info
1				Choose one...	
2				Choose one...	
3				Choose one...	
4				Choose one...	
5				Choose one...	
6				Choose one...	
7				Choose one...	
8				Choose one...	
9				Choose one...	
10				Choose one...	

### Notes

# Inputs from Technosphere: Energy

Material Type (100% Virgin or Max% Recycled)

Unit Process

## Inputs from Technosphere: Energy

Enter the type, amount, units and associated transportation information of energy inputs that come from the Technosphere for this unit process. There are three energy categories included below: Energy Generated On-site; Energy via Wire or Pipeline; and Energy via Truck, Rail or Barge. Please provide additional descriptions in the appropriate column. Also provide the basis for the data and any details or source information as appropriate. Insert rows and data for all inputs which account for at least 1% of mass, OR 1% of energy, OR 1% of environmental importance, where the latter is indicated by 1% of either ecosystem or human health impacts for any of three recent international impact assessment methods. E199 or Impact 2002+ or DK method. If any of the inputs are used for on-site waste treatment, please indicate which ones in the notes box below. Please use Standard International (SI) units.

Energy generated on-site	Amount	Units	Additional Description of Input (BTU value)	Basis for Data	Details or Source Info			
1				Choose one...				
2				Choose one...				
3				Choose one...				
4				Choose one...				
						<i>(Transportation data are not required for these inputs as they are generated on site)</i>		
Energy via wire or pipeline	Amount	Units	Additional Description of Input	Basis for Data	Details or Source Info			
1 Choose one...				Choose one...				
2 Choose one...				Choose one...				
3 Choose one...				Choose one...				
4 Choose one...				Choose one...				
5 Choose one...				Choose one...				
6 Choose one...				Choose one...				
7				Choose one...				
8				Choose one...				
						<i>(ICF will develop U.S national average default values for energy and GHG emissions associated with transporting each conventional fuel. ICF has already generated most of these numbers based on the national GHG inventory worked conducted for the EPA.)</i>		
Energy via truck, rail or barge	Amount	Units	Additional Description of Input (BTU value & origin)	Basis for Data	Details or Source Info	Transport mode (Truck, rail, barge, etc.)	Transport distance (km)	Empty ret (yes/no)
1 Choose one...				Choose one...		Choose one...		<input type="checkbox"/> Yes
2 Choose one...				Choose one...		Choose one...		<input type="checkbox"/> Yes
3 Choose one...				Choose one...		Choose one...		<input type="checkbox"/> Yes
4 Choose one...				Choose one...		Choose one...		<input type="checkbox"/> Yes
5				Choose one...		Choose one...		<input type="checkbox"/> Yes
6				Choose one...		Choose one...		<input type="checkbox"/> Yes

### Notes

# Inputs from Technosphere: Materials

Material Type (100% Virgin or Max% Recycled)

Unit Process

## Inputs from Technosphere: Materials

Enter the type, amount, units and associated transportation information of material inputs from Technosphere for this unit process. Please provide additional descriptions in the appropriate column. Also provide the basis for the data and any details or source information as appropriate. Insert rows and data for all inputs which account for at least 1% of mass OR 1% of environmental importance, where the latter is indicated by 1% of either ecosystem or human health impacts for any of three recent international impact assessment methods. EI99 or Impact 2002+ or DK method. If any of the inputs are used for on-site waste treatment, please indicate which ones in the notes box below. Please use Standard International (SI) units.

MATERIAL INPUTS	Amount	Units (mass)	Additional Description of Input	Basis for Data	Details or Source Info	Transport mode (Truck, rail, pipe, etc.)	Transport distance (kg)	Empty ret (yes/no)
1				Choose one...		Choose one...		<input type="checkbox"/> Yes
2				Choose one...		Choose one...		<input type="checkbox"/> Yes
3				Choose one...		Choose one...		<input type="checkbox"/> Yes
4				Choose one...		Choose one...		<input type="checkbox"/> Yes
5				Choose one...		Choose one...		<input type="checkbox"/> Yes
6				Choose one...		Choose one...		<input type="checkbox"/> Yes
7				Choose one...		Choose one...		<input type="checkbox"/> Yes
8				Choose one...		Choose one...		<input type="checkbox"/> Yes
9				Choose one...		Choose one...		<input type="checkbox"/> Yes
10				Choose one...		Choose one...		<input type="checkbox"/> Yes
11				Choose one...		Choose one...		<input type="checkbox"/> Yes
12				Choose one...		Choose one...		<input type="checkbox"/> Yes
13				Choose one...		Choose one...		<input type="checkbox"/> Yes
14				Choose one...		Choose one...		<input type="checkbox"/> Yes
15				Choose one...		Choose one...		<input type="checkbox"/> Yes
16				Choose one...		Choose one...		<input type="checkbox"/> Yes
17				Choose one...		Choose one...		<input type="checkbox"/> Yes
18				Choose one...		Choose one...		<input type="checkbox"/> Yes
19				Choose one...		Choose one...		<input type="checkbox"/> Yes
20				Choose one...		Choose one...		<input type="checkbox"/> Yes

### Notes





# Outputs to Environment: Air

Material Type (100% Virgin or Max% Recycled)

Unit Process

## Outputs to Environment

Please list the types, amount and mass of the outputs to the environment (air, water & soil) generated by this unit process. "Outputs to Environment" are flows released directly to the air, water or soil. They are "end-of-pipe" releases, after any control devices. Note that flows sent to off-site treatment are not flows directly to environment, and should be addressed on the "Outputs Techno" page. Use the "Additional Description" column to include more detail about the compound (e.g., Particulate Matter (PM) specify PM 2.5, PM 10 or PM unspecified). Constituents listed represent outputs that account for at least 1% of mass **OR** 1% of environmental importance, where the latter is indicated by 1% of either ecosystem or human health impacts for any of three recent international impact assessment methods. EI99 or Impact 2002+ or DK method. Scroll down to see water and soil emissions sections. Please use Standard International (SI) units.

Emissions to Air	Amount	Units (mass)	Additional Description	Basis for Data	Details or Source Info
1 List from Eco-Invent				Choose one...	
2				Choose one...	
3				Choose one...	
4				Choose one...	
5				Choose one...	
6				Choose one...	
7				Choose one...	
8				Choose one...	
9				Choose one...	
10				Choose one...	
11				Choose one...	
12				Choose one...	
13				Choose one...	
14				Choose one...	
15				Choose one...	
16				Choose one...	
17				Choose one...	
18				Choose one...	
19				Choose one...	
20				Choose one...	

# Outputs to Environment: Water & Soil

Emissions to Water		Amount	Units (mass)	Additional Description	Basis for Data	Details or Source Info
1	List from Eco-Invent				Choose one...	
2					Choose one...	
3					Choose one...	
4					Choose one...	
5					Choose one...	
6					Choose one...	
7					Choose one...	
8					Choose one...	
9					Choose one...	
10					Choose one...	
Emissions to Soil		Amount	Units (mass)	Additional Description	Basis for Data	Details or Source Info
1	List from Eco-Invent				Choose one...	
2					Choose one...	
3					Choose one...	
4					Choose one...	
5					Choose one...	
6					Choose one...	
7					Choose one...	
8					Choose one...	
9					Choose one...	
10					Choose one...	
<b>Notes</b>						



# Outputs to Technosphere

Material Type (100% Virgin or Max% Recycled)

Unit Process

## Outputs to Technosphere (Product and Other Outputs)

Enter information below about product, co-products, off-site recycling and outputs to waste treatment facilities from this unit process. Use the notes box to provide additional information as needed. Please use Standard International (SI) units.

Products & Co-Products of Beneficial Use	Amount	Units	Percentage of Total Annual Revenue
1			
2			
3			
4			
5			

Outputs to Off-site Recycling	Amount	Units	Basis for Data	Details or Source Info	Transport mode (Truck, rail, pipe, etc.)	Transport distance (kg)	Empty ret (yes/no)
1			Choose one...		Choose one...		<input type="checkbox"/> Yes
2			Choose one...		Choose one...		<input type="checkbox"/> Yes
3			Choose one...		Choose one...		<input type="checkbox"/> Yes
4			Choose one...		Choose one...		<input type="checkbox"/> Yes
5			Choose one...		Choose one...		<input type="checkbox"/> Yes

Outputs to Waste Treatment	Amount	Units	Basis for Data	Details or Source Info	Where is it going?	Transport mode (Truck, rail, pipe, etc.)	Transport distance (kg)	Empty ret (yes/no)
1			Choose one...		Choose one...	Choose one...		<input type="checkbox"/> Yes
2			Choose one...		Choose one...	Choose one...		<input type="checkbox"/> Yes
3			Choose one...		Choose one...	Choose one...		<input type="checkbox"/> Yes
4			Choose one...		Choose one...	Choose one...		<input type="checkbox"/> Yes
5			Choose one...		Choose one...	Choose one...		<input type="checkbox"/> Yes

### Notes

# About the Project

## About MERGE™ and the Life Cycle Inventory (LCI) Template

### About MERGE

MERGE™ was originally developed as an environmental assessment tool for chemical formulation and packaging design. The data underlying MERGE™ is industry average LCI data for 14 materials. MERGE™ was originally developed by Dr. Richard Denison of Environmental Defense. In 2006, GreenBlue was granted an exclusive license to MERGE™ in order to update the packaging portion of the tool with the assistance of the Sustainable Packaging Coalition.

### About the Life Cycle Inventory (LCI) Template

This template was developed by GreenBlue as part of the data collection process for the MERGE™ tool. It was created with the assistance of Dr. Greg Norris of Sylvatica and ICF International. It is based on templates originally developed by Dr. Norris, ICF and the US LCI Database (hosted by NREL) and is compliant with ISO 14048. Funding for the data collection portion of the MERGE™ project is supported by contributions from the members of the Sustainable Packaging Coalition, a project of GreenBlue. Funding for the redevelopment of MERGE™ including data processing and tool programming has been provided through a cooperative agreement from the EPA.

### About the Synergies of the MERGE Project and Other Efforts

Currently in the U.S., there are existing tools and tools under development that rely on industry average data that is publicly available. Some of these include EPA's Warm & ReCon tools, MERGE™ and also the Wal-Mart scorecard. However, much of the data that currently populates these tools is dated. The GreenBlue data template is designed to ensure consistent and transparent data collection and meets ISO standards. Data collected using the GreenBlue template will be shared across all of the tools and will be available for public use. It is hoped that the template will enable regular update of LCI data.

### Project Partners



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