How metals determine our lives

From 1980 until 2008 global metal demand increased by 87% up to more than six billion tonnes.

Trends suggest that if the populations in fast growing economies are going to use a similar suite of technologies and lifestyles, global in-use metal stocks required would be 3-9 times those existing at present.

LIFE CYCLE OF METALS

Environmental impacts related to metal flows

- Air pollution: e.g. Greenhouse gas emissions are generated during production of various metals, including copper, aluminium, nickel and zinc.
- Land degradation: e.g. Land clearing, and severe land degradation due to large scale expansion of mining activities.
- Impacts on local ecosystems due to open pit and mine waste.
- Biodiversity loss: e.g. Loss of species, Degradation of landscapes and ecosystems.
- Water pollution: e.g. Large consumption in mining and production, non-ambient groundwater and surface water resources, Direct discharge of wastewaters, etc.
- Erosion: e.g. Loss of species, Degradation of landscapes and ecosystems.
- Impact on human health: e.g. Metals enter the food web via plant uptake, Bio-accumulation may lead to a high toxicity to animals and humans on the top of the food chain.

Recycling Chain

All steps in the recycling chain are relevant for the overall recovery efficiency.

Recycling is an Opportunity

Energy savings for secondary compared to primary production are reported to range from 60-75% for steel and over 90% for aluminium.

Mass-based recycling targets often neglect electronic components. However, they contain specialty and precious metals. Their recovery should be increased. Recycling targets should be refined using a Product-Centric approach.

Policy options for sustainable metal management

- Reduce impact of mining by greening the global primary metal sector:
  - Define environmental impact assessment and monitoring in all phases.
  - Strengthen advanced mining concepts and the use of best available technology (BAT) through multilateral agreements.

- Support sustainable productions:
  - Conduct Life Cycle Assessment (LCA) as an essential strategy of sustainable metals management.
  - Support recycling-friendly product design.
  - Enhance technology for internal and recycling-related production through implementation of green technologies.
  - Improve access to emerging metal producers in emerging economies.

- Support enabling framework:
  - Enhance government support for data acquisition and analysis, recycling technologies research, and other research, and development efforts in this priority.
  - Introduce appropriate legislative framework and sustainable improvement of legislative systems.
  - Increase consumer awareness.
  - Promote recycling as key to sustainable metals management.
  - Promote recycling based on best available technology (BAT).
  - Boost technological capacity and infrastructure on recycling and recycling rates.
  - Promote higher end-of-life recycling rates of metals by supporting the development of necessary infrastructures, especially optimized collection schemes.

- Improve recycling infrastructure and technology in many developing countries.

Product-Centric Approach

How can we use a product as a resource?

The Product-Centric approach takes the multi-material composition of modern products into account.

Limits of Recycling

- Lack of basic recycling infrastructure and technology in many developing countries.
- New and complex applications of metals at mass production scales.
- Too much valuable metal today is lost because of imperfect collection of end-of-life products.

Drivers of the demand for metals

- Building-up of infrastructure
- Electronic revolution
- Shift towards renewable energy technologies

Results of the demand for metals

- Declining ore grades
- Resource scarcity and price hikes
- Environmental impact