



**SUSTAINABLE PACKAGING
COALITION®**

a project of **GreenBlue** 

Sustainable Packaging Indicators and Metrics Framework

Version 1.0

Sustainable Packaging Indicators and Metrics Framework

Sustainable Packaging Indicators and Metrics Framework was developed by the Sustainable Packaging Coalition®, an industry working group dedicated to developing and implementing sustainable packaging solutions.

www.sustainablepackaging.org

The Sustainable Packaging Coalition is a project of GreenBlue®, a nonprofit institute that works with the private sector to enable the positive redesign of industrial systems.

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- Material Use
- Energy Use
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- Material Health
- Clean Production and Transport
- Cost and Performance
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- Worker Impact

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Executive Summary

Publication of the *Sustainable Packaging Indicators and Metrics Framework* Version 1.0 (*Metrics Framework*) is the outcome of an 18-month project¹ that the Sustainable Packaging Coalition (SPC) undertook to develop a set of common indicators and metrics to help companies measure progress against the criteria articulated in the SPC Definition of Sustainable Packaging. The framework is divided into four sections – Introduction, Understanding Indicators and Metrics, User Guidelines and the Indicators and Metrics Modules. There is a stand-alone module for each of the key criteria of the SPC Definition, specifically material use, energy use, water use, material health, clean production and transport, cost and performance, community impact and worker impact.

Since the *Metrics Framework* provides a comprehensive palette of indicators and metrics that address the breadth of the SPC Definition, not all of the indicators and metrics are relevant for all organizations, all packaging types or all supply chain functions. Organizations should select those that are most relevant to their goals and operations. The User Guidelines section includes a detailed discussion on the selection and use of the indicators and metrics and suggestions for getting started.

Development

To identify the universe of relevant indicators, the SPC conducted a comprehensive survey of existing sustainability metrics developed by more than 50 organizations. A full list of sources can be found in the project process report published on the SPC website at www.sustainablepackaging.org. The research yielded a list of 273 indicators with more than 300 metrics having some relevance to packaging.

The second phase of work refined and pared down the universe of metrics and mapped them to the SPC Definition. Mapping narrowed the original universe to 60 indicators and metrics, which were divided across eight performance categories each relating directly to specific Definition criteria.

This set of 60 indicators and metrics was further refined by the project team comprised of 23 SPC member companies and a representative from the Environmental Defense Fund. The 24-member team divided into eight working groups – one per category/module. These working groups met on a weekly basis between June and September 2008.

The working groups' input was incorporated into a draft framework that was then shared with an additional 80 SPC member companies for comment. Following incorporation of their comments, the SPC formed a final document review committee to perform final vetting and editing of the *Metrics Framework*. Since that time, the Worker Impact module has been revised based on recommendations from the Global Packaging Project (GPP) social metrics committee and with consensus of the SPC working group that supported development of the Worker Impact module.

Organizing Principles

The SPC Definition of Sustainable Packaging informed development of the *Metrics Framework* because it establishes a clear set of objective criteria that delineate the specific areas (impacts and attributes) that are important to measure. Secondary principles that informed the *Metrics Framework* included life cycle thinking and the availability of international standards or protocols to guide the data collection and sharing processes.

While life cycle thinking influenced its development, the framework is not based strictly on a life cycle assessment approach nor do the metrics reflect only the life cycle impact categories as defined in the International Standard Organization's (ISO) 14040 series of life cycle assessment standards. The *Metrics Framework* includes a number of environmental attributes and a set of economic and social metrics for which there are not yet life cycle assessment standards/protocols but correlate to the SPC Definition criteria. Guidance on how to effectively apply life cycle thinking (or approach) to the non-life cycle impact metrics is provided in the User Guidelines and Indicators and Metrics Module sections of the framework, as well as in a discussion of the differences between industry average life cycle inventory, company specific performance, gate-to-gate and cradle-to-gate data.

Audience

All members of a packaging supply chain can use the *Metrics Framework* to measure packaging sustainability. However, it was developed with two primary audiences in mind – brand owners and retailers – for the following reasons: 1) they are who stakeholders and consumers most often look to for packaging and sustainability-related information; 2) they are best positioned to engage upstream supply chain partners in the collection of data; and 3) they have been driving the movement toward measurement. Because of this audience focus, some indicators and metrics may not apply to all members of the supply chain.

¹ A description of the project process is available on the [Sustainable Packaging Coalition website](http://www.sustainablepackaging.org).

Executive Summary

Disclosure

While the *Metrics Framework* offers a common approach to benchmark and measure progress toward sustainable packaging, it is not a standard for public reporting and its use is entirely voluntary. The framework is a resource that can help organizations:

- Better understand if and how they are making progress toward a vision of sustainable packaging as articulated in the SPC Definition of Sustainable Packaging.
- Provide a common approach to request, collect, normalize, and aggregate packaging sustainability data.
- Make well-informed decisions based on the economic, environmental and social benefits and impacts of their packaging.
- Identify opportunities and priorities for improving the sustainability profile of their packaging-related activities.
- Set future sustainable packaging goals.

SPC's *Metrics Framework* and the Global Packaging Project

While the *Metrics Framework* was released to Sustainable Packaging Coalition members in April 2009, public release was delayed while the SPC participated in the Global Packaging Project (GPP). As the work of the GPP has proceeded, project participants agreed that the *Metrics Framework* could provide a set of indicators and metrics for the GPP to pilot test and refine as part of its process to identify globally recognized metrics to evaluate packaging sustainability. While the *Metrics Framework* contains 57 metrics, it is likely that the final GPP metrics will reflect a subset of the SPC's metrics.

About the GPP

The Global Packaging Project started as an Initiative of the Global CEO Forum, which merged in June 2009 with the Comité International d'Entreprises à Succursales (CIES) and the Global Commerce Initiative to form The Consumer Goods Forum. Working from a global perspective, the GPP was chartered to: 1) define packaging's role in sustainability; 2) agree on common language/terminology to discuss packaging sustainability across the supply chain; and 3) develop a standard set of metrics by which to measure packaging sustainability over its full life cycle. The primary objective of the GPP is to minimize inefficiencies and potential supply chain disruptions resulting from uncoordinated efforts to measure packaging sustainability. The goal of the project is to ensure that:

1) requests for data related to the sustainability of packaging are made using a common set of indicators and metrics; and 2) the requested data is collected, normalized and delivered according to a common set of standards and protocols affiliated with each indicator and metric.

The work of the GPP will be completed in three Phases. Phase I, completed in May 2009, focused on: 1) developing and achieving consensus around key terminology; and 2) establishing a set of principles to guide the development of a common set of metrics.

Phase II of the GPP, launched in September 2009, is focused on development of the common set of metrics. As noted, selected metrics of SPC's *Metrics Framework* are serving as the baseline for the pilot testing of the GPP metrics. Phase III of the GPP will consist of pilot testing and validation of the set of metrics.

Metrics Pilot Testing/Validation

Pilot testing and metrics validation is expected to begin in Q1 of 2010. The GPP anticipates that pilot testing will be completed during Q2 2010, followed by release of a master set of metrics sometime at the end of Q2 2010. The SPC will follow the pilot testing and validation process and will incorporate the feedback as appropriate into a Version 2.0 of the framework. It is intended that any indicator and metric included in both the SPC's *Metrics Framework* Version 2.0 and the final GPP deliverable² will be compatible and consistent in terms of language, data request and collection guidelines and referenced measurement standards and protocols.

² It is likely that the SPC's *Sustainable Packaging Indicators and Metrics Framework* will include more indicators and metrics than the master list of metrics that will be released at completion of the GPP. The SPC's *Metrics Framework* is a more comprehensive set of metrics that has been developed to measure progress against all of the criteria defined in the SPC Definition of Sustainable Packaging. The Definition can be downloaded at www.sustainablepackaging.org. While the SPC and the GPP participants are generally aligned on that criteria, the GPP metrics have been limited to those that have global applicability, are commonly used, can be relatively easily measured and can be measured in accordance with scientific protocols (existing or to be released in the near future).

Quick Reference List

Material Use		
Indicators		Metrics Examples
Core	Total Material Use	<ul style="list-style-type: none"> o Metric tons / metric tons of substrate o kg / 1000 units of packaging o Metric tons / yr (based on production rate)
	Material Use Reduction	<ul style="list-style-type: none"> o Metric tons / metric tons of substrate o kg / 1000 units of packaging o Metric tons / yr (based on production rate)
	Material Waste	<ul style="list-style-type: none"> o kg / kg of final packaging material o kg / 1000 units of packaging o Metric tons / yr (based on production rate)
Supplemental	Virgin Material Use	<ul style="list-style-type: none"> o % of total material used / metric tons of substrate o % of total material used / 1000 units of packaging o % of total material used / yr (based on production rate)
	Renewable Material Use	<ul style="list-style-type: none"> o % of total material used / metric tons of substrate o % of total material used / 1000 units of packaging o % of total material used / yr (based on production rate)
	Post Consumer Recycled (PCR) Material Use	<ul style="list-style-type: none"> o % of total material used / metric tons of substrate o % of total material used / 1000 units of packaging o % of total material used / yr (based on production rate)
	Post Industrial Recycled (PIR) Material Use	<ul style="list-style-type: none"> o % of total material used / metric tons of substrate o % of total material used / 1000 units of packaging o % of total material used / yr (based on production rate)
Correlating	Chain of Custody	o Unknown, known or source-certified
	Material Use to Product Yield	<ul style="list-style-type: none"> o kg packaging material / kg product o kg packaging material / 1000 units of product o kg packaging material / 100 loads of laundry washed

Water Use		
Indicators		Metrics Examples
Core	Life Cycle Water Consumption	<ul style="list-style-type: none"> o m³ / metric ton of final packaging material o Litres / 1000 units of packaging o m³ / yr (based on annual production rate)
	Life Cycle Water Used from Stressed Sources	<ul style="list-style-type: none"> o m³ / metric ton of final packaging material o Litres / 1000 units of packaging o m³ / yr (based on annual production rate)

Energy Use		
Indicators		Metrics Examples
Core	Total Life Cycle Energy Intensity	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Renewable Energy Proportion	o % renewable energy use / yr
Supplemental	Life Cycle Energy Intensity (Non-Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Life Cycle Non-Renewable Energy Intensity (Non-Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Life Cycle Renewable Energy Intensity (Non-Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Life Cycle Energy Intensity (Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Life Cycle Non-Renewable Energy Intensity (Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
	Life Cycle Renewable Energy Intensity (Transport)	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging o MJ / yr (based on production rate)
Correlating	Recovered Latent Energy	<ul style="list-style-type: none"> o MJ / kg of final packaging material o MJ / 1000 units of packaging

Material Health		
Indicators		Metrics Examples
Core	Toxicants Concentration	<ul style="list-style-type: none"> o ppm in final packaging material o mg / kg of final packaging material o kg / 1000 units of packaging o % by weight / package
	Toxicants Migration	<ul style="list-style-type: none"> o Yes with supporting documentation o No

Quick Reference List

Clean Production and Transport		
	Indicators	Metrics Examples
Core	Toxic Emissions	<ul style="list-style-type: none"> kg / kg of final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Life Cycle GHG Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Air Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Water Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
Supplemental	Sulphur Oxides Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Nitrogen Oxides Emissions	<ul style="list-style-type: none"> kg / kg final packaging material Kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Particulate Matter Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	COD Emissions	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Suspended Solids Released	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
	Nitrates Released	<ul style="list-style-type: none"> kg / kg final packaging material kg / 1000 units of packaging Metric tons / yr (based on production rate)
Correlating	Environmental Management System Use	<ul style="list-style-type: none"> Yes with substantiating documentation No
	Energy Audits Conducted	<ul style="list-style-type: none"> Yes with substantiating documentation No

Cost and Performance		
	Indicators	Metrics Examples
Core	Total Cost of Packaging	<ul style="list-style-type: none"> \$ / kg of packaging € / 1000 units of packaging ¥ / yr
	Packaged Product Wastage	<ul style="list-style-type: none"> \$ packaged product + \$ packaging lost / 10000 units of packaging
	Life Cycle Embodied Energy Production	<ul style="list-style-type: none"> MJ / packaging ÷ MJ / product and packaging lost
Correlating	Packaging Service Value	<ul style="list-style-type: none"> \$ packaged product ÷ \$ of packaging
	Selling Unit Cube Efficiency	<ul style="list-style-type: none"> cm³ of packaged product ÷ cm³ of package
	Transport Packaging Cube Efficiency	<ul style="list-style-type: none"> cm³ of total selling unit packaging ÷ cm³ of pallet load
Community Impact		
	Indicators	Metrics Examples
Core	Product Safety	<ul style="list-style-type: none"> # products recalled ÷ # products shipped / yr
	Recycling of Packaging	<ul style="list-style-type: none"> Recycling rate x metric tons of packaging produced or used
	Reuse of Packaging	<ul style="list-style-type: none"> # reused / yr (based on annual production rate) Metric tons / yr (based on annual production rate)
	Landfilling of Packaging	<ul style="list-style-type: none"> Landfill rate x metric tons of packaging produced/used
	Packaging Energy Recovery Rate	<ul style="list-style-type: none"> % of packaging waste stream / yr
Correlating	Packaged Product Shelf-life	<ul style="list-style-type: none"> Mos. in packaging ÷ mos. without packaging
	End-of-Life Communications	<ul style="list-style-type: none"> Yes with substantiating documentation No
	Community Investment	<ul style="list-style-type: none"> € / yr

Quick Reference List

Worker Impact		
	Indicators	Metrics Examples
Core	Child Labor	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Forced or Compulsory Labor	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Freedom of Associations and/or Collective Bargaining	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Discrimination	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Excessive Working Hours	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Remuneration	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Occupational Health	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Safety Performance	<ul style="list-style-type: none"> o Satisfactory with substantiating third-party audit documentation o Needs Improvement as specified in third-party audit documentation o Needs Major Improvement as specified in third-party audit documentation o Unacceptable as specified in third party audit documentation – immediate action required
	Responsible Workplace Practices	<ul style="list-style-type: none"> o Satisfactory: has a business code of conduct and can provide substantiating documentation to guarantee implementation in own company as well supplier adherence o Needs Improvement: has a business code of conduct but it is not fully implemented an/or lacks a verification system or does not have a formal business code of conduct and verification system but company practices meet or exceed standard requirements o Needs Major Improvement: does not have a business code of conduct or any equivalent commitment to or demonstration of ethical and responsible behavior o Unacceptable as specified in third party audit documentation – immediate action required

Introduction

The Need

There are several factors driving the need to measure the sustainability of packaging systems. For example, packaging:

- Is an essential and visible part of product delivery and marketing;
- Is an icon of consumption;
- Consumes a significant amount of resources and has a short lifespan;
- Has an intimate relationship to customers; and
- Is persistently perceived by consumers as waste.

Globalization is also driving development of packaging measurement systems. Like products, packaging is frequently designed in one country, manufactured in another and sold in yet another. This system of commerce creates a host of economic, environmental and social impacts that can vary significantly in terms of regional and local severity and implications. For example, burning fossil fuels to produce the energy required to produce packaging contributes to global climate change, but mining the oil and coal to produce the fuel may have a more acute impact locally on soil erosion, biodiversity, land rights and the regional human health profile. Similarly, water is considered to be globally renewable but locally scarce. And, labor practices are typically well regulated and managed in developed countries but may be unregulated in developing economies, resulting in abuses of internationally recognized rights of workers.

As sustainably-minded organizations increasingly seek to understand and manage impacts on global, regional and local economic, environmental and social systems, there has been a proliferation of performance measurement systems such as scorecards and sustainability indices.

The packaging sector is no exception. However, measurement systems are only effective if they are comprised of meaningful and relevant indicators and metrics. Indicators and metrics are only meaningful if they facilitate measurement toward well-defined objectives that address the critical issues of concern and can facilitate collection of the required data without creating confusion in the marketplace or disruptions in the supply chain.

The Challenges

Measuring the sustainability of packaging is complicated by a number of factors.

- Packaging is produced from a variety of material types and in various formats even when used for the same application. For example, food is packaged in fiber, glass, aluminum, plastic and mixed materials formed into boxes, bottles, cans and pouches.
- Packaging has a very complex supply chain. While there are a number of companies – principally packaging converters – whose primary business is the production of packaging, packaging is often a small part of the focus of other members of the supply chain.
- Converters do not sell packaging in the consumer marketplace. They sell it to brand owners and retailers who, in turn, put their products into the packaging and then out into the market.
- Consumers and other stakeholders look to brand owners and retailers (not converters) for information about packaging but brand owners and retailers don't have all the data
- The relevance and significance of sustainability issues varies across the supply chain as does the level of expertise with measurement standards and protocols.
- The functional roles of packaging are not well understood by all relevant stakeholders. Since packaging is often disposed of after the use or delivery of a product, a common perception is that packaging is largely waste.

These factors raise questions about:

- Who can and should attempt to measure packaging sustainability;
- Which attributes and impacts of packaging should be measured in terms of sustainability performance and why;
- How those attributes and impacts should be measured; and
- Where the required data will come from.

A Solution

The *Metrics Framework* addresses these needs and challenges by:

- Providing a comprehensive set of indicators and metrics focused on package-level measurement that can be used by all members of a packaging supply chain³ ;
- Using the criteria articulated in the SPC Definition of Sustainable Packaging to determine which packaging impacts and attributes should be measured⁴ ;
- Clearly defining terminology;
- Addressing the need to set a measurement boundary and scope;
- Offering a common approach for requesting, collecting, sharing and aggregating data⁵ ;
- Helping organizations understand when to collect gate-to-gate or cradle-to-gate data;
- Providing data collection guidelines and referencing appropriate international standards and protocols.

The *Metrics Framework* also serves as a complement to the *SPC Design Guidelines for Sustainable Packaging* and the SPC's comparative assessment packaging design software –

³ While the *Metrics Framework* can be used by all members of the supply chain, not all indicators and metrics contained in the framework are relevant for all organizations or all types of packaging and associated supply chain functions.

⁴ Using the SPC Definition to determine what to measure is of particular importance because it ensures the indicators and metrics: 1) respond to identified sustainable packaging drivers; and 2) can measure progress toward specific goals and objectives.

⁵ It is not always possible or appropriate to aggregate collected data.

Introduction

COMPASS®. *The Design Guidelines* are intended to spur innovation beyond traditional packaging design criteria by providing a context for thinking about how to address issues of resource use, material sourcing, human health and material toxicity and end-of-life management. Through accessible visual comparisons across a set of key performance indicators, COMPASS uses the scientific rigor of life cycle assessment to inform packaging design and material selection. Using industry average⁶ life cycle inventory data, COMPASS provides comparative analyses of packaging designs and highlights the potential environmental benefits and impact of each design. Once packaging is in the marketplace, the *Metrics Framework* provides a common approach to requesting and collecting performance data to gauge an organization's actual progress towards the definition of sustainable packaging.

⁶ Future versions of COMPASS may allow organizations to enter their own organization-specific life cycle inventory data.

Understanding Indicators and Metrics

Indicators and supporting metrics have been used as business strategy, management and reporting tools for decades. One of the most common and long-standing uses of indicators and metrics is for financial reporting, wherein organizations use a standard metric like “number of widgets produced per hour of labor” to express performance against a standard indicator like “labor productivity.”

An indicator stands as a quantitative or qualitative proxy for an issue or characteristic an organization wants or needs to measure. As such, an indicator provides conceptual cues and a way to express movement — whether positive or negative — toward a goal. Generally, an indicator focuses on a piece of a system that can provide a sense of the bigger picture. For example, the indicator “small business survival rate” provides information about the overall economic health of a region. In terms of packaging, the indicator “greenhouse gas (GHG) emissions” provides information about packaging’s potential impact on climate change.

A metric is the method used to express an indicator. A metric is used to gauge the issue or characteristic — represented by the indicator — that an organization wants or needs to assess. Metrics are often computational or quantitative, but can also be a qualitative assessment of an indicator. Metrics are typically expressed as a numerator and a denominator, i.e., “A per B.” For example, a metric to quantify the indicator “GHG emissions” could be expressed as “kilograms of GHG per kilograms of packaging.”

The metric denominator is often also referred to as a functional unit. According to the ISO 14040 series of standards for life cycle assessment, a functional unit provides a way to “normalize” the data that is collected so that the measurement is expressed in comparable terms — apples to apples, for example. The functional unit of the metric must be consistent with the intended use of the metric and relevant to the issue or characteristic (the indicator) that is being quantified or qualified.

Indicators and metrics serve distinct purposes in the measurement process. Together, indicators and metrics provide an effective means by which an organization can understand where they are, where they are going and how much further they need to go relative to a stated goal or objective. Therefore, it has become commonplace to use “metrics” to refer to an indicator and metric as a single entity.

Common Types of Indicators

Just as there are numerous uses for indicators, there are also numerous types of indicators. The most common indicators are “core” indicators, which can also be referred to as key performance indicators. Supporting core indicators are “supplemental” indicators. The third type of indicator used in the *Metrics Framework* is “correlating.”

A **core indicator** is a quantifiable or qualitative representation of a measurable issue or characteristic **considered to be of interest to most stakeholders.** In aggregate, core indicators provide a robust evaluation of the big picture.

A **supplemental indicator** is a quantifiable or qualitative representation of a measurable issue or characteristic, which **augments core indicator data by providing a more specific or detailed measure** of an aspect of the core indicator.

A **correlating indicator** is a quantifiable or qualitative representation of a measurable issue or characteristic considered to be **of significant importance but may not be of interest to all stakeholders.** Correlating indicators provide additional information relative to, but sometimes outside the scope of the core and supplemental indicators.

An example of the relationship between these three types of indicators can be illustrated by considering how some of the indicators for Material Use relate to each other. Total Material Use, which measures a company’s overall resource use, is the “big picture” metric that most stakeholders will be interested in so it is designated as a core indicator. In order to accurately measure Total Material Use, companies

Indicator Relationships and Metrics

Total Material Use

- Metric tons / metric tons of substrate
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

- Core: Of interest to most stakeholders.

Virgin Material Use

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / yr (based on production rate)

- Supplemental: Augments core indicator data.

Chain of Custody

- Unknown, known or source-certified

- Correlating: Of significant importance; may not be of interest to all stakeholders.

Understanding Indicators and Metrics

will need to measure the amount of virgin and recycled material they are using. As a result, Virgin Material Use is designated as a supplemental indicator because it provides more detailed information about the core metric and has a direct relationship to the core metric. Chain of Custody, which measures if material comes from a source-certified location or not, provides some additional information about virgin material but that data is not directly related to the amount of material being used. Therefore, Chain of Custody is designated as a correlating indicator because it provides some important information that some but maybe not all stakeholders are interested in. While in this case Chain of Custody correlates to a supplemental indicator, correlating indicators may correlate to either core or supplemental indicators and, in some cases, may stand alone as metrics that simply provide additional information relevant to the general performance category being measured. See, for example, the Environmental Management System Use and Energy Audit correlating indicators in the Clean Production and Transport module.

Data Use and Interpretation

As noted, indicators and metrics are used for many purposes and by most public and private sector entities. Frequently, two or more organizations or two or more departments within an organization will use the same indicator and metric for different purposes. Likewise, two or more organizations or two or more departments within an organization may use the same indicator but choose different metrics if their reason for tracking the indicator differs. Therefore, three of the most important things to consider when defining the metric to be used to assess an indicator are:

- What the intended use of the measurement is.
- Who the intended recipient of the data is.
- How the data will be normalized.

To minimize unintended use of indicators and metrics, the *Metrics Framework* provides a clear definition for each indicator. However, it does not specify either the unit of measure (the nominator) or the functional unit (the denominator and data normalizer) for the metrics. Instead, the metrics are written generically; for example, "mass of total material used per functional unit of packaging," which allows organizations (data requestors and data collectors) to select the unit of measure and the data normalizer that will best serve the intended use of the measurement. Examples of units of measure and functional units that could be used for each metric are provided.

When collecting performance data that will be used for internal purposes, gross measurements may serve the purpose. However, when collecting data that will be shared with supply chain partners or included in a public sustainability report, rigorous measurement and careful data verification is necessary. It is also important to consider how recipients of the data may interpret it. A rule of thumb or best practice is to leave as little as possible to interpretation.

Common Uses of Performance Indicators

- Annual goal setting
- Benchmarking
- Comparative performance
- External communications
- Internal communications
- Internal management and decision making
- Internal performance evaluation
- Market assessment and positioning
- Periodic goal evaluation
- Policy evaluation
- Process optimization
- Public reporting
- Regulatory compliance demonstration
- Resource allocation
- Shareholder communications
- Short- and long-term risk assessment
- Stakeholder communications
- Trend analysis

User Guidelines

The *Metrics Framework* provides a comprehensive set of indicators and metrics for package-level performance measurement. The indicators and metrics are organized into stand alone categories or modules that include:

- Information on why it is important to measure the associated impacts or attributes;
- Terminology definitions;
- Relational diagrams;
- User guidance; and
- References to international standards or protocols.

Each module relates to a key criterion of the SPC Definition of Sustainable Packaging; specifically, material use, energy use, water use, clean production and transport, cost and performance, community impact and worker impact.

Although the *Metrics Framework* can be used by any member of a packaging supply chain, not all of the indicators and metrics are relevant for all organizations. Some are not applicable for certain types of packaging. Others are not relevant to some supply chain functions.

Except for indicators and metrics designated as life-cycle metrics, members of the supply chain should generally measure performance only for the period in which they have control or ownership of the packaging materials (raw or processed), packaging components or units of packaging. Downstream members of the supply chain, i.e., brand owners and retailers, can assess the broad benefits and impacts of their packaging by requesting and then summing up or aggregating data from their upstream suppliers. Typically each member of the supply chain can get full data only from their direct suppliers. Therefore, depending where an organization is in the supply chain, they may need to request that their direct suppliers also collect data from their own direct suppliers and follow the same data collection guidelines, standards or protocols. **Note that some measurement data may not be appropriate to aggregate, for example, social metrics data do not lend themselves to aggregation across the supply chain.**

Statements of what to measure and what not to measure as well as international standards and/or protocols that offer a common approach to the request and collection of data are included for a majority of the indicators and metrics. Use of a commonly recognized set of indicators and metrics and data collection protocols across the supply chain can minimize inefficiencies and avoid unintended supply chain disruptions that could result from a proliferation of disparate measurement schemes.

Resources

There are a number of existing resources that may facilitate use of the *Metrics Framework*. Users should become familiar with the British Standard Institute's (BSI's) Publicly Available Specification (PAS) 2050 standard,⁹ the Global Reporting Initiative, the International Standard Organization's (ISO) 14040 series of standards,¹⁰ Social Accountability International's SA8000 standard,¹¹ and the World Resource Institute/World Business Council for Sustainable Development's Greenhouse Gas (GHG) Protocol⁸.

The G3 Guidelines and the GHG Protocol currently apply to enterprise-level performance measurement,¹² so their guidance may require adaptation for use at the package level. The ISO standards relate to environmental management systems and life cycle assessment (LCA). They provide internationally accepted principles and a methodology for measuring environmental impacts of product systems. Most of the indicators and metrics in the *Metrics Framework* do not require the performance of a full life cycle assessment. However, life cycle assessment principles and methodology provide practical guidance to facilitate the measurement process. For example, the ISO standards address:

- Setting a boundary and scope;
- Collecting the required data;
- Normalizing the data; and
- Interpreting the data.

Reference to these and other resources, such as the Comité Européen de Normalisation's (CEN) EN, standards, the Verband der Netzbetreiber's VDN standards and certain ASTM (formerly the American Society for Testing and Materials) standards, are included in the framework modules when they can help determine what to measure and what not to measure.

Getting Started

Before attempting to measure your organization's progress toward the vision of sustainable packaging, carefully read through these guidelines, each of the modules and the glossary of terms. As you become familiar with the format and language of the *Metrics Framework*, think about how the indicators and metrics may be used to meet your organization's sustainable packaging goals.

If your organization is new to sustainability performance measurement, you may want to begin by focusing on only one module (a categorized set of indicators and metrics) and then address additional modules as you become familiar with the process and better understand how to best collect, interpret and use the data. Alternatively, you may choose to begin by using a core indicator and metric from each module.

⁷ The G3 Guidelines can be downloaded at the [Global Reporting Initiative website](#).

⁸ The Greenhouse Gas Protocol can be downloaded at the [Greenhouse Gas Protocol Initiative website](#).

⁹ PAS 2050 can be downloaded at the [BSI Group website](#).

¹⁰ ISO standards must be purchased. The referenced standards can be purchased online at the [International Organization for Standardization website](#).

¹¹ The SA 8000 standard can be downloaded at the [SAI website](#).

¹² GHG Protocol organizers are further defining guidelines for Scope 3 measurements, which will result in product-level and supply chain guidance. The results of this effort are expected to be released in 2010.

User Guidelines

If your organization has been working on sustainability performance measurement in other areas of your business, the *Metrics Framework* should be easy and straightforward to use. If your organization is already preparing a sustainability report in accordance with the GRI or a carbon footprint in accordance with the GHG Protocol ISO 14040/44 or PAS 2050, you can use the *Metrics Framework* to incorporate packaging sustainability data into those efforts. Likewise, where there are areas of overlap, data collected for your sustainability report or your carbon footprint may be used to extract packaging-specific data. Finally, if you use data for such multiple purposes, be careful to avoid double counting.

Goals

The *Metrics Framework* has been designed to yield data that can support a variety of business goals related to sustainable packaging. Such goals may be related to resource conservation, measuring and managing energy use and GHG emissions, reducing water use and consumption, reducing worker exposure to toxicants, meeting customer or consumer expectations, participating in voluntary reporting programs, focusing on social responsibility, achieving market differentiation and more. However, **you should not use the Metrics Framework until you have clearly defined your sustainable packaging goals.** If your organization has not defined sustainable packaging goals, the SPC Definition of Sustainable Packaging can inform your goal setting process by helping to identify areas on which to focus.

The goal setting process does not need to be complex. More than likely, your organization already has a vetted goal-setting process that can facilitate the establishment of sustainable packaging goals. Alternatively, you may simply want to appropriately adapt your organization's enterprise sustainability goals to your packaging portfolio(s). At a minimum, your sustainable packaging goals should meet the "S.M.A.R.T. goal" criteria, i.e., they should be specific, measurable, achievable, realistic and time bounded.

Boundary and Scope

A boundary and scope helps to determine what to include and not include in your measurement project based on your stated goals. In terms of measuring progress toward sustainable packaging, there are two types of boundaries to consider – organizational boundaries and operational boundaries. Organizational boundaries refer to the facility and functions that your organization owns and controls and for which it has direct responsibility. Operational boundaries refer to functions that your organization relies upon but are owned and controlled by another organization and, consequently, for which your organization has only indirect responsibility. You should set a boundary for both organizational and operational considerations. The boundary and scope may be different for different categories of data – e.g., you may use a different boundary and scope for material use than you do for energy use. Data requesting organizations and data collecting organizations should work together to establish the boundary and scope of measurement.

The *Metrics Framework* indicators and metrics are intended for use at the package-level¹³ rather than the enterprise-level. This means that no matter where you set your organizational and operational boundaries, you should only collect direct and indirect data for impacts and attributes related to packaging. At the same time, your scope of measurement should always consider the packaging to product relationship. For the most part, the economic, environmental and social impacts of products are much higher than packaging. Packaging-related product loss, damage or spoilage will result in loss of both packaging-related and product-related resources (materials and energy).

Finally, be transparent about where you set your project boundary and scope. That information provides the context within which to interpret and understand the measurement data.

Data Collection

Gate-To-Gate and Cradle-to-Gate Measurement

When measuring packaging sustainability performance, most downstream supply chain partners like a brand owner or

retailer will need to request information from their upstream suppliers and then sum up or aggregate the data. Typically each member of the supply chain can get full data only from their direct suppliers. Depending where your organization is in the supply chain, you may need to request that your direct suppliers also collect data from their own direct suppliers and ensure they follow the same data collection guidelines, standards or protocols. Hence, users of the *Metrics Framework* should be concerned with two types of measurement that are related to boundary and scope. These are known as "gate-to-gate" and "cradle-to-gate" measurements.

Package-level vs. Enterprise-level Measurement

A logging company may provide raw material to paper manufacturers, fiber board manufacturers, furniture makers and lumber companies. In terms of measuring its packaging-related impacts, the company should set its measurement boundary and scope around the organizational and operational functions required to harvest, process and transport only the raw material it sells to paper and fiber board manufacturers (packaging-level data). The logging company will need to determine if it is easier to segment data collection in that way or to collect full enterprise-level data and then proportionally allocate the total measurement based on the amount of materials sold to each sector.

¹³ Package-level measurement does not mean collecting data for individual packages but rather for packaging portfolios. A packaging portfolio could be all fiber packaging produced or all plastic packaging produced, only cereal boxes produced, only 12 oz plastic bottles produced or only cereal boxes or 12 oz plastic bottles produced for customer A. For example, if a converter produces plastic bottles for multiple beverage companies and each beverage company specifies a different weight of plastic, the volume of bottles produced for each customer should be considered to be a separate packaging portfolio. Data should be collected separately for each designated portfolio.

User Guidelines

Gate-to-gate measurement requires collection of data from the time you take ownership or control of the packaging materials (raw or processed), packaging components or units of packaging until you hand it off to the next downstream member of the supply chain. Cradle-to-gate measurement refers to data collection from raw material growth, extraction or harvesting (cradle) through some designated point in the manufacturing or production process (gate). See also Life Cycle Assessment in the Glossary.

When using the framework, each member of the supply chain will generally collect only gate-to-gate data. However in some cases, it may be easier for some members of the supply chain to collect cradle-to-gate information. When sharing data with supply chain partners, always disclose whether your data collection was gate-to-gate or cradle-to-gate to ensure the recipient does not re-aggregate and double count the impact.

Life Cycle Inventory (LCI), Industry Average and Organization-Specific Data

LCI data consist of the identification and quantification of the relevant system inputs (resources and intermediate products) and outputs (emissions, wastes) following the methodology prescribed in ISO 14044. Full LCI data are input and output flow data that has been collected for all the processes in the packaging system. LCI data may be validated industry average data or organization-specific data.

Validated industry average data are LCI data that has been collected from at least three or more different entities, compiled into averaged quantifications and maintained in a public (free) or proprietary (user license required) database. Organization-specific data are individual company-collected data and may be either LCI data or simply quantitative or qualitative attribute data. Organization-specific LCI data can be collected by individual suppliers in either a gate-to-gate or cradle-to-gate process and then aggregated by the most downstream supply chain partner into a full LCI data set.

Not all the indicators and metrics in the *Metrics Framework* require collection of LCI data; those that do are designated as a life cycle indicators /metrics. When using the life-cycle designated metrics, if you are the data requestor, specify your preference for validated industry average data or organization-specific data. If the data requestor does not specify a preference, disclose whether the data is industry average or your own company-collected data. Additionally, if you are using industry average data, disclose the source, e.g. ecoinvent.

Organization-specific data may be difficult to collect across the supply chain for a variety of reasons. For example:

- Some organizations may have little or no experience collecting data.
- Standard methodologies for collecting consumer use data related directly to your organization's packaging may not exist.
- Most end-of-life data for packaging are only available through regional or national waste management collection authorities who may aggregate the data in ways that make it difficult to proportionally allocate required measurements to your packaging portfolio.

Over time all organizations should increase efforts to collect organization-specific data. While industry average data can provide a performance benchmark, you cannot effectively measure progress toward your packaging sustainability goals across time and/or differentiate your sustainability performance in the marketplace if you do not eventually collect your own organization-specific data.

Data Neutrality

Data are neutral and do not imply a value judgement. Data simply inform. Numbers and percentages, whether high or low, are neither inherently good nor bad. The data must be interpreted within the context of the whole system and the full life cycle before it can be understood to represent or signify a more or a less preferable level of performance.

Transparency

As boundary and scope may vary from organization to organization, you should always be clear about what was and was not included in your data collection in a transparency statement. Your transparency statement should include:

- If you made any relevant assumptions and what they were.
- How and where you set your operational and organizational boundary and scope.
- If applicable product category rules exist and were followed.
- If you include both direct and indirect sources (or when you did and did not).
- Which data are organization-specific performance data and which are industry average LCI data.
- If you requested data from upstream supply chain partners and how you aggregated the data.
- What caused any significant variation in performance if you are tracking data against an established baseline (see Baseline Performance).

Transparency is very important when you share performance data outside your organization, e.g., with your supply chain partners or customers or in any publicly released documents or reports. You do not want suppliers, customers or stakeholders making assumptions about your performance data, as each of these groups may interpret the data differently and use it for different purposes.

User Guidelines

Baseline Performance

Measuring progress toward sustainable packaging is not a onetime activity. You should collect, track and compare performance measurements at consistent intervals, e.g., annually or bi-annually.¹⁴ This will require establishing a baseline against which to compare future performance.

If you are just beginning to collect packaging-related performance data, your first-year data will become the baseline data against which you should compare your performance in subsequent years.¹⁵ If you have been collecting packaging-related data for a year or more, select a year that will serve as your baseline year. Examine the data from each year carefully to ensure you choose a baseline year that represents average performance over the number of years for which you have data.

Once you begin to measure performance against an established baseline, you should present your current data in clear comparison to the baseline to illustrate upward or downward trends. You should also explain any significant variances in performance. For example, your total energy intensity may decrease during a measurement period because of a decrease in production rate vs. an actual decrease in energy use. In such a scenario, total energy intensity per unit of packaging produced could increase while the overall use of energy decreases.

There are also scenarios in which resetting your baseline may be required, such as the sale or acquisition of production facilities, product lines or corporate divisions/subsidiaries.

Units of Measure

The *Metrics Framework* strives for a balance between specificity and flexibility. While it offers a comprehensive set of indicators and metrics, some may or may not be relevant to your organization depending upon where your organization sits in the supply chain and what types of packaging material or packaging components you produce and/or use. You must first decide which indicators are relevant to your business and your sustainability goals. When making this decision, also consider the potential expectations of your downstream supply chain partners.

Additionally, the metrics – i.e., the “how” to measure the indicators – have been written in generic terms, for example, “mass” or “volume” per “functional unit of packaging material, packaging components, packaging or time.” You will need to replace the generic terms “mass” or “volume” with specific units of measure such as kilograms, grams, metric tons, megajoules, etc. and select the functional unit by which you want to normalize the data – e.g., “tons of packaging material” or “1,000 units of packaging,” etc. If you are collecting data in response to a downstream partner’s data request, work with the data requestor to determine an appropriate functional unit. And, if you subsequently request data from your upstream supplier, specify that they normalize and use the same functional unit.

¹⁴ The SPC recommends annual performance measurement.

¹⁵ Industry average LCI data related to a specific date in time, e.g., 2006 data, could serve as your baseline data.

Indicators and Metrics Modules

The *Metrics Framework* is not a standard for public reporting and use of the indicators and metrics in these modules is entirely voluntary. The indicators and metrics are organized into eight stand alone modules that relate to key elements of the SPC Definition of Sustainable Packaging.¹⁶ While the *Metrics Framework* can be used by any member of the supply chain, not all indicators and metrics contained in the framework modules are relevant for all organizations or all types of packaging and associated supply chain functions.

Before using the modules, read the User Guidelines section of this document, establish your sustainable packaging goals and set the boundary and scope of your measurement project.

Each module is stand alone” because it:

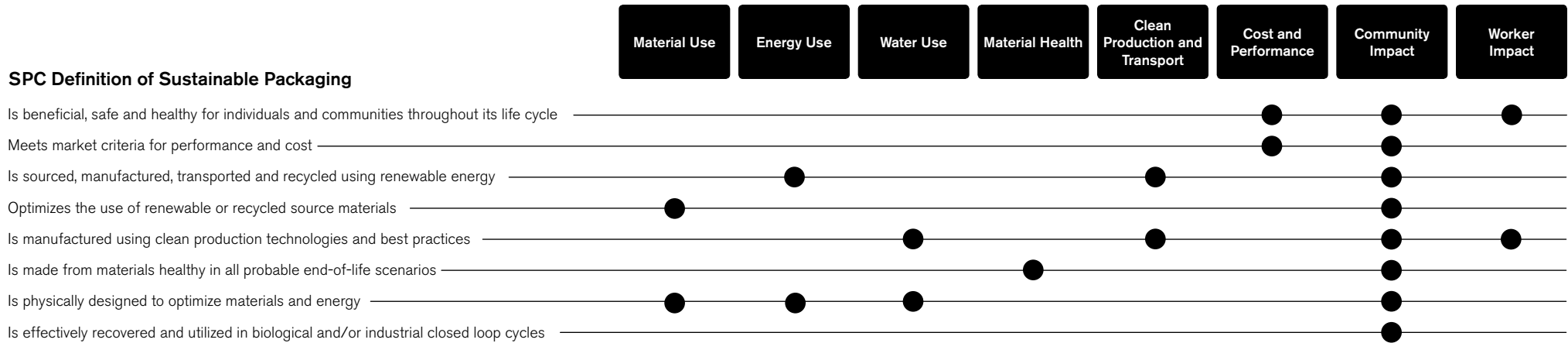
- Illustrates how the performance category links to the SPC definition criteria;
- Explains why the measurements should be made;
- Provides an indicator/metric relational diagram;
- Provides an indicator definition;
- Specifies the metric to be used;
- Provides examples of how the metric can be calculated; and
- Provides recommendations for what to measure and what not to measure.

¹⁶ This figure shows only the most direct and relevant linkages between modules and definition criteria; other indirect linkages exist.

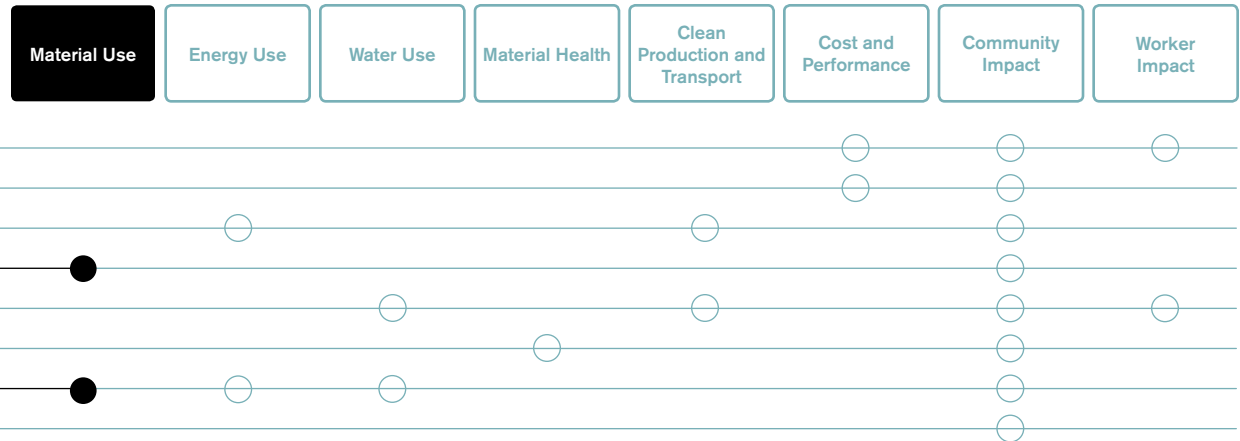
What to Measure and What Not to Measure

Recommendations are provided for what to measure and what not to measure for the majority of indicators in each module. These recommendations are not prescriptive. Rather, they are intended to facilitate a common approach to the data request and collection processes. Use this guidance as appropriate to your organization’s role and position in the supply chain and to the extent it aligns with the boundary and scope of your measurement project and sustainability goals. When applicable, references to specific international standards and protocols are also provided to facilitate a common approach.

Framework Performance Categories Mapped to SPC Definition



Material Use



Why Measure “Material Use”

To: 1) understand the types of materials that are used; 2) understand how much of each material type is used; 3) understand where the materials that are used come from; and 4) track progress towards more responsible use of resources.

Reducing material use through design innovation or by increasing the use of recycled materials can: 1) reduce end-of-life waste; 2) lower overall operating costs and reduce the total cost of packaging; and 3) improve an organization’s overall environmental and social responsibility profile.

On the other hand, irresponsible and/or over-sourcing of materials can: 1) cause disruption of natural eco-systems by, for example, deforestation, land erosion, species habitat destruction and natural resource depletion; and 2) impede the ability of communities that traditionally depend upon natural ecosystems for their livelihood to remain economically viable.

Key Terminology

1. A “packaging component” is any stand alone element of a primary or secondary package, such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging, such as a pallet or strapping, and includes labels, adhesives, inks and/or coatings used on the component.

2. A “unit of packaging” includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.
3. “Transport,” in terms of sustainable packaging, includes transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units to a filler; it does not include transport of packaging that contains product).
4. “Renewable resources,” according to the U.S. Environmental Protection Agency (EPA), are natural resources that can be remade, re-grown or regenerated in a relatively short period of time. Examples of renewable resources are plants and trees from agriculture and forestry.
5. “Non-renewable resources,” according to the U.S. EPA, are natural resources that cannot be remade, re-grown or regenerated as fast as they are consumed and used up. Examples of non-renewable resources are oil, coal, iron ore, minerals including uranium, metals and alloys and old growth forests.

Before using the indicators and metrics in this module, read the User Guidelines section of this document and be sure you understand how to set a boundary and scope for your measurement project and the difference between gate-to-gate, cradle-to-gate, industry average life cycle inventory (LCI) data and organization-specific performance data. When sharing data with your supply chain partners, be transparent about your measurement boundaries and type of data collected.

Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners’ expectations. Use the “what to measure” and “what not to measure” guidelines as appropriate for your organization’s role and position in the supply chain.

Material Use



Total Material Use

- Metric tons / metric tons of substrate
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Material Use Reduction

- Metric tons / metric tons of substrate
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Material Waste

- kg / kg of substrate
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Material Use to Package Product Yield

- kg packaging material / kg product
- kg packaging material / 1000 units of product
- kg packaging material / 100 loads of laundry washed

Virgin Material Use

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / yr (based on production rate)

Renewable Material Use

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / yr (based on production rate)

Post Consumer Recycled (PCR) Material Use

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / yr (based on production rate)

Post Industrial Recycled (PIR) Material Use

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / yr (based on production rate)

Chain of Custody

- Unknown, known or source-certified

Indicator Relationships and Metrics

■ Core ■ Supplemental □ Correlating

Material Use



Total Material Use (Core)

Definition

The mass of all materials used in substrates, packaging components or units of packaging.

Metric

Mass of all materials used per functional unit of substrate, packaging components, packaging or time.

Examples

- Metric tons / metric tons of substrate
- Kilograms / 1000 units of packaging
- Metric tons / year (based on annual production rate)

What to Measure

Measure all materials used in packaging material substrates, packaging components or units of packaging. For additional guidance, refer to standards EN 13428:2004 and EN 13427:2004. Note that these standards apply specifically to measuring “adequate minimum packaging weight.”

What not to measure

Do not include process scrap material (see material waste indicator/metric). Do not measure processing chemicals, formulations or solvents.

Virgin Material Use (Supplemental)

Definition

The ratio of virgin material used to total material used in substrates, packaging components or units of packaging.

Metric

Percent of total material used that is virgin material per functional unit of substrate, packaging components, packaging or time.

Examples

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / year (based on production rate)

What to Measure

Measure all virgin materials used in packaging material substrates, packaging components or units of packaging.

What not to Measure

Do not include process scrap material (see material waste indicator/metric). Do not include non-virgin materials.

Renewable Material Use (Supplemental)

Definition

The ratio of renewable material (virgin and recycled) used to total material used in substrates, packaging components or units of packaging.

Metric

Percent of total material used that is renewable material per functional unit of substrate, packaging components, packaging or time.

Examples

- % of total material used / metric tons of substrate
- % of total material used / 1000 units of packaging
- % of total material used / year (based on production rate)

What to Measure

Measure all materials – whether virgin or recycled – used in packaging material substrates, packaging components or units of packaging that were sourced from a renewable natural resource. For additional guidance when measuring bioplastics, refer to standard ASTM D6866.

What not to Measure

Do not include process scrap material (see material waste indicator/metric). Do not include any bio-based material that is sourced from a non-renewable natural resource.

Post Consumer Recycled (PCR) Material Use (Supplemental)

Definition

The ratio of post consumer recycled material to total material used in the production of substrates, packaging components or units of packaging.

Metric

Percent of total material used that is PCR material per functional unit of substrate, packaging components, packaging or time.

Examples

- % of total material used / metric ton of substrate
- % of total material used / 1000 units of packaging
- % of total material used / year (based on production rate)

What to Measure

Measure all materials that were recovered (at end-of-life) and were recycled for use in substrates, packaging components or units of packaging. For additional guidance, refer to standard ISO 14021.

What not to Measure

Do not include any process scrap materials produced during the production of substrates, packaging components, or packaging that are recovered and reused during the production process. Do not include pre consumer or post industrial recycled materials.

Material Use



Post Industrial Recycled (PIR) Material Use (Supplemental)

Definition

The ratio of post industrial recycled material to total material used in the production of substrates, packaging components or units of packaging.

Metric

Percent of total material used that is post industrial recycled material per functional unit of substrate, packaging components, packaging or time.

Examples

- % of total material used / metric tons substrate
- % of total material used / 1000 units of packaging
- % of total material used / year (based on production rate)

What to Measure

Measure all materials that were recovered and recycled during the processing and/or production of substrates, packaging components or units of packaging that could not be used within the manufacturing process that generated it. For additional guidance, refer to standard ISO 14021.

What not to Measure

Do not measure scrap material that is reused in the process that generated it. Do not include pre consumer or post consumer recycled materials.

Chain of Custody (Correlating)

Definition

The linked set of organizations, from point of harvest or extraction to point of purchase, that have held legal ownership or physical control of raw materials used in substrates, packaging components or units of packaging.

Metric

Unknown, known or sourced-certified.

Examples

- Unknown
- Known
- Source-certified

What to Measure

Chain of custody should be tracked when supply chain reliability is questionable and where greater transparency is required. The chain of custody will be deemed "known" if each party in the supply chain is under contractual obligation and is able to disclose proof of their material source(s) through purchasing agreements, inventory records, etc. A certificate of confirmation should accompany each delivery of material from the supplier attesting to the source. For additional guidance, refer to any relevant source certification system protocols, such as the Forest Stewardship Council (FSC) guidelines.

What not to Measure

Do not try to account for chain of custody of commodity materials. The custody of most commodities cannot be traced because the material is bought and sold on the open market, not in a traceable chain from one extractor to a known raw material processor or to a known substrate manufacturer.

Material Use to Packaged Product Yield (Correlating)

Definition

The ratio of packaging material used to amount of product or product service¹⁷ delivered.

Metric

Mass of packaging materials used per functional unit of product or product service delivered.

Examples

- Kilograms packaging material / kilograms product
- Kilograms packaging material / 1000 units of product
- Kilogram packaging material / 100 loads of laundry washed

What to Measure

Calculate the total weight of the materials used in the packaging, and then determine the ratio to the mass of product or amount of product service delivered.

What not to Measure

Do not include process scrap material. Do not measure processing chemicals, formulations or solvents.

¹⁷"Product service" refers, for example, to the number of loads of laundry that can be washed per unit of packaged laundry detergent or the number of glasses of juice that can be made from a package of juice concentrate.

Material Use

Material Use	Energy Use	Water Use	Material Health	Clean Production and Transport	Cost and Performance	Community Impact	Worker Impact
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Material Use Reduction (Core)

Definition

The mass reduction in material used in substrates, packaging components or units of packaging resulting from design or material innovation.

Metric

Mass reduction in material use per functional unit of substrate, packaging components, packaging or time.

Examples

- Metric tons / metric tons of substrate
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure all materials – virgin or recycled – that are no longer required in substrates, packaging components or units of packaging, but that were required prior to implementing a design or material innovation. For additional guidance, refer to standards EN 13428:2004 and EN 13427:2004. Note that in these standards the indicator is referred to as “prevention by source reduction.”

What not to Measure

Do not include reduction in scrap material (see material waste indicator/metric). Do not include reduction in processing chemicals, formulations or solvents.

Material Waste¹⁸ (Core)

Definition

The mass of material waste generated during the production and extraction of raw material and the production and transport of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of substrate, packaging components, packaging or time.

Examples

- Kilograms / kilograms of substrate
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

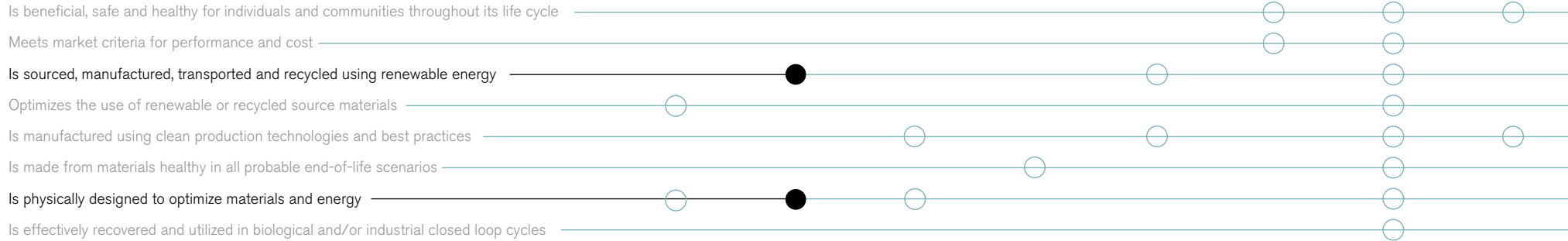
Measurement should include the scrap, unwanted surplus material, unwanted by-products and broken, contaminated or otherwise spoiled material associated with the growth, extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and the transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging.

What not to Measure

Do not include mining rubble and tailings.

¹⁸ This indicator and metric applies only to waste that is land filled as a final disposition.

Energy Use



Why Measure Energy Use

To: 1) understand how much energy is being used; 2) understand what percentage of total energy use is renewable; and 3) track progress toward energy conservation and an increased use of renewable energy.

The majority of energy used to extract or harvest raw materials, produce packaging materials and components and transport packaging is currently derived from fossil fuels that are finite natural resources. Energy conservation can reduce the depletion of these resources and may also: 1) reduce an organization's carbon footprint; 2) help to minimize or reverse conditions related to climate change; 3) lower total operating costs and reduce the total cost of packaging; and 4) improve an organization's overall environmental and social responsibility profile. On the other hand, improperly managed mining and drilling of fossil fuels can: 1) scar the natural landscape; 2) disrupt ecosystems; 3) release greenhouse gases (GHGs) into the atmosphere; and 4) fragment or destroy species habitat. Moreover, the burning of fossil fuel: 1) creates GHG emissions which contribute to climate change; 2) releases sulphur dioxide, which contributes to the creation of acid rain; and 3) releases particulate matter, which can cause and/or exacerbate human health conditions such as asthma.

Key Terminology

1. "Sourcing," as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials and the collection and processing of recycled and reused materials.
2. The phrase "final packaging material" refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
3. A "packaging component" is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping, and includes labels, adhesives, inks and/or coatings used on the component.
4. A "unit of packaging" includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.

Before using the indicators and metrics in this module, read the User Guidelines section of this document and be sure you understand how to set a boundary and scope for your measurement project and the difference between gate-to-gate, cradle-to-gate, industry average life cycle inventory (LCI) data and organization-specific performance data. When sharing data with your supply chain partners, be transparent about your measurement boundaries and type of data collected.

Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners' expectations. Use the "what to measure" and "what not to measure" guidelines as appropriate for your organization's role and position in the supply chain.

5. "Transport," in terms of sustainable packaging, includes transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units to a filler; it does not include transport of packaging that contains product).

Energy Use

- Material Use
- Energy Use**
- Water Use
- Material Health
- Clean Production and Transport
- Cost and Performance
- Community Impact
- Worker Impact

Total Life Cycle Energy Intensity

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Renewable Energy Proportion

- % renewable energy used / yr (based on production rate)

Life Cycle Energy Intensity (Non-Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Life Cycle Energy Intensity (Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Life Cycle Renewable Energy Intensity (Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Life Cycle Non-Renewable Energy Intensity (Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Life Cycle Renewable Energy Intensity (Non-Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Life Cycle Non-Renewable Energy Intensity (Non-Transport)

- MJ / kg of final packaging material
- MJ / 1000 units of packaging
- MJ / yr (based on production rate)

Recovered Latent Energy

- MJ / kg of final packaging material
- MJ / 1000 units of packaging

Indicator Relationships and Metrics

■ Core ■ Supplemental □ Correlating

Energy Use



6. "Disposal," as used in the indicator definitions, refers to any end-of-life management process including recycling, recovery for reuse, composting, incineration, landfilling, etc.
7. "Renewable energy," according to the U.S. Department of Energy (DOE), is energy derived from sources that are naturally replenished in a relatively short period of time. Renewable energy sources include biomass, hydropower, geothermal energy, wind energy and solar energy.
8. "Non-renewable energy," according to the U.S. DOE, refers to energy derived from fossil fuels and nuclear power.
9. The term "latent energy" refers to energy stored in packaging material that may be recovered and valorized.

Total Life Cycle Energy Intensity (Core)

Definition

The total transport and non-transport energy used during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What to Measure

Measure all direct and indirect energy – both renewable and non-renewable – used during the growth, harvest or extraction and processing of raw materials, processing of recycled and/or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging. Include direct and indirect energy – both renewable and non-renewable – used to transport raw, recycled, reused or final packaging materials, packaging components or packaging units. Include direct and indirect

energy used to heat, cool and illuminate any facility space in which any of the operations specified here are performed. Latent energy must be included when measuring total energy intensity, as that energy may or may not be recovered and valorized. For additional guidance, refer to standards ISO 14040 and 14044 and to VDI6400. Note that in VDI6400 the indicator is referred to as "cumulative energy demand."

What not to Measure

Do not include energy used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging. Do not measure energy used to transport packaging that contains product.

Life Cycle Energy Intensity – Non-Transport (Supplemental)

Definition

The total energy used during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What to Measure

Measure all direct and indirect energy – both renewable and non-renewable – used during the growth, harvest or extraction and processing of raw materials, processing of recycled and/or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging. Include direct and

indirect energy used to heat, cool and illuminate any facility space in which any of the operations specified here are performed. Latent energy must be included when measuring non-transport energy intensity, as that energy may or may not be recovered and valorized.

What not to Measure

Do not include direct or indirect transport-related energy use. Do not include energy used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Life Cycle Non-Renewable Energy Intensity – Non-Transport (Supplemental)

Definition

The total non-renewable energy used during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

Energy Use



What to Measure

Measure all direct and indirect non-renewable energy used during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging. Include direct and indirect non-renewable energy used to heat, cool and illuminate any facility space in which any of the operations specified here are performed. Latent energy must be included when measuring non-renewable energy intensity, as that energy may or may not be recovered and valorized.

What not to Measure

Do not include renewable energy used for any purpose. Do not include direct or indirect transport-related energy use. Do not include energy used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Life Cycle Renewable Energy Intensity – Non-transport (Supplemental)

Definition

The total renewable energy used during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What to Measure

Measure all direct and indirect renewable energy used during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging. Include direct and indirect renewable energy used to heat, cool and illuminate any facility space in which any of the operations specified here are performed. Latent energy must be included when measuring renewable energy intensity, as that energy may or may not be recovered and valorized.

What not to Measure

Do not include non-renewable energy used for any purpose. Do not include direct or indirect transport-related energy use. Do not include energy used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Life Cycle Energy Intensity – Transport (Supplemental)

Definition

The total energy used to transport packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What to Measure

Measure all direct and indirect energy – both renewable and non-renewable – used to transport raw, recycled and/or reused materials, final packaging materials, packaging components and/or packaging units.

What not to Measure

Do not measure energy used to transport packaging that contains product. Do not measure direct or indirect non-transport related energy use.

Life Cycle Non-Renewable Energy Intensity – Transport (Supplemental)

Definition

The non-renewable energy used to transport packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What to Measure

Measure all direct and indirect non-renewable energy used to transport raw, recycled and/or reused materials, final packaging materials, packaging components and/or packaging units.

What not to Measure

Do not measure renewable energy used for any purpose. Do not measure direct or indirect non-transport-related energy use.

Energy Use



Life Cycle Renewable Energy Intensity – Transport (Supplemental)

Definition

The total renewable energy used to transport packaging materials, packaging components or units of packaging.

Metric

Energy units per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging
- Megajoules / year (based on annual production rate)

What To Measure

Measure all direct and indirect renewable energy used to transport raw, recycled and/or reused materials, final packaging materials, packaging components and/or packaging units.

What not to Measure

Do not measure non-renewable energy used for any purpose. Do not measure direct or indirect non-transport related energy use.

Recovered Latent Energy (Correlating)

Definition

The amount of latent energy stored in packaging material that is recovered and made available again for use.

Metric

Energy units recovered per functional unit of final packaging material, packaging components or packaging.

Examples

- Megajoules / kilograms of final packaging material
- Megajoules / 1000 units of packaging

What to Measure

Credit (against Life Cycle Total Energy Intensity) the standardized energy recovery value for latent energy that is known to have been released and recovered from packaging materials, packaging components or units of packaging by an end-of-life revalorization process such as waste-to-energy incineration. For additional guidance, refer to standards EN 13431:2004 and ISO 1928:2009.

What not to Measure

Do not take credit for energy that remains embedded in packaging materials, packaging components or units of packaging. Latent energy can only be accounted for when it has been released and recovered for reuse.

Renewable Energy Proportion (Core)

Definition

The ratio of renewable energy used to total energy used during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Percent or total energy used that is derived from renewable sources per functional unit of time.

Example

- % renewable energy used / year

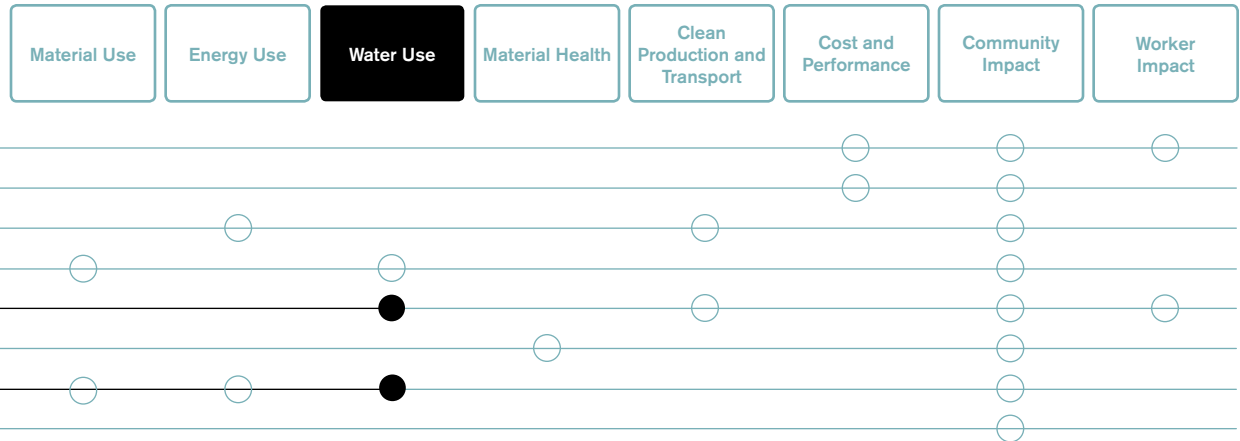
What to Measure

Using the data collected to measure “Total Energy Intensity,” “Non-Renewable Energy Intensity” (Non-Transport and Transport) and “Renewable Energy Intensity” (Non-Transport and Transport), calculate the percentage of total energy used that is derived from renewable sources.

What not to Measure

N/A

Water Use



Why Measure Water Use

To: 1) understand how much water is used; 2) understand how much water is consumed; 3) understand how much water is taken from stressed sources; and 4) track progress toward water conservation.

Water is essential to human health and well-being, ecosystem health and economic viability. Yet, in many parts of the world, including parts of the U.S. and Europe, water is becoming a scarce resource because many water sources and municipal water systems are drawn down at a rate greater than their recharge rate. In response, cities are considering new water regulations, including allowing the reuse of specially treated sewage water to supplement municipal drinking water supplies. Additionally, scientific modeling of the effects of climate change predict further stresses on water systems that may result in flooding of coastal areas while drought occurs, persists or worsens in other areas. Packaging supply chain partners involved with water-intensive processes may: 1) be subject to high use taxes; 2) have their license to operate revoked in certain communities; or 3) be denied expansion permits. Monitoring water use and consumption and adopting water conservation practices could: 1) lower overall operating costs and reduce the total cost of packaging; and 2) improve an organization’s overall environmental and social responsibility profile.

Key Terminology

1. “Sourcing,” as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials and the collection and processing of recycled and reused materials.
2. The phrase “final packaging material” refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
3. A “packaging component” is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.
4. A “unit of packaging” includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.
5. “Disposal,” as used in the indicator definitions, refers to any end-of-life management process including recycling, recovery for reuse, composting, incineration, landfilling, etc.
6. The term “water consumption” is used to indicate: 1) fresh water (excluding rain) that is mechanically diverted from a source and then used in such a way that it is not available again as liquid fresh water; or 2) water that is degraded

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Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners’ expectations. Use the “what to measure” and “what not to measure” guidelines as appropriate for your organization’s role and position in the supply chain.

Water Use



Life Cycle Water Consumption

- m³ / metric ton of final packaging material
- Litres / 1000 units of packaging
- m³ / yr (based on production rate)

Life Cycle Water Used from Stressed Sources

- m³ / metric ton of final packaging material
- Litres / 1000 units of packaging
- m³ / yr (based on production rate)

Indicator Relationships and Metrics

Core
 Supplemental
 Correlating

during use such that it cannot be collected for reuse. The difference between water “use” and water “consumption” is that consumption causes the water to become unavailable for direct or immediate use. An example of water “use” is water used in paper production processes that is collected, processed and reused on site. An example of water “consumption” is water that evaporates during a production process. Another example of water consumption is water that becomes an ingredient of a final material such as that used in water-based ink.

- The term “stressed water sources” refers to sources of water where the draw down rate is greater than the recharge rate. The United Nations Commission on Sustainable Development suggests that water sources are stressed when freshwater resources fall below 1000-1500 cubic meters per capita per year. A useful resource for understanding stressed watersheds has been produced by the World Business Council for Sustainable Development (WBCSD) and is available at the [WBCSD website](#).

Life Cycle Water Consumption (Core)

Definition

The total volume of water consumed during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Volume per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Cubic meters / metric ton of final packaging material
- Liters / 1000 units of packaging
- Cubic meters / year (based on annual production rate)

What to Measure

Measure all water consumed during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging.

What not to Measure

Do not measure water “use” (refer to *Key Terminology*, for distinction between consumption and use).

Life Cycle Water Used from Stressed Sources (Core)

Definition

The volume of water that is drawn from “stressed watersheds” and used during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Volume per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Cubic meters / metric ton of final packaging material
- Liters / 1000 units of packaging
- Cubic meters / year (based on annual production rate)

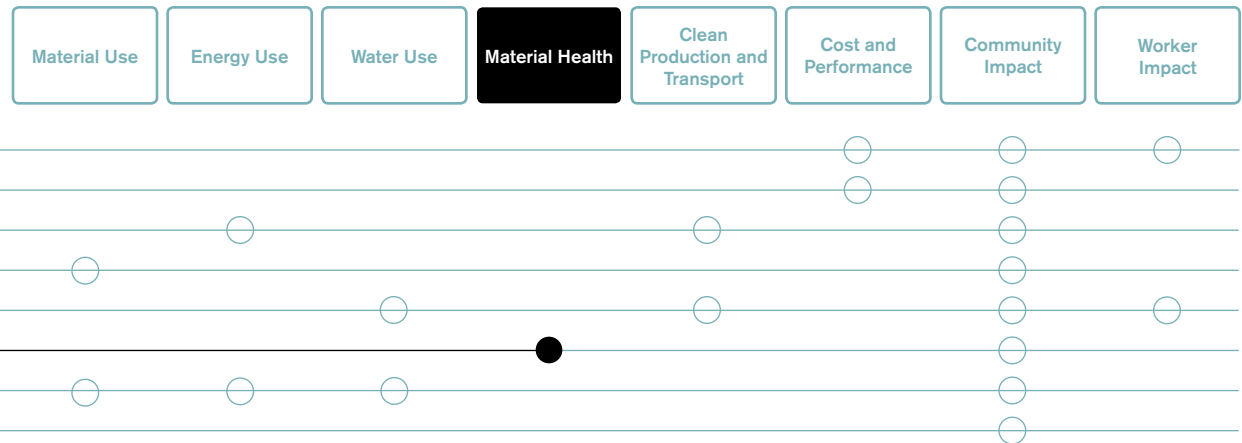
What to Measure

Measure all water mechanically diverted from a stressed watershed – whether the water is “used” or “consumed” – during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into packaging units, filling of packaging units and end-of-life processing of packaging.

What not to Measure

Do not measure water used during hydropower production.

Material Health



Why Measure Material Health¹⁹

To: 1) understand the potential human and ecosystem health impacts of packaging materials and 2) track progress towards the reduction of toxicants in packaging.

Ensuring that packaging materials, packaging components and units of packaging are healthy in all probable end-of-life scenarios can reduce human and eco-system health risks. Producing and/or using "healthy packaging" can:

- 1) lower overall operating costs and reduce the total cost of packaging by reducing the cost of compliance; and
- 2) enhance an organization's overall environmental and social responsibility profile. The use of toxicants and other environmentally relevant chemicals in packaging can affect both human and ecosystem health in a number of ways including but not limited to: 1) packaging worker exposure; 2) migration, transfer or leaching of toxicants from package to product; 3) air and water pollution; and 4) soil contamination.

Key Terminology

1. The phrase "final packaging material" refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
2. A "packaging component" is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of

transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.

3. A "unit of packaging" includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.
4. The U.S. EPA defines a "toxicant" as a harmful substance or agent that may injure an exposed organism and a "toxic substance" as a chemical or mixture that may present an unreasonable risk of injury to human health or the environment. Use of the term toxicants throughout the framework includes Persistent Bioaccumulative Toxic Substances and Carcinogens, Mutagens and Reproductive Toxicants. Refer to the U.S. EPA's Toxic Substances Control Act (TSCA) Chemical Substances Inventory and the European Union's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulations. For assistance in understanding U.S. Food and Drug Administration (FDA) rules and regulations related to toxicants and packaging refer to the [FDA website](#). For assistance in understanding the European Food Safety Authority's (EFSA) approach to toxicant risks refer to the [EFSA website](#). Note that the EFSA is not a regulatory body.
5. "Persistent Bioaccumulative Toxic Substances (PBTs)", according to the U.S. EPA, are chemicals that are toxic, persist in the environment and bioaccumulate in food chains and, thus, pose risks to human health and

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Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners' expectations. Use the "what to measure" and "what not to measure" guidelines as appropriate for your organization's role and position in the supply chain.

ecosystems. The biggest concerns about PBTs are that they transfer easily among air, water and land, and span program, geographical and generational boundaries. Refer to the U.S. EPA list of PBTs and the EU listing of PBTs.

¹⁹ Material health is also referred to as "material safety" in Environmental Health and Safety literature and on material safety data sheets (MSDS's).

Material Health



Toxicants Concentration

- ppm in final packaging material
- mg / kg of final packaging material
- kg / 1000 units of packaging
- % by weight / package

Toxicants Migration

- Yes with supporting documentation
- No

Indicator Relationships and Metrics

■ Core ■ Supplemental □ Correlating

6. “Carcinogens, Mutagens and Reproductive Toxicants” (CMRs) are chemicals that can affect human health. OSHA defines carcinogens as substances that are either known to cause cancer in humans or animals or are suspected of being capable of causing cancer in humans; mutagens as substances that cause chromosomal damage or genetic alteration; and reproductive toxicants as substances with lethal teratogenic (causing malformation or physical defects) effects in a developing fetus or embryo and substances that affect the fertility of females and/or males. Refer to a list of substances treated as carcinogens by OSHA Code of Federal Regulation 29CFR1910.1001-1052. The State of California’s Proposition 65 list includes the most comprehensive list of CMRs regulated in the U.S. The EU consolidated list of CMRs can be found online.
7. “Migration” in the framework refers to the undesirable transfer of toxicants from packaging to product. Refer to U.S. FDA guidance on measuring migration related to food packaging. EU guidance on measuring migration related to food packaging can be found in the European Communities Council’s (ECC) Regulation No. 935/2004.

Toxicants²⁰ Concentration²¹ (Core)

Definition

The mass of toxicants present in packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging component or packaging (measured separately for each toxicant).

Examples

- ppm in final packaging material
- milligrams / kilograms of final packaging material
- kilograms / 1000 units of packaging
- % by weight / unit of packaging

What to Measure

Measurement should include all toxicants that are material ingredients of final packaging materials, packaging components or units of packaging. It should also include measurement of residual toxicant contamination that may result from the use of toxicants in final production or handling processes. Measurements should include all toxicants included on the U.S. EPA TSCA list or the EU REACH list and in U.S. EPA, U.S. FDA, U.S. OSHA, EU REACH and ECC regulations and/or directives as applicable to geographic location and governing authority. For additional guidance, refer to standards EN 13428:2004, EN 13427:2004; CEN CR 13695-1 and CEN CR 13695-2.

What not to Measure

Measurement should not include process chemicals, formulations or solvents, used in processing or production functions.

Toxicants²² Migration (Core)

Definition

Packaging meets U.S. FDA and/or ECC regulations related to migration.

Metric

Yes with substantiating documentation or No.

Example

- Yes with substantiating documentation
- No

What to Measure

Refer to FDA: CFR Title 21 and EU: 1935/2004 - EC Framework regulation Particularly Part III Compendium of National Legislation on Food Contact Materials and Articles (2009.06.02))

What not to Measure

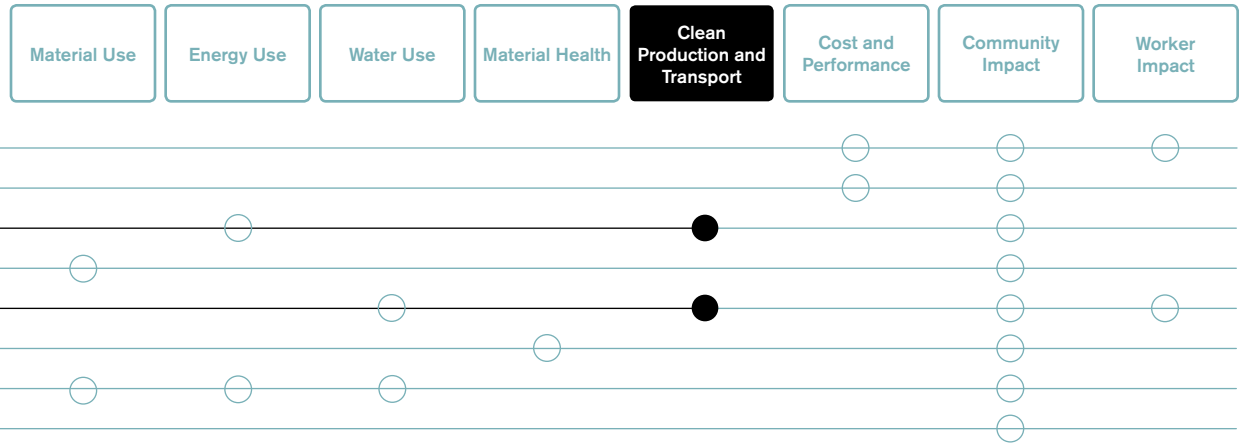
Refer to cited regulations

²⁰ Toxicants include PBTs and CMRs.

²¹ Consult references cited in *Key Terminology* for information related to toxicant concentration thresholds.

²² Toxicants include PBTs and CMRs.

Clean Production and Transport



Why Measure Clean Production and Transport

To: 1) understand how processes associated with the production of packaging can effect human and eco-system health; and 2) measure progress toward cleaner and healthier packaging-related operations.

Clean production and transport practices can minimize emissions and other impacts associated with the use of toxicants and other environmentally relevant substances. Clean production and transport can also: 1) lower overall operating costs and reduce the total cost of packaging by reducing the cost of compliance; 2) reduce operating risks and associated liabilities including insurance costs; and 3) improve an organization’s overall environmental and social responsibility profile. On the other hand, toxicants used in the growth, harvest or extraction and processing of raw material, processing of recycled or reused materials or in packaging production processes can cause harm to workers and/or eco-systems if appropriate health and safety practices are not followed. Toxicant use can also leave inadvertent residue on packaging materials, packaging components or units of packaging. Toxic emissions can cause systemic health issues including cancer and genetic disorders with an elevated risk for pregnant women and children. Toxicants in landfilled packaging production waste may leach and contribute to soil and ground water contamination. Release of GHG emissions contribute to global warming and climate change. Release of particulate matter is implicated in respiratory disorders such as asthma. Nitrogen oxide and sulphur oxide emissions

cause acid rain and the resulting acidification of water ways and soil. Chemical oxygen demand (COD), nitrates and suspended solids contribute to eutrophication, which disrupts water ecosystems and can lead to incidents including but not limited to excessive algae blooms, fish kills and/or coral reef destruction.

Key Terminology

1. “Sourcing,” as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials and the collection and processing of recycled and reused materials.
2. The phrase “final packaging material” refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
3. A “packaging component” is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.
4. A “unit of packaging” includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.

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Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners’ expectations. Use the “what to measure” and “what not to measure” guidelines as appropriate for your organization’s role and position in the supply chain.

5. “Transport,” in terms of sustainable packaging, includes transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units to a filler; it does not include transport of packaging that contains product).
6. “Disposal,” as used in the indicator definitions, refers to any end-of-life management process including recycling, recovery for reuse, composting, incineration, landfilling, etc.

Clean Production and Transport



7. “Greenhouse Gases” are gases that trap heat in the atmosphere. Some greenhouse gases, such as carbon dioxide, occur naturally and are emitted to the atmosphere through natural processes and human activities. The International Panel on Climate Change (IPCC) recognizes four primary greenhouse gases (GHGs). These are water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄). However, the IPCC and other leading climate change agencies include a number of entirely human-made gases in their GHG inventory which, by category, include halocarbons and other chlorine and bromine containing substances, also known as fluorinated gases, which are dealt with under the Montreal Protocol; and sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) dealt with under the Kyoto Protocol. Carbon dioxide has a global warming potential of one, while methane and nitrous oxide have warming potentials of 25 and 310 respectively. Fluorinated gases can be intense greenhouse gasses with the multiplier for sulfur hexafluoride (SF₆) being 23,900 times as potent as carbon dioxide. A complete list of pertinent GHGs can be found on the [IPCC website](#). The principal greenhouse gases that enter the atmosphere because of human activities are:

- Carbon Dioxide (CO₂): Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas and coal), solid waste, trees and wood products, and as a result of other chemical reactions (e.g., manufacturing cement).
- Methane (CH₄): Methane is emitted during the production and transport of coal, natural gas and oil. Methane emissions also result from waste elimination by livestock, some agricultural processes and by the decay of organic waste in municipal solid waste landfills.
- Nitrous Oxide (N₂O): Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

- Fluorinated Gases: Hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (“High GWP gases”).
8. U.S. EPA defines a “toxicant” as a harmful substance or agent that may injure an exposed organism and a “toxic substance” as a chemical or mixture that may present an unreasonable risk of injury to human health or the environment. Use of the term toxicants throughout the framework includes Persistent Bioaccumulative Toxic Substances and Carcinogens, Mutagens and Reproductive Toxicants. Refer to the Toxic Substances Control Act (TSCA) Chemical Substances Inventory and the European Union’s Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulations. For assistance in understanding U.S. Food and Drug Administration (FDA) rules and regulations related to toxicants and packaging refer to the [FDA website](#), and for assistance in understanding the European Food Safety Authority’s (EFSA) approach to toxicant risks, refer to the [EFSA website](#). Note that the EFSA is not a regulatory body.
 9. “Persistent Bioaccumulative Toxic Substances” (PBTs), according to the U.S. EPA, are chemicals that are toxic, persist in the environment and bioaccumulate in food chains and, thus, pose risks to human health and ecosystems. The biggest concerns about PBTs are that they transfer easily among air, water and land, and span program, geographical and generational boundaries. Refer to the U.S. EPA list of PBTs and the EU listing of PBTs.
 10. “Carcinogens, Mutagens and Reproductive Toxicants” (CMRs) are chemicals that can affect human health. OSHA defines carcinogens as substances that are either known to cause cancer in humans or animals or are

suspected of being capable of causing cancer in humans; mutagens as substances that cause chromosomal damage or genetic alteration; and reproductive toxicants as substances with lethal teratogenic (causing malformation or physical defects) effects in a developing fetus or embryo and substances that affect the fertility of females and/or males. Refer to the list of substances treated as carcinogens by OSHA; the State of California’s Proposition 65 includes the most comprehensive list of CMRs regulated in the U.S. Also refer to the EU consolidated list of CMRs.

11. Chemical Oxygen Demand (COD) is a measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater. It is defined as the quantity of a specified oxidant that reacts with a sample under controlled conditions. The quantity of oxidants consumed is expressed as a rapid indicator of organic pollutants in water.

Toxic Emissions (Core)

Definition

The mass of all toxic emissions released to air, water or soil during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass released to each medium per functional unit of final packaging material, packaging components, packaging or time (measured separately for each toxicant).

Examples

- Kilograms / kilograms final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

Clean Production and Transport



Toxic Emissions

- kg / kg of final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Life Cycle GHG Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Water Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Air Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Suspended Solids Released

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

COD Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Nitrates Released

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Sulphur Oxides Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Nitrogen Oxides Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

Particulate Matter Emissions

- kg / kg final packaging material
- kg / 1000 units of packaging
- Metric tons / yr (based on production rate)

EMS Use

- Yes with substantiating documentation
- No

Energy Audit

- Yes with substantiating documentation
- No

Indicator Relationships and Metrics

■ Core ■ Supplemental □ Correlating

Clean Production and Transport



What to Measure

Measure all direct and indirect toxicant emissions released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and end-of-life processing of packaging. Include emissions from toxicants that may be used to clean transport vehicles, equipment and machinery. Refer to the U.S. EPA TSCA list or the EU REACH list and in U.S. EPA, U.S. FDA, U.S. OSHA, EU REACH and ECC regulations and/or directives as applicable to a geographic location and governing authority.

What not to Measure

Do not measure emissions from toxicants used for routine facility maintenance unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Life Cycle GHG Emissions (Core)

Definition

The mass of GHGs released to the atmosphere during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass released per functional unit of final packaging material, packaging components, packaging or time (expressed in CO₂ equivalency).

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure all direct and indirect GHG emissions released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials,

production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units, transport of raw, recycled and/or reused materials, final packaging materials, packaging components and/or units of packaging and the end-of-life processing of packaging. Include direct and indirect GHG emissions from energy sources used to heat, cool and illuminate any facility space in which any of the operations specified here are performed. For additional guidance, refer to standards ISO 14040 and 14044, the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and PAS 2050.

What Not to Measure

Do not include direct or indirect GHG emissions released during the transport of packaging that contains product. Do not include GHG emissions released as a result of heating, cooling and illuminating facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Air Emissions (Core)

Definition

The mass of non-toxic, non-GHG emissions released to the atmosphere during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass released per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure all direct and indirect non-toxic, non-GHG emissions released into the atmosphere during the growth, harvest or

extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units, transport of raw, recycled and/or reused materials, final packaging materials, packaging components and/or units of packaging and the end-of-life processing of packaging. Include direct and indirect GHG emissions from energy sources used to heat, cool and illuminate any facility space in which any of the operations specified here are performed.

What not to Measure

Do not include direct or indirect GHG emissions released during the transport of packaging that contains product. Do not include GHG emissions released as a result of heating, cooling and illuminating facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging. Do not measure toxic emissions released into the atmosphere as those are measured by the Toxic Emissions indicator/metric. Do not include GHG emissions, which should be calculated in accordance with the Life Cycle GHG Emissions indicator/metric.

Sulphur Oxide (SO_x) Emissions (Supplemental)

Definition

The mass of SO_x released to the atmosphere during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

Clean Production and Transport



What to Measure

Measure direct and indirect emissions of SO_x released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units, transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging and the end-of-life processing of packaging. Include direct and indirect SO_x emissions from energy sources used to heat, cool and illuminate any facility space in which any of the operations specified here are performed.

What Not To Measure

Do not measure direct or indirect SO_x emissions released during the transport of packaging that contains product. Do not include SO_x emissions released from energy sources used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Nitrogen Oxides (NO_x) Emissions (Supplemental)

Definition

The mass of NO_x released to the atmosphere during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure:

Measure direct and indirect emissions of NO_x released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units, transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging and the end-of-life processing of packaging. Include direct and indirect NO_x emissions from energy sources used to heat, cool and illuminate any facility space in which any of the operations specified here are performed.

What Not To Measure:

Nitrogen oxides are a family of gases. While nitrous oxide (N₂O) is a primary GHG, other nitrogen oxides are considered indirect GHGs. So, to avoid double counting, do not include any NO_x emissions included in GHG emission data. Do not measure direct or indirect NO_x emissions released during the transport of packaging that contains product. Do not include NO_x emissions released from energy sources used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Particulate Matter Emissions (Supplemental)

Definition

The mass of PM₁₀ and PM_{2.5} particulate matter released to the atmosphere during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass of PM₁₀ and PM_{2.5} per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure direct and indirect emissions of particulate matter released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units, transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging and the end-of-life processing of packaging. Include direct and indirect particulate matter emissions from energy sources used to heat, cool and illuminate any facility space in which any of the operations specified here are performed.

What Not To Measure

Do not measure direct or indirect particulate matter emissions released during the transport of packaging that contains product. Do not include particulate matter emissions released from energy sources used to heat, cool and illuminate facility space that is not used for packaging-related functions or activities, e.g., administrative offices, unless the facility is used exclusively to produce final packaging materials, packaging components or units of packaging.

Water Emissions (Core)

Definition

The mass of non-toxic emissions released to water during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass released per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

Clean Production and Transport



What to Measure

Measure all direct and indirect non-toxic emissions released to water during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and end-of-life processing of packaging.

What not to Measure

Do not measure toxic emissions released to water as those are measured by the Toxic Emissions indicator/metric.

COD Emissions (Supplemental)

Definition

The mass of COD emissions released to water during the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure direct and indirect COD emissions released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and the end-of-life processing of packaging.

What Not To Measure

N/A

Suspended Solids Released (Supplemental)

Definition

The mass of suspended solids released to water during

the sourcing of raw, recycled and reused materials and the production, filling and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure direct and indirect emissions of suspended solids released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and the end of life processing of packaging.

What Not To Measure

N/A

Nitrates Released (Supplemental)

Definition

The mass of nitrates released to water during the sourcing of raw, recycled and reused materials and the production, filling, and/or disposal of packaging materials, packaging components or units of packaging.

Metric

Mass per functional unit of final packaging material, packaging components, packaging or time.

Examples

- Kilograms / kilograms of final packaging material
- Kilograms / 1000 units of packaging
- Metric tons / year (based on production rate)

What to Measure

Measure direct and indirect nitrates released during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging

materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and end-of-life processing of packaging.

What Not To Measure

N/A

Environmental Management Systems (EMS) Use (Correlating)

Definition

An EMS is in place for all operations related to the sourcing of raw, recycled and reused materials and the production, filling and transport of packaging materials, packaging components or units of packaging.

Metric

Yes with substantiating documentation or No.

Example

- Yes with substantiating documentation
- No

What to Measure

Refer to ISO standard 14001.

What not to Measure

N/A

Energy Audit (Correlating)

Definition

An annual energy audit is conducted of all operations related to the sourcing of raw, recycled and reused materials and the production, filling and transport of packaging materials, packaging components or units of packaging.

Metric

Yes with substantiating documentation or No.

Example

- Yes with substantiating documentation
- No

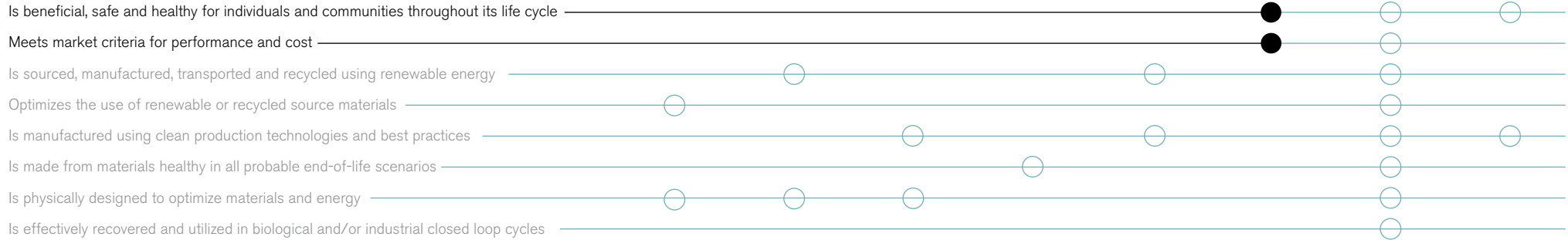
What to Measure

N/A

What not to Measure

N/A

Cost and Performance



Why Measure Cost and Performance

To: 1) understand if and how packaging is meeting marketplace performance and sustainability expectations while controlling costs; and 2) track overall operating efficiency.

Packaging that meets environmental and social criteria for sustainability but is cost prohibitive or fails to meet marketplace performance expectations is not sustainable packaging. Therefore, it is important to track packaging cost and performance as a critical market check and balance against the other sustainable packaging criteria and to facilitate understanding of an organization's overall operating efficiency and value creation. However, **due to issues related to competition and anti-trust laws, cost measurement data that may be collected in accordance with the indicators and metrics provided in this framework may not be appropriate for sharing with supply chain partners, with customers or in external reports.**

Key Terminology

1. "Performance," in terms of packaging, includes but may not be limited to the packaging's ability to successfully contain, preserve, protect and transport products, communicate packaging and product information and facilitate product usability.
2. "Sourcing," as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials, and the collection and processing of recycled and reused materials.

3. The phrase "final packaging material" refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
4. A "packaging component" is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.
5. A "unit of packaging" includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.
6. "Transport," in terms of sustainable packaging, includes transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units to a filler; it does not include transport of packaging that contains product).
7. "Disposal," as used in the indicator definitions, refers to any end-of-life management process including recycling, recovery for reuse, composting, incineration, landfilling, etc.

Before using the indicators and metrics in this module, read the User Guidelines section of this document and be sure you understand how to set a boundary and scope for your measurement project and the difference between gate-to-gate, cradle-to-gate, industry average life cycle inventory (LCI) data and organization-specific performance data. When sharing data with your supply chain partners, be transparent about your measurement boundaries and type of data collected.

Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners' expectations. Use the "what to measure" and "what not to measure" guidelines as appropriate for your organization's role and position in the supply chain.

Cost and Performance



Total Cost of Packaging

- \$ / kg of packaging
- € / 1000 units of packaging
- ₪ / yr

Packaged Product Wastage

- \$ packaged product + \$ packaging / 10000 units of packaging

Life Cycle Embodied Energy Protection

- MJ / packaging ÷ MJ / product and packaging lost

Packaging Service Value

- \$ packaged product ÷ \$ of packaging

Selling Unit Cube Efficiency

- cm³ of packaged product ÷ cm³ of package

Transport Cube Efficiency

- cm³ of total selling unit packaging ÷ cm³ of pallet load

Indicator Relationships and Metrics

■ Core ■ Supplemental □ Correlating

Cost and Performance



Total Cost of Packaging (Core)

Definition

The total cost of all materials, energy, equipment and direct labor used during the sourcing of raw, recycled and reused materials and the production, filling, transport and/or disposal²³ of packaging materials, packaging components or units of packaging.

Metric

Cost per functional unit of final packaging material, packaging components, packaging or time.

Examples

- \$ / kilograms of final packaging material
- € / 1000 units of packaging
- ₪ / year based on production rate

What to Measure

Measure the cost of all materials, the direct and indirect cost of energy, the direct cost of equipment and the direct cost of all human resources used during the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of final packaging components into units of packaging, filling of packaging units, transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging and end-of-life processing of packaging. Direct labor costs should be calculated as “fully loaded” costs – not just wages or salary. Measurement should include facility and equipment operating and maintenance costs that are directly related to the packaging processes specified here. Energy and utility costs associated with shipping and receiving operations should be proportionally allocated by volume of packaging and volume of product if both are handled within one facility. If packaging is warehoused, include all costs associated with the warehouse facility. Include waste disposal costs, compliance costs and cost of research that is directly related to the resources and processes specified here.

What not to Measure

Do not include any indirect labor costs. An example of indirect labor cost would include but not be limited to cost of sales personnel. Do not include facility operating overhead that is not directly related to the processes specified here. Do not include cost of handling or transporting packaging that contains product.

Packaging Service Value²⁴ (Correlating)

Definition

The ratio of packaged product value to packaging value.

Metric

Value of packaged product delivered divided by value of resources (materials and embedded energy) used for the packaging.

Examples

- \$ of packaged product ÷ \$ of packaging

What to Measure

Calculate the total cost of packaging, and then determine the ratio of the stated packaged product value to the calculated cost (value) of the packaging.

What not to Measure

N/A

Selling Unit Cube Efficiency (Correlating)

Definition

The ratio of packaged product volume to the selling unit packaging volume.

Metric

Volume of packaged product divided by volume of packaging used to display and sell the packaged product to a consumer.

Example

- Cubic centimeter of packaged product ÷ cubic centimeter of packaging

What to Measure

Include primary and secondary packaging components, e.g., a bottle of aspirin in a box.

What not to Measure

Do not include tertiary or transport packaging, the cube efficiency of which is measured by the Transport Packaging Cube Efficiency metric.

²³ Depending on local, regional or national policies, regulations and legislation pertaining to waste management, organizations may not currently track the cost associated with disposal of the packaging they produce or use. Organizations that do not track this cost now should consider tracking it in the future. All organizations should be transparent as to whether disposal costs are or are not included in the total cost of packaging and how disposal cost data is collected.

²⁴ If this indicator/metric is used to compare performance, the comparison should be made only among packaging with the same application, e.g., milk cartons to milk jugs vs. milk cartons to cereal boxes.

Cost and Performance



Transport Packaging Cube Efficiency (Correlating)

Definition

The ratio of total selling unit packaging volume to transport unit packaging volume.

Metric

Volume of total selling unit packaging divided by volume of transport unit packaging.

Example

- Cubic centimeters of total selling unit packaging ÷ cubic center meters of pallet load

What to Measure

Measure only selling unit packaging volume to pallet load volume.

What not to Measure

N/A

Packaged Product Wastage (Core)

Definition

The value of packaged product lost due to packaging failure.

Metric

Cost of packaged product lost or returned plus cost of the product's packaging per functional unit of packaging.

Examples

- \$ of packaged product + \$ of packaging lost / 10,000 units of packaging

What to Measure

Calculate the total cost of a unit of packaging. Add that cost to the stated value of the lost or returned product. Include the cost of primary and secondary packaging.

What not to Measure

Do not include the cost of transport packaging unless there is bulk product loss due to failure at the transport system level.

Life Cycle Embodied Energy Protection (Core)

Definition

The ratio of energy invested in packaging to the energy invested in product and packaging lost due to packaging failure.

Metric

Life cycle energy impact per functional unit of packaging divided by the life cycle energy impact per functional unit of product and packaging lost due to packaging failure.

Example

Megajoules / product ÷ Megajoules / product and packaging

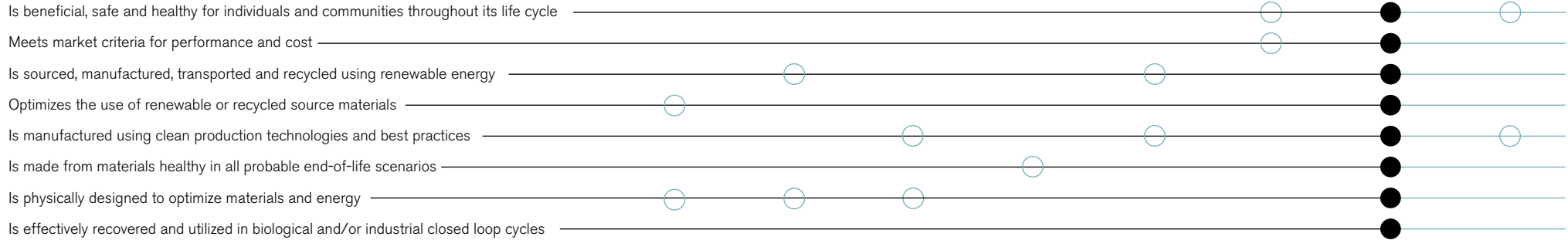
What to Measure

Perform a life cycle assessment of the packaging and the product limiting the boundary and scope of the assessment to direct and indirect energy use and its associated emissions. If it is not possible to collect organization-specific LCI performance data, use relevant industry average LCI data.

What not to Measure

Do not measure the physical or functional attributes or conditions of the packaging or product other than those related to energy use.

Community Impact



Why Measure Community Impact

To: 1) understand how packaging is and is not delivering value to consumers and the communities in which they live; and 2) track progress towards increasing customer value while minimizing undesired effects.

Packaging affects communities in many beneficial ways, but it imposes some detrimental impacts as well. As a beneficial agent, packaging ensures product quality delivery by, for example: 1) preventing products from being damaged in transport; 2) providing a safe and convenient way for consumers to move or carry products; 3) keeping food products fresher and safe for consumption longer; 4) protecting the efficacy of drugs; 5) communicating product information and much more. Its detrimental impacts exist because: 1) packaging production is resource intensive; 2) toxicants and other environmentally relevant chemicals used during the growth, harvest or extraction and processing of raw materials, processing of recycled materials and the production of packaging materials, packaging components and units of packaging can release harmful emissions into natural eco-systems and have direct or indirect effects on human health; and 3) packaging has end-of-life implications that add stress to both human and natural systems.

Measuring and understanding the community benefits and impacts of packaging can: 1) improve an organization's overall environmental and social responsibility profile; 2)

help an organization maintains its license to operate in a community; 3) facilitate permitting for expansion in a community; and 4) help build market share.

Key Terminology

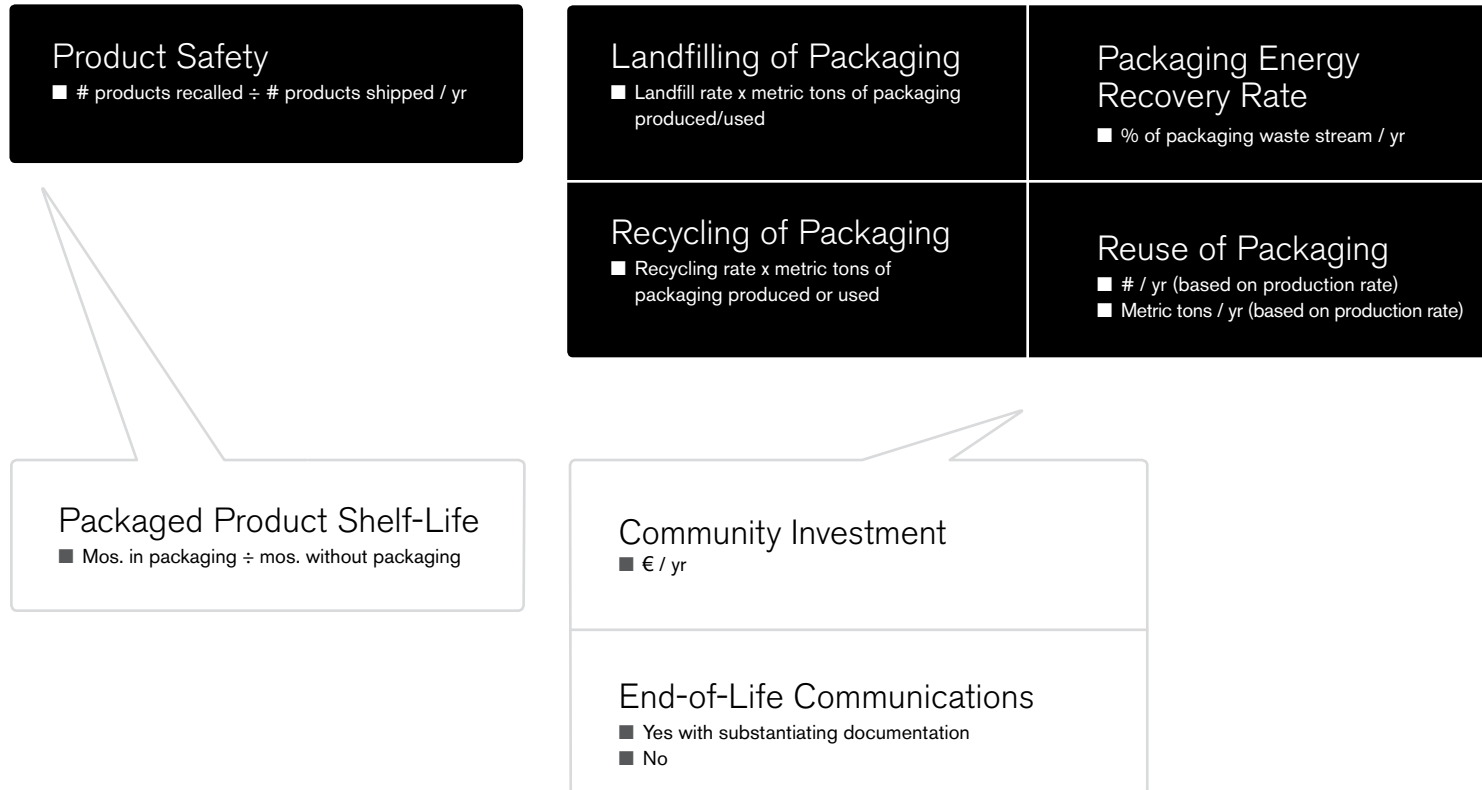
1. A "packaging component" is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.
2. A "unit of packaging" includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.

Before using the indicators and metrics in this module, read the User Guidelines section of this document and be sure you understand how to set a boundary and scope for your measurement project and the difference between gate-to-gate, cradle-to-gate, industry average life cycle inventory (LCI) data and organization-specific performance data. When sharing data with your supply chain partners, be transparent about your measurement boundaries and type of data collected.

Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners' expectations. Use the "what to measure" and "what not to measure" guidelines as appropriate for your organization's role and position in the supply chain.

Community Impact

- Material Use
- Energy Use
- Water Use
- Material Health
- Clean Production and Transport
- Cost and Performance
- Community Impact**
- Worker Impact



Indicator Relationships and Metrics

- Core
- Supplemental
- Correlating

Community Impact



Product Safety (Core)

Definition

The percentage of shipped products recalled for safety issues related to packaging.

Metric

Total number of products recalled divided by total products shipped per functional unit of time (measure by product and packaging type).

Example

products recalled ÷ # products shipped / year

What to Measure

Measure the number of products that are recalled because of packaging failure as a percent of the total number of products shipped. Take measurements separately by product and packaging type.

What not to Measure

Do not include number of product safety recalls for reasons unrelated to packaging.

Packaged Product Shelf Life (Correlating)

Definition

The ratio of a product's shelf life in packaging to a product's shelf life without packaging.

Metric

Shelf life of product in packaging divided by shelf life of product without packaging.

Example

Months in packaging ÷ months without packaging

What to Measure

Measure the length of time a product in packaging is suitable for sale compared to a product not in packaging. Compare only same product types in same packaging types.

What not to Measure

Do not take and compare measures of different types of products in the same types of packaging or of same types of products in different types of packaging.

Recycling of Packaging (Core)

Definition

The mass of recyclable packaging discarded from all sources (commercial and residential) that is collected for recycling and is recycled based on national waste management statistics.

Metric

Material recycling rate multiplied by mass of packaging produced or used (by packaging material type).

Example

Recycling rate x metric tons of packaging produced or used

What to Measure

Measure each type of packaging produced and/or used for which national waste management recycling rates exist. For additional guidance, refer to standards EN13430:2004 and ISO 14021.

What not to Measure

N/A

Reuse of Packaging (Core)

Definition

The number or mass of packaging components or units of packaging (collected from any source) that are reused for the same basic function.

Metric

Number or mass of packaging reused per functional unit of time.

Example

- # / yr (based on rate of production)
- Metric tons / yr (based on rate of production)

What to Measure

Measure all reused packaging components or packaging units. This metric can be used for primary, secondary and tertiary packaging. For additional guidance, refer to standard EN13429:2004.

What not to Measure

N/A

Landfilling of Packaging (Core)

Definition

The mass of packaging from all sources (commercial and residential) that goes to a landfill based on national waste management statistics.

Metric

Material landfill rate multiplied by mass of packaging produced and/or used (by packaging material type).

Example

- Landfill rate x metric tons packaging produced or used

What to Measure

Measure each type of packaging produced and/or used based on national waste management landfill rates.

What not to Measure

N/A

Packaging Energy Recovery Rate (Core)

Definition

Mass of packaging that is recovered and used for energy generation based on national waste management statistics.

Metric

Percent of packaging waste recovered and turned to energy per functional unit of time.

Example

- % of packaging waste stream / year

What to Measure

Use national waste management statistics. If data is available, measure by material type. Organization-specific data may be used if it is documented and third-party verified. For additional guidance, refer to standard EN13431:2004.

What not to Measure

N/A

Community Impact



End-of-Life Communications (Correlating)

Definition

Consumer-focused communications (labeling, icons, website, etc.) to support appropriate end-of-life management of packaging components or units of packaging is used.

Metric

Yes with substantiating documentation or No.

Example

- Yes with substantiating documentation
- No

What to Measure

N/A.

What not to Measure

N/A

Community Investment (Correlating)

Definition

The value of investments made in community projects related to packaging such as recycling education programs or recycling infrastructure development, etc.

Metric

Investment per functional unit of time, including description of project(s) supported.

Example

- € / year

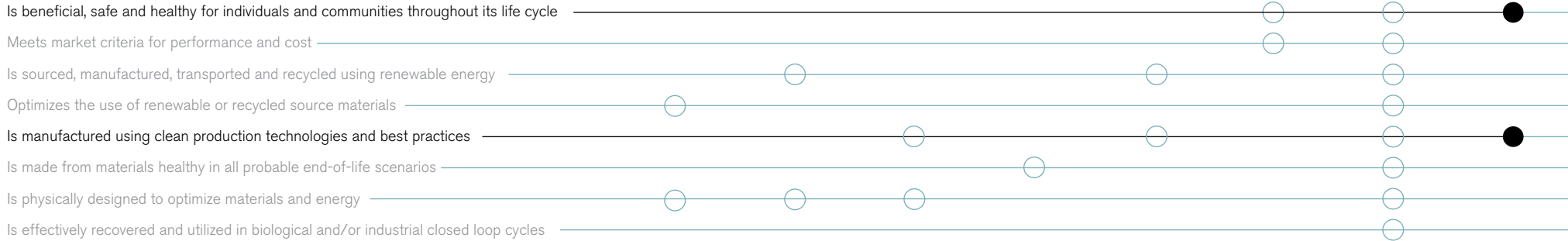
What to Measure

Measure contributions given to or investments made in any/all packaging-related community project(s). Include a description of the project(s) supported.

What not to Measure

Do not include contributions given to or investments made in any community project that is not packaging-related.

Worker Impact



Why Measure Worker Impact

To: 1) understand how workers across the supply chain are treated; and 2) track progress toward ensuring equitable, safe and healthy working conditions for all workers.

Stakeholders from consumer groups to social investment managers are increasingly interested in the social performance of organizations, particularly regarding labor practices. Stakeholders' interests do not end at corporate boundaries but continue across global supply chains. The increased focus on corporate social responsibility over the last decade has helped to improve working conditions around the globe, yet inequitable, unsafe and unhealthy working conditions still exist. Measuring worker benefits and impacts across the supply chain is an important risk management strategy that can help protect an organization's corporate image and brand reputation while improving the quality of life for all workers.

Key Terminology

1. "Sourcing," as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials and the collection and processing of recycled and reused materials.
2. The phrase "final packaging material" refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.
3. A "packaging component" is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping and includes labels, adhesives, inks and/or coatings used on the component.
4. A "unit of packaging" includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.
5. "Transport," in terms of sustainable packaging, includes transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units

Before using the indicators and metrics in this module, read the User Guidelines section of this document and be sure you understand how to set a boundary and scope for your measurement project and the difference between gate-to-gate, cradle-to-gate, industry average life cycle inventory (LCI) data and organization-specific performance data. When sharing data with your supply chain partners, be transparent about your measurement boundaries and type of data collected.

Select the indicators and metrics that are relevant to your business goals, position in the supply chain and downstream supply chain partners' expectations. Use the "what to measure" and "what not to measure" guidelines as appropriate for your organization's role and position in the supply chain.

- to a filler; it does not include transport of packaging that contains product).
6. "Child Labor", consistent with the International Labor Organization (ILO), is defined as any work performed by a child younger than 15 years of age or younger than the age of compulsory schooling in a locality if that age is greater than 15 years; and/or any work, which by its nature or circumstances may jeopardize health or safety, performed by a young person under the age of 18 years.

Worker Impact



Child Labor

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Forced or Compulsory Labor

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Freedom of Association and/or Collective Bargaining

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Discrimination

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Excessive Working Hours

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Remuneration

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Occupational Health

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Safety Performance

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

Responsible Workplace Practices

- Satisfactory: has a business code of conduct and can provide substantiating documentation to guarantee implementation in own company as well supplier adherence
- Needs Improvement: has a business code of conduct but it is not fully implemented an/or lacks a verification system or does not have a formal business code of conduct and verification system but company practices meet or exceed standard requirements
- Needs Major Improvement: does not have a business code of conduct or any equivalent commitment to or demonstration of ethical and responsible behavior
- Unacceptable as specified in third party audit documentation – immediate action required

Indicator Relationships and Metrics

- Core
- Supplemental
- Correlating

Note: Social metrics data does not lend itself to aggregation across the supply chain.

Worker Impact



7. “Forced or compulsory labor”, consistent with ILO conventions, is defined as all work or service which is exacted from any person under the threat of punishment or retaliation, or demanded as a means of repayment of debt for which said person had not offered himself or herself voluntarily.
8. “Collective bargaining”, consistent with ILO conventions, is defined as the negotiation of a contract for labor between an employer or group of employers and one or more worker organizations, which specifies the terms and condition of employment.
9. “Discrimination”, consistent with ILO conventions, is defined as treating people differently because of certain characteristics, such as race, color or sex, which results in the impairment of equality of opportunity and treatment.
10. “Excessive working hours”, consistent with ILO conventions, is defined as more than a 48-hour workweek excluding overtime, or a 60-hour workweek including overtime for non-supervisory employees.

Child Labor (Core)

Definition

Incidents involving child labor, as defined in Key Terminology, related to the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on child labor in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on child labor in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Forced or Compulsory Labor²⁵ (Core)

Definition

Incidents involving forced or compulsory labor, as defined in Key Terminology, related to the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on forced or compulsory labor in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on forced or compulsory labor in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Freedom of Association and/or Collective Bargaining (Core)

Definition

Incidents involving the failure of an organization to inform workers involved in the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging, that they have the right to form, join and organize a trade union and to bargain collectively, as defined in Key Terminology; and/or incidents involving restriction or denial of the right to association and bargain collectively; and/or incidents involving worker discrimination, intimidation or other retaliation for reasons related to association or collective bargaining.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

²⁵ Forced/compulsory labor includes involuntary prison labor.

Worker Impact



Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on freedom of association and collective bargaining in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on freedom of association and collective bargaining in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Discrimination (Core)

Definition

Incidents of discrimination, as defined in Key Terminology, related to the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on discrimination in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on discrimination in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Excessive Working Hours (Core)

Definition

Incidents of excessive work hours, as defined in Key Terminology, related to the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on excessive work hours in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on excessive work hours in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Worker Impact



Remuneration (Core)

Definition

Incidents involving failure to pay wages and provide benefits and terms of employment that meet legal, minimum requirements and the industry benchmark to workers involved with the sourcing of new, recycled and reused materials and the production, filling, and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on remuneration in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging. For additional guidance, refer to SA8000.

What not to Measure

Do not include audit data on remuneration in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Occupational Health (Core)

Definition

Provision of a clean and healthy work environment and, as applicable, dormitory facilities that meet OSHA and/or EU-OSHA requirements for all workers involved with the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on occupational health conditions in work environments related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging.

What to Measure

Do not include audit data on occupational health conditions in work environments that are not directly related to the packaging supply chain functions specified here. Those auditable conditions should be measured and tracked at the enterprise level.

Safety Performance (Core)

Definition

The number of health and safety incidents related to the sourcing of raw, recycled and reused materials and the production, filling and/or transport of packaging materials, packaging components or units of packaging.

Metric

Satisfactory, needs improvement, needs major improvement or unacceptable.

Example

- Satisfactory with substantiating third-party audit documentation
- Needs Improvement as specified in third-party audit documentation
- Needs Major Improvement as specified in third-party audit documentation
- Unacceptable as specified in third party audit documentation – immediate action required

What to Measure

As appropriate to your position in the supply chain, collect audit data on safety incidents related to the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging units and transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging.

Worker Impact



What not to Measure

Do not include incidents that are not directly related to packaging supply chain functions specified here. Those incidents should be measured and tracked at the enterprise level.

Responsible Workplace Practices (Core)

Definition

Organization has an enforced written business code of conduct – inclusive of procedures for verification and remediation – stating that the organization is committed to conducting its operations in an ethical, legal and socially responsible manner and further detailing appropriate treatment²⁶ of all packaging workers, including those employed by suppliers, contract and sub-contract manufacturers and other service providers.

Metric

Satisfactory, needs improvement, needs major improvement.

Example

- Satisfactory: has a business code of conduct and can provide substantiating documentation to guarantee implementation in own company as well supplier adherence
- Needs Improvement: has a business code of conduct but it is not fully implemented an/or lacks a verification system or does not have a formal business code of conduct and verification system but company practices meet or exceed standard requirements
- Needs Major Improvement: does not have a business code of conduct or any equivalent commitment to or demonstration of ethical and responsible behavior

What to Measure

N/A

What not to Measure

N/A

²⁶ A business code of conduct should, at a minimum, address sexual harassment, racial or gender discrimination, fair and equitable wages, safe and healthy working conditions and compliance with internationally accepted child and compulsory labor standards. The SA8000 standard is a good reference for developing an appropriate business code or ensuring existing code addresses current responsible business practice expectations.

Glossary

Acid Rain

Acid rain refers to a mixture of wet and dry deposition (deposited material) from the atmosphere containing higher than normal amounts of nitric and sulfuric acids. The precursors, or chemical forerunners, of acid rain formation result from both natural sources – volcanoes and decaying vegetation – and man-made sources – primarily emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) resulting from fossil fuel combustion. When fossil fuels are combusted, acid-forming nitrogen and sulfur oxides are released to the atmosphere. These compounds are transformed in the atmosphere, often traveling thousands of kilometers from their original source, and then fall out on land and water surfaces as acid rain. Acid rain is best known for the damage it causes to forests and lakes. Less well known are the many ways it damages freshwater and coastal ecosystems, soils and even ancient historical monuments, or the heavy metals these acids help release into groundwater.

Alternative Fuels

Alternative fuels, as described by the U.S. DOE, include bio-diesel, electricity, ethanol, methanol, natural gas, propane and hydrogen. Some alternative transportation fuels, such as ethanol and bio-diesel, are renewable while others, such as propane and natural gas, are non-renewable.

Baseline Performance

Baseline performance is the benchmark against which future measurements can be compared over time.

Bio-Fuel

Bio-fuel is fuel derived from organic matter (obtained directly from plants,²⁷ or indirectly from agricultural, commercial, domestic and/or industrial wastes) instead of from fossil products.

Boundary and Scope

Boundary and scope are terms used in measurement processes to define the physical and functional attributes and conditions and the timeframe that will be included within the parameters of the measurement project.

Chemical Oxygen Demand (COD)

Chemical oxygen demand is a measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater. It is defined as the quantity of a specified oxidant that reacts with a sample under controlled conditions. The quantity of oxidants consumed is expressed as a rapid indicator of organic pollutants in water. COD is expressed as mg/LO₂.

Child Labor

Consistent with International Labor Organization (ILO), child labor is defined as any work performed by a child younger than 15 years of age or younger than the age of compulsory schooling in a locality if that age is greater than 15 years; and/or any work, which by its nature or circumstances may jeopardize health or safety, performed by a young person under the age of 18 years.

Closed Loop System

Closed Loop System refers to an industrial system that functions within a zero-waste supply chain that completely reuses, recycles or composts all materials.

Collective Bargaining

Collective Bargaining, consistent with ILO conventions, is defined as the negotiation of a contract for labor between an employer or group of employers and one or more worker organizations, which specifies the terms and condition of employment.

Discrimination

Discrimination, consistent with ILO conventions, is defined as treating people differently because of certain characteristics, such as race, color or sex, which results in the impairment of equality of opportunity and treatment.

Disposal

Disposal refers to any end-of-life management process including recycling, recovery for reuse, composting, incineration or landfilling, etc.

Eutrophication

Eutrophication is a process whereby water bodies, such as lakes, estuaries or slow moving streams, accumulate nutrients that stimulate excessive algal growth. Nutrients can come from many sources, such as: 1) fertilizers applied to agricultural fields, golf courses and suburban lawns; 2) deposition of nitrogen from the atmosphere; 3) erosion of soil containing nutrients; 4) sewage treatment plant discharges; and 5) the burning of fossil

fuels. As the algae grow faster, they shade existing plants until both the algae and some plants die off. As the dead algae and plants are decomposed by microbes, dissolved oxygen is used up, creating an anoxic condition – an environment without oxygen. Such an environment becomes unsuitable for plants and animal life. Algal blooms also lead to oxygen depletion resulting in fish population decline and the creation of aquatic conditions that can be harmful to human health.

Final Packaging Material

Final packaging material refers to the material substrates and ready-to-use auxiliaries such as inks, adhesives and coatings used to produce packaging. The phrase is also used to distinguish substrates from raw source materials and processed auxiliary materials from the individual formulation chemicals that comprise them.

Forced or Compulsory Overtime

Forced or compulsory labor, consistent with ILO conventions, is defined as all work or service which is exacted from any person under the threat of punishment or retaliation, or demanded as a means of repayment of debt for which said person had not offered himself or herself voluntarily.

²⁷ The environmental, economic and social impacts of corn-based bio-fuel should be considered when comparing it with traditional fuels.

Glossary

Functional Unit

According to the ISO 14040 series of standards for life cycle assessment, a functional unit provides a way to “normalize” the data that is collected so that the measurement is expressed in comparable terms.

Goal

A goal or objective is an endpoint that a person or organization intends to achieve or bring about.

Greenhouse Gases (GHG)

Gases that trap heat in the atmosphere are often called greenhouse gases. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. The International Panel on Climate Change (IPCC) recognizes four primary greenhouse gases (GHGs). These are water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄). However, the IPCC and other leading climate change agencies include a number of entirely human-made gases in their GHG inventory which, by category, include halocarbons and other chlorine and bromine containing substances, also known as fluorinated gases, which are dealt with under the Montreal Protocol, and sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) dealt with under the Kyoto Protocol. Carbon dioxide has a global warming potential of one, while methane and nitrous oxide have warming potentials of 25 and 310 respectively. Fluorinated gases can be intense greenhouse gases with the multiplier for sulfur hexafluoride (SF₆) being 23900 times as potent as carbon dioxide. A

complete list of pertinent GHGs can be found on the [IPCC website](#). The principal greenhouse gases that enter the atmosphere because of human activities are:

- **Carbon Dioxide (CO₂):** Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas and coal), solid waste, trees and wood products, and as a result of other chemical reactions (e.g., manufacturing cement).
- **Methane (CH₄):** Methane is emitted during the production and transport of coal, natural gas and oil. Methane emissions also result from waste elimination by livestock, some agricultural processes and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous Oxide (N₂O):** Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Fluorinated Gases:** Hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs, and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (“High GWP gases”).

Indicator

An indicator stands as a quantitative or qualitative proxy for an issue or characteristic an organization wants or needs to measure

- **Core Indicator:** A core indicator is a quantifiable or qualitative representation of a measurable issue or characteristic considered to be of interest to most stakeholders. In aggregate, core indicators provide a robust evaluation of the big picture.
- **Correlating Indicator:** A correlating indicator is a quantifiable or qualitative representation of a measurable issue or characteristic considered to be of significant importance but may not be of interest to all stakeholders. Correlating indicators provide additional information relative to but outside the scope of the core and supplemental indicators.
- **Supplemental Indicator:** A supplemental indicator is a quantifiable or qualitative representation of a measurable issue or characteristic which when measured, provides data that augments a core indicator, generally providing a more specific or detailed measure of an aspect of a core indicator.

Latent Energy

Latent energy refers to energy stored in packaging material that may be recovered and valorized.

Life Cycle Assessment (LCA)

LCA is the “compilation and evaluation of the inputs, outputs and the potential environmental

benefits and impacts of a product system throughout its life cycle” (ISO 14040: 2006). It is a rigorous approach to assessing environmental aspects and potential impacts of industrial or other systems. LCA enables the estimation of the cumulative impacts resulting from all stages in the product life cycle, often including impacts not considered in more traditional analyses (e.g., raw material extraction, material transportation, ultimate product disposal, etc.). The LCA methodology may be applied on individual phases of a life cycle, e.g., a manufacturing process. Partial life cycle assessments are called cradle-to-gate or gate-to-gate. A full life cycle assessment is known as cradle-to-grave assessment.

- **Cradle-to-Gate:** Cradle-to-gate is a partial life cycle assessment process that includes the resource acquisition and production/manufacturing phases until a specified point (the gate), depending on who is doing the assessment. In terms of packaging, cradle-to-gate measurement may, for instance, include the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging and filling of packaging components, as well as the transport functions that are required to move materials, components and units of packaging from one supply chain partner to another up until product is put into the packaging.
- **Gate-to-Gate:** Gate-to-Gate is a partial life cycle assessment process of only

Glossary

one phase of the life cycle. In terms of packaging, gate-to-gate measurement may, for instance, assess the physical and functional attributes or conditions related to packaging that occur during the period of time a supply chain partner owns or is responsible for packaging material, packaging components or units of packaging up to the point of transfer to the next partner in the supply chain.

- **Cradle-to-Grave:** Cradle-to-Grave is a full life cycle assessment that includes resource acquisition to final disposition. In terms of packaging, cradle-to-grave measurement would include the growth, harvest or extraction and processing of raw materials, processing of recycled or reused materials, production of final packaging materials, conversion of final packaging materials into packaging components, assembly of packaging components into units of packaging, filling of packaging components, use of packaging and end-of-life management of packaging/packaging materials. It would also include any transport functions that are required to move raw, recycled, reused or final packaging materials, packaging components and units of packaging from one supply chain partner to another. But, it would not include transport of packaging that contains product.

Life Cycle Inventory Data

Life cycle inventory data is the data collected or derived during a life cycle inventory analysis. A life cycle inventory analysis is the process of examining all the inputs and outputs in a product system's life cycle, beginning with what the product is composed of, where those materials came from, where they go and the inputs and outputs related to those component materials during their lifetime. The purpose of the inventory analysis is to quantify what comes in and what goes out, including the energy and material associated with materials extraction, product manufacture and assembly, distribution, use and disposal and the environmental emissions that result.

Metric

A metric is the method used to express an indicator. A metric is used to gauge the issue or characteristic — represented by an indicator — that an organization wants or needs to assess. Metrics are often computational or quantitative, but can also be a qualitative assessment of an indicator. Metrics — particularly computational metrics — are typically expressed as a numerator and a denominator, i.e., "A per B."

Non-Renewable Resource

A non-renewable resource, according to the U.S. EPA, is a natural resource that cannot be remade, regrown or regenerated as fast as it is consumed and used up. Examples of non-renewable resources are oil, coal, iron ore, minerals including uranium metals and alloys, and old growth forests.

Packaging Component

A packaging component is any stand alone element of a primary or secondary package such as a bottle cap or a protective sleeve, or any stand alone element of transport packaging such as a pallet or strapping, and includes labels, adhesives, inks and/or coatings used on the component.

Particulate Matter

Particulate matter is the term for solid or liquid particles found in the air. Some particles are large or dark enough to be seen as soot or smoke, but fine particulate matter is tiny and is generally not visible to the naked eye. Both on-road and non-road mobile sources emit fine particulate matter. Diesel-powered vehicles and engines contribute more than half the mobile source particulate emissions. Fine particulate matter is a health concern because very fine particles can reach the deepest regions of the lungs. Health effects include asthma, difficult or painful breathing and chronic bronchitis, especially in children and the elderly. Fine particulate matter associated with diesel exhaust is also thought to cause lung cancer and is, therefore, listed as a mobile source air toxicant. Fine particulate matter can travel long distances on air currents and is also a major cause of haze, which reduces visibility.

Renewable Energy

Renewable energy resources are naturally replenished in a relatively short period of time. Based on U.S. DOE data, renewable energy resources include biomass, hydropower, geothermal energy, wind energy and solar energy.

Renewable Resource

A renewable resource, according to the U.S. EPA, is a natural resource that can be remade, regrown or regenerated in a relatively short period of time. Examples of renewable resources are plants and trees.

Stakeholders

As defined in the Global Reporting Initiative Guidelines, stakeholders are individuals or organizations with a legitimate interest in a given situation, action or enterprise. For performance measurement purposes, stakeholders are broadly defined as those groups or individuals: 1) who can be reasonably expected to be affected by an organization's activities, products and/or services; or 2) whose actions can reasonably be expected to affect the ability of the organization to effectively implement its strategies and achieve its objectives.

Glossary

Source-Certified

Within the context of raw material use, source-certified refers to materials that have been certified through programs run by organizations including, but not limited to, the Forest Stewardship Council and the Sustainable Forestry Initiative.

Sourcing

Sourcing, as used in the indicator definitions, refers to and includes all of the functions involved in the growth, harvest or extraction and processing of raw materials and the collection and processing of recycled and reused materials.

Stressed Water Sources

The term “stressed source” or “stressed watershed” refers to sources of water where the draw down rate is greater than the recharge rate. On a regional basis, stressed sources of water cannot provide enough water for all uses – agricultural, industrial and domestic – due to depletion of water quantity and/or quality. The UN Commission on Sustainable Development suggests that waters sources are stressed when freshwater resources fall below 1000-1500 cubic meters per capita per year.

Sustainability (Corporate)²⁸

Sustainability in the corporate sector encompasses strategies and practices that aim to meet the needs of stakeholders today while seeking to protect, support and enhance the human and natural resources that will be needed in the future.

Transport

Transport, in terms of sustainable packaging, refers to the transport of raw, recycled, reused or final packaging materials, packaging components or units of packaging between supply chain partners (e.g., transport of substrate to a converter or transport of packaging units to a filler; it does not include transport of packaging that contains product).

Total Suspended Solids (TSS)

Total suspended solids are a water quality measurement that refers to the dry-weight of particles trapped by a filter, typically of a specified pore size. TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes and sewage. High concentrations of suspended solids can cause many problems for stream health and aquatic life.

Toxicant

A toxicant is defined by the U.S. EPA as a harmful substance or agent that may injure an exposed organism, and a toxic substance as a chemical or mixture that may present an unreasonable risk of injury to human health or the environment. A list of U.S. EPA regulated toxicants is provided in the [Toxic Substances Control Act \(TSCA\) Chemical Substances Inventory](#). European Union regulated toxicants are listed in the [EU's Registration, Evaluation, Authorisation and Restriction of Chemicals \(REACH\) regulations](#).

- **Persistent Bioaccumulative Toxic Substances (PBTs):** PBTs, according to the U.S. EPA, are chemicals that are toxic, persist in the environment and bioaccumulate in food chains and, thus, pose risks to human health and ecosystems. PBTs transfer easily among air, water and land, and span program, geographical and generational boundaries. Refer to the U.S. EPA list of PBTs and the EU listing of PBTs.
- **Carcinogens, Mutagens and Reproductive Toxicants (CMRs):** The U.S. Occupational Safety and Health Administration (OSHA) defines carcinogens as substances that are either known to cause cancer in human or animals or are suspected of being capable of causing cancer in humans; mutagens as substances that cause chromosomal damage or genetic alteration; and reproductive toxicants as substances with lethal teratogenic (causing malformation or physical defects) effects in a developing fetus or embryo and substances that affect the fertility of males and/or females. Refer to the list of substance treated as carcinogens by OSHA. The State of California's Proposition 65 includes the most comprehensive list of CMRs regulated in the U.S. Also refer to the EU consolidated list of CMRs.
- **Toxicant Migration:** Toxicant migration, refers to the undesirable transfer of toxicants from packaging to product.

Unit of Packaging

A unit of packaging includes all the components required to create a useable package, e.g., a fiber milk carton with an HDPE pouring spout, security seal, cap and any auxiliary materials used such as labels, adhesives, inks and/or coatings.

Water Consumption and Use

The term “water consumption” is used to indicate: 1) fresh water (excluding rain) that is mechanically diverted from a source and then used in such a way that it is not available again as liquid fresh water; or 2) water that is degraded during use such that it cannot be collected for reuse. The difference between water “use” and water “consumption” is that consumption causes the water to become unavailable for direct or immediate use. An example of water “use” is water used in paper production processes that is collected, processed and reused on site. An example of water “consumption” is water that evaporates during a production process. Another example of water consumption is water that becomes an ingredient of a final material such as that used in water-based ink.

²⁸ Numerous definitions of sustainability exist and increasingly organizations are customizing definitions of sustainability to incorporate the broadly accepted principles of the concept (i.e., a blending of economic, environmental and social concerns) with their own specific visions, goals and objectives. The definition provided here is intended to be generic and illustrative of the basic principle.