

## **Global Study of Materials Flow and Energy Consumption**

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A worldwide study of materials flow and energy consumption in the production of the commodities Al, Cr, Fe, Cu, Mn, Ni, phosphate and coal has been carried out by BGR in cooperation with the German Federal Environmental Office. The results of the study should permit measures to be recommended to ensure sustainable development compatible with the environment. The study considered the materials flow in the mining, mineral processing and smelting stages of the production of marketable concentrates and metals: metallic ores and coal, spoil, mine water, tailings, water from processing plants, refinery additives and fluxes, slag, exhaust gases, and waste water, as well as energy consumption. All figures are normalized with respect to 1 t of marketable product. The residues are subdivided into usable and non-usable, and a rough estimate of their impact on the environment is made. Technological possibilities for avoiding or minimizing production of non-usable residues and avoiding mineral losses in the mining and processing stages are discussed. The energy consumed in production and possibilities for increasing efficiency are dealt with. The energy studies include the energy expended in transporting German imports from where they are produced to Germany. Moreover, the CO<sub>2</sub> balance was determined for all commodities in the study. The coverage of this study ranges from over 90 % of world production in case of Al and Cr to 50 % of world mine production in the case of Mn ore.