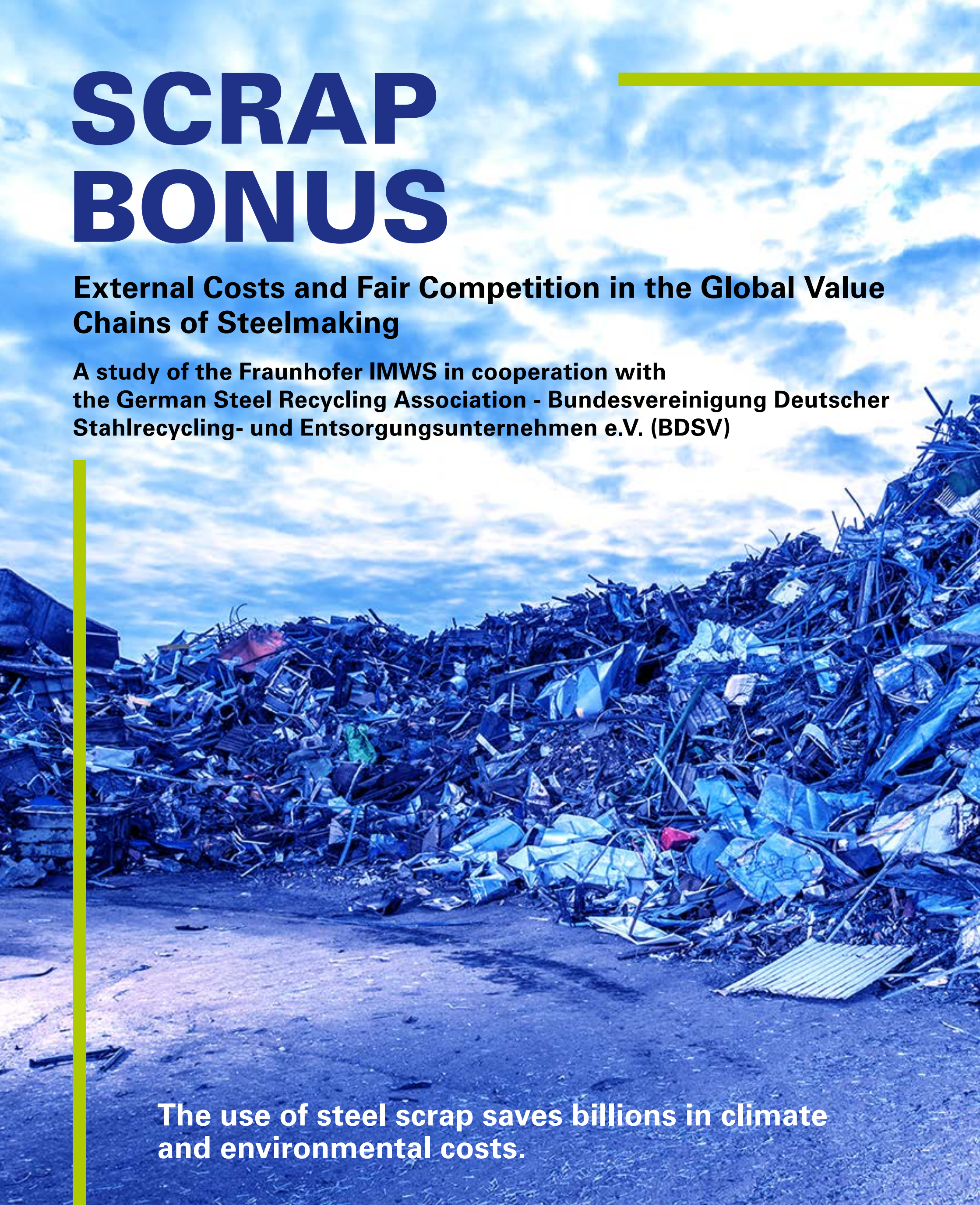

SCRAP BONUS

External Costs and Fair Competition in the Global Value Chains of Steelmaking

A study of the Fraunhofer IMWS in cooperation with the German Steel Recycling Association - Bundesvereinigung Deutscher Stahlrecycling- und Entsorgungsunternehmen e.V. (BDSV)

The use of steel scrap saves billions in climate and environmental costs.

BEST IN SCRAP
BDSV. THE steel scrap association.

BDSV

Study scrap bonus: mission and motivation

The use of scrap as a raw material in steel production reduces greenhouse gas emissions significantly, avoids local environmental pollution and conserves exhaustive resources. The use of scrap makes a decisive contribution to climate protection. The study aims to promote knowledge and understanding of these extraordinarily positive effects which are largely unknown in politics and the public.

Scrap is an essential raw material in steel production. In 2018, 93.8 million tons of high-quality scrap (D: 19 million tons) were melted in the European Union to produce new steel. This corresponds to about half the raw material input (EU: 56 %; D: 44 %). This scientific study illustrates the positive contribution of using scrap in steel production to current megatrends such as climate protection policy and circular economy concepts.

„The positive effects of scrap use should be integrated into the price mechanism. Otherwise, the threats of external effects and inefficiencies are impending.“

Project goal and structure: the three work packages

Work Packages

1. Technical and Economic Foundations
2. Scrap Bonus: Concept and Quantification
3. Options for the Internalization of the Scrap Bonus

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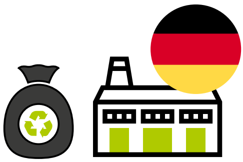
Recommendations to Policymakers

Scrap: A high-quality and climate-friendly raw material



1 t Scrap =
1,67 t CO_2 savings

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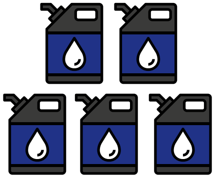

CO_2 emissions
equivalent to 705 l gasoline

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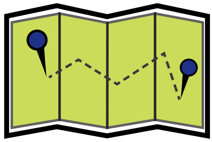


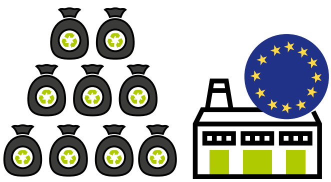
Distance of 9.000 km:
Berlin to Beijing

CO_2 savings due to steel scrap use in detail and comparison

The use of scrap in steel production replaces primary raw materials, in particular iron ore and coke but also alloying elements such as chromium and nickel in stainless steel. Emissions of 1.67 t CO_2 (for stainless steel scrap: 4.3 t CO_2) are saved by one ton of steel scrap. This amount of CO_2 is released when around 700 liters (stainless steel scrap 1,800 liters) of gasoline are burned. An average passenger car can travel about 9,000 km (respectively 23,000 km) with this fuel.

In 2018, steel mills in the European Union used around 93.8 million tons of scrap. Assuming conservatively that these were exclusively carbon steel scrap, this corresponds to a saving of 157 million tons of CO_2.

„The CO_2 savings in the EU through the use of steel scrap correspond to the emissions caused by automobile traffic in France, Great Britain and Belgium combined.“



93.8 Mio. t scrap used in the EU =
157 Mio. t CO_2 savings (2018)

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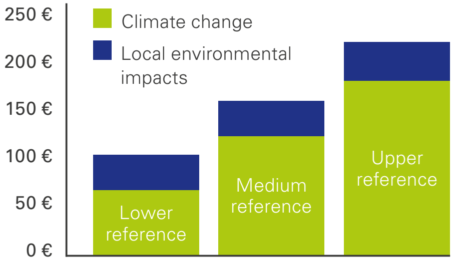
CO_2 emissions caused by all automobile traffic in
France, Great Britain and Belgium combined

Scrap bonus: concept and quantification in euro

Scrap bonus: concept and quantification in euro



The scrap bonus represents the welfare gains associated with the use of one ton of scrap in steel production. To this end, environmental damages avoided are converted into monetary units.

The quantification is based on studies on the costs of environmental pollution (climate change and local environmental impacts). Three scenarios are derived for CO_2 emissions: Climate costs of 30, 70 and 110 euro per ton of CO_2.

This takes into account the complexity and uncertainties of the current state of science. Avoided costs of local environmental pollution are estimated at 29 euro per ton of steel scrap. The scrap bonus of carbon steel is quantified at values up to 213 euro. A scrap bonus of up to 502 euro is achieved by using one ton of stainless steel scrap.

„The use of steel scrap saves billions in climate and environmental costs.“

Yearly savings of environmental costs by using steel scrap in Germany and Europe

Germany

up to 4 billion Euro (2018)

Europe

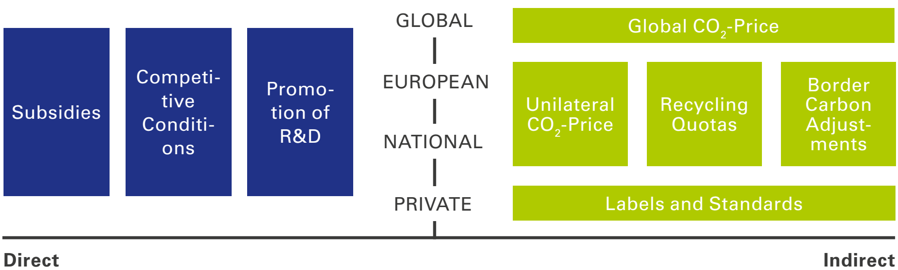
up to 20 billion Euro (2018)

Results and consequences: incorporating the scrap bonus in the price mechanism

The market does not adequately reflect the environmental benefits stemming from the use of scrap. Particularly in developing and emerging economies, the environmental impacts avoided by the use of scrap are not sufficiently priced. Integrating the scrap bonus into the price mechanism is economically recommendable. The following instruments are suitable: Globally coordinated pricing of CO_2 would be optimal, but is not achievable in the short and medium term. At present, only European or national solutions, such as the development of an integrated concept for the decarbonization of the European steel sector while ensuring competitiveness and the correction of CO_2 prices, can help. At the private level, labels and standards can promote awareness among consumers. Indirect measures include promotion of research and development as well as better competitive conditions for the steel and steel recycling industry, e.g. the urgently needed improvement of railway infrastructure.

„Avoiding environmental pollution must be rewarded.“

Instruments for the implementation of the scrap bonus



Technical and economic foundations

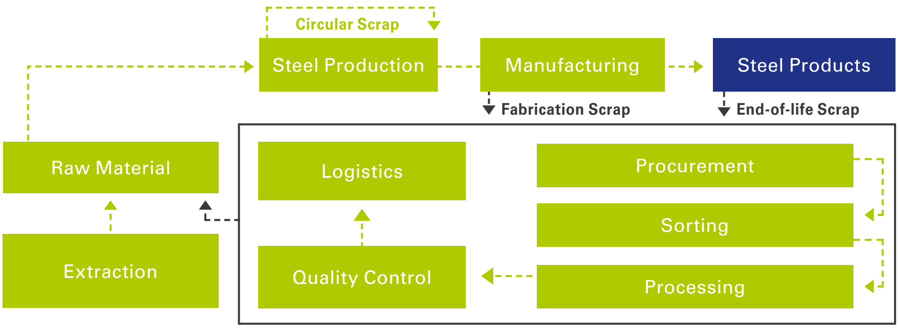



Steel is produced from both ores and scrap. It is used primarily to manufacture durable consumer and capital goods. Steel can be recycled indefinitely without loss of quality. The steel used in machinery, vehicles or buildings is also referred to as the in-use stock of steel. If the products made of steel and stainless steel are no longer used, they drop out of the in-use stock and can be employed again as raw materials.

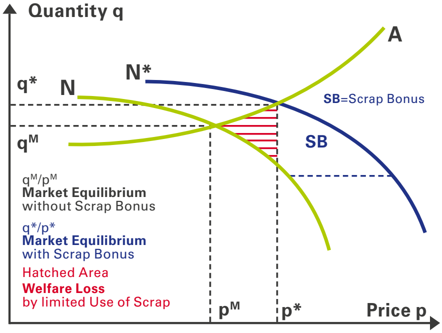
The steel recycling industry makes this sustainable, „regenerative“ source of raw materials accessible („Urban Mining“): it procures scrap, bundles material flows and processes them. It ensures the quality of the scrap, both in terms of its mechanical properties and its chemical-metallurgical composition.

„Steel can be recycled any number of times without any loss of quality.“

Steel recycling shows the way for a circular economy in action



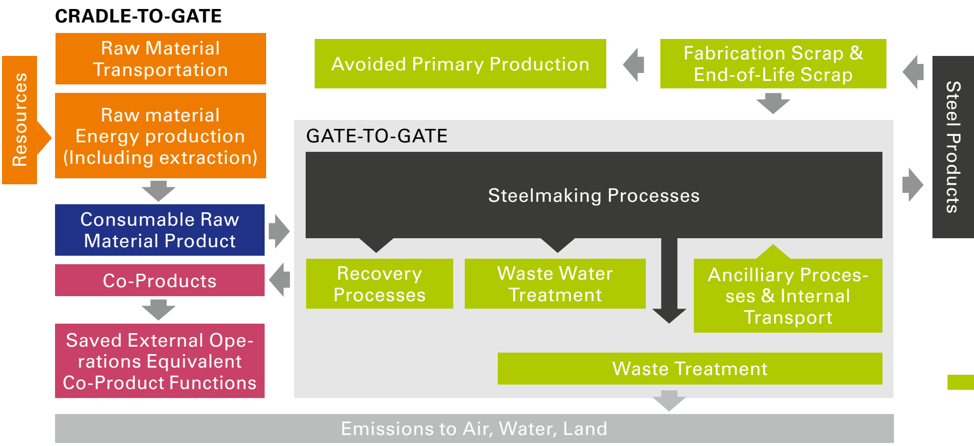
Research methodology



The environmental impacts of steel production – and its reduction through the use of scrap – have an economic dimension. Economists denote those effects on uninvolved third parties that are neither compensated for nor included in economic decisions externalities.

For better understanding, an economic supply and demand model of the scrap market was used, taking into account external effects and welfare losses. Environmental impacts avoided were quantified on the basis of life cycle assessments from the research literature. These calculate the emissions from steel production along the value chain, from the mine to the steelworks´ gate. Thereby, they determine the emissions avoided by the use of scrap.

„The use of scrap avoids emissions along the entire value chain of steel production.“



German Steel Scrap Assocation - Bundesvereinigung Deutscher Stahlrecycling- und Entsorgungsunternehmen e.V. (BDSV)

The BDSV represents the interests of German companies and companies operating in Germany, that are active in the areas of steel recycling and waste disposal services. It is the largest steel recycling association in Europe. The focus of the association are the economic and ecological framework conditions of the recycling industry. The association stands for the preservation of the environment and the conservation of raw material reserves. However, the ecological goals must be translated into an economically realistic and competitive environment.

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The central challenge facing humanity in the 21st century is sustainability in all areas of life, especially the efficient use of exhaustible raw materials. The Fraunhofer Institute for Microstructures of Materials and Systems IMWS conducts applied research in the field of material efficiency. It is a driving force, innovator and problem solver for industry and public clients in the fields of reliability, safety, durability and functionality of materials in components and systems. Its core competencies are in the field of characterization of materials down to the atomic scale and in material development.

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