

# Climate-related impacts



Stormwater management system at Ormeau Quarry, Queensland

## ABSOLUTE GHG EMISSIONS (SCOPE 1 AND 2)



**2.6m**  
TONNES CO<sub>2</sub>-e

**↑5%** IN FY2018    **↓27%** SINCE FY2012

## GHG EMISSIONS INTENSITY (SCOPE 1 AND 2)



**375**  
TONNES CO<sub>2</sub>-e  
PER A\$M REVENUE

**↓23%** IN FY2018    **↓44%** SINCE FY2012

## Our approach

### Climate-related impacts and the transition to a low carbon economy affect our operations, customers and supply chains.

We recognise that as a global manufacturer of construction and building products, we are a significant emitter of carbon, particularly through our clinker manufacturing operations in Australia, which account for 49% of our total emissions of 2.6 million tonnes of CO<sub>2</sub>-e.

Since FY2012, we have reduced our absolute (Scope 1 and 2) greenhouse gas (GHG) emissions by 27% through actively re-aligning our portfolio towards lighter-weight products and less carbon-intensive businesses, reducing clinker manufacturing in Australia in favour of imports from larger scale, more modern and efficient operations in Asia<sup>1</sup>, and investing in energy efficiency and alternative fuels programs.

We are committed to continuing to develop appropriate strategies to identify, manage and respond to climate-related risks and opportunities across our business. This encompasses building the resilience of our portfolio to climate impacts through adapting and responding to market, policy and technological changes by creating innovative solutions and products that support a smooth transition to a low carbon future.

We strive to provide transparent disclosure of those risks and opportunities, and how we manage and respond to climate impacts, to help investors and others understand our business. **We are progressively adopting the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) to improve both our approach in assessing and managing climate-related risks and opportunities and our related external reporting.**

The TCFD recommendations are focused on the financial impact of climate-related risks and opportunities and focus on four core elements of how organisations operate: governance, strategy, risk management, and metrics and targets. We have outlined how we manage our climate risks, and the metrics and targets we use to monitor performance. We have actively monitored and reported our emissions across our international operations for the past 13 years, and since 1991 for our Cement business<sup>2</sup>.

Following engagement with numerous large investors and other stakeholders, we have incorporated key information previously included in our CDP Climate Change responses over the following pages, with detailed carbon emissions and energy consumption data available at [boral.com/energy\\_and\\_emissions](http://boral.com/energy_and_emissions). Further information on our approach to reporting is outlined on page 16.

1. Following the closure of Boral's clinker manufacturing plant at Waurm Ponds, Victoria, in 2013, clinker has been imported from Asia. The emissions intensity of our Waurm Ponds clinker manufacturing operations in FY2013 was 0.98 tonnes CO<sub>2</sub>-e per tonne of production. The emissions intensity of our imported clinker, included as Scope 3 emissions, is 0.95 tonnes CO<sub>2</sub>-e per tonne of production, including shipping to the Port of Geelong (a 3% reduction in emissions).  
2. Early years of emissions reporting was through the Cement Industry Federation – this was later expanded to include company reporting.

## Strategy

Boral acknowledges the physical and financial risks associated with climate-related impacts and the potential impact on our business from a global transition to lower carbon energy sources.

Such a global transition may impact our business through the pricing of energy, the availability of raw materials such as clinker, gypsum and fly ash, and construction industry standards and customer preferences for lower carbon solutions, which present both risks and opportunities. The key transition and physical climate-related risks and opportunities faced by Boral and the mitigation strategies we are adopting are further explored on pages 28–29.

As part of our business strategy, we have been reducing our exposure to high fixed cost, energy- and emissions-intensive operations.

**We have been growing through shifting our portfolio to lighter-weight building products that have more scalable manufacturing and more variable costs, and are less energy-intensive to produce.**

We have been closing cement manufacturing kilns and exiting the bricks business, which has underpinned reductions in our absolute GHG emissions and emissions intensity of 27% and 44% respectively over the past six years.

This repositioning of the business has both reduced Boral's risks associated with the transition to a lower carbon economy and our exposure to energy costs. In FY2018, total energy and fuel costs accounted for around 7% of Boral's cost base<sup>3</sup>.

With cement being highly emissions-intensive and an important input into downstream concrete production and in some building products, we are continuing to look at ways to reduce future cement-related carbon emissions.

## Risk management

Climate-related risks are incorporated into Boral's risk identification and management process, which includes a formal bottom-up, organisation-wide risk management process undertaken on a yearly basis. This process is managed by Group Risk & Internal Audit. A summary of our risks and responses, including climate-related risks, is included on pages 12–13.

To supplement the annual risk review process, in 2017, a targeted Climate-related Risks and Opportunities Strategic Review was undertaken across Boral's businesses using the recommended framework set out by the TCFD. This process identified more specific climate-related risks and opportunities which are included on pages 28–29. The outcomes of this review were presented to the Board HSE Committee.

Sustainability risks are embedded into Group and business-level strategies.

In FY2018, our Cement business accounted for 59% of Boral's GHG emissions. Details of how our alternative fuels project at Berrima Cement Works is reducing carbon emissions is included on page 30.

More broadly, we continue to focus on energy efficiency improvements, and the use of waste materials and biofuel development to reduce our own operational emissions.

Within our supply chain, the biggest role Boral is likely to play in reducing GHG emissions is by increasing the use of fly ash as a cement substitute in the ready mix concrete industry in the US, where Boral is the largest broker of fly ash.

The World Business Council for Sustainable Development Cement Sustainability Initiative<sup>4</sup> identifies a reduction of the clinker to cement ratio through the use of alternative cementitious materials such as fly ash and slag as an important key mitigation lever in reducing carbon emissions associated with cement production. Substituting cement with fly ash during ready mix concrete production achieves the same result. The important role our Fly Ash business has in reducing the US concrete industry's carbon emissions is further explored on page 29.

To gain a better understanding of the potential climate-related transition risks and opportunities, Boral's Cement business has commenced scenario analysis work focused on clinker production and imports. Three climate scenarios have been developed, and these are informing the development of appropriate response strategies to potential climate transition risks. This includes two-degree scenarios as recommended by the TCFD and consistent with Paris Agreement temperature targets. This work is currently being completed and reviewed internally. Further information on the scenario analysis work is provided on page 32.

## Governance

The full Board maintains oversight of Boral's response to climate-related risks and opportunities, including risk identification and management, strategy and external reporting. In addition, the Board HSE Committee is responsible for reviewing and monitoring the effectiveness of Boral's policies, systems and governance structure in identifying and managing HSE risks that are material to the Group, as well as compliance with legal and regulatory requirements associated with HSE matters. The Board HSE Committee considers energy and climate-related issues at each of its meetings.

The Board Audit & Risk Committee is responsible for satisfying itself that a sound system of risk oversight and management exists and that internal controls are effective. It meets at least four times per year and receives an annual report on our organisation-wide risks, which include climate-related risks and opportunities. Further details of the roles and responsibilities of the Board HSE and Audit & Risk Committees are in the Corporate Governance Statement in the Annual Report.

While the full Board maintains oversight of Boral's climate-related risks, the CEO & Managing Director is accountable for the management of Boral's risks in relation to climate impacts and delegates responsibility to the Executive Committee.

The Executive Committee, which includes the CEO & Managing Director, is individually and collectively accountable for assessing and managing these risks. Divisional Chief Executives and the Group HSE Director have specific responsibilities in respect of climate-related risks and opportunities.

3. Includes cost base of USG Boral and Meridian Brick joint ventures, which are equity accounted.

4. World Business Council for Sustainable Development, Cement Sustainability Initiative, <https://www.wbcscement.org>

# Climate-related impacts

## Risks and opportunities

**Climate-related risks encompass both risks relating to the transition to a lower carbon economy and physical risks.**

We have outlined Boral's key risks and opportunities based on the Climate-related Risks and Opportunities Strategic Review undertaken in 2017 and the scenario analysis work currently being completed by the Cement business.

## Risks

TRANSITION RISKS – MEDIUM AND LONG-TERM

**Increased energy costs from changes in carbon or energy policy.** The potential introduction of regulatory pricing mechanisms and/or trading systems in Australia, and the countries from which we import clinker, would most impact our more energy-intensive Cement business. Exposure to a carbon cost in our Cement business would, however, be mitigated to the extent that the industry is afforded assistance as an emissions-intensive trade exposed industry.

Changes in energy policy in the countries in which we operate and from which we import key raw materials may result in increased energy and raw material costs.

Our strategy is to continue to shift our product portfolio towards less energy-intensive businesses. We have programs in place to continue to reduce our energy costs where our exposures are highest. For example, our alternative fuels program in Cement is expected to initially replace 25,000 tonnes of coal and up to 50,000 tonnes of coal in coming years.

In USG Boral, the introduction of Sheetrock® technology over the last few years reduced emissions intensity associated with manufacturing of plasterboard by about 20%, in part through reducing energy required for drying the plasterboard, and there are further improvement opportunities planned.

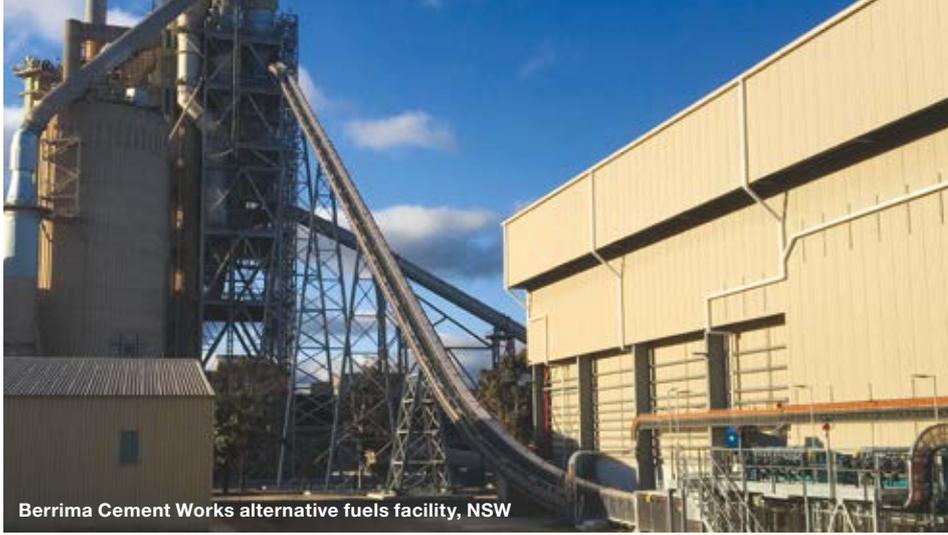
**Potential reduction in fly ash supply in North America as coal-fired power utilities curtail over time.** The US Energy Information Administration (EIA) is projecting coal to contribute 24% of the country's electricity generation mix in 2040 or, if the Clean Power Plan is enacted, approximately 19%. At these levels, the amount of fly ash going to landfill should reduce, however not materially impact, the fly ash available for the construction industry. Refer to the case study on page 29 for how Boral intends to support growth in fly ash demand.

**Supply chain impacts from environmental policy.** Pollution concerns, particularly in Asia, may result in temporary and/or permanent closures of energy-intensive manufacturing facilities. This has the potential to affect the supply balance and price of raw materials such as imported clinker used in our Cement business, synthetic gypsum used by USG Boral and slag and fly ash used by Boral Australia in producing low-carbon concrete such as ENVISIA®.

For our Cement business, we are leveraging the scenario analysis work to develop appropriate response strategies and are incorporating these risks into our broader strategic planning. USG Boral's strategic planning process includes developing appropriate gypsum supply options.

**Changes in construction industry standards on materials efficiency** and regulation of existing products in buildings and large construction and infrastructure projects, as well as **shifts in consumer preferences** may result in demand shifts towards low carbon construction materials. This may require fast tracking capital expenditure and R&D investment in low carbon product solutions.

We are investing in developing lower carbon building materials solutions such as ENVISIA® low carbon concrete, WarmPave asphalt and high-recycled content TrueExterior® Siding & Trim products and are piloting USG-developed Sheetrock® EcoSmart Panels.



Berrima Cement Works alternative fuels facility, NSW



## Leveraging our Fly Ash business to reduce carbon emissions

Fly ash is a residue generated by coal-fired power stations. As a substitute cementitious material used in the manufacture of concrete, fly ash has multiple benefits. It enhances the strength, impermeability and durability of concrete, is typically cheaper than cement, and mitigates carbon emissions associated with cement production.

We currently sell around 7–7.5 million tons (6.4–6.8 million tonnes) of fly ash per annum. The replacement factor of Portland cement by fly ash in ready mix concrete generally varies between 1:1 and 2:3, depending on the properties of the ash and desired performance of the concrete. Therefore, for every 1 million tonnes of fly ash we can bring to market and sell as a cement substitute, we could eliminate 0.67–1 million tonnes of CO<sub>2</sub>-e being produced<sup>2</sup>.

Fly ash substitution of Portland cement in concrete is currently ~16% in the US, and compares to ~50% in European markets. So there is considerable opportunity for higher substitution if we can increase supply of fly ash.

Our strategy is to increase the amount of fly ash we bring to market by reducing the amount of ash that would otherwise go to landfill and by reclaiming ash that is currently in landfill across the US, which is estimated to exceed 1 billion tons<sup>3</sup>.

Initiatives underway to increase our supply of fly ash include improved network optimisation, increased use of beneficiation technologies and new ash storage facilities to reduce ash going to landfill, reclamation of landfilled ash and potentially importing excess fly ash from countries where it is abundant. We are aiming to increase available fly ash for sale over the next three years by 1.5–2 million tons per annum.

PHYSICAL RISKS – SHORT-TERM AND ONGOING

**Increased severity of extreme weather events** such as cyclones, severe storms and floods may result in business interruption due to plant damage; supply chain, transport and logistics impacts; and delays in customer deliveries and demand. For example, Boral North America was impacted by two hurricanes in late 2017, which had an adverse US\$10 million impact on FY2018 earnings<sup>1</sup>.

Across our operations, as we have been building new plant and equipment, we have been investing in our water management systems to allow our operations to better withstand floods, storm deluge and other extreme weather conditions. Such measures include investing in pumping equipment to improve our recovery response at quarries following high rainfall events, investing in generators to provide backup power supply during storms, and building sophisticated settlement ponds and closed loop site water systems that allow us to continuously re-use process water while minimising environmental impacts.

**Changes in precipitation patterns and unseasonal weather variability**, including rising mean temperatures, may impact water security, result in bushfires and adversely impact the prosperity of local economies.

Although water is not considered a material risk at a Group level, at an individual site level, either too little water during drought periods or too much water is a risk. Measures implemented to better manage excess water due to storms and flooding are outlined under extreme weather events above.

## Opportunities

PRODUCTS AND SERVICES

**Capturing growth opportunities from a transition to a lower carbon economy.** Our North American Fly Ash business is well positioned to harness future growth opportunities from increasing substitution of cement in the manufacture of concrete, thereby reducing carbon emissions in the broader supply chain. Refer to the adjacent case study.

We continue to invest in science-based materials product innovation to provide creative solutions that meet our customers' preferences and support the transition to a lower carbon economy. In FY2018, we invested A\$17 million in R&D through our innovation centres in the USA, Australia and Thailand. Our product solutions include ENVISIA®, a high performing concrete with lower carbon emissions than standard concrete; TrueExterior® Siding & Trim products comprising up to 70% fly ash – a coal combustion by-product that would otherwise go to landfill; and USG-developed Sheetrock® EcoSmart Panels being piloted at our Pinkenba plant.

ENERGY SOURCE

**Reduced energy costs through energy efficiency initiatives and alternative fuels use in cement manufacturing.** Our alternative fuels facility at Boral's cement operations in Berrima will reduce our energy costs and carbon footprint through reducing coal consumption – refer to page 30 for further details. Boral Australia is developing plans that will enable it to firm up targets and goals regarding energy efficiency improvements and renewable energy.

RESILIENCE

**Using Boral Timber residue by-products as biofuel.** We have recently announced a \$1.2 million feasibility study, co-funded by the Australian Renewable Energy Agency, to determine the technical and financial viability of converting up to 50,000 tonnes per annum of sawmill residues from our Herons Creek hardwood sawmill, in NSW, into renewable diesel and bitumen using world-first technology. If the feasibility study is successful, the transport-grade diesel and bitumen produced could potentially supply up to 15% of Boral's annual needs.

1. Defined as earnings before interest, tax, depreciation and amortisation.  
 2. Assumes one tonne of cement produced results in one tonne of carbon emissions.  
 3. Sources: American Coal Ash Association estimates ~1 billion tons of fly ash is currently landfilled. The US Environmental Protection Agency (EPA) estimates that ~1.5 billion tons of total coal ash has been landfilled or impounded.

# Climate-related impacts

## OUR GOALS AND TARGETS

A FURTHER  
**10–20%**  
REDUCTION IN  
EMISSIONS INTENSITY  
BY 2023

A REDUCTION OF  
**1.1–1.5**  
million tonnes  
CO<sub>2</sub>-e IN SUPPLY CHAIN  
THROUGH INCREASED  
FLY ASH SUPPLY BY 2022

CURRENTLY  
**9%**  
DELIVER ANNUAL  
GROWTH  
IN SHARE OF REVENUE  
FROM LOW CARBON,  
HIGH-RECYCLED  
PRODUCTS

## Metrics and targets

**Our Scope 1 and 2 emissions have reduced by 27% since FY2012 to 2.6 million tonnes of CO<sub>2</sub>-e<sup>1,2</sup>.**

**Our emissions intensity has reduced by 44% since FY2012 to 375 tonnes of CO<sub>2</sub>-e per A\$ million of revenue<sup>1,2,3</sup>.**

### Our approach to reducing emissions

We are confident that Boral's emissions intensity will continue to reduce over the coming years, as we know that our future will be focused on less emissions-intensive operations than our past, and we continue to reduce emissions through efficiency programs and product development. At times, however, our absolute emissions may increase as production increases to meet demand and through acquisition, as was the case in FY2018.

We have an emissions-intensive cement manufacturing plant at Berrima accounting for ~60% of Boral's total emissions, and a bricks business in Western Australia and bricks joint venture in the USA together accounting for ~10% of our emissions.

We have no intention to invest in new cement or brick kilns, and these manufacturing operations are unlikely to be in Boral's portfolio in the long-term, which would result in our Scope 1 and 2 emissions reducing by around 70%.

However, we cannot put targeted dates around the life of these operations, which will be determined by economic drivers.

**Over the next five years, we are aiming to further reduce the emissions intensity of our operations by 10%–20%, delivering a total emissions intensity reduction of 50–55% since FY2012.** This targeted trajectory reflects higher expected growth in our less energy- and emissions-intensive businesses in North America and Asia relative to our more mature business in Australia. It does not capture the potential exit of non-core brick operations, other divestments or possible acquisitions.

In Australia, we are a member of the Cement Industry Federation (CIF). The CIF policy is to support the Federal Government's national target to reduce emissions by 26–28% by 2030, and the CIF has been working with the World Business Council for Sustainable Development and its current roadmap to reduce emissions.

The 27% reduction in Boral's absolute GHG emissions over the past six years reflects our portfolio re-alignment towards less emissions-intensive operations through divestments and plant closures, the shift to imported clinker and our investment in more energy efficient technologies and alternative fuels programs.

Boral Australia, as part of its divisional sustainability strategy, is establishing aspirational goals and targets regarding energy efficiency improvements and renewable energy.

**We are also focused on growing the contribution of our low carbon and high-recycled content products which accounted for 9% of Group revenue in FY2018.** Our low carbon and high-recycled content products and businesses include Boral North America Fly Ash and TrueExterior® Siding & Trim, and in Boral Australia, ENVISIA® concrete, WarmPave and Boral Recycling.

Initiatives to further expand the revenue contribution of low carbon and high-recycled content products include:

- increasing fly ash sales in North America, including through higher penetration of fly ash in ready mix concrete
- enhancing our capability and response to product development to better align with customer needs and expectations
- improving our marketing of low carbon products
- increasing the recycling of our own waste into products
- piloting Sheetrock® EcoSmart Panel production at our Pinkenba plant, Queensland, which will see 25% less water, less energy and 20% fewer carbon emissions during plasterboard manufacturing.

## Berrima alternative fuels program

At our Berrima cement kiln in NSW, we have recently constructed a new alternative fuels facility which will use waste by-products from other industries. The use of alternative fuels will reduce coal consumption, reducing the carbon intensity of cement produced at Berrima, while also reducing materials going to landfill.

Alternative fuels used will include wood waste such as untreated sawdust, pallets, bark chips and mill off-cuts, commercial waste such as paper, cardboard, packaging and some plastics, and tyre chips.

The alternative fuels program will initially replace 25,000 tonnes of coal a year, reducing coal-related emissions by 26,000 tonnes CO<sub>2</sub>-e per annum.

In coming years, we are working towards replacing up to 30% of coal use at the site, equal to around 50,000 tonnes, with up to 100,000 tonnes of alternative fuels a year.

At a total investment of \$11 million, including a \$4 million NSW State Government grant, the program is expected to deliver ~\$3 million in annual cost savings.

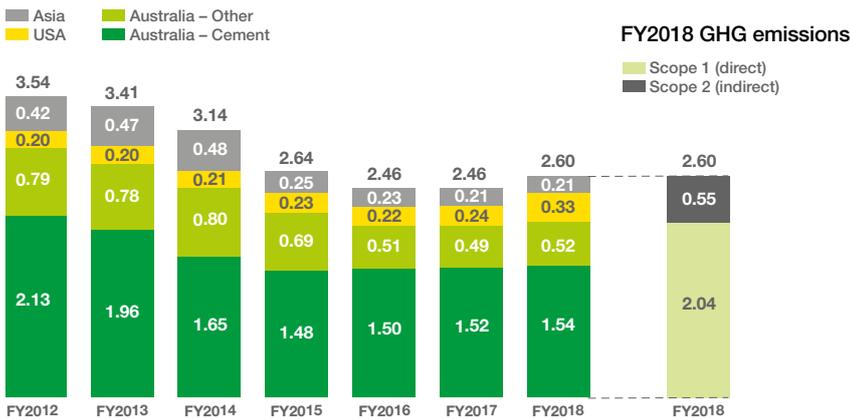
## Greenhouse gas emissions

In FY2018, Boral's absolute (Scope 1 and 2) emissions of 2.6 million tonnes of CO<sub>2</sub>-e increased by 5% compared to the prior year, reflecting the inclusion of the acquired Headwaters business in North America and modestly higher emissions from Boral Australia and USG Boral<sup>1,2</sup>.

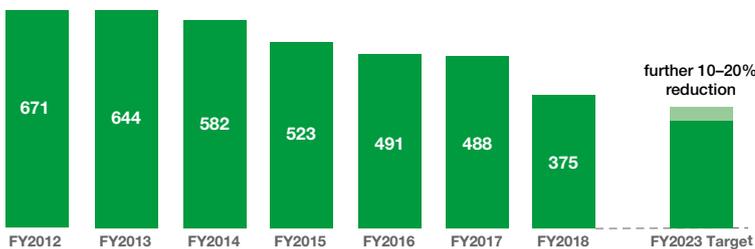
In line with our strategy, Boral's emissions intensity reduced by 23% to 375 tonnes of CO<sub>2</sub>-e per A\$ million of revenue, with the acquired Headwaters businesses being substantially less energy- and carbon-intensive than our traditional businesses<sup>1,2,3</sup>.

Absolute emissions were up 1% in Cement, 5% higher in the remainder of the Australian operations, 1% higher in Asia and up 35% in the US. The substantial increase in US emissions reflects the inclusion of Headwaters, as well as underlying growth in production volumes driven by stronger demand. The modestly higher emissions in Australia and Asia reflect overall higher activity levels driven by stronger demand across both regions.

### GHG emissions from operations<sup>1,2,4</sup> (million tonnes CO<sub>2</sub>-e)



### GHG emissions intensity from operations<sup>1,2,3</sup> (tonnes CO<sub>2</sub>-e per A\$m revenue)



This year, we focused on improving data collection of our Scope 3 emissions to more reliably report on our most material indirect emissions. While we have further work to do in collecting carbon information from suppliers, early indications suggest our **key Scope 3 emissions** which relate to clinker imported into Australia by Boral Cement and the purchase of cement in our US building products businesses (Stone, Roofing, Block) **are in the order of 1.2 million tonnes per annum**.

**Looking more broadly at the role Boral plays in the supply chain, our FY2018 fly ash sales in North America resulted in ~5.2 million tonnes of avoided CO<sub>2</sub>-e per annum<sup>5</sup>, resulting in a net Scope 3 positive impact of 4.0 million tonnes of CO<sub>2</sub>-e per annum for these cementitious materials.**

**With plans to increase available annual supply of fly ash by 1.5-2.0 million tons over the next three years, we are targeting a further reduction of 1.1-1.5 million tonnes of CO<sub>2</sub>-e in the supply chain by 2022.**

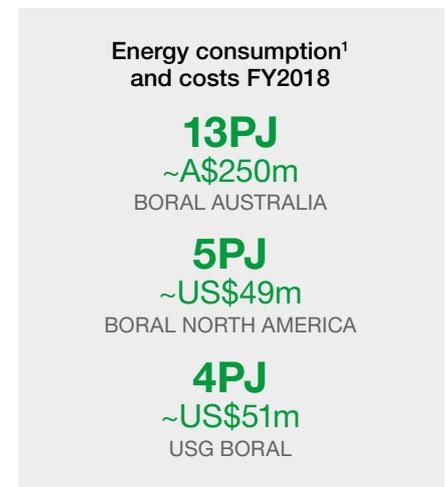
Further data on Boral's energy consumption, GHG and other emissions can be found at [boral.com/energy\\_and\\_emissions](http://boral.com/energy_and_emissions).

Definitions of Scope 1, 2 and 3 emissions are included on page 53.

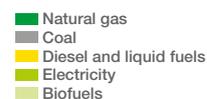
## Energy consumption

In FY2018, our operations consumed 22 petajoules of energy<sup>1</sup>, up 7% on last year, reflecting the acquisition of Headwaters and increased production volumes across our three divisions. Boral's Cement operations accounted for 31% of the Group's energy consumption.

Expenditure on energy increased 28% to A\$380 million, compared to FY2017. This reflects the acquisition of Headwaters, increased fuel, electricity and gas unit costs, as well as higher underlying energy consumption across all three Boral divisions.



### Energy by fuel source<sup>1,4</sup>



### GHG emissions by source<sup>1</sup>



1. Data provided for GHG emissions and energy consumption is for 100%-owned operations and Boral's share of 50%-owned joint venture operations – it excludes some joint ventures which in aggregate are not deemed to have material emissions.  
 2. USG Boral Asia emissions data for FY2017 has been restated using local electricity emissions factors where available.  
 3. Group reported revenue adjusted to include 50% share of underlying revenues from USG Boral and Meridian Brick joint ventures, which are equity accounted.

4. Figures may not add due to rounding.

5. We have used a conservative conversion factor to estimate CO<sub>2</sub>-e emissions displaced as a result of fly ash substitution of cement in ready mix concrete, assuming that for every one tonne of fly ash approximately 0.8 tonne of CO<sub>2</sub>-e is displaced. This conversion rate accounts for varying qualities of fly ash, and therefore substitution rates of 1.25 tonnes of fly ash per tonne of cement in ready mix concrete and assumes one tonne of cement produced results in one tonne of carbon emissions.

# Climate-related impacts

## Scenario analysis

We have commenced scenario analysis to assess the implications, including financial risks, of a transition to a lower carbon economy on Boral's Cement business.

We have focused on our Cement business as it is our most emissions-intensive and more likely to be impacted by domestic and global policy changes.

We are testing the resilience of our Cement operations by modelling three different future climate transition scenarios out to a 2030 horizon. The scenarios draw on historical relationship assumptions and future expectations focused around four key levers – carbon policy, construction policy and industry standards on construction materials efficiency, energy policy and energy efficiency, and environmental policies.

## Developed scenarios

The scenarios chosen reflect a balance between sufficient stress testing and most probable policy transitions in respect of the four key levers. As with any modelling of possible long-term future states, there are inherent limitations, as it is difficult to predict which, if any, of the scenarios might eventuate.

The three scenarios being considered are a Reference Case, which incorporates a modest future policy transition, a Globally Aligned and a Regionally Differentiated scenario. The latter two scenarios are aligned with the Paris Agreement two degrees celsius (2°C) economy and leverage existing projections from the Internal Energy Agency (IEA) as recommended by the TCFD. Each scenario considers a range of future domestic and international economy-wide emissions pricing net of any local assistance to emissions-intensive sectors.

<b>Reference Case (3–4°C economy)</b>	<p>Domestic and global attempts to address climate impacts lead to some policy shifts, however, these are insufficient to stabilise global temperatures to below 3°C to 4°C above historic levels.</p> <p>With the progressive retirement of coal-fired power plants through to 2050, energy demands are increasingly met by renewable energy and alternative fuels such as solid waste derived fuels.</p> <p>The construction sector attempts to advocate the use of greener construction materials, however, policies do not provide a clear pathway and market acceptance is slow. As a result, there is limited uptake of substitutes to replace carbon intensive Portland cement, as well as few uses of timber to replace concrete.</p>
<b>Globally Aligned carbon policy (2°C economy)</b>	<p>Global cooperation leads to ambitious action to achieve the 2°C climate goal. In Australia, coal-fired power plants are rapidly decommissioned by 2035. Internationally, coal becomes less important as a source of energy. Successful breakthroughs in renewable energy technologies are swiftly deployed, as is the use of alternative fuels.</p> <p>The construction sector makes several advancements in its industry standards. Strong policies and market acceptance favour the growing use of high-blend cements in place of Portland cement, while cement use as a whole is reduced by deploying timber as an alternative construction material to concrete, and through designing structures that use concrete more efficiently.</p>
<b>Regionally Differentiated carbon policy (2°C economy)</b>	<p>Varying pace of decarbonisation leads to regional divergence in policy to achieve the 2°C climate goal. While some countries adopt stronger policy actions than others, Australia's policy actions result in a more gradual transition over a longer period.</p> <p>With progressive closure of coal-fired power plants out to 2050, fossil fuels continue to be the primary source of energy in Australia, with increasing use of alternative fuels but limited penetration by renewable energy and no resultant change in energy price. Conversely, other countries push ahead with the development and implementation of renewable energy, as a result experiencing a decrease in overall prices of energy as renewables compete with coal.</p> <p>Though the construction sector implements policies for the use of other cements and construction materials, market acceptance is moderate. This leads to a modest increase in the use of high-blend cements, timber instead of Portland cement and concrete, and the beginnings of more concrete-efficient design structures.</p>

All three scenarios assume that China continues the closure of old-technology and sub-scale kilns into 2020 due to a variety of reasons including health, pollution and overcapacity, impacting the supply and price of clinker exports.

## Scenario analysis – process, status and next steps

Sponsored by Cement's Executive General Manager, coordinated by the Group environmental team, and with the assistance from external adviser EY, the scenario analysis is being undertaken by a 12-person working group, including Group Audit and Risk, environmental, sustainability and strategy managers.

While work is still underway, the team has developed the scenarios and assessed the implications for Boral. The findings and insights from this first phase of work have been presented and are being reviewed by the Executive Committee and the Board, with further refinements to the analysis being made.

The Cement scenario analysis is proving to be a useful tool that is formalising and testing our current expectations and direction for the Cement business, including opportunities for growth and changes that will be required to our current operating models.

The scenario analysis work will help inform strategic discussions and decision making and be incorporated into Boral's planning processes. More specifically, it is providing a greater understanding of the relative influence of different policy levers and carbon pricing outcomes on:

- our decision to manufacture or import clinker
- the demand for clinker and other cementitious materials, and
- capital investments required by the Cement business.

In FY2019, we will complete our Cement scenario analysis and consider whether to apply a similar process, where it makes sense to do so, in other parts of the business to further assess Boral's transition and physical climate risks.

Through our annual and sustainability reporting, we will continue to inform our stakeholders of the risks and opportunities that we identify.