Resource Efficiency

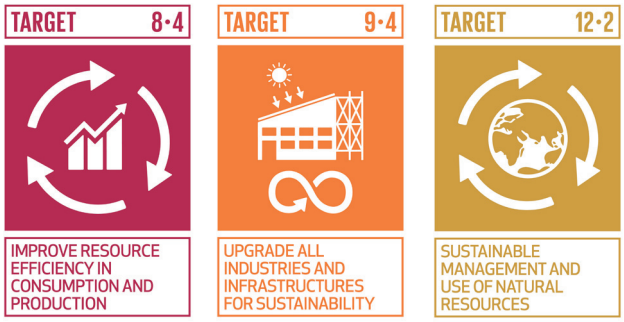
A crucial approach for achieving sustainable development

1

Increasing economic growth while decreasing environmental impacts

The accelerating rise in the resource use that we are currently experiencing is a key driver of a wide range of interrelated social, economic and environmental challenges that will continue to intensify if no measures are taken. Resource efficiency yields environmental, economic and social benefits.

Substantial increases in resource efficiency are vital for achieving "the future we want" captured in the 17 Sustainable Development Goals (SDGs) of 2030 Agenda[1]. In fact, twelve SDGs depend directly on the sustainable use of resources[1], with resource efficiency being explicitly addressed in Targets 8.4, 9.4, and 12.2.



Resource efficiency has many benefits for the economy, for innovation and for jobs. There is strong evidence that increasing resource efficiency can yield higher economic growth and employment, foster innovation and improve the competitiveness of countries and companies that apply such measures[1]. An analysis of opportunities in resource efficiency reveals that over US$ 2 trillion of annual benefits could enter the global economy by 2030 from taking action in just fifteen fields, including e.g. energy efficiency in buildings, yields in large-scale farms and food waste[2]. According to the same study, the US$ 900 billion of investment needed for implementing such measures could potentially create 9 million to 25 million jobs. Over the longer term, this could also result in reduced resource price volatility, which encourages investment in long-term innovation[2].

Acting on resource efficiency leads to a reduction in environmental impacts such as emissions of greenhouse gases (GHG) which makes it a critical measure for achieving the goals set in the Paris Agreement cost-effectively[1]. For instance, extracting metal ores goes frequently together with the loss of vital ecosystem services. At the same time, the mineral content in ores is going down worldwide. Extracting and processing them requires therefore ever-increasing amounts of energy. Consequently, reducing the demand for mineral raw material leads to a reduction in GHG, next to other environmental benefits.

2

Key Concepts in Resource Efficiency

Resource efficiency is a widely applied concept and there are various definitions. The present document refers to the definitions provided by the International Resource Panel (IRP), an independent scientific panel hosted by UN Environment. Under this understanding, resource refers to natural resources and not to other types such as human or financial resources[12].

Resource Efficiency

- Broadly speaking, it denotes how "effectively" economic activities convert natural resources into useful material products or economic output[3] and reduce the associated impacts on the environment[1].

Published by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

BOX 1

Natural Resources and Raw Materials

Natural Resources

Natural resources refer to the aspects of the natural world that have the capacity to produce goods and services that contribute to human welfare[1]. In the broadest sense, these are: air, water, land, biodiversity and ambient energy[1]

The term refers to resources prior to their extraction or processing by humans.

Raw Materials

Raw materials are basic substances or mixtures of substances in an untreated state except for extraction and primary processing. In the broadest sense, these are: metal ores, non-metallic minerals, fossil fuels and biomass.

Secondary raw materials are derived from manufactured goods as they are turned into waste[4].

BOX 2

Resource Efficiency and related concepts

Resource efficiency is only one among many terminologies which share the common goal to reduce the demand for natural resources and the materials derived from them[5]:

Circular Economy (CE): represents an economic model that closes the loops of material cycles. It aims to maintain the utility of products, components and materials, and retain their value[6] (used for example in the EU).

3R's: refers to the principles of reducing waste, reusing and recycling resources and products[7] (used for example in Japan).

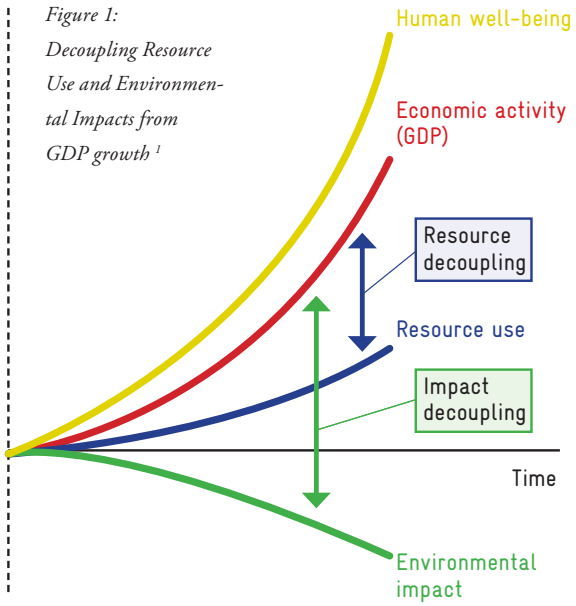
Sustainable Material Management (SMM): implies a systemic approach to using and reusing materials more productively over their entire life cycle[8] (used for example in the USA).

Sustainable Consumption and Production (SCP): Various countries have developed programmes in this area. The 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP) supports the shift towards SCP in developed and developing countries[9].

- The three core components of resource efficiency are: *technical efficiency* (ratio of material output per input), *resource productivity* (economic output or value added per unit of material input) and *environmental intensity* (environmental pressure per unit of value added)[1]
- Increasing resource efficiency aims to decouple economic growth and human well-being from resource use and environmental impacts (Figure 1)

  On the macro-economic level, the term decoupling serves to describe a situation in which resource use, or environmental pressure, either grow at a slower rate than the economic activity that is causing them (relative decoupling) or decline in absolute terms while the activity continues to grow (absolute decoupling).

Figure 1: Decoupling Resource Use and Environmental Impacts from GDP growth [1]



Source: UNEP (2011b), Figure 1, p.xiii.

3

Enhancing resource efficiency: national policy approaches and good practice in business

Potential for enhancing resource efficiency exists throughout the entire life-cycle: Resource efficiency gains can be yielded in the extraction of raw materials, in product design, throughout the production process, during the consumption phase associated to its use and finally, in the waste management and use of waste as a secondary raw material.

Macro-level

- At the national level, some countries have already developed programmes with concrete goals for increasing resource efficiency. For instance, Germany adopted a national Resource Efficiency Programme (ProgRess) for the first time in 2012, which aims to decouple economic growth and resource use[10] (see Box 3). The Indian Resource Panel, formed in 2015, is providing its government with the required advice in order to develop an Indian Resource Efficiency Programme[11]. China has included "circular development" as an important element in its 13th Five-Year Plan (2016-2020)[12]. Moreover, Mexico has developed a Special Programme on Sustainable Consumption and Production for 2014-2018.

- Achieving resource efficiency goals requires a mix of policy instruments, which should be adapted to the country's specific conditions. Economic policy instruments should effectively internalise the environmental costs, systematically reduce the environmental burden and provide coherent incentives for efficient resource use. According to OECD[13], the main types of instruments available to policy makers are: economic instruments, regulations, information based approaches, voluntary approaches, and public financial support.

- Ultimately, as estimations show, developing ambitious policies in both resource efficiency and climate protection has many benefits: it can lead to an increase in macroeconomic growth, an improvement in the cost competitiveness of businesses, a reduction in resource dependency as well as the strengthening of trade balances in many net resource-importing economies[1, 2].

Micro-level

- Next to macro-economic benefits, resource efficiency also provides many benefits on the micro-economic level. Companies can profit from resource efficiency enhancing measures to strengthen their economic situation and to become less vulnerable to supply shortages and volatile raw material prices. This is especially the case for manufacturing industries. The German Centre of Resource Efficiency (VDI-ZRE) has identified four sets of successful measures for resource efficiency. These are (1) improvement of internal processes, (2) changes in production, (3) technology change, and (4) resource efficiency as a holistic process[14].

- Next to manufacturing industries, other sectors of the economy have a particular potential for implementing measures enhancing resource efficiency and profit from it. Among the sectors where the IRP report has identified best practices are the following[12]:

BOX 3

The German Resource Efficiency Programme (ProgRess)[10]

Background

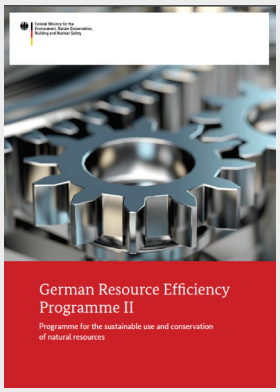
The first German Resource Efficiency Programme has been adopted by the Federal Government in 2012. It is reviewed and updated every four years. ProgRess II was adopted in 2016.

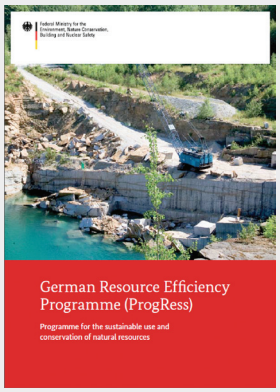
Focus

ProgRess focuses only on abiotic raw materials, excluding fossil fuels used for energy production and including biomass used as a material. It covers the entire value chain and defines ten action areas with corresponding policy approaches (123 in total)

Targets

Germany has set itself ambitious targets in ProgRess: To double raw material productivity of domestic production by 2020, compared to 1994. Germany seeks to continue the trend in total raw material productivity from 2000–2010 until 2030.





- Heavy industry, for instance of iron and steel
- Solid waste management
- Urban development
- Food systems
- Mobility
- Electricity systems

For some examples of measures that companies can implement to enhance resource efficiency, see for instance the website of the German Centre for Resource Efficiency (www.resource-germany.com) or the Central European Resource Efficiency Atlas (www.resourceefficiencyatlas.eu).

Photos: Resource Efficiency is found in all parts of the life cycle of products and services, for example in the extraction of raw materials (front page right), in agricultural production (front page left), as well as in the reuse (top left), and recycle (top right) of manufactured products.

Sources

1) UNEP (2017) Resource Efficiency: Potential and Economic Implications. A report of the International Resource Panel. Ekins, P., Hughes, N., et al.

2) Dobbs, R.; Oppenheim, J.; Thompson, F.;Brinkman, M.; Zornes, M. (2011). Resource Revolution: Meeting the world's energy, materials, food, and water needs. McKinsey Global Institute, McKinsey Sustainability & Resource Productivity Practice.

3) European Environment Agency (1999) Making sustainability accountable: Eco-efficiency, resource productivity and innovation. Moll, S. & Gee, D. EEA. Copenhagen.

4) Eurostat (n.d.). Raw Materials. Retreived from http://ec.europa.eu/eurostat/web/environmental-data-centre-on-natural-resources/natural-resources/raw-materials

5) OECD (2017) The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches, p.8

6) European Environment Agency (2016). Circular Economy in Europe: Developing the Knowledge Base. Publications Office of the European Union. Luxembourg

7) Ministry of the Environment of Japan (2005). Japan's Experience in Promotion of the 3Rs For the Establishment of a Sound Material-Cycle Society. Retreived from http://www.env.go.jp/recycle/3r/en/approach/02.pdf

8) United States Environmental Protection Agency (n.d.). Sustainable Materials Management. Retreived from https://www.epa.gov/smm

9) SDKP (n.d.) Sustainable Consumption and Production. Retrieved from https://sustainabledevelopment.un.org/topics/sustainableconsumptionandproduction

10) Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) (2012). German Resource Efficiency Programme II. BMUB, Division WR III 1. Berlin

11) TERI; GIZ; Adelphi Consult GmbH; Development Alternatives; IFEU; VDI ZRE (2017) Recommendations for an Indian Resource Efficiency Programme (IREP): A Guiding Document for Policy Makers by the Indian Resource Panel. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. New Delhi

12) Jinhui Li (2016) Seventh Regional 3r Forum In Asia and The Pacific, 2-4 November, 2016, Adelaide, SA, Australia – Role of Circular economy in achieving SDGs: Case of China. United Nations Centre for Regional Development.

13) OECD (2016), Policy Guidance on Resource Efficiency, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264257344-en

14) VDI ZRE (2016) Competitive Advantage: Resource Efficiency – Definitions, Basics, Facts and Examples. 3rd Edition. VDI ZRE. Berlin. Retrieved from https://www.resource-germany.com/fileadmin/user_upload/downloads/en/VDI-ZRE-competitive-advantage-resource-efficiency.pdf

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Address
Köthener Straße 2-3, 10963 Berlin, Germany
I www.giz.de

Project:
Initiative Resource Efficiency and Climate Action

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Responsible/contact:
Elisabeth Dürr
E elisabeth.duerr@giz.de

Authors:
GIZ: Detlef Schreiber, Elisabeth Dürr, Michael Funcke-Bartz,
Ariel Araujo Sosa

Design/layout:
Additiv. Visuelle Kommunikation, Berlin

Photo credits:
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Berlin, 2018