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Criticality of Raw Materials and its impact on future developments of building technologies

Our planet provides us a wide range of natural resources throughout the world. Many of these resources are renewable and globally available. However, some are concentrated in few regions and have to be mined energy and resource intensive. These scarce resources are mainly metallic ores and industrial minerals, which are essential elements of several innovative technologies, such as display technologies and electricity storage systems.

In countries with large import dependencies, several studies on strategically important metals have classified raw materials as critical by combining supply and vulnerability risks. Traditional building materials in the housing sector are rarely affected as they are widespread and often substitutable. Within the scope of developing resource efficient buildings, innovative building technologies, such as efficient and renewable energy systems, are becoming increasingly integral elements in new or refurbished buildings. As a part of these future technologies, critical raw materials will also play a decisive role for buildings.

Against this background, the doctoral thesis considers how innovative technologies in the housing sector are affected by raw material criticality. As previously mentioned, the criticality of raw materials is defined by supply risks and vulnerability. Based on a qualitative analysis of causal links between supply and demand of raw materials and related price development, as well as environmental and social aspects, a quantitative model is developed in order to assess the risks for the future. The quantitative model is created using a System Dynamics approach, which allows the simulation of non-linear behaviour over time.

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