

# CLAY BRICK & ROOF TILE SUSTAINABILITY STRATEGY AND ROADMAP

APRIL 2024

THINK  
BRICK

ARTA 

## MESSAGE FROM THE CEO

The Australian Clay Brick, Paver and Roofing Tile industry understands our responsibility to minimise our impact on the environment and support our local communities. We take pride in manufacturing beautiful, durable, versatile and lower carbon products for Australians. Our focus over the coming decade will be on measuring, understanding and reducing our carbon emissions as an industry. Our goal is to transition our businesses and the products we make to a low-carbon and circular economy. Our members are already taking steps towards a sustainable future. This roadmap sets out our commitment to supporting our industry to ensure we bring everyone along with us.

## ACKNOWLEDGEMENT OF COUNTRY:

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to lands, waters and communities. We pay our respect to Aboriginal and Torres Strait Islander cultures; and to Elders past and present.



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## ABOUT US



Think Brick Australia is the credible voice of the Australian clay brick and paver industry. We inspire contemporary architecture and sustainable design using our products through research, technical resources and industry advocacy.



The Australian Roofing Tile Association represents roof tile manufacturers nationally and our members include the major industry leaders. We strive to push for sustainable and innovative roofing solutions that Australians can be proud of. We assist our members with technical resources and research whilst advocating for industry collaboration.



This Strategy and Roadmap is a joint initiative between members of Think Brick Australia and the Australian Roofing Tile Association. Together we will set a plan to lead Australia's clay brick, paver and roof tile industry towards a lower carbon future.

## OUR VISION

To make clay bricks, pavers and roof tiles the construction material of choice for a resilient Australia.

### WHAT WE DO

Think Brick Australia provides research, technical resources and training to the industry and promotes clay brick as a building material to architects, developers, builders and property owners.

The Australian Roofing Tile Association provides the industry with technical resources to assist with the design and construction of tiled roofs. We inform on technical and regulatory changes to ensure products are being used in a safe and sustainable manner.

We also support our members' sustainability ambitions by setting targets and tracking progress.

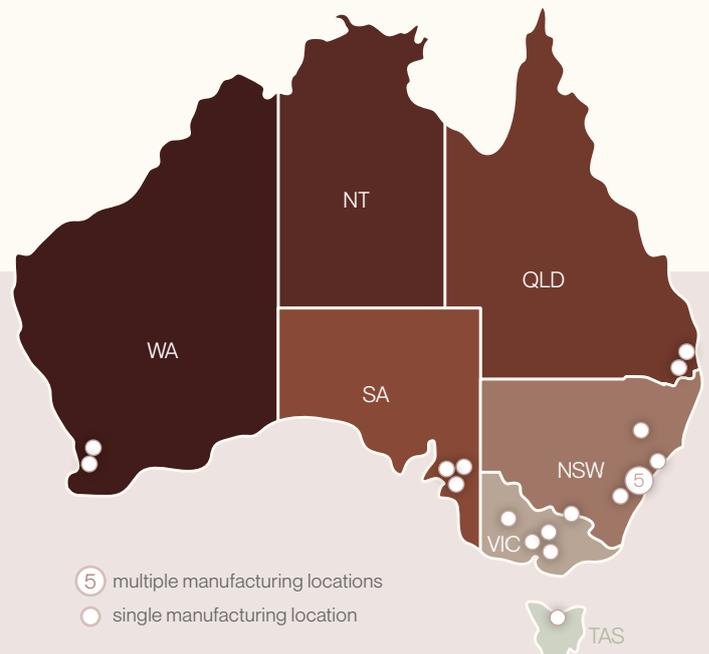
### OUR ROAD AHEAD

We developed this roadmap towards the goal of a lower carbon future together with our members. It covers clay bricks, pavers and roof tiles.

To reach our sustainability targets we need further research, investment and commitment from all stakeholders in our supply chain.

### A SNAPSHOT OF OUR INDUSTRY

- 11 manufacturer members
- 20+ locations
- ~ 600 million bricks produced annually
- Over \$2.8 billion production value
- 30,000+ jobs from all associated manufacturing and construction activities



## OUR MANUFACTURERS

BRICK	LOCATION	INTERESTING FACTS
Austral Bricks est 1908	NSW: Horsley Park, Punchbowl QLD: Rochedale SA: Golden Grove VIC: Wollert WA: Bellevue	Austral Bricks has a proud history of brickmaking spanning over 100 years. The Brickmasters 1788-2008 by Ron Ringer is a comprehensive history of the company, commissioned as part of the centenary celebrations of Austral Bricks in 2008.
Daniel Robertson est 1853	TAS: Longford	Have achieved Climate Active Carbon Neutral certification.
Bowral Bricks est 1922	NSW: Bowral	Bowral dry-pressed bricks reflect the rich colours of Australian landscapes.
Krause Bricks est 1945	VIC: Stawell	Located in Stawell, Victoria, Krause uses the rich clay from the Victorian Goldfields.
Littlehampton Bricks & Pavers est late 1800s	SA: Littlehampton	Littlehampton Bricks use traditional skills and techniques to produce a premium range of hand-crafted clay bricks and clay pavers.
Midland Brick est 1946	WA: Middle Swan, South Guildford	Midland Brick is Western Australia's largest clay brick manufacturer with a long-standing history of producing quality masonry. It is proud to be a part of upcoming sustainability initiatives such as BGC's reconciliation action plan.
Namoi Valley Bricks est 1959	NSW: Gunnedah	Using local clay from the Liverpool Plains, Namoi Valley Bricks produce bricks ranging in colour from a rich red to a pearly cream.
PGH Bricks & Pavers est 1958	NSW: Schofields, Albury, Cecil Park, Bringelly QLD: Oxley SA: Golden Grove VIC: Thomastown, Scoresby	PGH is owned by CSR, which was formed in 1855 and is one of Australia's oldest manufacturing companies, with a combined revenue of over \$2 billion across all brands.
ROOF TILES		
Lutum est 1960	NSW: Wyee, Emu Plains VIC: Dingley Village SA: Pooraka	Lutum is the largest Australian privately owned roofing and masonry company. The name 'Lutum' comes from the Latin word for earth or clay, representing the materials in their products.
Bristle Roofing est 1929	QLD: Wacol VIC: Dandenong	One the country's largest suppliers of concrete and terracotta roof tiles, producing up to 250,000 units per day from two plants and offering a comprehensive range of more than 40 colours and seven profiles.

## ABOUT CLAY BUILDING PRODUCTS

Clay bricks and roofing tiles have been used since the Neolithic period and remain one of the most common building materials in use today. While the fundamentals of brick making have remained the same, advances in technology have led to more efficient processes and higher quality, more durable products.

### BENEFITS OF CLAY BUILDING PRODUCTS

**Durable:** Clay building products have been protecting communities from extreme temperatures and weather events for thousands of years. Our members have warranties for up to 100 years!

**Fire Resistant:** Clay building products are non-combustible. This means they do not burn and do not contribute to fire spreading in a dwelling.

**Versatile:** With hundreds of styles, colours and shapes, clay building products can be used to meet any aesthetic needs.

**Low maintenance:** Clay building products are low maintenance and do not require as much upkeep over their longer lifespan when compared to other materials.

### OUR PROCESSES

The process for making clay building products is standard across the industry. Raw materials including clay and shale are mixed with water and shaped, dried and fired into durable, versatile building products.

Products may undergo additional processing before or after firing to create different styles, colours and finishes.

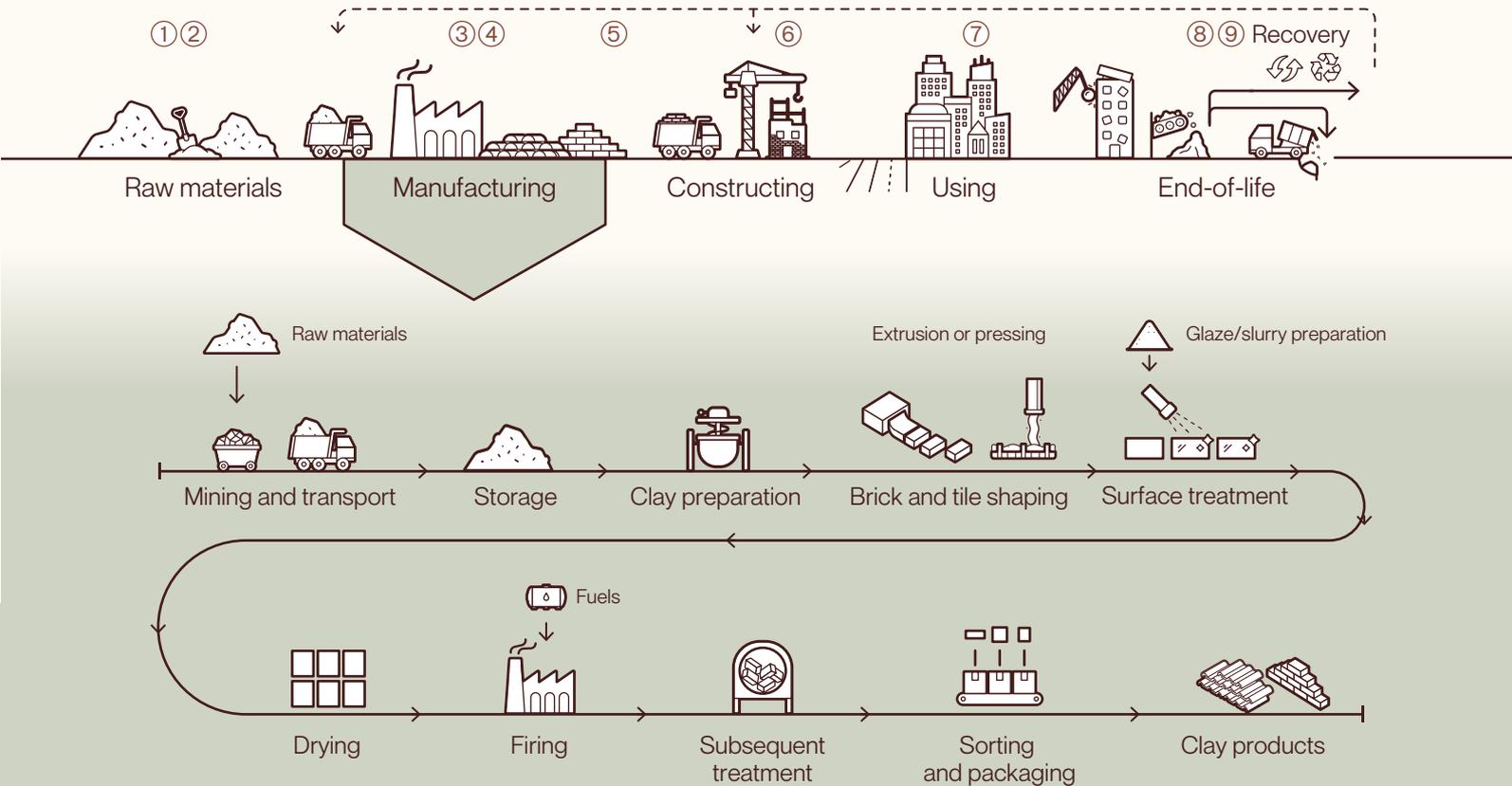
## ABOUT CLAY

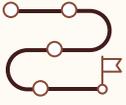
Most of the clay used in Australian bricks, pavers and roof tiles is quarried from local clay pits. Clay is smooth, sticky earth that can be moulded when wet and hardens when dried or fired. Shale is a layered rock made up of compacted mud or clay that tends to break easily into thin sheets. These clays and shales are combined to make brick, paver and roofing products. Clay building products contain recycled content which varies between company and product types.

## OUR MANUFACTURING PROCESS

### LOCAL AND SUSTAINABLE MANUFACTURING

1. 95% of our materials are locally sourced.
2. Clay is an abundant and readily available material.
3. We employ locally.
4. We use scrubbers to reduce emissions.
5. We use recyclable packaging.
6. We comply with Australian laws and legislation.
7. Our members' products have desirable thermal characteristics that can reduce operational energy in a well designed building.
8. Clay pits are repurposed after use and given back to the community.
9. Our members support the circular economy through schemes to reduce, reuse and recycle clay bricks, pavers, roof tiles and associated products.





## OUR ROADMAP

### HOW WE DEVELOPED THE ROADMAP

Think Brick Australia and Australian Roofing Tile Association members worked with thinkstep-anz to create the roadmap. We are committed to meeting our Environmental, Social and Governance (ESG) obligations and to supporting a more resilient and sustainable Australia.

### ASSUMPTIONS

- Australia's electricity network continues to decarbonise.
- The transport sector increases its decarbonisation efforts.

### THE ROAD AHEAD

This roadmap covers clay brick, paver and roof tile products manufactured by members of Think Brick Australia and the Australian Roofing Tile Association.

To successfully reduce our emissions and lessen our impact we need:



More research and development.



Investment and commitment from researchers, government and all stakeholders throughout our value chains.



## PATHWAY TO 2050



### 2024-2030

We will begin working with our members in 2024 to develop a baseline for their scope 1 and 2 emissions and water use. This will involve providing upskilling and training for our members who need extra support with data collection and target setting.

In 2025 we will use this baseline to set an industry target for 2030 and 2050.

Until 2030 we expect to make the biggest difference by:

- finding alternative fuel sources to power our kilns
- moving to renewable energy in our factories where feasible
- continued innovation into more efficient materials.

While reducing our emissions is a big focus, we also know that we need to take a balanced approach by:

- using less potable water and increasing the number of factories with closed-loop water systems
- moving into the circular economy by continuing to increase how much of our product can be repurposed, remanufactured and recycled
- continuing to support our local communities and support the next generation of bricklayers and blocklayers.

### Towards 2050

- The Australian Government is developing a plan to achieve Net Zero by 2050. All Australian states and territories have individually committed to net zero by 2050 at the latest. We understand the part our industry will need to play in meeting these obligations.
- In 2030 we will update our roadmap to ensure we are supporting national, state, and territory targets.
- We will continue to make our manufacturing processes and materials more efficient.
- Our aim is to do our part to support Australia's 2050 obligations.

We will follow the carbon reduction hierarchy to avoid, reduce and replace before offsetting the remainder of our emissions to move towards a lower carbon future and will not rely on carbon offsetting in our targets.



## CARBON

### WHERE ARE WE COMING FROM?

In 2008 Think Brick Australia engaged Energetics to conduct an LCA of brick products. The average member product impacts<sup>†</sup> calculated in this study were:

Cradle-to-gate impact:

- 0.61 kg CO<sub>2</sub>e/SBE\* or
- 0.20 kg CO<sub>2</sub>e/kg

Whole of life cradle-to-grave impact:

- 0.70 kg CO<sub>2</sub>e/SBE or
- 0.23 kg CO<sub>2</sub>e/kg

Whole of life cradle-to-grave impact for a brick wall:

- 40 kg CO<sub>2</sub>e/m<sup>2</sup>

<sup>†</sup>This value was based on an industry average figure from 2008 data and may not be representative of today's manufacturing processes.

\* 1 SBE = 1 single brick equivalent = 3kg

### WHERE ARE WE NOW?

The Australian clay brick, paver and roof tile industry is working on strategies to reduce CO<sub>2</sub> emissions.

#### A snapshot of our members' current emissions reduction targets

- Brickworks carbon emissions have followed a general downward trend, with a 46% decrease compared to the base year 2005/06 (scope 1 and 2). Brickworks is aiming to reduce scope 1 and 2 emissions by 15% by 2030, from baseline FY22, across combined Australian and North American operations.
- CSR Group achieved a 12.9% reduction in scope 1 and scope 2 emissions per tonne of saleable product between 2020 and 2023. CSR Group (including PGH) aims to reduce 30% of greenhouse gas emissions (kg CO<sub>2</sub>e) per tonne of saleable product by 2030 from baseline 2020.

### INTERNATIONAL LEADERSHIP

We want to ensure that our performance stacks up globally, so our targets will be informed by global leadership.

#### European ceramic sector

- [View Executive Summary](#)
- Committed to becoming climate-neutral by 2050 as part of the European Green Deal.
- Has achieved about 33% reduction in total emissions since 1990.
- Emissions peaked in the early 2000s and have reduced by more than 45% since then.

#### Germany

- [View German brick and roofing tile industry roadmap](#)
- Targeting to reduce to 1.1 million tonnes CO<sub>2</sub> per year by 2030 from the 2020 baseline of 1.74 million t CO<sub>2</sub> per year.
- Have achieved a 40% reduction in emissions between 1990 (2.9 million t CO<sub>2</sub> per year) and 2020 (1.74 million t CO<sub>2</sub> per year).

#### United Kingdom

- In 2022 the [Brick Development Association \(BDA\)](#) UK assessed the carbon emissions of all member companies. Total carbon emissions were calculated at 26 kg per m<sup>2</sup> of brickwork (as an average of all clay bricks). BDA announced a reduction of 21% between 2021 and 2022.
- The [British Ceramic Confederation \(BCC\)](#) launched the British Ceramics: Towards Net Zero initiative in 2021. The baseline used in the Towards Net Zero roadmap is 1.2 million tonnes CO<sub>2</sub> per year.

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## HOW WE PLAN TO REDUCE CARBON

### Measuring emissions consistently



#### Opportunities

We will develop an industry-wide strategy for measuring direct (scope 1) and electricity-related (scope 2) greenhouse gas emissions. Indirect (scope 3) emissions are not a part of this roadmap cycle, but will be considered in the future.



#### Barriers/Considerations

Some of our smaller members will need industry support and resourcing to help measure their emissions.

### Supporting Environmental Product Declarations (EPDs)



#### Opportunities

We will support member organisations to produce EPDs for their products. EPDs provide consistent data sources when developing reduction targets.



#### Barriers/Considerations

Time and financial restraints are the main barrier for companies wanting to get an EPD. This applies especially to small businesses. As associations, we will work with these smaller members to address these constraints.

### Setting targets

We need to understand where we are as an industry to support us in setting accurate and achievable targets.

In 2024 we will begin to support our members to measure and record baseline scope 1 and scope 2 emissions and water use. As an industry association, we will identify our funding priorities for the next five years.

In 2025 we will develop and release our industry reduction targets for 2030 and 2050 based on the 2024 baseline and feedback from our members. Reduction targets will represent an average reduction across all members and will require each business to show how they consistently improve their performance. This is a collaborative effort and we want to make sure that any industry targets are meaningful, from the biggest companies through to our small family businesses.

### Reducing our impact

From 2025 we will finish establishing our baseline and setting our reduction targets to 2030. In 2030 we will re-assess and re-set our targets based on the previous five years.

### Alternative energy sources

Our members have been exploring alternative energy sources for factories and kilns for many years and have already shown what's possible. This includes using waste oil, biofuels including biogas and sawdust, and renewable electricity (including the installation of solar farms in factories). One of our members, Brickworks, is undertaking a viability study investigating whether a renewable gas facility can be installed onsite, with the potential to produce approximately 210,000 GJ p.a. of renewable gas.

Based on these best practice examples, we have identified opportunities for our industry.



#### Opportunities

- We will work to ensure all our members are able to follow the path set by the leaders.
- We will support our leading members to keep pushing the industry forward.
- We will drive research and development into alternative fuel sources and transitioning to renewable energy.
- We will advocate for financial support or incentives from the government to support research and development.
- We will support our members to navigate red tape and will advocate for policy change where needed.



#### Barriers/Considerations

- Adopting alternative energy sources needs to be led at an industry level.
- Transitioning to renewable energy sources requires financial support and government investment, especially for smaller members.
- Navigating red tape, especially at a local level, can hinder innovation when transitioning to alternative energy sources.

### Scope 3 emissions

As an industry we are only beginning to map our value chains and understand how to measure our scope 3 emissions. We will support our members to understand and measure their scope 3 emissions.



#### Opportunities

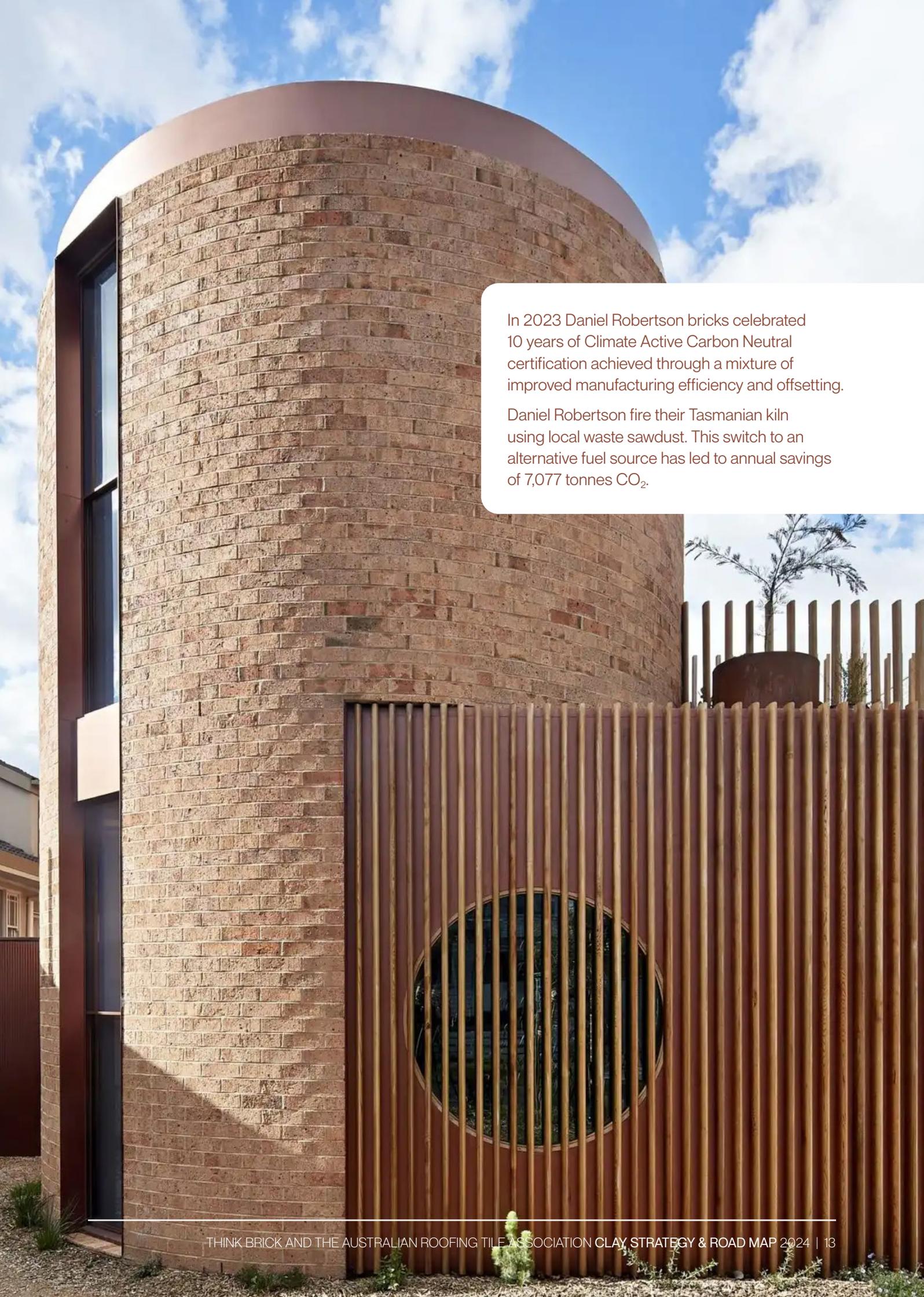
Relatively simple value chains will help us with measuring and collecting data.



#### Barriers/Considerations

Businesses will need training and support to start measuring scope 3 emissions.

PGH have installed a 377 kW solar system in their Cecil Park NSW facility. The 400 m<sup>2</sup> panel area is expected to produce 510,000 kWh of electricity annually and reduce carbon emissions by 347 tonnes of CO<sub>2</sub>e per year.



In 2023 Daniel Robertson bricks celebrated 10 years of Climate Active Carbon Neutral certification achieved through a mixture of improved manufacturing efficiency and offsetting.

Daniel Robertson fire their Tasmanian kiln using local waste sawdust. This switch to an alternative fuel source has led to annual savings of 7,077 tonnes CO<sub>2</sub>.



## CIRCULAR ECONOMY

The concept of a circular economy involves reducing waste and consuming fewer non-renewable resources. It focuses on enabling economic growth by designing long-lasting products that can be repurposed, remanufactured, recycled, or reintroduced to the environment.

Negative impacts on the environment and nature are minimised by extracting fewer materials from ecosystems and producing less pollution and waste.

Research shows that circular strategies – using regenerative materials, extending the life of products and using waste as a raw material – can support reducing CO<sub>2</sub> emissions and achieving the goals of the Paris Agreement.

We will align our industry strategy with the **four circular solutions** for the built environment in the [Circularity Report 2023](#).

### One: Be as energy efficient as possible

We will support the development of new technologies and alternative fuels to help our industry transition to renewable energy and reduce the energy needed to produce clay bricks, pavers and roof tiles.

### Two: Make the most of what already exists

We will drive research into how clay bricks, pavers and roof tiles can be developed using less material while retaining the structure and strength required by legislation.

We will assist members in communicating the recyclability of clay brick, paver and roof tiles.

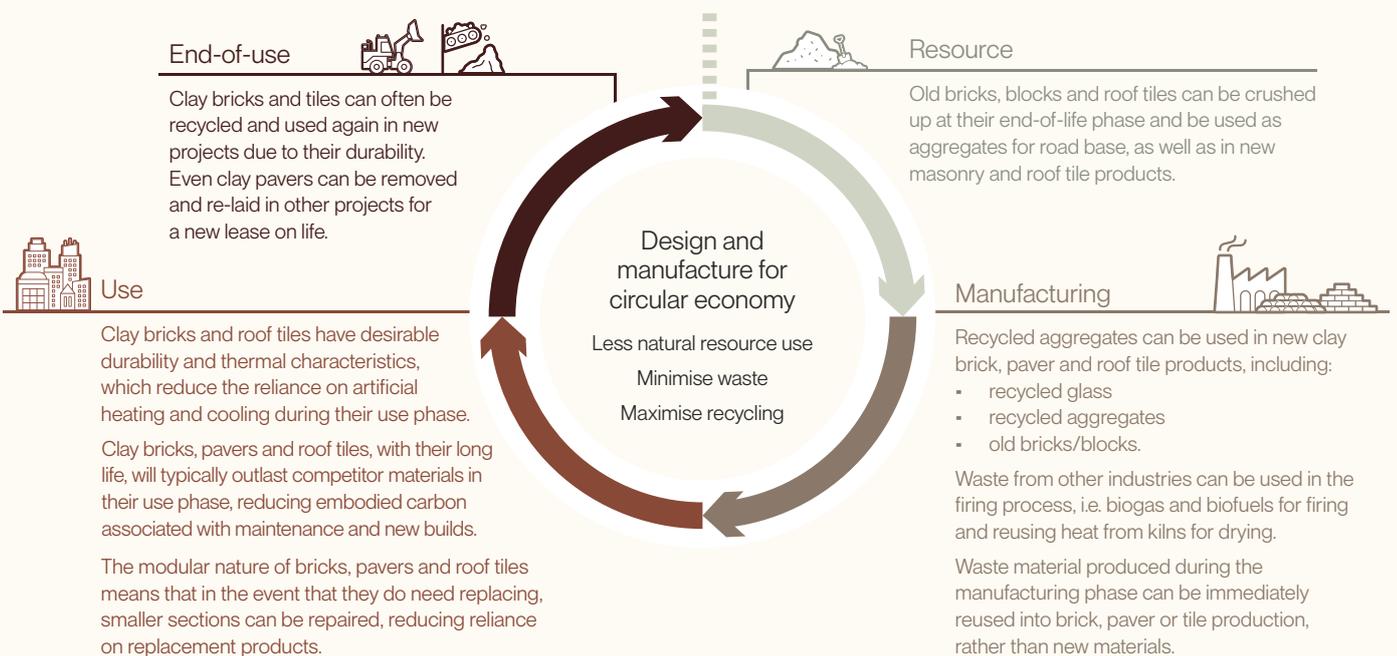
We will work with the wider construction industry to promote resilience in the built environment. The longevity of clay building products will allow infrastructure to have an increased lifespan, reducing the need to build new.

### Three: Prioritise circular materials and approaches

We will drive research and development into how we can use more recycled materials in clay masonry and roof tile products.

### Four: Reuse waste

We will work with industry to increase the range and availability of recycled materials in clay building products.



## INNOVATION IN MATERIALS

We are working with our members to lessen the amount of raw material we use and to explore how we can incorporate more recycled content into our products. Some of our members have found ways to use up to 12% recycled content in their products.<sup>1</sup>

As industry associations we will promote more innovation in the raw materials we use.

### To do this we will need to:

- Advocate for government support in research and development.
- Advocate for more financial and policy support for businesses trying to innovate.
- Conduct a cost/benefit study to understand any potential trade-offs between material innovation and manufacturing efficiency.

<sup>1</sup> [Brickworks Low Emission Technology Statement](#)

### Barriers and challenges

- A consistent supply chain for waste materials is needed before changing production methods and clay mixtures. As other industries become more efficient and reduce waste, the less suitable materials may be available.
- When introducing any waste materials into producing clay the risk of contamination needs to be carefully considered.
- Environmental regulations that impede innovation when using recovered resources.

Most Think Brick and ARTA members offer pickup schemes for pallets. These schemes encourage clients to return pallets for reuse rather than sending them to landfill.

## RECYCLING CLAY BRICKS, PAVERS AND ROOF TILES

Part of transitioning to a circular economy means finding ways to reuse and recycle what we already have. As an industry we will continue to promote the recyclability pathways for clay bricks, pavers and roof tiles.

As industry associations we will:

- educate consumers on the recyclability of clay building products as being one of the only products that can be reused in new applications with their original properties intact
- advocate for subsidies to increase brick, paver and roof tile recyclability across the industry.

### LOCAL SOURCING

A big benefit of using clay bricks, pavers and roof tiles is that they are made using almost 100% locally sourced clay.

- This helps keep our transport emissions low.
- Members can control the raw materials going into their products and maintain strict quality assurance standards.

We will advocate for more recognition of locally sourced materials and local supply chains in the wider construction industry.

All Think Brick Australia members have designed their machinery so they can reuse the unfired bricks and offcuts back into manufacturing. Unusable bricks are either sold as second grade to be used in other projects or, if broken beyond use, are crushed and repurposed. These efforts divert bricks from landfills.





## OTHER ENVIRONMENTAL OUTCOMES

### DURABILITY AND RESILIENCE

Bricks are estimated to have a service life exceeding 150 years, while clay roof tiles are expected to last around 100 years. Buildings built using clay bricks and roof tiles stay standing more often in the face of disaster events such as fire and flooding. This reduces the need for rebuilding and helps communities to recover faster.

We will work with industry to support the retention and renovation of existing buildings rather than demolition and rebuilding. We will continue to advocate for building with durable and resilient products.

The Austral Bricks Wollert plant is self-sufficient in water, using only water they collect and store on site. At this site, all water used in the production process is harvested on site, including runoff from the plant roof and hardstand. The site's fire service has two 750,000 litre tanks, sufficient for four hours' supply to hydrants.

### WATER

Limiting potable water use is especially important in water stressed locations like Australia. Our members are saving and recycling water as much as possible in the manufacturing process. Some members have already achieved their 2030 water reduction targets and are continuing to save water.

Our next steps are to support all members to follow the path set by our leaders.

- In 2024 we will support all members in measuring and recording water usage per tonne of product to create an industry baseline.
- In 2025 we will develop and release our industry water reduction targets for 2030 and 2050 based on the 2024 baseline and feedback from our members.
- From 2025 our industry focus will be to reduce our impacts according to our 2024 baseline data and 2025 reduction targets. In 2030 we will re-assess and re-set our targets based on the previous five years.

Similarly, the South Guildford plant of Midland Brick operates entirely on reclaimed water, providing 100% of the necessary supply for all manufacturing processes, thereby conserving potable water solely for essential purposes like drinking and sanitation.

Such initiatives not only reduce the strain on water resources but also exemplify the integration of sustainable practices into Australian manufacturing operations, contributing positively to environmental stewardship and resource efficiency.





## SOCIAL OUTCOMES

### AUSTRALIAN-MADE

The Australian clay brick, paver and roof tile industry is a local industry. We can supply the country with quality-assured clay building products that meet Australian standards and are resilient to supply chain disruption.

We will continue to promote the benefits of using Australian-made products and supporting local economies.

### HEALTH AND SAFETY

We take care of our people. All members follow Australia's health and safety regulations. Our larger members report on health and safety performance in annual sustainability reports. Our smaller family-owned businesses uphold strong health and safety standards.

We will work with our members to measure and report on health and safety performance across the industry.

### SUPPORTING OUR LOCAL COMMUNITIES

Our members are 100% Australian-owned and operated which means we care about and are invested in our local communities with initiatives including:

- training and apprenticeship programs
- supporting employees through leadership development programs
- supporting local charities like the Children's Cancer Institute for Medical Research since 2002.

We will begin to report on the community initiatives across our industry and the impact they have. We will support our members to develop and promote new initiatives.

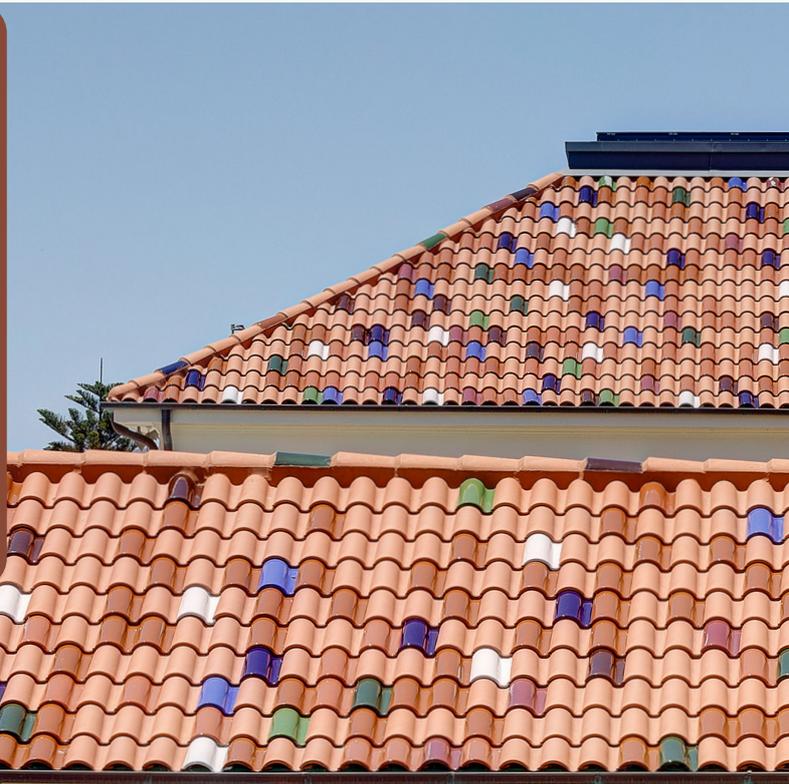
### WORKING TOWARDS A TRANSPARENT SUPPLY CHAIN

Our simple and local supply chains are transparent. Our larger members report under the Modern Slavery Act 2018 and have published modern slavery statements.

We will support all members to understand and report on their supply chains.

The Australian Brick and Blocklaying Training Foundation (ABBTF) supports the next generation of bricklayers and blocklayers. The organisation focuses on growing a skilled and available workforce of bricklayers and blocklayers for the industry. ABBTF has introduced schemes and plans such as Step Out programs for secondary school students, support for long-distance apprenticeships, promotions and resources to support TAFE and RTO and sponsorships for industry trade awards.

The ABBTF is supported through a small levy on the sale of clay bricks which is matched by Think Brick Australia members.





## WHAT WE NEED FOR SUCCESS

### SUPPORT ACROSS INDUSTRIES

Delivering on our ambitions will need industry action but we cannot do it alone. The government is critical to supporting local industries to achieve better sustainability outcomes. We need the input, support and action of policymakers, governments, investors, researchers, innovators and end users.

### NEW REGULATORY FRAMEWORKS

The existing regulatory frameworks, which include standards and work methods across the supply chain, must be updated. Barriers to innovation in the use of recycled materials and production methods should be addressed to drive innovation and research and development.

### STANDARDISING REGULATIONS

Feedback from our members highlights the need for consistency, transparency and communication across jurisdictions, especially at a local level. Navigating red tape is stifling businesses' opportunities to innovate and achieve better environmental outcomes.

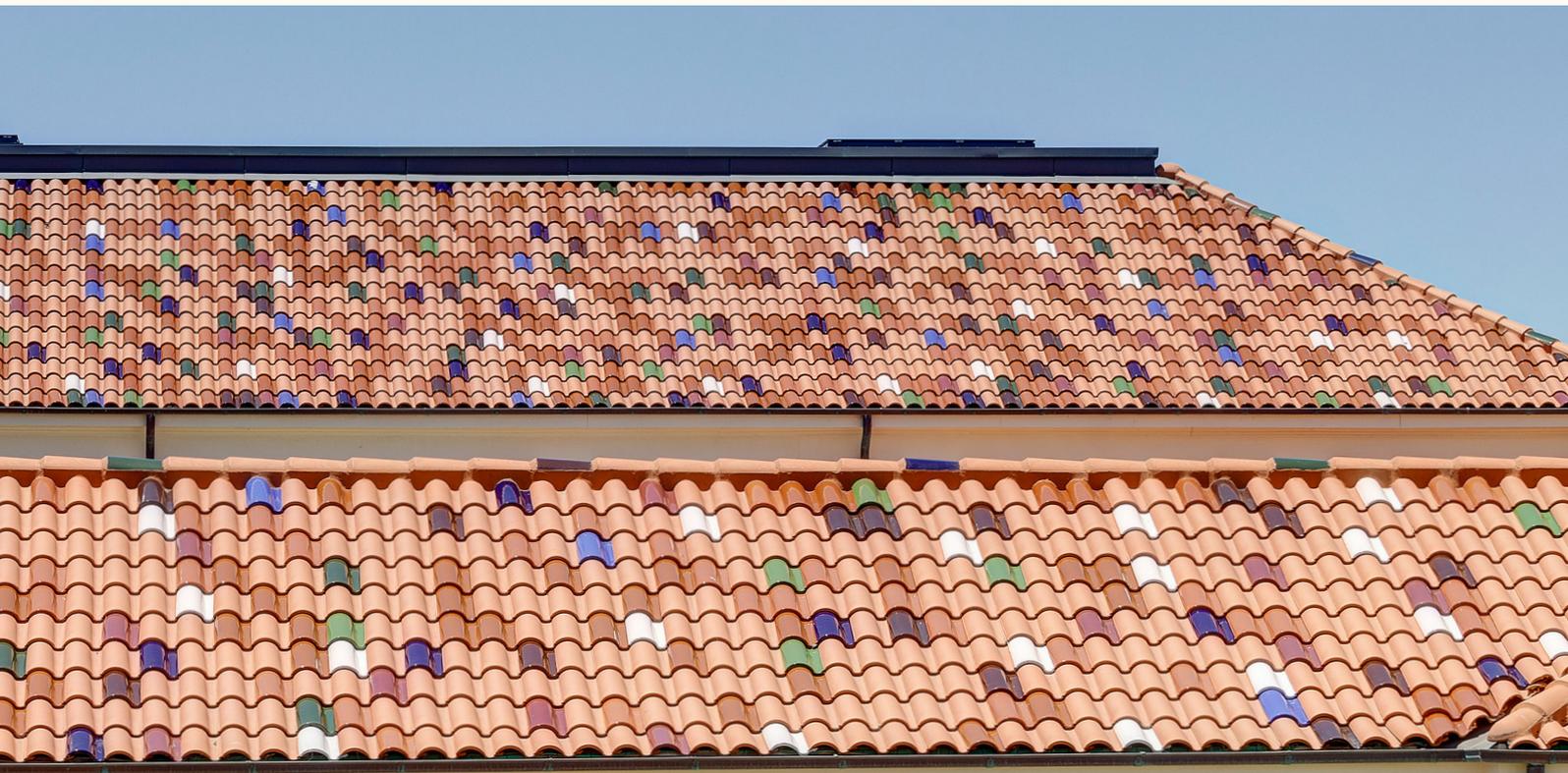
### GOVERNMENT SUPPORT

As industry associations we work with the government to advocate for improved sustainability outcomes across the life cycle of clay building products.

### RESEARCH AND INNOVATION

To put this roadmap into action we need innovation across the clay value chain. It will be essential to remove barriers to innovation and encourage knowledge-sharing across the industry.

We need further research and development to support more recycled content in clay building products, develop more efficient product designs and use more renewable energy sources in manufacturing.



## GLOSSARY

**Biofuel:** An alternative fuel that is developed from biological, natural and renewable sources.

**Carbon dioxide (CO<sub>2</sub>):** A colourless, odourless and non-combustible gas. It is a greenhouse gas that contributes to global warming. Formed by complete combustion of fossil fuels (coal, natural gas, petroleum), biofuels (charcoal, timber) and from CO<sub>2</sub>-containing products (such as limestone).

**Carbon dioxide equivalents (CO<sub>2</sub>-e):** A measure that quantifies the global warming effect of different greenhouse gases in terms of the amount of carbon dioxide that would deliver the same global warming effect.

**Carbon offsets:** An action intended to compensate for the emission of CO<sub>2</sub>-e into the atmosphere as a result of industrial or other human activity, especially when quantified and traded as part of a commercial scheme.

**Common brick:** Brick for building purposes not especially treated for texture or colour.

**Embodied carbon:** Greenhouse gas emissions associated with materials and construction processes throughout the whole life cycle of a building or infrastructure being the sum of upfront embodied carbon, in-use embodied carbon and end-of-life embodied carbon, measured as CO<sub>2</sub>-e.

**Embodied energy:** The total energy necessary for an entire product life cycle including raw material extraction, transport, manufacture, assembly, installation, maintenance, repair, disassembly, replacement, deconstruction and/or decomposition. This includes renewable and non-renewable energy.

**Environmental Product Declaration (EPD):** An independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impacts of products and services in a credible way. An EPD is compliant with the standard ISO 14025 and is known as a Type III environmental declaration.

**Face brick:** Brick made especially for facing purposes, often treated to produce surface texture. They are made of selected clays, or treated, to produce desired colour.

**Grog:** Refers to crushed brick or other fired ceramics that can be used as an alternative material in brick production.

**Life Cycle Assessment (LCA):** An analysis of the environmental and/or social impacts of a product, process or a service for its entire life cycle. It looks at the raw material extraction, production, manufacture, distribution, use and disposal of a product or building.

**Mortar:** Mixture of cement-like materials with water and sand (or other fine material). Used in masonry work to bind two masonry units together and then hardens in place.

**Net zero:** Reduction of anthropogenic greenhouse gas emissions to zero or to a residual level that is consistent with reaching net zero emissions in eligible 1.5°C pathways (hence time-bound) and neutralizing the impact of residual emissions (if any) by removing an equivalent volume of carbon.

**Operational emissions:** The emissions associated with energy used to operate the building or in the operation of infrastructure.

**Potable water:** Water that is suitable for human consumption.

**Renewable energy:** Renewable energy is energy that is produced from renewable sources such as energy from wind, hydro, solar, geothermal, tide, waves and biomass.

**Scope 1 emissions:** GHG emissions released to the atmosphere as a direct result of an activity, or series of activities at a facility level. Scope 1 emissions are sometimes referred to as direct emissions. Examples are:

- emissions produced from manufacturing processes
- emissions from the burning of diesel fuel in trucks
- fugitive emissions, such as methane emissions from coal mines
- production of electricity by burning coal.

**Scope 2 emissions:** GHG emissions released to the atmosphere from the indirect consumption of an energy commodity. For example, 'indirect emissions' come from the use of electricity produced by the burning of coal in another facility.

**Scope 3 emissions:** Indirect GHG emissions other than scope 2 emissions that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business. Some examples are extraction and production of purchased materials, transportation of purchased fuels, use of sold products and services and flying on a commercial airline by a person from another business.

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