

+ + + METAL SCARCITIES INFLUENCE RENEWABLE ENERGY TRANSITION + + + RESEARCH PROJECT
„FEASIBLE FUTURES“

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The research project „**Feasible Futures**“, funded by the **Austrian Climate- and Energyfunds (KLIEN)** of the Austrian Federal Government, investigates how supply crises of fossil and metal resources might influence and endanger the transition to renewable energies. First project results now are available in English at the website <http://www.umweltbuero-klagenfurt.at/feasiblefutures/>

Renewable energy technologies such as **photovoltaics** or **storage technologies** required to balance renewable energy volatility need metals which are not limitless. Furthermore, many metals are of great importance not only for renewable energy technologies but also for other industrial uses. Geological resource limits thus can intensify **resource use competition**. Also, basic industrial metals such as copper are not necessarily available without problems.

Dr. Werner Zittel, energy expert of Ludwig-Böhlkow-Systemtechnik GmbH in Munich, now has finished a report based on original data and own calculations assessing metal availability. His conclusion: **cadmium, chromium, copper, gold, lead, nickel, silver, tin and zinc seem to be close to or at peak production** already. Others like **bismuth, boron, germanium, manganese, molybdenum, niobium, tungsten, and zirconium** might experience peak production probably within **the next two to three decades**. Production of metals beyond peak will decline and consume ever more energy. Peak oil and other fossil fuel limits will aggravate metal availability thus.

Yet there are „**elements of hope**“. Those are relatively abundant - although production costs and energy consumption in these cases might increase as well in the future: **oxygen, silicon, aluminium, iron, calcium, sodium, potassium and magnesium**.

„A resilient and cautious strategy“, says Dr. Zittel, „would be to use elements from the first group very rarely and substitute their use as far as possible, either by other elements, by enhanced recycling or by more efficient use in specific applications“. „But it must be emphasised that **recycling** of these metals becomes **increasingly problematic** as their more efficient use also reduces their metal content in the disposed products“, he warns.

„A wise strategy would also try to base future technological development on those materials which are abundant“, says Dr. Zittel, and concludes: „**Where substitution is not possible or known, it might be wise to end the use of this application.**“

„**Feasible Futures**“ will investigate how the growth of certain renewable energy technologies will be influenced by metal resource limits. Additionally, it will study the effects of peak oil - taking it as an example of a resource limit - on the capitalist economy using economic modelling. Finally, the project „**Feasible Futures**“ will critically evaluate current mainstream approaches to energy transition against the backdrop of possible influences of resource limits.

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