THE END IS JUST THE BEGINNING

ROCKWOOL's vision for circularity in the built environment







The August 2021 IPCC report concludes that climate change impacts are irreversible and will affect all human life on earth. Global warming will exceed 2°C during the 21st century – unless deep reductions in carbon dioxide (CO²) and other greenhouse gas emissions occur in the coming decades.

This conclusion requires the construction sector to focus on two parallel approaches – ensuring that the built environment is resilient and adaptable enough to withstand the irreversible impacts of climate change, while simultaneously reducing the sector's GHG emissions to prevent and mitigate even worse climate change impacts.

Because it is responsible for a significant percentage of global emissions, the construction industry carries a massive responsibility when it comes to climate change mitigation. According to the latest figures, almost 40 percent of the global carbon emissions are associated with the built environment. The Ellen MacArthur Foundation concludes that such high emissions are rooted in the linear – take, make, dispose – model of the built environment, and that by eliminating waste and applying circularity practices, we can help cut the sector emissions close to 40 percent by 2050².

To address this wasteful system, we need to reimagine the built environment; to rethink the materials we use, how we construct our buildings and infrastructure, how we use them and what happens to them when they are no longer useful. In nature, there is no waste; a leaf that falls from a tree becomes food for the forest ecosystem. In contrast, the current way in which the construction sector operates is highly wasteful and is one of the sectors with the highest environmental impacts. This exerts huge pressure on our sector to put an end to the waste and loss of valuable materials to landfills, incinerators and energy plants.

In this paper, we share how ROCKWOOL envisions the future of the built environment to fit the planet's current and future needs – one that will be resilient and agile. We call on the entire industry to join forces and collaborate to make this vision a reality.

^{1.} https://environmentjournal.online/articles/emissions-from-the-construction-industry-reach-highest-levels/

^{2.} https://ellenmacarthurfoundation.org/topics/climate/overview

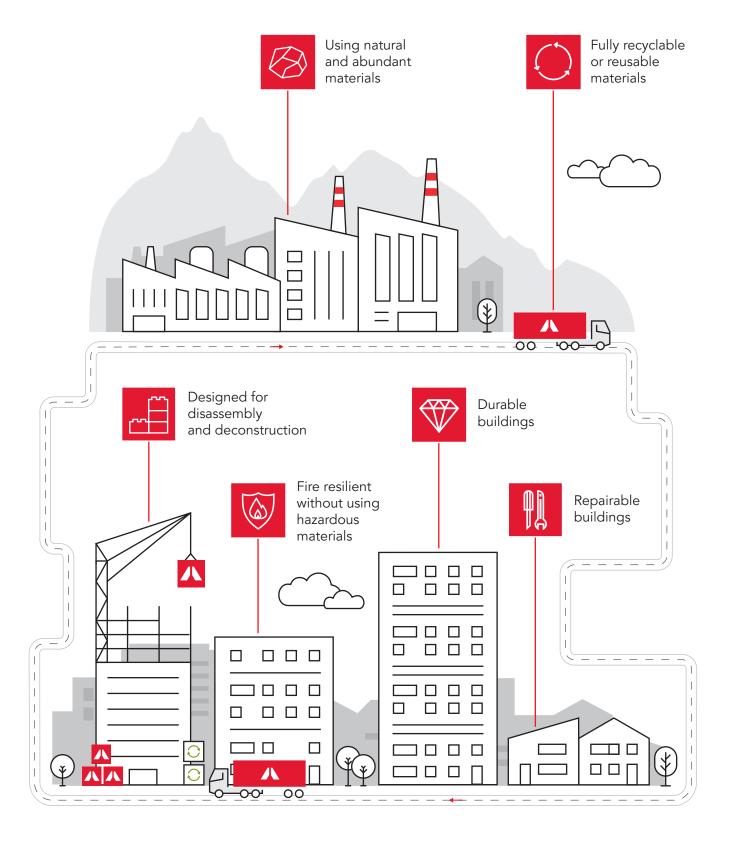
Vision

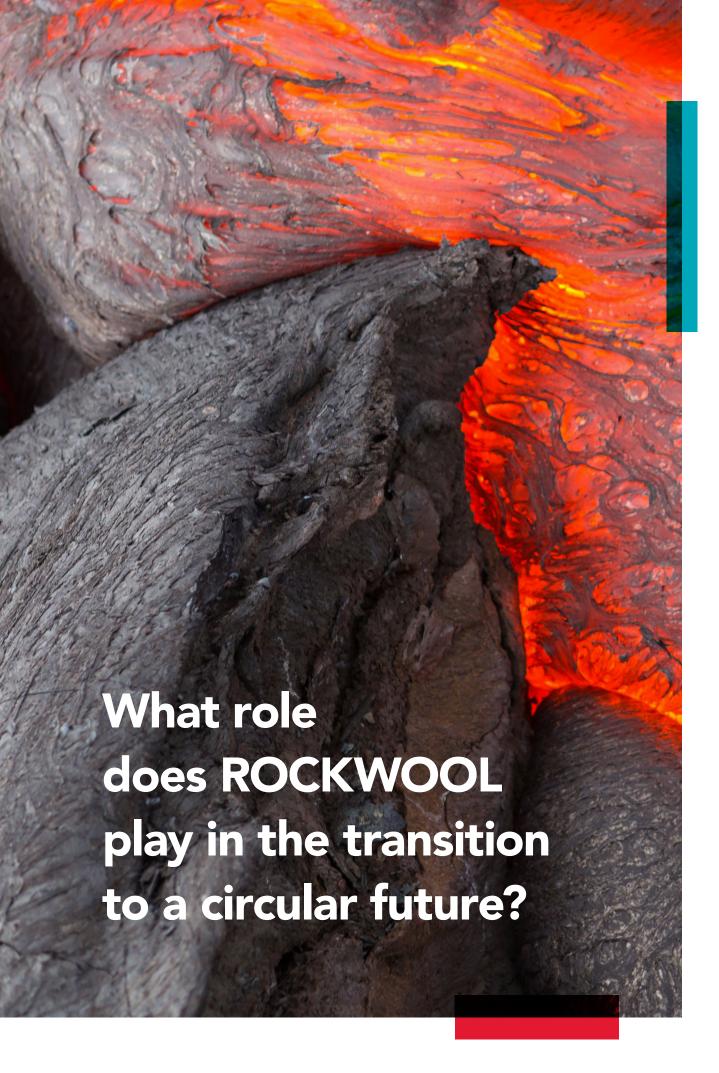
Circularity at ROCKWOOL is a strategic priority. Our stone wool products are inherently circular, so we have a strong natural foundation. However, we plan to do more – much more. ROCKWOOL's vision for circularity in the built environment goes beyond closing the loop of materials into developing a truly systemic approach to resource utilisation throughout the entire lifecycle of our products, including material choice, design, usage and end-of-use cycle.

We envision a built environment that uses natural and abundant materials that are not fossil-based, that are naturally fire-resilient, and are free from any substances hazardous for human or plants. In our vision, materials will be safely used, reused and recycled an infinite amount of times, without losing their quality and integrity. We believe that building to last is the ultimate utilisation of resources. That means that buildings should be both durable and flexible, so they are

built to last and designed to allow for their use-phase to be extended through maintenance and repair. What's more, it also entails buildings being designed for disassembly so that once the building has served its purpose and it is time to renovate or rebuild it, all the materials in the building should be retrievable and recyclable back to new products rather than being disposed in landfills or generating greenhouse gas emissions through incineration.

Circular by nature







Closing the loop of materials – ROCKWOOL's stone wool is fully recyclable and is actually being recycled

A key attribute of our stone wool is that it can be fully recycled into new products – infinitely, and without any loss in performance. It is circular by nature. This contributes to closing the materials loop in one of the most wasteful sectors of our economy. As a company that aspires to take responsibility for its own resources, we do not, however, simply rely on the products being 'recyclable'. We lead by example by going beyond the recyclability label and implementing a clear strategy for increasing recycled volumes.

By offering comprehensive recycling services in a growing number of countries, we contribute to greater circularity in the construction sector. In the past three years, we have increased the volume of reclaimed stone wool material by more than 30 percent and expanded the availability of reclaimed material service to 14 countries. We are well on our way to meeting our interim goal of offering this service in 15 countries by 2022 and the longer-term goal of 30 countries by 2030.

In addition to recycling our own stone wool material from market, our technology allows us to upcycle material flows from other industries, providing an alternative to these materials being landfilled or incinerated. We repurpose this material, for example, from the aluminium industry and from power plants. As a result, ROCKWOOL stone wool products can have a recycled content of up to 75 percent.



CASE STUDY: ROCKCYCLE® IN ACTION IN LEIPZIG

Our Rockcycle® service is supporting a major housing project in Leipzig, Germany, to significantly reduce the amount of waste that otherwise would be sent to landfill. Built in the early 1980s, the façade of the housing project is currently being retrofitted with ROCKWOOL stone wool insulation. Typically, cutting insulation panels to size on a construction site like this

would result in 5 to 10 percent of the material being discarded and thrown away. Instead, via Rockycle® the cutoffs are collected and returned to our factories where they are processed and recycled back into new stone wool with the original quality, durability and thermal properties.





CHALLENGES:

We are working to expand our recycling services to other markets and to increase the recycled volumes in markets where we already operate Rockcycle®. However, we often find ourselves competing against very low landfilling prices and regulatory hurdles that create disincentives for recycling. We need the collaboration of local and national policymakers to set stricter regulation on landfilling construction material and to ease transport of recyclable materials. This will help to ensure that recyclable materials stay out of landfill and incineration and return to generate value in the economy.

Further, successfully reclaiming and recycling materials is heavily dependent on building a network of competences and partnerships in the field of reverse logistics, waste management and deconstruction. It remains challenging to find and establish such cross-value collaborations due to the lack of existing skills and enabling conditions in many markets.



FIRE RESILIENCE

Made with natural materials, stone wool products offer fire resilience and protection without using flame retardants that can risk human or environmental health

Our products are based on stone, primarily volcanic types like basalt and gabbro. Stone is by far the most abundant natural resource on Earth. On average, the Earth produces 38 000 times more stone through volcanic activity than we use annually to produce stone wool. By using this natural and abundant material, we help to decouple the growing demand for construction materials from the use of finite resources. We are working with our suppliers to ensure the stone we use is extracted in a sustainable way.

Using a naturally resilient material such as stone as the base for our products means that we can leverage the natural attributes to create non-combustible stone wool products. In a world with an increasingly volatile climate leading to an increase in fire occurrences, we need to adapt by building more resilient housing and infrastructure – to save lives, livelihoods and resources.

What is more, our stone wool contains no fire retardants and is one of the most tested and studied building materials anywhere in the world. Hundreds of scientific tests have proven stone wool to be completely safe to manufacture, install, and live alongside, confirming that it poses no risk to the environment or human health.



CHALLENGES:

When it comes to the choice of materials in the built environment, we believe that stricter regulations are needed when it comes to fire safety, hazardous materials, and the release of microplastics over the lifetime of a product. More stringent regulations will secure improved choices for the construction industry and ensure safer and better performing buildings.

Despite an increasing focus on circularity and material health in the built environment in certain geographies, regulatory frameworks too often fail to adequately promote or require the use of non-combustible materials to protect the health of building residents from hazardous emissions associated with flame retardants.



CASE STUDY: BRADFORD ROYAL INFIRMARY

The Bradford Teaching Hospitals NHS Foundation Trust is responsible for providing hospital services to over 500,000 people across the Bradford district in the UK. Built in the 1960s, the façade of the hospital's Women's and New-born Unit had never been upgraded. Heat loss, draughts, noise and leaks were just some of the issues that made the five-storey building a cold and difficult space for patients and staff alike. Fire safety was a vital aspect of this project, and needed to meet strict criteria and to demonstrate the robustness and safety of the design and the products

used. ROCKWOOL's fire protection solutions can help slow the spread of flames, contain fires locally and stop them from spreading further. Resilient stone wool insulation is a key component in fireresilient buildings, as its fibres are noncombustible and can resist temperatures above 1,000°C without using any flame retardants, which can have negative impacts on the prime users of the building - mothers and newborn babies.







ROBUSTNESS

Stone wool is a strong and durable material that can ensure a longer lifecycle for buildings and enhance material efficiency

One of the key attributes of the circular economy is resource effectiveness – to build better systems and products that will serve their purpose and generate value for longer. Many of our building products have a life span of more than 60 years with no loss of thermal or mechanical performance. Such durability helps extend the lifecycle of buildings, improve their performance and ensure they stay in use for longer, reducing the waste associated with demolition and reconstruction.

Another key aspect of durability in the built environment is the ability to prolong the use-phase of the building through repair and maintenance instead of demolishing it when its performance no longer meets the requirements of the law or the needs of its users. In product categories such as flat-roof, façade, and general building insulation, ROCKWOOL's insulation products are especially well-suited for life-extension applications. Sometimes referred to as re-insulation, this entails repairing and upgrading a building's existing insulation to meet higher energy performance standards, without demolishing and building anew. This contributes to extending the lifespan of buildings and the materials used to make them. We are currently exploring ways to use our applications to support more life-extension projects.



CHALLENGES:

Although we continue investing in the development of our products' durability and performance, we believe an industry-wide approach is required. This will set common standards and indicators to measure the durability and aging performance of insulation materials, and allow clients to make better-informed decisions.



CASE STUDY: LAGOH SHOPPING CENTRE, SEVILLE

Covering an area the size of 20 football fields, the Lagoh shopping and leisure complex in southern Spain sprawls over 100 000 m². The Lagoh shopping centre is an active reference case for energy efficient construction, and has been designed and built using recycled and recyclable materials.

The circularity of the ROCKWOOL insulation and Rockpanel cladding was a perfect match for the building's facade requirements as well as the insulation under its green roof.

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ADAPTABILITY

Our products are well suited to a future where the built environment will need to be more flexible and adaptable due to demographic changes and environmental concerns

Flexible construction is becoming a key factor in adapting buildings to meet the changing needs of society. This is why design for disassembly principles in construction are starting to gain traction. Making products that are reusable and recyclable starts at the design phase. This also pertains to ROCKWOOL's products, most of which are well-aligned with these principles. ROCKWOOL's insulation, cladding, and acoustic tiles, for example, are easily separated from other materials during a building's renovation or demolition, in that they are typically fitted without the use of glue or other means that inhibit easy separation. This makes recycling or reuse easier and allows for more flexible construction and deconstruction of buildings.



CHALLENGES:

We welcome the publication of the ISO:20887 standard on design for disassembly for the construction industry. In fact, we are already trying to improve our product portfolio to become even more compatible with the principles. We also believe that achieving design-for-disassembly

will require a strong collaboration throughout the entire industry, including installers and construction companies, to ensure that all the components of the building can be disassembled, and that installation is done in a way to allow for disassembly in the future.



CASE STUDY: SNEEK WAREHOUSE CONVERSION

In the Dutch town of Sneek, an old warehouse was repurposed to serve as much-needed base for assisted living apartments. The Rockzero® building system from ROCKWOOL ensured that the transformation took place in record time – while securing the highest insulation values. As the development would take place in a residential area, the buildings needed to

be constructed as quickly as possible to minimise disturbance to those living in the area and is an example of the future trends in the built environment – repurposing and adapting existing assets with minimal disturbance for the surroundings.

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At ROCKWOOL Group, we're committed to enriching the lives of everyone who experiences our solutions. Our expertise is perfectly suited to tackle many of today's biggest sustainability and development challenges, from energy consumption and noise pollution, to fire-resilience, water scarcity and flooding. Our range of products reflect the diverse needs of the world, while supporting our stakeholders in reducing their own carbon footprint. Stone wool is a versatile material and forms the basis of all our businesses. With over 11,800 passionate colleagues in 39 countries, we're the world leader in stone wool solutions, from building insulation to acoustic ceilings; external cladding systems to horticultural solutions; engineered fibres for industrial use to insulation for the process industry – as well as marine and offshore.

