

## **HISTORY AND DEFINITIONS OF ECO-EFFICIENCY**

### **Definitions of eco-efficiency**

#### ***ISO/DIS 14045***

The ISO/DIS 14045 states: “Eco-efficiency is a quantitative management tool that enables the consideration of life cycle environmental impacts of a product system alongside its product system value to a stakeholder”.

#### ***World Business Council for Sustainable Development (WBCSD)***

WBCSD defines eco-efficiency as: “Eco-efficiency is achieved by the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the Earth’s estimated carrying capacity.” In short, it is concerned with creating more value with less impact.

The following three objectives are defined by the World Business Council for Sustainable Development (WBCSD) regarding Eco-efficiency.

- Reduce the consumption of resources. The material and energy consumption should be reduced through enhancing recyclability. Producing products with higher quality and longer life times may also lead to improvements within the area.
- Reduce the impact on nature. Improvements can be performed using renewable resources which are sustainably managed, as well as minimizing emissions, waste disposal, and toxic substances.
- Provide customers with higher quality products and services. The customer benefit can be improved through providing the user additional services of the product such as e.g. functionality or/and increased overall life time. It is however important that higher customer benefit must not interfere with the two former objectives.

#### ***Organisation for Economic Co-operation and Development (OECD)***

The OECD has called eco-efficiency “the efficiency with which ecological resources are used to meet human needs” and defines it as a ratio of an output (the value of products and services produced by a firm, sector, or economy as a whole) divided by the input (the sum of environmental pressures generated by the firm, the sector, or the economy).

### **European Environment Agency (EEA)**

The European Environment Agency defines eco-efficiency as “A concept and strategy enabling sufficient delinking of the ‘use of nature’ from economic activity needed to meet human needs (welfare) to allow it to remain within carrying capacities; and to permit equitable access and use of the environment by current and future generations” – more welfare from less nature” (see Figure 1)

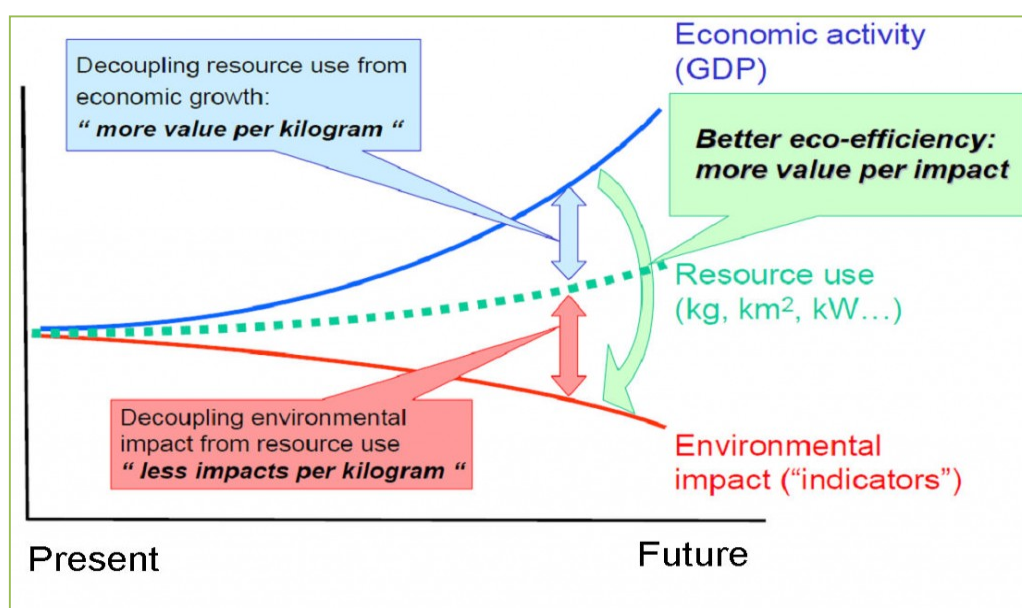


Figure 1

**Academic experts** and **practitioners** term eco-efficiency the synthesis of “economic and environmental efficiency in parallel”.

### **Differences between the definitions**

There are two main differences between the definition of Eco-efficiency used by EEA and businesses, and the original definition by the WBCSD:

1. There is no absolute but a relative reference in the EEA used by businesses. This means that products are compared to each other and not to the carrying capacity of the earth.
2. There are also no normative elements in this definition of EEA (Huppel and Ishikawa 2005). Therefore, an EEA can never say which production method is good or bad for the environment or economy, only whether it is better or worse.

## **History of eco-efficiency concept**

Although the term “eco-efficiency” has been in use for more than a decade, it has only been embraced by the wider business community in the past couple of years. The following timeline identifies key events and drivers towards the emergence, acceptance, and implementation of eco-efficiency.

### ***1962 Silent Spring***

Publication of Rachel Carson’s inflammatory book on the chemical industry which highlighted important questions about humankind’s impact on nature. This book raised awareness of the role of businesses and provided a launch pad for the environmental movement.

### ***1972 Limits to Growth***

This publication issued a strong warning that economic growth was using up resources at an unsustainable rate and the limits to growth of the planet would be reached within the next 100 years. Challenging conventional wisdom of the time, the Club of Rome predicted this would result in a sudden and uncontrollable decline in both population and industrial capacity. While the study was highly criticized, it nonetheless initiated serious dialogue on the Earth’s carrying capacity and highlighted the possibility to alter these growth trends in order to establish a condition of ecological and economic stability that is sustainable far into the future.

### ***1972 UN Conference on the Human Environment***

Leaders from industrialized and developing nations convened at the UN Conference on the Human Environment in Stockholm, Sweden, in order to delineate the “rights” to a healthy and productive environment. At that time the focus for companies was largely on environmental protection by complying with legislation.

### ***1975 Pollution prevention***

Pollution prevention shifted emphasis from “controlling” pollution once it has been created to “preventing” its creation in the first place. The US manufacturer 3M was instrumental in developing the concept with its “Pollution Prevention Pays”, a program implemented in 1975 to eliminate pollution at source. They achieved more than 800 million \$ in cumulative first-year savings.

### ***1980s Environmental movement***

The environmental movement grew as consumers became more conscious of the environmental impacts of the products they were buying. In 1984, a poison gas leak occurred at a Union Carbide pesticide factory in Bhopal, India, and the roles and responsibilities of business were questioned by society.

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***1987 The Brundtland Report, Our Common Future***

This seminal report from the World Commission on Environment and Development examined the world's environmental and development challenges and how to solve them. A call to action, the book prescribed interaction between governments and the need for a common approach.

***1989 Cleaner production***

The United Nations Environment Programme (UNEP) formalized the concept of cleaner production, and defined it as “the continuous application of an integrated preventive environmental strategy applied to processes, products and services to increase eco-efficiency and reduce risks to humans and the environment”. This focus became somewhat more proactive as business embraced the concept of pollution prevention via cleaner production, not necessarily regulation-driven control. Governments began to work more cooperatively with companies rather than by command-and-control regulation.

***1991 The WBCSD***

The Business Council for Sustainable Development (BCSD) – now the World BCSD, WBCSD – first used the term eco-efficiency in 1991. This concept established the link between environmental performance and economic benefits. Stephan Schmidheiny and the BCSD took the concept worldwide through a publication entitled Changing Course. Having coined the phrase eco-efficiency, the WBCSD went on to host a number of dialogues, workshops and publications.

***1992 UN Conference on Environment and Development, Rio***

Heads of state met for the first international Earth Summit to address urgent problems of environmental protection and socio-economic development. Agenda 21, a plan for achieving sustainable development in the 21st century, was adopted.

The term “sustainable development” reflected increasing focus on the development agenda and was embraced through the work of the World Commission on Environment and Development (Our Common Future in 1987). The 1992 Earth Summit endorsed eco-efficiency as a means for companies to implement Agenda 21 in the private sector, and the term has become synonymous with a management philosophy geared towards sustainability. In addition to eco-efficiency, companies began to address corporate social responsibility (CSR) and how company operations affect society in general.

***1994 Declaration of the Factor 10 Club***

The limited physical carrying capacity of the Earth became more accepted with clear targets, and more concrete solutions: eco-efficiency and innovation as tools to unlink economic growth from physical growth. The Factor 10 Club, as an international body of senior government,

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nongovernment, industry, and academic leaders called for the adoption of a factor ten increase in energy and resource productivity in developed countries, while reducing the total use of natural resources globally. It asked for an absolute unlinking of economic growth from the use of natural resources.

***1998 Factor four***

“Factor four” was introduced in 1998 by the Rocky Mountain Institute. It refers to a hypothetical fourfold increase in “resource productivity”, brought about by simultaneously doubling wealth and halving resource consumption. It goes on to illustrate technologies that can deliver the necessary improvements.

***2002 World Summit***

The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio principles, were reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002.

***2004 First International Conference on Eco-efficiency (Leiden)***

Eco-efficiency For Sustainability: Quantified Methods For Decision Making, April 2004, Leiden Netherlands. This conference has been focused on identifying operational methods for quantified eco-efficiency analysis that can guide decision making towards societal eco-efficiency, contributing to sustainability. Participants represented a range of subject areas, from economics to environmental science, social choice theory, and evaluation and decision theory, and from applications involving sustainability decision makers in research and development, eco-design, business, and politics.

***2006 2<sup>nd</sup> Second International Conference on Eco-Efficiency ( Egmond aan Zee)***

In June 2006 the Second International Conference on Eco-Efficiency in Egmond aan Zee, Netherlands, on the theme Quantified Eco-Efficiency Analysis for Sustainability and building on the First International Conference in 2004, has further developed understanding of the concept of eco-efficiency, how it is being implemented in industry, and what policies are most effective in promoting it.

***2010 The 3<sup>rd</sup> International Conference on Eco-Efficiency (Egmond aan Zee)***

The 3<sup>rd</sup> International Conference on Eco-Efficiency in June 2010 (Egmond aan Zee, Netherlands). Modelling and Evaluation for Sustainability: Guiding Eco-Innovation and Consumption.



## Leonardo da Vinci

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#### **Sources:**

Eco-efficiency conference, <http://www.eco-efficiency-conf.org/>

EPA (US Environmental Protection Agency), <http://www.epa.gov/>

European Environment Agency (EEA), <http://www.eea.europa.eu/>

Five Winds International, <http://www.fivewinds.com>

*Huppes, G.; Ishikawa, M.*, 2005: Eco-efficiency and its Terminology. In: Journal of Industrial Ecology 9/4 (2005), pp. 43-46

ISO (International organization for Standardization),  
[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=43262](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43262)

Tosca Sustainability Framework, <http://www.tosca-life.info/>

UNEP (United Nations Environment Programme), <http://www.unep.org/>

World Business Council for Sustainable Development (WBCSD),  
<http://www.wbcsd.org/templates/TemplateWBCSD5/layout.asp?MenuID=1>