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Breaking Down New Zealand's Energy Consumption between 2006/2007 and 2012/2013

To achieve the goal in New Zealand's Climate Change Response (Zero Carbon) Amendment Act 2019 – commonly called the Zero Carbon Act – of net zero greenhouse gas emissions by 2050, the most tractable lever is energy. Fortunately the country already uses renewable sources for over 80% of its electricity (aiming at 100% by 2030) and about 60% of all energy. But exactly where and how within the New Zealand (NZ) economy does energy get consumed? New research* answers this question for the first time and holds vital policy implications to meet the Act's ambitious goal.

The research applied two perspectives (production activities in the economy and end-use, or "final demand") and two very technical methods to slice and dice national energy consumption. It also analysed both energy directly consumed and the subset of energy "embodied" as production inputs – the way cement as a building input embodies energy already consumed heating, grinding and mixing it.

Over 2006/07–2012/13, a timeframe the methods dictated, marked differences emerged between sectors, and contemporaneous structural changes in the economy shaped consumption. Different components either pushed totals up or pulled them down. Overall though, the key figure of total direct consumption, rolling together both the production of goods and services and private or household consumption, fell about 4%.

The lion's share of direct consumption was swallowed by five sectors: Transport; Electricity Generation (even power plants use energy); Pulp, Paper and Print; Food Processing, Beverage and Tobacco (FPBT); and Agriculture, Forestry and Fishing. Their combined total dipped from 82% to 79% over the period. The top sectors in embodied consumption were somewhat different: Commercial and Residential; FPBT; Transport; Electricity Generation; and Mining and Construction.

Growth in services pulled embodied consumption down because services entail fewer physical inputs along the

way than industry: think TV streaming services versus manufacturing actual televisions.

From the final demand perspective, a steady 80% of energy ended up in exports and household consumption. On the production side, direct energy intensity pulled consumption down most. Since intensity means how much energy goes into producing GDP, lower intensity speaks to higher energy efficiency. Electricity generation deintensified most, as much coal was mothballed and, crucially, renewables shot up 52%.

The biggest consumption driver was population growth, followed (and amplified) by rising consumption per head. The latter was already high internationally, largely due to heating uninsulated homes and the OECD's highest car ownership rates. Unsurprisingly, NZ racks up large per capita emissions, too.

Policy implications abound for reshaping, and reducing, consumption. For instance, first, since transport used the most direct energy, NZ should concertedly: transition from fossil-fuel vehicles to green transport; phase out thirsty old imports; ease congestion; and set strict emissions standards. Second, energy efficient building standards, measures like household smart meters and energy-saving devices, and exporting less energy-intensive products would mitigate private consumption and exports' share. Third, since deintensifying direct energy best curbs consumption, heavy direct-consumption sectors should embrace renewables and replace inefficient production techniques. Finally, the study validates the government's goal to grow renewables (like wind and solar) to 100% of electricity by 2030.

*For the full study by Le Wen, Fengtao Guang and Basil Sharp, see "Dynamics in Aotearoa New Zealand's energy consumption between 2006/2007 and 2012/2013", *Energy*, 225, 15 June 2021, 120186. <https://doi.org/10.1016/j.energy.2021.120186>