Open pit mining requires huge amounts of unused extraction.

FACTSHEET MEASURING RESOURCE EXTRACTION

SUSTAINABLE RESOURCE MANAGEMENT NEEDS TO CONSIDER BOTH USED AND UNUSED EXTRACTION

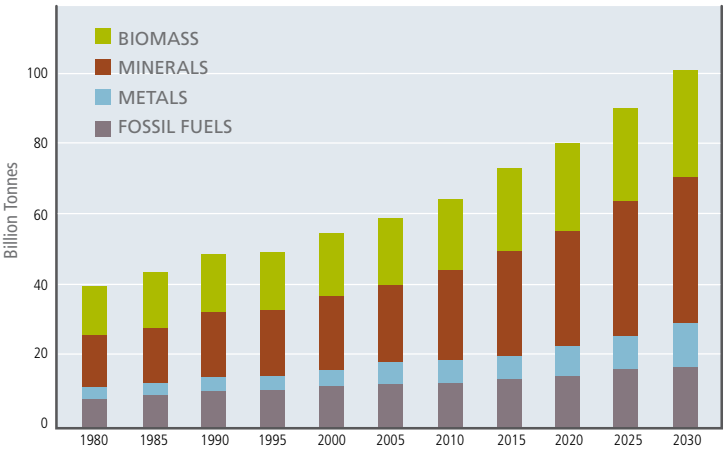
In the mining or harvesting of raw materials, resources like soil, overburden, and plant residues are being leftover.
Also agricultural processes and food production are connected with huge amounts of unused material flows.

Resources processed in manufacturing, consumed in households and used for other purposes are inextricably linked to unused resources; unused resources have to be considered appropriately when measuring resource productivity.

USED EXTRACTION

Worldwide approx. 60 billion tonnes of raw materials were extracted or harvested in 2010. The used extraction of fossil fuels, metals, minerals and biomass is expected to increase to 100 billion tonnes in 2030.

Global Used Extraction of Resources 1980–2030
(Projections 2010–2030 based on ‚business as usual' scenario)




© Ewamewa2 | Dreamstime.com

By-catch is often one third of total catch in marine fishery.

UNUSED EXTRACTION

In order to make use of these raw materials, twice to triple as much resources have to be extracted or translocated; these resources are not further used. Thus, there is no used extraction without unused extraction:

- In mining and quarrying, soil, overburden and interburden are removed to gain access to precious minerals, which are then separated from waste rock and tailings. Mining generates the largest flows of unused extraction which are directly dumped as waste.
- In agriculture and forestry, harvest residues often remain on the field or in the forest, despite the fact that some of them could be further used (e.g. straw for energy) at least to some extent without compromising soil fertility.
- In agriculture, the loss of soil in the form of erosion is often a major flow than the harvest itself; estimates of global soil erosion from agricultural land range between 25 and 50 billion tonnes per year.
- In fisheries, by-catch is often one third of the total catch, thrown back into the sea, unintentionally killed.

There is also unused extraction without used extraction. For example, building houses, roads, tunnels and dams involves the excavation and deposition of soil and earth. A preliminary estimate of the global excavation of soil and earth for building infrastructure (landscape modelling) ranges between 40 and 50 billion tonnes per year, almost the amount of worldwide mining activities!

The example of a car

In rough figures the production of a car weighing 1 tonne requires about 14 additional tonnes of used and unused extraction.
In addition, running the car requires used and unused extraction of about 8 more tonnes of resources for fuel, spare parts, etc.
The development and maintenance of infrastructure is not even included in these data.


© Joy Fera | Dreamstime.com

In addition to the construction materials used for infrastructure, huge amounts of soil and rock are excavated and disposed off without further use.


© Stefan Bringezu

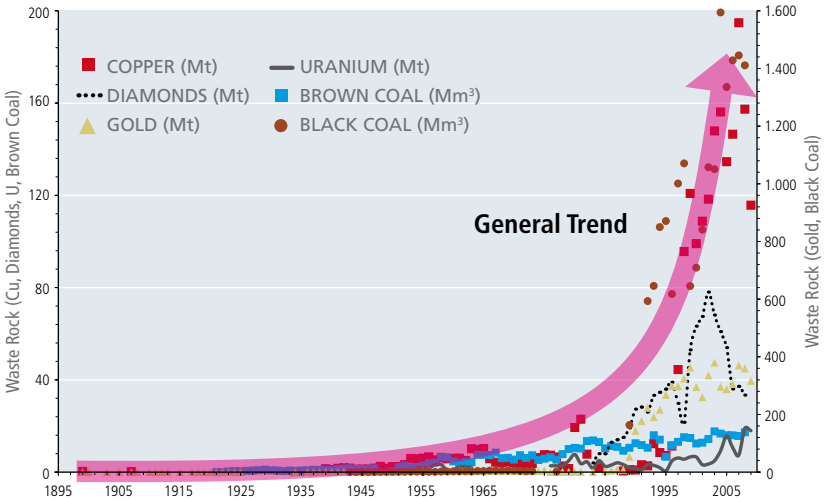
Unused timber at a clearcut in British Columbia forestland.

UNUSED EXTRACTION TENDS TO GROW WITH THE DEPLETION OF DEPOSITS

Easily accessible deposits or those with high ore-grades are usually found first. With their depletion, mining has to go deeper or extract bigger volumes in order to get to the valuable materials from lower ore-grades. As a consequence, landscapes and water bodies will be changed to a larger scale, and more mining waste will be generated, the more difficult it becomes to access deposits.

General Trend of Waste Rock in Australian Mining

Source: Mudd (2009), Data for Australia as one of the globally most important resource providers.



RESOURCE EXTRACTION AFFECTS THE ENVIRONMENT IN MANY WAYS

The environmental impacts of resource extraction grow with the overall volume of resource flows. Increasing total material requirements will lead to growing environmental change, at different locations on the globe, with varying local and regional effects. Effects may differ depending on the region and its bio-geographical conditions. Total resource flows tend to damage eco-system functions and services in different ways:

- clearing the vegetation expands with the scale of open pit mines;
- the higher the amount of total extraction, the more water must be pumped out to keep the mine running; ground water levels will be reduced at a wider scale; water depletion and pollution may impact human settlements, adjacent agriculture or natural eco-systems;
- the larger the volume of extraction, the higher both the amount of subsequent disposal and the extent of landscape changes becomes, as well as the succeeding requirements for rehabilitation; worldwide, restoration of mining sites remains limited;
- the higher the amount of mining waste from metal mining, the higher the risk of acid mine drainage and metal pollution of water bodies becomes, also after mine closure;
- the higher the amount of total extraction by underground mines, the higher the risk of subsidence after mine closure;
- the loss of fertile top soil by erosion may lead to severe degradation and the abandonment of the fields, inducing farmers to convert natural land to cropland elsewhere;
- new quarries for construction minerals, gravel, sand, crushed stone, and earth may represent hot spots of interference with nature conservation.

TMR – Total Material Requirement

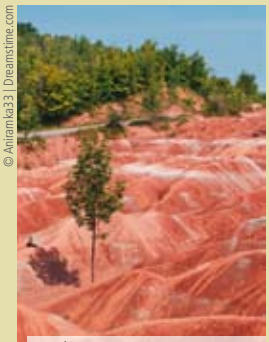
TMR measures the total material resource basis of an economy without water and air, recording all primary material requirements of the infrastructure, production and consumption system, stemming from either the domestic or the foreign environment.

INCREASE EFFICIENCY IN RESOURCE USE IS EASIER THAN REDUCING UNUSED EXTRACTION

Without unused extraction the damage caused by mining, farming and new construction would be significantly lower. However, the relation of used and unused extraction depends on geological and technological factors which may not be changed as easily as efficiency in the further use of the materials in production and consumption.

THE WAY FORWARD TO SUSTAINABLE RESOURCE MANAGEMENT

- Economic development and growth of well-being must be further decoupled from total resource extraction. For that purpose, total resource productivity needs to be drastically increased. Policy programmes for sustainable resource management should aim to adjust total material consumption - both used and unused – towards sustainable levels.
- Countries need to account for used and unused extraction on their domestic territory as well as the total resource requirements for their imports and exports. Unintentional problem shifting should be minimized via appropriate impact assessment and better information with comprehensive indicators, statistics and capacities.
- Indicators to measure Total Material Consumption (TMC) per capita and Total Resource Productivity (GDP/TMR) are increasingly being used by statistical and environmental agencies and should become standard.
- Measuring the resource consumption of products and services needs to include unused extraction. This can be done by using the material footprint or the material input per unit of service (MIPS) as indicators.
- Also economic units such as industry, company sites, organisations and households need to measure both their used and unused material footprint.
- Mining and extractive industries are challenged to search for, explore and develop those resources where geological conditions and technologies allow unused extraction and its related impacts to be minimized.
- The capacities of farmers need to be improved to cultivate land with minimal erosion losses.
- Fisheries are challenged to reduce the unused by-catch.
- All industries and households need to enhance material and energy efficiency in order to reduce total resource requirements.
- Waste management should be further developed to (secondary) resource management as recycling tends to relieve the pressure caused by primary resource extraction on nature.
- Although the existing data is often sufficient to record a reliable order of magnitude of total resource flows of European and OECD countries, data on the resource requirements of internationally traded products and on unused extraction worldwide needs to be continuously improved. Toward this end, international cooperation of data providers and users needs to be strengthened, and a process established to provide, maintain, and update total resource use related data.
- Any incentives to manage resources more sustainably such as taxation or standards should take unused extraction into account.



Soil erosion as a consequence of clearcutting in forestland.

The other side of the (aluminium) coin: red mud tailings – unused residue from the aluminium production.

büro G29 | kmk | Aachen

Contact:
Aachener Stiftung Kathy Beys // Schmiedstraße 3 // 52062 Aachen // Germany
phone: +49 (0) 241-40 929-0 // fax: +49 (0) 241-40 929-20 // mail: info@www.aachener-stiftung.de // www.aachener-stiftung.de // www.faktor-x.info