OVERVIEW OF THE OECD SUSTAINABLE MANUFACTURING TOOLKIT PROTOTYPE

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Background

The general principle of sustainable manufacturing is to reduce the intensity of materials use, energy consumption, emissions, and the creation of unwanted by-products while maintaining, or improving, the value of products to society and to organizations. As consumption grows, efficiencies in production and consumption patterns will need to grow even faster so that the net impact on the resource base and the environment is reduced. Enhancing sustainability performance of the production process is an important contribution to developing a stronger and cleaner economy.

Measuring and benchmarking sustainability performance can be done at many levels: global, national, regional, corporate, process and product. Much work is being done to establish metrics for various aspects of production at all of these levels. Ideally, these metrics would be harmonized and linked between levels.

National and international initiatives have provided means of measuring intensities of entire economies for greenhouse gases, pollutants, energy efficiencies and materials efficiencies, among others. The OECD and International Energy Agency (IEA) have played a lead role in many of these (Pollutant Release and Transfer Registers[1], Material Flows and Resource Productivity[2], Sustainable Materials Management[3] and energy metrics[4]) and have participated in others. These focus largely on national-level accounting and indicators.

On a corporate level, the ISO[5] has provided standards for establishing environmental management systems (ISO 14001), measuring environmental performance (ISO 14031), life cycle assessment (ISO 14040), eco-labelling (ISO 14023) and corporate GHG measurement (ISO 14064). The Global Reporting Initiative[6] (GRI) has established a framework and reporting structure for overall corporate sustainability reporting that is used by many larger companies. The European Union has created EMAS[7] (Eco-Management and Audit Scheme), which also provides an important reporting framework.

Countries have their own environmental perspectives and priorities to improve efficiencies and reduce the environmental burden of production. While some national initiatives are linked to international guidance (ISO standards, OECD guidelines, EU directives, and UNEP initiatives on life cycle assessment[8]) there is little coherence between countries on the broad measurement of sustainable manufacturing.

[1] See http://www.oecd.org/newsEvents/0,3382,en_2649_34411_1_1_1_1_1,00.html and www.prtr.net.
[2] See http://www.oecd.org/document/51/0,3343,en_2649_34441_34808435_1_1_1_1,00.html.
[3] See http://www.oecd.org/document/62/0,3343,fr_2649_34395_37895358_1_1_1_1,00.html
[4] See http://www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4122
[5] See http://www.iso.org/iso/iso_catalogue/management_standards/iso_9000_iso_14000/iso_14000_essentials.htm
[6] See http://www.globalreporting.org/ReportingFramework/ReportingFrameworkOverview/
[7] See http://ec.europa.eu/environment/emas/index_en.htm
[8] See http://lcinitiative.unep.fr/

A metrics gap

There are many reporting frameworks, metrics and methodologies available for companies to measure their sustainability performance but no internationally-accepted "preferred" comprehensive approach. Voluntary reporting initiatives (GRI, EU's EMAS and ISO 14031) provide flexible frameworks within which companies can choose appropriate indicators and methods. This has led to a large number of corporate sustainability reports (CSRs) that are not easily compared.

Many detailed and sophisticated approaches to measuring sustainability performance (such as life cycle assessment (LCA), material flows analysis (MFA), environmental accounting, etc.) have been developed but these require significant effort and expertise[9]. Each approach includes several variants. For example, there are dozens of LCA databases and models to choose from and each model usually offers a choice of "methods", each with its own assumptions, benefits and drawbacks. The EU and UNEP are both trying to bring coherence to the field of LCA by providing detailed case studies and data repositories. It is important that the OECD work be complementary with these initiatives to harmonize methodologies.

The general reporting frameworks do not provide tools with which a company can analyse its processes and products to identify opportunities for improvement. Whereas the detailed approaches are technically challenging and results are difficult to compare across companies and products.

The OECD has developed an approach that focuses on simple guidance to help companies calculate a set of core indicators that are easily compared across companies, processes and products. The guidance is aimed to be used by non-experts. The data required to calculate these indicators are generally available to companies that have conducted environmental analysis or reporting. For those that haven't, the toolkit provides a starting point for understanding and collecting much of the necessary data.

The draft toolkit

The draft toolkit draws from many approaches including LCA, MFA and environmental accounting to calculate an integrated set of core indicators at the facility level. The facility level was chosen since the objective is for the company to review its materials, processes and products in detail to pinpoint which ones can most easily be changed to improve its overall sustainability performance.

By design, the toolkit focuses on environmental and financial performance of the facility. Broader economic and social performance are being investigated for inclusion in future versions.

The toolkit:

- Takes a broad perspective of environmental performance (resource, energy and water consumption; GHGs; solid wastes; air and water pollution; restricted substances; and land use);
- Includes product characteristics (energy consumption, GHG production, and product lifetime);
- Is intended to provide guidance that is simple enough for non-experts to use;
- Includes financial costs and benefits (materials, products and environmental protection);
- Includes links to more detailed approaches, methodologies, data sources; and
- Normalizes the indicators to facilitate comparison across products, companies, countries and time.

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9 OECD has reviewed these approaches in terms of their applicability to sustainable materials management. See: http://www.olis.oecd.org/olis/2007doc.nsf/linkto/env-epoc-wgwpr(2007)5-final. A summary of the methodologies reviewed is included in Table 2 in the Annex. The study concludes that a combination of these is required to "gain the most comprehensive picture of social, economic and environmental impacts across the lifecycle of materials".

The core indicators are:

- **Infrastructure indicator**
  A1. Percent of land occupied that is "natural cover"
- **Materials indicators**
  B1. Recycled content of material inputs
  B2. Renewable proportion of energy consumed
  B3. Non-renewable materials intensity of production
  B4. Water intensity
- **Process indicators**
  C1. GHG intensity
  C2. Energy intensity
  C3a. Waste intensity (mass balance approach)
  C3b. Waste intensity (total waste approach)
  C4. Intensity of pollutant releases to air
  C5. Intensity of pollutant releases to water
- **Product indicators**
  D1. Recycled content of products
  D2. Recyclability of products
  D3. Renewable materials content of products
  D4. Restricted substances content of products
  D5. Annual energy consumption
  D6. Annual GHG production
  D7. Non-renewable materials intensity over product lifetime (product mix)

To calculate these indicators, a company is guided through the processes of mapping a facility, dividing it into distinct production processes (including one for overhead), listing which inputs are used for each process and what the outputs are. This establishes the basis for compiling 44 data items, some of which are repeated for each material (such as weight and energy content), each energy source (such as quantity consumed and energy content) and product (such as weight and expected lifetime). Financial information such as the costs of materials and the value of the products are also included to facilitate the calculation of value added for normalization and as input to the financial analysis.

A simple spreadsheet is provided to guide the company through data entry, calculation of the indicators and financial analysis.

The core indicators establish one “environmental performance scenario”. Moving the facility from one scenario to another one that improves environmental performance involves costs and benefits of making the change. Some of the costs and benefits (such as increasing the recycled content of materials used may be less expensive than using virgin materials) are already captured by the data used to calculate the core indicators. Other elements, such as compliance costs or additional labour costs can be added and included in the financial analysis.

The toolkit also provides additional indicators at the product and process level to assist in interpretation and setting priorities for change. For example: these indicators show which product, material or energy source is contributing most to GHG intensity. For a given product, they also show whether the greatest contribution to energy intensity is coming from materials, production or use.

Future development

If you have used the toolkit, we would like to hear about your experience and results. Your feedback will be taken into account when we finalize the document for mid-2010.

Further background information on the project is available on the OECD website:
www.oecd.org/sti/innovation/sustainablemanufacturing.