# *Outdoor Industry Association Eco Working Group Metrics & Methodologies: Energy & Greenhouse Gas (GHG) Emissions for the Eco Index™*

**Approved by OIA Eco Working Group Vote – 12/29/09**
**Approved by EOG Sustainability Working Group – 1/26/10**

***Intended Use of this Document:***

*The Outdoor Industry Association (OIA) Eco Working Group (EWG) recognizes that tools are needed to support Outdoor Industry companies in calculating energy and greenhouse gas (GHG) metrics across their product life cycles. The methodology presented in this document was created by the OIA EWG Lenses Subgroup to support the development of those calculation and data collection tools.*

*A Data Collection and Calculation Task Force is working to develop a supporting framework and identify and/or develop necessary tools to foster implementation of this energy and GHG methodology.*

## Scope and Purpose

### Eco Index™

The Eco Index™ is an Outdoor Industry environmental assessment tool containing guidelines, indicators and metrics. The capabilities of the Eco Index allow measurement of environmental impacts of products through an evaluation that includes a life cycle based perspective. The index is intended to enable companies to incorporate environmental considerations into their product designs and to manage their supply chains in a way that supports their environmental goals. It is designed to be used for both materials, such as intermediate products, as well as finished products, providing a means to cumulatively assess impact at various stages of a product's life cycle, as well as a finished product's complete life cycle. Companies who use it will be striving to achieve a level of environmental accountability and performance that may not immediately be within their reach.

It is important to note that the overall scope of the Eco Index project expands on the methodology referenced in this document by creating structure for all supply chain members to ultimately provide their primary data in an ongoing manner. Most life cycle methodologies are tailored to measuring a product's impact at a single point in time with a combination of primary and secondary data. The Eco Index expands upon typical life cycle boundaries by allowing for continual reporting of primary data throughout the supply chain. In doing so, the Eco Index can be used as a supply chain design and management tool. Some use of secondary data will be necessary at the onset in order to provide a complete supply chain view but this need is anticipated to diminish over time.

As organizations gain experience using the Eco Index, for example, measuring greenhouse gas (GHG) emissions and collecting life cycle energy use data, their efforts will support a more rigorous use of the recommended methodology. Over time, this will lead to more rigorous measurement of environmental impact. Therefore, although the highest level of environmental impact measurement may not be within an organization's immediate reach, continually improving the accuracy of impact measurements, by using the Eco Index and gaining experience with it, is integral to improving the environmental performance of companies.

**Metrics & Methodologies for Energy Use and Greenhouse Gas Emissions**

A key component of the Eco Index is the envisioned iterative process of its ongoing review and adjustment to ensure incorporation of the best available methodological practices to measure environmental impact. This document describes the methodology currently recommended as the best practice to assess the life cycle GHG emissions of a product[1]. As other globally accepted methodologies become available to measure GHG emissions at a product level, they will be considered for incorporation into the Eco Index[2].

It should be noted that the methodology discussed in this document allows for a finished product's full life cycle assessment as well as an assessment of a portion of its life cycle. This partial life cycle assessment includes a particular supply chain member's contribution to the finished product's environmental footprint. With respect to energy and greenhouse gases, the life cycle assessment of the finished product will be the sum of all the supply chain members' or processes' contributions to the metrics designated for energy use or greenhouse gas emissions. In order to meet this end goal of creating additive metrics, each supply chain actor must record metrics in terms of the unit of product they produce whether it is yards of fabric or pairs of shoes. However, to be meaningful the metric shall not be used to assess or communicate a finished product's footprint unless all relevant steps of the entire life cycle are included (i.e. including use phase and end of life).

## Terms and Definitions

For the purposes of this document the following terms and definitions apply For other definitions, see PAS 2050:2008 (referenced later in this document).

*Carbon dioxide equivalent ($CO_2e$)*
Unit for comparing the radiative forcing of a greenhouse gas to carbon dioxide. [ISO 14064-1:2006; PAS 2050:2008]

*Finished product*
Product sold in the marketplace to an end user (e.g., pair of shoes, water bottle)

*Intermediate product*
Material that is an input to the manufacturing of another product including other intermediate products as well as a finished product(e.g., fabric, thread, zipper)

*Methodology*
The protocol for calculating impact, including the definition of scope boundaries, sources of impact, and data requirements, as well as the calculation of impact or 'footprint'

*Metrics*
Units of measure of the life cycle environmental impact of a product, intermediate product, or process associated with the supply chain of the studied product

*Primary data*
Direct quantitative measurements (a.k.a., direct data or primary activity data) concerning the studied product or process made by the organization conducting the assessment or by another organization in the supply chain about the specific product's life cycle

*Product*
Goods or services

*Raw material*
Unprocessed materials sourced from agricultural goods, mining, water sources, etc.

[1] Product is defined below in the "Terms and Definitions" section of this document.
[2] A methodology that is viewed as a likely candidate for future consideration is the World Resources Institute and World Business Council for Sustainable Development GHG Protocol Initiative to develop two new standards for product and supply chain GHG accounting and reporting.

*Secondary data*
Data obtained from sources other than by direct measurement. Secondary data are used when primary activity data are not available or are impractical to obtain. Secondary data are representative of an average or general measurement of similar processes or materials, e.g., from industry datasets or reports or aggregated trade association data.

## Metrics: Energy Use and Greenhouse Gas Emissions

The following metrics have previously been approved by the EWG to assess climate change impact:

1. **Energy use: quantity and type of energy used**
   - ✓ Metric: *Megajoules (MJ) per unit of product, by energy source*
2. **Greenhouse gas (GHG) emissions: quantity of GHG emissions released**
   - ✓ Metric: *kilogram (kg) of carbon dioxide equivalents ($CO_2e$) per unit of product*

   Notes: For energy use based GHG emissions, emission factors provide the link that enables one to convert the energy use data (e.g., MJ per unit of product) into resulting GHG emissions (e.g., kg $CO_2e$ per unit of product). Emission factors can come from either primary data or secondary data sources. For further information about emission factors see Attachment C.

## Methodology: OIA EWG Overview and Guidance for Publicly Available Specification (PAS) 2050: 2008[1]

The Eco Index methodology to measure energy use and climate change impact of a product or intermediate product is the Publicly Available Specification (PAS) 2050: 2008 – *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services*. PAS 2050 was prepared by British Standards Institution (BSI)[2], and was co-sponsored by The Carbon Trust and the Department for Environment, Food and Rural Affairs (DEFRA). A free copy of PAS 2050 is available on BSI's website: http://www.bsigroup.com/en/Standards-and-Publications/Industry-Sectors/Energy/PAS-2050/. Also available on this link, free of charge, is the *Guide to PAS 2050* which steps through the calculation of a product carbon footprint.

PAS 2050 measures the GHG impact of a product across all or a portion of that product's life cycle. This approach provides the basis for comparative assessment and selection of products as well as intermediate products, providing useful information to an organization within the supply chain in evaluating design choices, for example. Additionally, PAS 2050 is the only internationally accepted methodology currently available to measure GHG emissions at the product level, and it is in accordance with ISO standards and built upon Intergovernmental Panel on Climate Change documents.

Although PAS 2050 was designed to measure a product's GHG impact, in order to quantify the GHG impact, one must quantify energy use. Therefore, PAS 2050 guides the assessment of both metrics: kg of $CO_2e$ per unit of product and MJ of energy per unit of product by energy source.

Highlights of PAS 2050:
- ✓ Applicable to the assessment of GHG life cycle emissions of finished products as well as the assessment of emissions for intermediate products or discrete phases of a product's life cycle.
- ✓ Includes guidelines to ensure that data capture is additive through the supply chain, enabling values per unit of product to include all upstream inputs in a consistent fashion.
- ✓ In certain cases as set out in the data quality rules of PAS 2050, the use of secondary data is allowed to replace primary or direct data. See Section 7.4 of PAS 2050 for further guidance.

[1] Permission to reference PAS 2050- *Assessing the life cycle greenhouse gas emissions of goods and services* is granted by the British Standards Institution (BSI – http://www.bsigroup.com). A copy of PAS 2050 can be obtained at www.bsigroup.com/en.Standards-and-Publications/How-we-can-help-you/Professional-Standards-Services/PAS 2050/

[2] BSI British Standards is the UK's national standards organization that produces standards and information products that promote and share best practice. It serves the interests of a wide range of industry sectors as well as governments, consumers, employees and society overall, to make sure that British, European and international standards are useful, relevant and authoritative.

- ✓ Contains specifications for identifying the system boundary, the sources of GHG emissions associated with products that fall inside or outside the system boundary, the data requirements for carrying our the analysis, and the calculation of the results.
- ✓ Organizations within the supply chain that have implemented tracking of corporate energy use or GHG emissions using the Global Reporting Initiative (GRI) or GHG Protocol should be able to utilize this data to meet the data requirements of PAS 2050 for primary data.

**Further Instructions for Data Collection for the Energy Use Metric**

The metric for energy use is Megajoules (MJ) of energy used per unit of product, by source.

The sources of energy (as a percentage of the total) are to be reported. This includes a measurement of energy used by facilities owned, operated or controlled by the company conducting the assessment, as well as energy used during the entire life cycle including: Materials, Product Manufacturing, Consumer Packaging, Transportation and Distribution, Use and Services and End of Life. In all cases, energy use is to be portioned out by energy source.

Data for some energy use within the supply chain, such as energy associated with intermediate products, will be provided by upstream suppliers participating in the Eco Index project. This will reduce the workload on any given supply chain member while increasing the accuracy of available information. PAS 2050 references the inclusion of all prior GHG emissions at any given point in the supply chain, but it should be acknowledged that the expectation is that each supplier will simply pass these totals to the next in an additive fashion.

In the event secondary data sources are used, the percent of secondary data relative to primary data is to be communicated, along with references to the sources of the secondary data. Refer to the PAS 2050:2008 (http://www.bsigroup.com/en/Standards-and-Publications/Industry-Sectors/Energy/PAS-2050/) for detailed information regarding data and recordkeeping requirements.

To assist the collection of the energy use metric, see Attachment B for specific conversions to understand energy intensity by fuel type.

## Attachment A
## Scope of PAS 2050:2008

This section provides some highlights of PAS 2050:2008. However, this summary is not intended to replace PAS 2050:2008. It is important that all users of this document review the PAS 2050:2008 in its entirety prior to using this methodology. The Table of Contents for PAS 2050:2008 can be found below. A copy of the full document is available free of charge at http://www.bsigroup.com/en/Standards-and-Publications/Industry-Sectors/Energy/PAS-2050/

**PAS 2050:2008 Table of Contents**

| Categories | PAS 2050 | Notes |
|---|---|---|
| **Reporting Level** | Functional Unit of Product | |
| **Organizational Boundaries** | Business to Consumer (cradle to grave) or Business to Business (cradle to gate) | |
| **Emissions Sources for Reporting** | Life Cycle Emissions | See PAS 2050, section 6.4 for specific boundaries for reporting. |
| **Includes Supply Chain?** | Yes | |
| **Unit of Emissions To Be Reported** | All GHG emissions converted to $CO_2e$ | See PAS 2050, Annex A for complete listing of GHG's to be reported on and their $CO_2e$ conversion factors. |
| **Stored Carbon** | Includes stored carbon accounting (if relevant over a 100-year assessment period) | See PAS 2050, Section 5.4 |
| **Land Use** | Accounts for land use change from life cycle inputs arising from agricultural products. Based location of agricultural product (see IPCC guidelines for factors) | See PAS 2050, Section 5.5 |
| **Emissions Offsets** | Offsets ***cannot*** be logged as reductions. Must be certified | See PAS 2050, Section 5.7 |
| **Material Contribution to GHG Emissions** | Must include all material emissions accounting for at least 95% of the GHG's associated with the products lifecycle | See PAS 2050, Section 6.3 |
| **Applicable Time Period** | Updated every two years | |
| **Third Party Verification** | Needed in order to claim compliance with PAS 2050 guidelines. Potential exists to "self verify" claims | |

## Attachment B
## Understanding Energy Intensity by Fuel Type

To convert from any energy source to any energy measure (or vice versa), see the conversion tool at http://www.onlineconversion.com/energy.htm

Additionally, to understand the amount of energy inherent in commonly used fuel types, use the table below which converts a limited number of volumes of primary energy sources to Gigajoules (GJ). To convert to Megajoules (MJ), multiply GJ by 1000.

| **Coal** | GJ | **Crude Oil** | GJ | **Gasoline** | GJ | **Natural Gas** | GJ | **Electricity** | GJ |
|---|---|---|---|---|---|---|---|---|---|
| tonne (metric) | 26.00 | barrel | 6.22 | gallon | 0.125 | therm | 0.1055 | kilowatt-hour | 0.0036 |
| ton (short) | 23.59 | tonne (metric) | 44.80 | tonne (metric) | 44.80 | 1000 cubic feet | 1.1046 | megawatt-hour | 3.6000 |
| ton (long) | 26.42 | ton (short) | 40.64 | **Diesel** | | 1000 cubic meters | 39.01 | gigawatt-hour | 3600.0 |
| | | ton (long) | 45.52 | gallon | 0.138 | MMBtu | 1.055 | | |
| | | | | tonne (metric) | 43.33 | | | | |
| | | | | **Fuel Oil** | | | | | |
| | | | | gallon | 0.144 | | | | |
| | | | | tonne (metric) | 40.19 | | | | |

***Table Source:***
Global Reporting Initiative (GRI),
http://www.globalreporting.org/ReportingFramework/G3Online/PerformanceIndicators/

***References***

*International Energy Agency's (IAE) annual publication of Energy Balances for OECD and non- OECD countries.*

*The Greenhouse Gas Protocol (GHG) Initiative - A corporate accounting and reporting standard (Revised Edition, 2004) of the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).*

*Kyoto Protocol, 1997.*

## Attachment C
## Emissions Factors

In order to calculate GHG emissions from energy and non-energy based activity data as discussed in Section 9 of PAS 2050 it is important to use the proper emissions factors for global energy (electricity, natural gas, coal etc.) use and global warming potentials of common GHG emitting substances (HFC's, SF6, PFC's etc.).

Using the emissions factors in calculations:

$$\text{GHG Emissions} = (\text{activity data}) \times emissionsfactor$$

It should be noted that emissions factors for common fuel types and energy sources can vary widely depending on the location in which those fuels or energy sources are produced or expended. For example, coal mined in Europe will have a different emissions intensity than coal mined in the United States. Or, electricity consumed in China will have a very different emissions intensity than electricity consumed in Canada. It is important to take into account where a fuel or energy source is coming from in addition to what type and how much of it is being used. When calculating emissions from fuel use or energy sources one should ensure that they are using the most current and regionally specific emissions factors available.

The websites listed below will aid in locating the most current and pertinent emission factors for all fuel types:

http://www.eia.doe.gov/oiaf/1605/pdf/Appendix%20F_r071023.pdf
http://www.epa.gov/ttn/chief/efpac/index.html
http://www.theclimateregistry.org/downloads/GRP.pdf

For General Guidance on GHG calculation and Preparation see:
http://www.epa.gov/ttn/chief/ap42/index.html