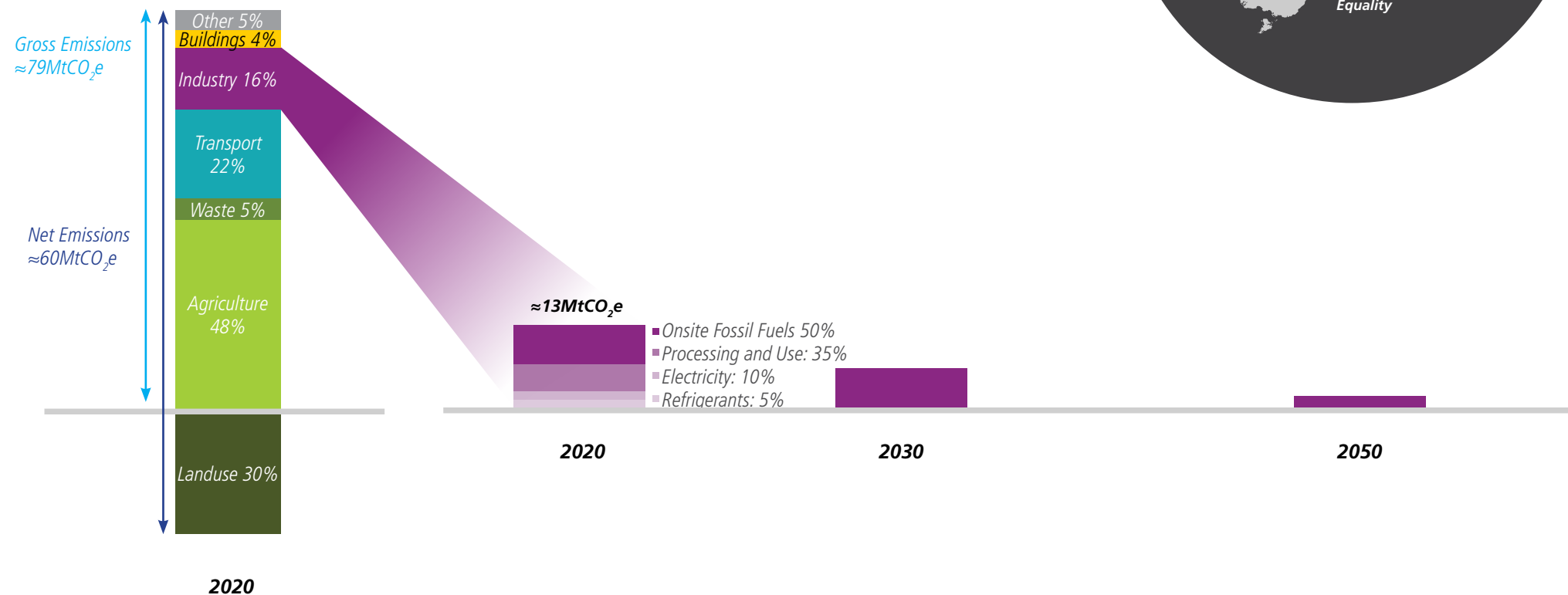


- THE CHALLENGE:**
- ▶ HIGH EMISSIONS
 - ▶ HEATING CLIMATE
 - ▶ UNEMPLOYMENT
 - ▶ HOUSING CRISIS
 - ▶ DECLINING BIODIVERSITY
 - ▶ LINEAR ECONOMY
 - ▶ ECONOMIC INSECURITY
 - ▶ POLLUTED WATERWAYS
 - ▶ DEGRADING SOIL

- TRANSITION: INDUSTRY:**
- ▶ HIGH-VALUE LOW-CARBON PRODUCTS
 - ▶ RENEWABLE PROCESS HEAT
 - ▶ REFRIGERANT UPGRADES
 - ▶ CROSS-SECTOR INITIATIVES



Transition: Industrial Product Manufacturing Systems

CHALLENGE STATEMENT

Industrial manufacturing produces the goods we require for both domestic consumption and export revenue. It is also an excellent vehicle to create a range of jobs within New Zealand, plus the COVID-19 pandemic has highlighted the importance of production, certainly in respect of essential items. However, from a sustainability perspective, there are several challenges for industry. Some 13 MtCO₂[1] has been attributed to this sector (approximately 16% of New Zealand's gross emissions), predominantly the result of process heating. High levels of water use and wastewater creation can also pose a challenge for local environmental systems and can constrain industrial intensification without ongoing innovation and investment. Beca's industrial specialists have identified the following opportunities to move New Zealand to a lower carbon manufacturing sector.

KEY OPPORTUNITIES

High-value low-carbon products: A low carbon manufacturing sector supplying high value products to discerning consumers globally would have less of an environmental impact and the potential to create more economic value. Investment in the development of industrial ecosystems, and renewable technologies could provide highly skilled jobs in many regions. For example, hosting data centres, production of ammonia, aluminium and other energy intensive processing. As an example, aluminium produced in New Zealand has one of the lowest carbon footprints per tonne of aluminium so will become increasingly cost competitive on a global scale when accounting for the cost of carbon. The below initiatives will further de-carbonise New Zealand's products.

Investments in renewable process heat:

- Focused investment in advanced optimisation of existing processes.
- Projects converting from fossil fuel to electric boilers/heat-pumps for low to medium heating. This can be constrained by the electricity transmission network and return on capital. Targeted projects to upgrade the transmission network capacity in unison with government support to decrease cost of non fossil-fuel process heat would create conditions for adoption and change. Additional renewable electricity generation is also required (see Electricity Transition). Electrification of 4TWh of energy would give savings of 1.9MtCO₂e (assuming 92% renewable electricity from the grid).[2]
- Projects supporting replacement of coal with biomass would create jobs to manufacture and install the new equipment. However, large sites are constrained by available quantities of local fuel. This would require a long-term plan for regional afforestation and a larger forestry industry to provide the required biomass for future conversions.
- There is also potential to utilise green hydrogen formed from renewable electricity for process heat, with current technology enabling the potential blending with natural gas in existing distribution systems. This would also create new job opportunities with a new hydrogen industry.

Refrigerants Upgrade Projects: Replacement of high global warming potential refrigerants (such as hydrofluorocarbons) with natural refrigerants (e.g. ammonia and CO₂) would reduce New Zealand's greenhouse gas (GHG) emissions by up to 0.8MtCO₂e.[3] The challenge is to support companies to reduce the economic burden of process safety management (particularly SMEs) associated with natural refrigerants and the capital cost for these upgrades. Rational integration of heat pumps with refrigeration is an opportunity that users will also require assistance with.

Support for Cross-sector Initiatives: Organisations can partner to move towards a circular economy. For example, creating recycle loops for PET packaging, or treating high chemical oxygen demand (COD) dairy waste in shared municipal wastewater biogesters creating biogas for heat and electricity cogeneration. Supporting economies of scale will allow more effective recycling/regeneration and create additional value streams. There are several areas where cross-sector focus is occurring and more are required.