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Integrated and holistic suitability assessment of recycling options for masonry rubble

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Our industrial society depends on continuous mining and consumption of raw materials and energy. Besides, the building sector causes one of the largest material streams in Germany. On the one hand, the building sector is connected with a high need in material and energetic resources as well as financial expenditures. On the other hand, nearly 50 % of the volume of waste arises from the building industry. During the last years, the limitation of natural resources, increasing negative environmental consequences as well as rising prices and shortages of dump space have led to a change in thinking in the building and waste industry to a closed substance cycle waste management.

In consideration of the production figures of the main kinds of masonry units (clay bricks, sand-lime bricks, autoclaved aerated concrete brick, concrete blocks), a not unimportant quantity of masonry rubble (including gypsum plaster boards, renders, mortars and mineral insulating materials) of more than 20 million tons per year is generated in the medium term. With regard to a sustainable closed substance cycle waste management, these rest masses have to be recycled if possible. Processed aggregates made from masonry rubble can be recycled in the production of new masonry units under certain conditions. Even carefully deconstructed masonry units can once more re-used as masonry units, particularly in the area of the preservation of monuments and historical buildings. In addition, masonry rubble in different processing qualities is applied in earth and road construction, horticulture and scenery construction as well as concrete production.

The choice of the most suitable recycling option causes technical, economical and ecological questions. At present, a methodology for a comprehensive suitability assessment with a passable scope of work does not exist. Basic structured and structuring information on the recycling of masonry rubble is absent up to now. This as well as the economic and technical constraints lead to a subordinated utilization on a rather low application level (downcycling). However, masonry rubble should also be recycled on a higher level (upcycling) in the future. For this purpose, an integrated and holistic but also practically oriented methodology for the suitability assessment of different recycling applications for masonry rubble is developed for a PhD currently. The suitability assessment includes the simultaneous evaluation of technical, economical and ecological aspects. Therefore, all recycling phases (demolition, processing, re-use) and the main kinds of masonry units (sorted or mixed) with their specific properties have to be considered.