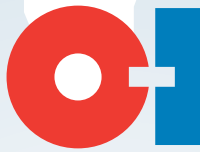




WHEN IT
COMES TO Carbon
Footprints,
are you getting the full picture?



INTRODUCES

**THE COMPLETE
LIFE CYCLE
ASSESSMENT**



A Time for Clarity

WHY COMPLETE LCAs MATTER

Climate change is one of the greatest challenges of our time.

In responding to the imperative to reduce greenhouse gases, O-I feels a strong sense of responsibility—both as a global corporate citizen and as a business serving consumer goods producers.



In the absence of a complete LCA, it is difficult to determine what is—and what is not—reflected in a carbon footprint.

To this end, we recently established ambitious environmental sustainability goals (see page 11). As a critical first step toward achieving those goals, we undertook one of the first complete life cycle assessments in the packaging sector. It is global in scope and encompasses every stage of the packaging life cycle.

LCA METHODS VARY WIDELY

The findings from our LCA helped to define our sustainability program and offer unprecedented clarity for our customers. Because packaging LCA methods are widely inconsistent, it is difficult to accurately and objectively compare the carbon footprint of different packaging materials.

Simply put, in the absence of a complete life cycle analysis, customers and consumers sometimes see merely the tip of the proverbial iceberg when it comes to a packaging material's true environmental profile.

By providing a global and comparative perspective, O-I's LCA complements the life cycle assessments recently conducted by the North American and European

glass container industries. It also facilitates “apples-to-apples” comparisons with other consumer goods packaging materials.

SETTING A HIGHER STANDARD

We expect that the complete LCA methodology used by our company and our industry will establish a higher standard of clarity for conducting environmental impact assessments in the consumer goods packaging industry. To that end, there are some basic questions customers should ask their packaging suppliers to help determine what is – and what is not – being reflected in their LCAs (see page 6).

I invite you to learn more about our LCA findings, as well as our sustainability goals, in the pages that follow. We view our commitment to sustainability as foundational to our company and the pursuit of our strategic priorities.

Many opportunities remain in the effort to improve sustainability in the packaging industry. We hope that our customers, our industry and consumers will join us as we continue working toward a more sustainable world.

Al Stroucken, CHAIRMAN & CEO, O-I



In Search of a Better Method

SOME LCA DATA IS INCONSISTENT AND INCOMPLETE

THE CHALLENGE

Consumer goods makers need reliable information about the carbon footprint of each link in their supply chain. However, environmental data available in the packaging industry is widely inconsistent due to broad variations in data measurement and the completeness of life cycle assessments.

As a result, it has been nearly impossible to compare the environmental impact of one packaging material with that of another.

THE SOLUTION

To address these challenges, O-I developed a complete life cycle modeling tool that measures the environmental impact of every stage in the product life cycle (depicted at right). Each of these life cycle stages yields carbon emissions that contribute to the total carbon footprint.

With the complete LCA methodology, O-I can ensure that the impact of each stage is included in the overall carbon footprint calculation. As a result, customers and consumers get a clear picture of glass packaging.



EXAMINING THE *Full Life Cycle*

Raw material extraction & processing

Extraction and then processing of raw materials, including recycled glass (cullet). Cullet reduces the raw materials required to make new glass containers.

Raw material transport

Transportation of raw materials and cullet to the manufacturing facility.

Production process

Production plus combustion of fuels and energy for melting and forming glass containers.

Transport of finished goods

Transportation of finished containers to the end user.

End-of-life management

Refilling, recycling or disposal of glass packaging.



COMPLETE Carbon Footprint

Comparing the Data

This complete or cradle-to-cradle approach enables like-to-like comparisons of the carbon footprints of different products. When making these analyses, it is critical that customers and manufacturers have the information they need to assess the merits of the data they are provided.

These issues, including data from O-I's complete carbon footprint assessments, are addressed in detail in the following pages.



Putting LCAs to the Test

HOW TO EVALUATE ENVIRONMENTAL DATA



Critical Questions WHEN EVALUATING LCA DATA

When comparing environmental data across packaging materials, it is crucial to ask the following questions:

- ▶ Has a **complete analysis** been done on all stages in the life cycle?
- ▶ Is the **extraction** and **treatment** of raw materials included in the analysis?
- ▶ What **standard**, if any, does the life cycle analysis follow?
- ▶ What **baseline assumptions** were made for the data?
ASSUMPTIONS INCLUDE:
Energy mix
Life cycle stage
Raw material transportation distances
End-of-life scenarios
- ▶ Has the analysis been **validated** or **endorsed**?
- ▶ How does the analysis account for and define **end-of-life management**?

In the packaging industry, there are a number of factors that complicate the ability to directly compare carbon footprints across different materials. In addition to variations in LCA methodologies and completeness (described in detail on page 7), it is important to consider the following:

- ▶ **Recycling** significantly impacts the carbon footprint of a packaging material. However, some LCAs do not account for the energy savings that result from the use of recycled materials in production and the reuse of containers over time.
- ▶ **Electrical Grid** sources vary widely around the globe, significantly impacting a product's carbon footprint.
- ▶ **Raw Material** extraction, location and processing can contribute significant carbon emissions to the overall footprint of a product. This important step is often omitted in LCA methodologies.
- ▶ **Transportation** impact of finished containers can be exaggerated through the use of incomplete LCAs that overlook carbon-intensive steps such as raw material extraction or processing.

INCOMPLETE ASSESSMENTS

"LCAs vary for many reasons. For example, at O-I we process materials and manufacture glass containers at one location. Some packaging industries have more extensive raw material processes that take place off-site, and these are sometimes omitted from assessments. A complete LCA should include raw material processing and every other stage of the packaging life cycle."

Jay Scriptor
Vice President of Sustainability, O-I

Measuring Carbon

MANY LCAs OFFER INCOMPLETE PICTURES

Though the total carbon footprint of a product is made up of emissions produced at every stage of the life cycle, many life cycle analyses available today only reflect a portion of these processes.

The prevalence of incomplete assessments is not surprising given the broad disparity in carbon footprint composition across different products and packaging materials.

Many LCAs present carbon footprint data based on only the most favorable stages of a packaging material's life cycle.

COMMON APPROACHES TO THE LCA

The graphics on the right depict commonly used LCA methodologies, such as cradle-to-gate and cradle-to-grave, which selectively focus on a limited part of the full life cycle. The only approach that generates a complete picture of a product's carbon footprint is cradle-to-cradle, which includes the recovery of post-consumer materials in closed loop production. This is the methodology O-I has used in its study.



Gate-to-gate

This focuses only on one value-added process or step in the supply chain. It ignores all steps before and after.



Cradle-to-gate

An assessment of a product's impact through production. Finished goods transportation and disposal are not included.



Cradle-to-grave

Covers all stages from materials extraction through manufacture, use and disposal, but does not account for the potential impact of reuse or recycling.



Cradle-to-cradle

Addresses all inputs and outputs for each life cycle stage, including the impact of reuse and recycling.

VALIDATION OF O-I's Complete LCA Model

To ensure the highest integrity of the data generated by the complete LCA model, O-I engaged the renowned supply chain and sustainability research firm AMR Research to conduct a rigorous analysis of the company's framework.

AMR tested the model using five different sets of published data and compared it with current best practices. They found the model to be consistent and accurate. Additionally, AMR reviewed and validated all data sources and equations in the model.

ISO DEFINITION OF LIFE CYCLE

"LCA considers the entire life cycle of a product, from raw material extraction and acquisition, through energy and material production and manufacturing, to use and end of life treatment and final disposal."

International Organization for
Standardization (ISO) 14040: 2006
Environmental Management

Carbon Footprint Composition

EMISSIONS BY STAGES OF THE LIFE CYCLE

Using the complete LCA methodology, O-I ran two sets of analyses to illustrate the importance of looking at the full life cycle when comparing carbon footprint data across different packaging materials. The first analysis, depicted in the charts below, used publicly available data to compare the composition of carbon footprints of major packaging material types by life cycle stage. The findings confirm that different materials are more carbon-intensive at different stages, reflecting the importance of like-to-like comparisons.

Carbon Footprint Breakdown

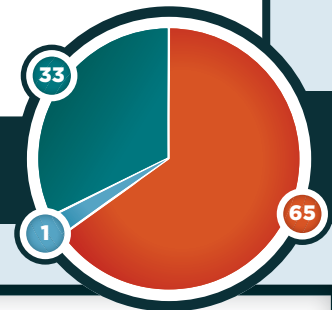
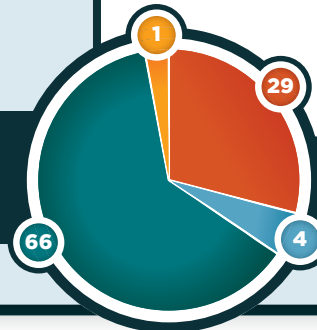
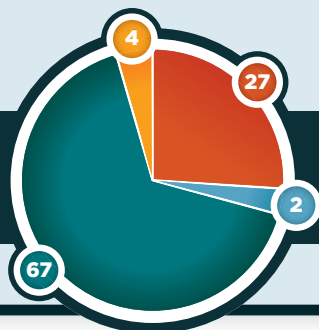
REGIONAL COMPOSITION BY PERCENTAGE



The use of recycled glass directly reduces the energy needed to extract and process raw materials.

For the purposes of this analysis, this impact is reflected in the charts below for all packaging materials.

EUROPE



Glass

Aluminum

PET

POLYETHYLENE
TEREPHTHALATE

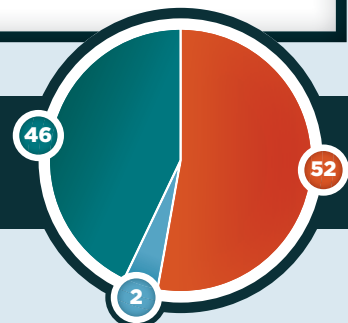
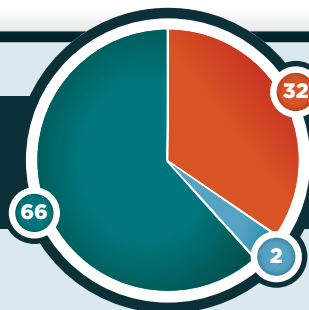
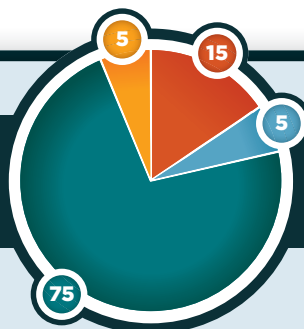
Raw material extraction & processing
Includes the impact of recycling

Raw material transport

Production process

Transport of finished goods

NORTH AMERICA



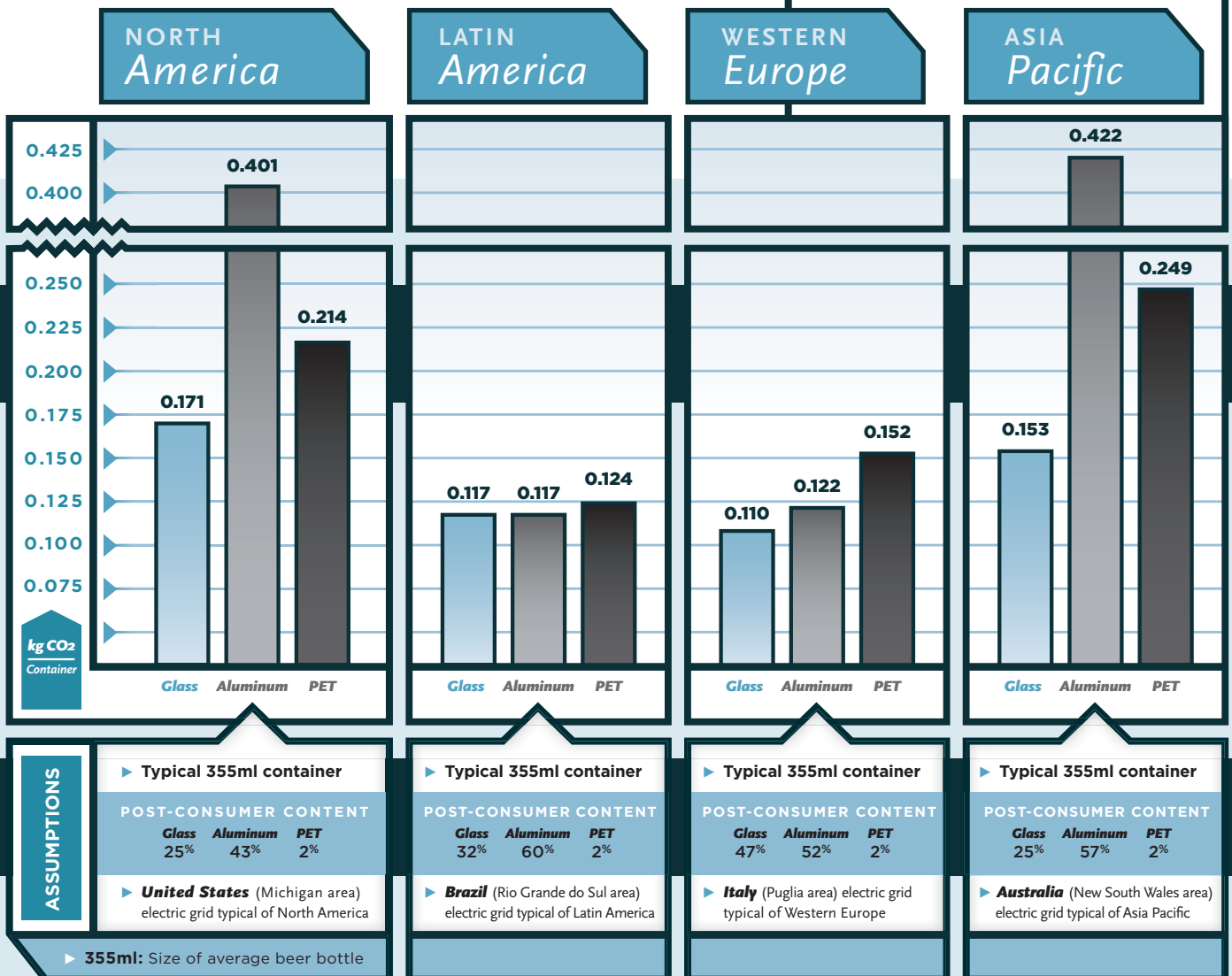
Comparing Carbon Footprints

PACKAGING MATERIALS AROUND THE WORLD

The **second analysis** calculated the complete carbon footprint of the most commonly used carbonated beverage containers in O-I's four global operational regions. To ensure accuracy and clarity, the analyses drew on actual manufacturing data from O-I for the glass figures and publicly available data for the other materials. The assumptions associated with each analysis are listed with the relevant charts below.

REFILLABLE *Glass Bottles*

Refillable bottles, which can be used an average of 30 times, have a greatly reduced carbon footprint. In Latin America and Western Europe, refillables represent over 60 and 35 percent of the market, respectively, at an average carbon footprint in both regions of **0.006 kgCO₂e per container**. Due to the small size of this footprint, it is not shown below.

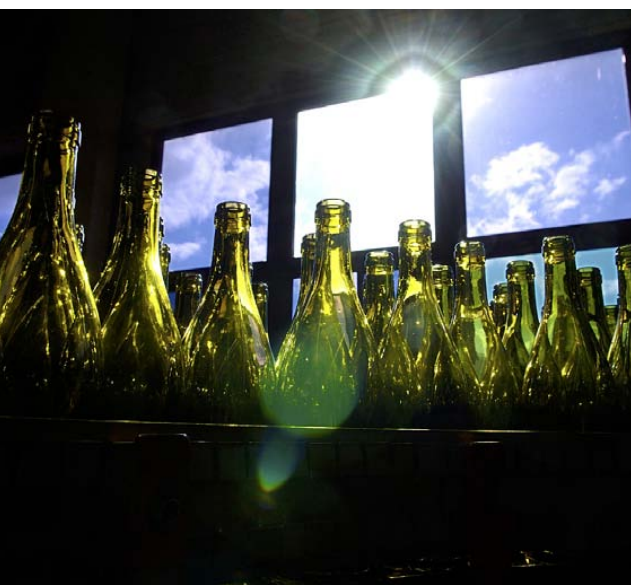


The Full Benefits of Glass

SOCIAL, ENVIRONMENTAL AND TECHNOLOGICAL

While a life cycle assessment establishes an important quantitative benchmark, the full sustainable benefits of glass packaging include additional environmental, health, social and economic dimensions that reach above and beyond what can be measured in an LCA. These include health and safety, recycling, reuse and resource efficiency.

Health & Safety



Packaging's most important function

is product preservation—and no other packaging material does this better than glass. For example:

- ▶ Glass containers protect food and beverage products from penetration by contaminants.
- ▶ Glass containers are easily and repeatedly resealable and keep products fresher for longer.

RECYCLING & REUSE

Glass recycling and reuse contribute significantly to reducing glass packaging's carbon footprint. The use of recycled glass or cullet (pictured above) in batch materials has the following beneficial impacts:

- ▶ Every 1 kg of cullet used replaces 1.2 kg of virgin raw materials that would otherwise need to be extracted.
- ▶ Every 10 percent of recycled glass or cullet used in production results in an approximate 5 percent reduction in carbon emissions and energy savings of about 3 percent.

RESOURCE EFFICIENCY

Glass is resource efficient, and can be reused in its original form more than other packaging materials. Additionally, several initiatives currently underway in the glass industry will further increase the efficiency of glass packaging, including:

- ▶ Efforts to improve recovery and recycling of glass containers help eliminate the diversion of glass to landfill, leading to a decrease in energy use and global warming potential.
- ▶ Lightweighting glass containers reduces raw material usage, emissions, energy used and overall weight.

The Path Forward

O-I'S SUSTAINABILITY GOALS

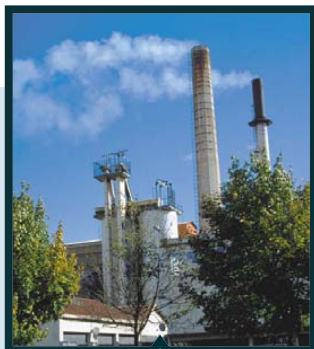
Building on knowledge gained by its complete LCA, O-I has launched a long-range sustainability portfolio aimed at making continuous improvements in four key areas. The portfolio is structured to prioritize efforts and streamline decision making. It consists of multiple projects aimed at achieving specific, measurable goals on a 10-year basis, using 2007 as the baseline. Some of the key initiatives are highlighted below.

O-I's Key Program Areas & Goals



ENERGY *Reduction*

DESCRIPTION: Take measures to improve energy efficiency and reduce energy use to ultimately decrease environmental impact and reduce costs.



EMISSIONS *Reduction*

DESCRIPTION: Reduce overall emissions to minimize operational costs and environmental impact in support of global carbon reduction targets.



CULLET *Usage*

DESCRIPTION: Develop a strategy to continue and expand O-I's role as the largest buyer of recycled glass in the world.



WORKPLACE *Safety*

DESCRIPTION: Reinforce workplace safety as an integral company value and ensure that each employee's safety is a top priority.

GOALS

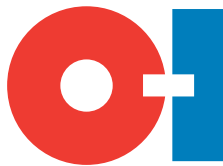
GOAL: Cut energy consumption by 50 percent.

GOAL: Reduce total CO₂ equivalent emissions by 65 percent.

GOAL: Achieve a recycled content of 60 percent in containers globally.

GOAL: Achieve zero accidents.

O-I'S GOALS ARE SET ON A 10-YEAR BASIS, USING 2007 AS THE BASELINE.



Owens-Illinois, Inc. (O-I): Millions of times a day, O-I glass containers deliver many of the world's best-known consumer products to people all around the world. With the leading position in Europe, North America, Asia Pacific and Latin America, O-I manufactures consumer-preferred, 100 percent recyclable glass containers that enable superior taste, purity, visual appeal and value benefits for our customers' products. Established in 1903, the company employs more than 22,000 people with 78 plants in 21 countries. In 2009, net sales were \$7.1 billion.

FOR MORE INFORMATION, VISIT www.o-i.com



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