How we can recycle more buildings

December 4 2019, by Seyed Ghaffar

Credit: Marcin Jozwiak from Pexels

More than 35 billion tonnes of non-metallic minerals are extracted from the Earth every year. These materials mainly end up being used to build homes, schools, offices and hospitals. It's a staggering amount of resources, and it's only too likely to increase in the coming years as the global population continues to grow.

Thankfully, the challenges of sustainable construction, industrial growth and the importance of resource efficiency are now clearly recognised by governments around the world and are now at the forefront of strategy and policy.

A critical component of the UK government's sustainability strategy concerns the way in which construction and demolition waste—CDW, as we call it in the trade—is managed. CDW comes from the construction of buildings, civil infrastructure and their demolition and is one of the heaviest waste streams generated in the world—35% of the world's landfill is made up of CDW.

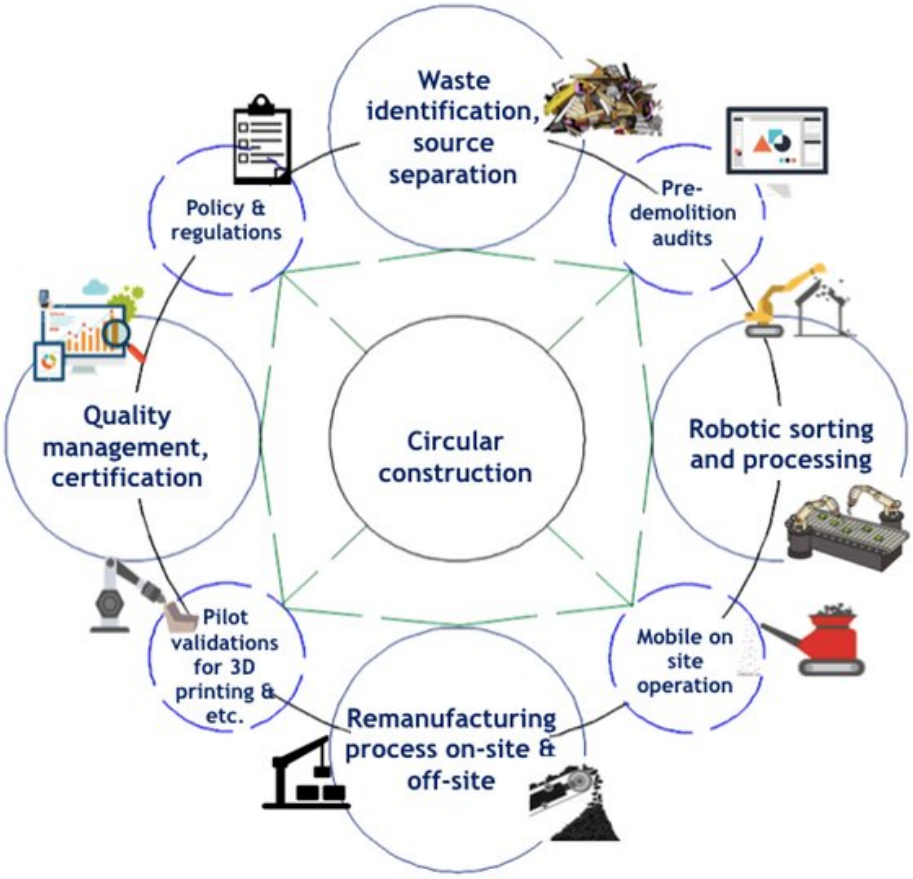
The EU's Waste Framework Directive, which aims to recycle 70% of non-hazardous CDW by 2020, has encouraged the construction industry to process and reuse materials more sustainably. This directive, which favours preventive measures—for example, reducing their use in the first place—as the best approach to tackling waste, has been implemented in the UK since 2011. More specific to the construction industry, the Sustainable Construction Strategy also sets overall targets for diverting CDW from landfill.

Policies worldwide recognise that the construction sector needs to take immediate action to reduce greenhouse gas (GHG) emissions, tackle the climate crisis and limit resource depletion, with a focus on adopting a circular economy approach in construction to ensure the sustainable use of construction materials.

Instead of simply knocking buildings down and sending the CDW to landfill, circular construction would turn building components that are at the end of their service life into resources for others, minimising waste.

It would change economic logic because it replaces production with sufficiency: reuse what you can, recycle what cannot be reused, repair

what is broken, and re-manufacture what cannot be repaired. It will also help protect businesses against a shortage of resources and unstable prices, creating innovative business opportunities and efficient methods of producing and consuming.



Changing the mind-set

The mind-set of the industry needs to change towards the cleaner production of raw materials and better circular construction models.

Technical issues—such as price, legal barriers and regulations—that stand in the way of the solutions being rolled out more widely must also be overcome through innovation.

Materials scientists, for example, are currently investigating and developing products that use processed CDW for manufacturing building components—for example, by crushing up CDW and using it to make new building materials.

Technical problems around the reuse of recycled materials should be solved through clever material formulations and detailed property investigations. For instance, the high water absorption rate in recycled aggregates causes durability problems in wall components. This is something that research must address.

Moreover, it is illegal in the EU to use products that haven't been certified for construction. This is one of the main obstacles standing in the way of the more widespread reuse of materials, particularly in a structural capacity. Testing the performance of materials for certification can be expensive, which adds to the cost of the material and may cancel out any savings made from reusing them.

For the construction, demolition and waste management industries to remain competitive in a global marketplace, they must continue to develop and implement supply chain innovations that improve efficiency and reduce energy, waste and resource use. To achieve this, substantial research into smart, mobile and integrated systems is necessary.

Radically advanced robotic artificial intelligence (AI) systems for sorting and processing CDW must also be developed. Many industries are facing an uncertain future and today's technological limitations cannot be assumed to apply. The construction industry is likely to be significantly affected by the potential of transformative technologies such as AI, 3-D

printing, virtual/augmented reality and robotics. The application of such technologies presents both significant opportunities and challenges.

A model for the future

As the image below shows, we have developed a concept for an integrated, eco-friendly circular construction solution.

Advanced sensors and AI that can detect quickly and determine accurately what can be used among CDW and efficient robotic sorting could aid circular construction by vastly improving the recycling of a wide range of materials. The focus should be on the smart dismantling of buildings and ways of optimising cost-effective processes.

The industry must also be inspired to highlight and prove the extraordinary potential of this new construction economy. We can drive this through a combination of creative design, focused academic research and applied technology, external industry engagement and flexible, responsive regulation.

Only through a combination of efforts can we start to recycle more buildings, but I'm confident that with the right will—and the right investment—we can start to massively reduce the amount of materials we pull from the ground each year and move towards a truly sustainable future.

Provided by The Conversation

https://phys.org/news/2019-12-recycle.html