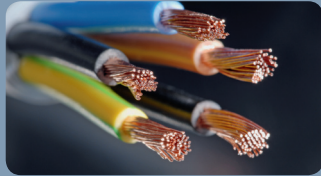




International Panel
for Sustainable
Resource Management



Assessing Global Metal Flows –

METAL STOCKS IN SOCIETY AND RECYCLING RATES

Economic development is deeply coupled with the use of metals, but the growing demand implies a permanent pressure on the resource base. The growing metal stocks in our society can serve as huge mines above ground. Recycling is a way to mitigate negative impacts on increasing metal demand and to assure the potentials of economic growth. In its first two metal reports, “Metal Stocks in Society: Scientific Synthesis” and “The Recycling Rates of Metals: A Status Report”, UNEP’s International Panel for Sustainable Resource Management addresses the issue of mines above ground.

Economic Development and Metal Use

Economic development is deeply coupled with the use of metals. During the 20th century the variety of metal applications in society grew rapidly. Beside mass-applications like steel in buildings and aluminium in planes, more and more different kinds of metals are in use for innovative technologies like the specialty metal indium in LCD screens. Metals are present everywhere around us and are one of the major materials upon which our economies are built. While there are endless applications for metals, it becomes obvious that there are four dominating fields of application: building and construction, transport, electrical and electronic equipment, and jewellery. In particular in emerging economies, but also in industrialized countries, the demand for metals is increasing. Therefore, mining activities expand, leading potentially to growing environmental impacts. Recycling is a way to mitigate these impacts. For instance, the largest

municipal park in China is capable of recycling one million tons of copper per year. The largest copper mine in China produces less than half of that. We can call this “mines above ground” or “urban mining”, such is their importance in generating raw materials. Hence, strengthening the recycling of metals is needed.

Metal Stocks in Society

The continued increase in the use of metals over the 20th century has led to a substantial shift in metal stocks from below ground to the applications in society above ground. Such a shift raises social, economic, and environmental issues that have to be addressed by quantifying the amount of metal stocks in society and their lifetime. For instance the average lifetime of copper in a building is 25 to 40 years afterwards the metal is ready for mining.



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The in-use stock of copper has grown in the US from 73 to 238kg per capita (from 1932 to 1999). The world average is 50kg per capita (2000). Comparison of the per capita stocks in industrialized countries with those in developing countries suggests that if the total world population were to enjoy the same levels as the industrialized countries, the amount of global in-use metal stocks required would be 3–9 times those existing at present. The report provides reasonably detailed information of the in-use stocks for five metals, and sparse but potentially useful information for nineteen other metals. Closing the information gaps about stocks in human society provides important information about the potential of metal recycling to supply future demand. The utilization of these growing metal stocks through recycling is expected to be an important source for future metal supply.

Recycling Rates of Metals

Metals possess the advantage that they are inherently recyclable. So they can, in principle, be used over and over again and thus save energy and minimize negative environmental impacts in contrast to the mining of virgin material.

The report defines various metrics for the recycling of metals, discusses relevant aspects of recycling processes, and presents current information on different types of recycling rates. The working group states that for only a limited number of metals such as iron and platinum, the end of life recycling rate is above 50%.

UNEP's Resource Panel was established to provide independent, coherent and authoritative scientific assessments of policy relevance on the sustainable use of natural resources and, in particular, their environmental impacts over the full life cycle. It aims to contribute to a better understanding of how to decouple economic growth from environmental degradation.

Despite the often low recycling rates, there is significant potential for improvement. Opportunities for improving recycling are presented and their implementation will support the establishment of a circular economy.

Lessons and Urgent Issues

The growing metal stocks in our society can serve as huge mines above ground. Exploiting this potential can contribute to the reduction of the extraction of metals from primary sources. This would contribute to decoupling of resource use from economic growth. However, there are considerable data gaps regarding the size of these metal stocks and their recycling potential. These gaps have to be filled. The recycling rates of many metals are low. Open material cycles are typical for consumer goods like cars and electronics. Therefore, these product groups need special attention. Recycling rates are very low for specialty metals like lithium for which an appropriate recycling infrastructure still has to be developed. This development needs to be supported by policy instruments such as research and development, economic incentives and capacity building activities. Tapping the full potential of mining above ground and closing of material cycles with appropriate global infrastructure are essential to establish a green economy and to secure sustainable development.

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The Global Metal Flows Group is promoting the recycling of metals and the establishment of a circular economy by a series of 6 assessment reports: stocks in society, recycling rates, environmental impacts, geological stocks, future demand and critical metals.