7.4 Worked Example: $NECO_2$, the Sustainably Managed Exemption, and the Global Pattern

Test case context. On 22 April 2026 — Earth Day — the Building Research Association of New Zealand (BRANZ) and CIL Masterspec announced that $NECO_2$, the National Embodied Carbon Repository, had been named a finalist in the Infrastructure Sustainability Council (ISC) Awards in the Supply Solutions category. The repository is described as the only Ministry of Business, Innovation and Employment–endorsed national carbon repository for construction, drawing on twelve years of BRANZ-verified carbon data and providing free public access to embodied carbon factors for thousands of New Zealand construction products. It is paired in practice with BRANZ's LCAQuick assessment tool, used by architects, designers and engineers to compare materials early in design. $NECO_2$ is a useful test case for the framework set out in this chapter precisely because it is a high-quality, well-governed, publicly accessible repository operating in good faith inside the international standard. The gap this section identifies is therefore not a BRANZ failure. It is the standard itself, surfacing in the database that implements it. New Zealand is the diagnostic, not the diagnosis: the same audit, performed against ICE in the United Kingdom, EC3 in North America, the EU Level(s) database, or any other EN 15804–compliant repository, would produce a finding of the same shape. The standard is the same. The exemption is the same. The certification scheme that switches the LULUC factor to zero is the same.

7.4.1 How $NECO_2$ inherits the exemption

$NECO_2$ entries follow EN 15804 and ISO 21930, the two international standards that govern Environmental Product Declarations for construction products. Three structural features of those standards determine the result that appears on the architect's screen.

First, biogenic neutrality. Under EN 15804+A2, biogenic carbon sequestered into a wood product during forest growth is recorded as a negative number in modules A1 to A3, and the matching positive number is required to appear in module C at end of life. This is the formal sequestration–release pair. In a design comparator, the user typically sees the cradle-to-gate result first, where the negative is fully visible and the positive is not yet shown. The visible figure for structural softwood is therefore the credit without the bill.

Second, the system boundary. EN 15804 defines a product system. It does not define a landscape system. Soil organic carbon efflux from the harvest event is not assigned to any module, and therefore has no place to appear. Foregone sequestration — the carbon the standing forest would have continued to accumulate had it not been harvested — is a counterfactual landscape calculation, and is similarly outside the system boundary. Both quantities exist in the physical world and are measured by the national research apparatus, as Section 7.4.4 shows. They simply do not exist inside EN 15804.

Third, the explicit exemption. ISO 21930 (2017) and EN 15804+A2 assign a characterisation factor of 0 $kgCO_2e$ per kg CO_2 to land-use and land-use-change emissions for forests certified as 'sustainably managed', and a factor of 1 for forests classified as unsustainably managed. The certification schemes that determine which category a given harvest falls into are FSC and PEFC. This is the key: the standard does not ignore land-use change emissions because they cannot be measured. It writes them down to zero, by definition, on the basis of an industry-administered certification. The certification is the off switch.

Table 7.4.1 shows how each of the three liabilities catalogued in Chapter 6 lands inside the $NECO_2$ / EN 15804 architecture.

Liability category	EN 15804 module	Treatment in $NECO_2$ / LCAQuick output	Reasonable range, $kgCO_2e$ per m^3 NZ Radiata structural softwood
Soil organic carbon efflux from harvest event	Outside system boundary	Not reported	80 to 350
Foregone sequestration on the harvested stand	Outside system boundary	Not reported	90 to 280
End-of-life biogenic release: decay and methane	C3 / C4	Required by EN 15804+A2 to net the A1 sequestration credit, but in practice presented as a separate downstream module that the early-design comparator does not display	80 to 270
Indirect land-use change	**GWP-LULUC**	**Characterisation factor of zero applied to certified 'sustainably managed' harvest, by design**	**Suppressed by definition**
Total unreported liability, structural softwood, NZ Radiata	—	—	**250 to 900**

Pigs and oranges, displayed on a public website. When LCAQuick presents an early-design comparison between, say, a CLT panel and a concrete equivalent, the timber number is reported on a different scale than the concrete number, and the user is invited to subtract them as if they were commensurable. This is precisely the regulatory asymmetry that Table 7.1 of this chapter generalises. The comparator is doing exactly what an honest regulator-authored common-scale disclosure would prevent.

7.4.2 Magnitude of the gap on a single posted entry

Applying the central full-boundary figures from Chapter 6 to a one cubic metre unit of New Zealand kiln-dried structural radiata pine, the three excluded liability categories combine to a reasonable range of 250 to 900 kgCO_2e per cubic metre. The lower bound corresponds to short-rotation plantation on already-degraded soil, with high recovery rates and a high-value end-of-life pathway. The upper bound corresponds to long-rotation harvest on carbon-rich soil, with landfill disposal and methane release. For the structural softwood typically modelled in LCAQuick — radiata, ~28-year rotation, NZ conditions — the central estimate sits in the range of 400 to 600 kgCO_2e per cubic metre of unaccounted liability.

That is enough to flip the sign on most timber-versus-concrete comparisons that an early-design tool of this kind currently produces. Not all. Mass timber against high-cement-content concrete with no supplementary cementitious material substitution may still favour timber under most scenarios. But the margin moves from 'obvious' to 'depends on assumptions', which is the honest answer.

Table 7.4.2 sets the posted figure beside the full-boundary central estimate for four representative materials, including the two competing structural metals. The table is symmetric by construction. NECO_2 also under-reports liabilities and credits on the competing side: concrete carbonation under module D is often omitted or under-applied; structural steel's electric arc furnace recovery credit is similarly under-represented; recycled aluminium's end-of-life recovery credit (in the range of −5 to −9 tCO_2e per tonne recovered) is rarely surfaced in the early-design comparator. A full-boundary correction does not simply make timber look worse. It re-ranks the entire materials hierarchy on a common scale. That is the policy ask in its most general form.

Material, 1 m³ structural unit	**NECO_2-style A1–A3 figure used in early-design comparators (kgCO_2e)**	**Full-boundary central estimate (kgCO_2e)**	**Direction of correction**
Radiata pine, kiln-dried structural	−600 to −650 (net negative after biogenic credit)	+50 to +400	Sign reversal in most scenarios
Reinforced concrete, 30 MPa, NZ mix	+380 to +450	+340 to +430 (after carbonation, module D)	Modest downward adjustment
Structural steel, NZ market mix, ~30% recycled content	+1,800 to +2,400	+1,650 to +2,300 (after EAF recovery credit, module D)	Modest downward adjustment
Recycled aluminium, structural extrusion	+500 to +900	+200 to +600 (after end-of-life recovery credit, module D)	Material downward adjustment

Provenance of the figures. The ranges in Table 7.4.2 are derived by applying the Chapter 6 framework to NZ-specific parameters: 28-year radiata rotation; soil orders representative of the planted forest estate as mapped by Manaaki Whenua S-Map; SOC efflux ranges anchored to the Scion Long-Term Site

Productivity trial measurements; foregone-sequestration ranges anchored to the National Planted Forest Inventory yield class distribution; end-of-life methane ranges anchored to the New Zealand Greenhouse Gas Inventory's harvested wood products half-life parameters. The central estimate cited in the prose corresponds to mid-range assumptions across all four inputs. The full derivation is set out in Chapter 6, Sections 6.3 to 6.5; this section applies that framework rather than re-deriving it.

7.4.3 Asymmetry of the disclosure burden

It is worth pausing on what is being asked of each material in the current architecture.

Concrete producers must disclose the calcination chemistry of clinker, the supplementary cementitious material content of the mix, the kiln fuel mix, the transport distances, and — increasingly under EN 15804+A2 — the carbonation uptake at end of life. Steel fabricators must disclose primary versus electric arc furnace pathways, scrap content, recovery rate at end of life, and module D credit. Aluminium smelters must disclose the electricity grid intensity behind primary metal, the recycled content of secondary metal, and recovery credits under module D.

Timber producers, under the same standard, are permitted to declare their feedstock 'sustainably managed' by reference to FSC or PEFC certification, and the LULUC characterisation factor collapses to zero. Soil organic carbon, foregone sequestration, and end-of-life methane sit either outside the boundary entirely or in a downstream module that the early-design comparator does not display.

This is the core observation. The disclosure obligation imposed on the structural alternatives is genuinely demanding. The disclosure obligation imposed on timber is the production of a certificate. Concrete, steel, and aluminium are therefore not the opponents of full-boundary disclosure. They are its natural constituency. They already disclose the analogues of the three excluded categories. They are being asked to compete on a scoreboard that gives the other side a definitional credit and an exempt liability. Removing the timber exemption levels the comparator by raising standards on one side, not by lowering them anywhere.

7.4.4 Environmental impact versus extraction practices: the research apparatus already knows

Every nation that has signed the United Nations Framework Convention on Climate Change submits an annual greenhouse gas inventory using the same IPCC 2006 guidelines and the 2019 refinement. The Land Use, Land-Use Change and Forestry sector of every such inventory reports soil organic carbon change from land-use change. The forestry research institutes, soil science agencies, and atmospheric measurement programmes in every major timber-producing country are the bodies that supply the underlying data to those inventories. The construction product disclosure regime in every major construction market uses EN 15804, ISO 21930, or a closely harmonised national equivalent. The architecture is the same in every jurisdiction. Two parallel systems: the national inventory, where soil carbon, biogenic methane, and land-use-change emissions are real numbers; and the product disclosure, where those same quantities are zero or out-of-boundary. The gap between the two systems is global by virtue of the standards layer being global.

This section audits one country end-to-end because one country can fit on a single page. New Zealand has the further usefulness of operating itself as a full member of every international body relevant to this question — UNFCCC, IPCC, ISO, OECD, WTO, FSC, PEFC — while having a population of 5.5 million and a primary income drawn from resource and agricultural exports. The full machinery is present. The signal-to-noise is high. The same audit, done for any other UNFCCC signatory, would produce a table of the same shape with different proper nouns.

On 1 July 2025, the New Zealand government merged its Crown Research Institutes for forestry, soils, agricultural land use, and horticulture into a single Public Research Organisation, the Bioeconomy Science Institute (BSI), Maianga Taiao. The four constituent CRIs — Scion, Manaaki Whenua – Landcare Research, AgResearch, and Plant & Food Research — are now one entity, reporting to the Minister of Science, Innovation and Technology. Together with NIWA, the atmospheric and climate research institute, these bodies have spent decades publishing research on the environmental impact of resource extraction practices, including the precise quantities that EN 15804+A2, as implemented in NECO$_2$, treats as zero or out-of-boundary. Table 7.4.3 sets out what each contributing institute has on the public record.

Crown Research Institute (now Bioeconomy Science Institute / BSI)	**Relevant published research**	**What it establishes that NECO$_2$ does not surface**
Scion (forestry research)	Long-Term Site Productivity (LTSP) trials, six NZ sites, full radiata rotation completed; New Zealand was the first country in the global LTSP network to report a full rotation. Garrett & Fields (2025) on deep soil carbon in NZ planted forests, Carbon Balance and Management.	Direct measurement of soil and forest-floor carbon and nutrient loss under the three core harvest treatments. Confirms that carbon and nutrients are exported from site at harvest, that low-fertility sites do not fully recover within a rotation when the forest floor is removed, and that soil organic carbon is a measurable, depletable, and management-sensitive pool. The pool exists. The numbers exist. The product-level disclosure does not.
Manaaki Whenua – Landcare Research (soils and land-use research)	National Soil Carbon Monitoring System (500 sites across five land-use classes, ongoing); Land Resources and Climate Change programme; soil carbon contribution to NZ's UNFCCC reporting.	Establishes that soil carbon stocks are quantified at national scale, that land-use transitions move soil carbon, and that the average NZ agricultural soil carries roughly 100 t C / ha in the top 30 cm. This is the data infrastructure that makes 'no SOC change on harvest' an active assumption rather than a measurement gap.

Crown Research Institute (now Bioeconomy Science Institute / BSI)	Relevant published research	What it establishes that $NECO_2$ does not surface
AgResearch (pastoral and land-use GHG research)	NZ Agricultural Greenhouse Gas Research Centre (NZAGRC) co-funded soil carbon work; nitrous oxide emission factors from disturbed soils.	Demonstrates that the same regulator demands measurement-grade SOC and N_2O accounting from pastoral land use while accepting category-zero defaults for forestry land use under EN 15804+A2.
Plant & Food Research	Co-author on the Maximising Forest Carbon report to MPI (2023); soil and ecosystem carbon work cross-listed under BSI.	Contributes to the body of CRI work explicitly identifying 'a lack of information as to how soil carbon changes when land use changes' — an in-house acknowledgement that the figure is uncertain, not zero. EN 15804+A2 codes uncertain as zero.
NIWA (atmospheric and climate research)	National greenhouse gas measurement and atmospheric inversion programmes; co-author on national emissions accounting research.	Provides the atmospheric verification layer that constrains national-scale emissions. NIWA's top-down measurements and the inventory's bottom-up accounts have to reconcile. They do not reconcile if SOC efflux and biogenic methane from harvest are zero at the product level but positive at the national level.
BRANZ (building research)	$NECO_2$, LCAQuick, CO_2NSTRUCT, and twelve years of BRANZ-verified carbon data; supported by the Building Research Levy.	Implements the international EN 15804 / ISO 21930 standard with rigour and transparency. The standard, not the implementation, is the source of the exemption. BRANZ is downstream of an upstream choice made by a different ministry, in a different framework, on a different timeline.

The Inventory itself. New Zealand's Greenhouse Gas Inventory, the official annual report submitted to the UNFCCC, is unambiguous. From the Ministry for the Environment's own April 2024 Snapshot publication:

> *"In most cases, afforestation causes an increase in net emissions in the year of planting due to losses in soil carbon and biomass from the land-use change."*

The same paragraph distinguishes that initial loss from subsequent uptake as the new stand grows. The point is not that the Inventory says forestry is bad. The point is that the New Zealand government, in its UNFCCC submission, explicitly accounts for soil carbon loss from land-use change to forestry. The figure exists. It is reported. It is reconciled against atmospheric measurements. It is audited internationally. Every UNFCCC signatory submits the same category of report under the same IPCC framework. The New Zealand Snapshot is quoted here only because it is published in plain English in a public document. The smoking gun is not New Zealand's. It is global.

The same government, through MBIE, simultaneously endorses a public construction-materials repository whose methodology does not pass that figure through to the per-product number an architect or specifier sees in early-stage design. The two systems run on parallel tracks: the National Inventory tells the truth at the national scale, $NECO_2$ tells a different and less complete story at the product scale, and the per-product number is the one that goes into the building. That parallel-track architecture is not unique to New Zealand. It is the standard configuration.

The exemption in $NECO_2$ is not a blind spot caused by missing science. It is an architectural choice to use a product-level standard, EN 15804, that suppresses figures the same Crown apparatus measures, reports, and reconciles in another system. The science sits in one ministry. The product disclosure sits in another. The standard sits with an international standards body. The certification that switches the LULUC factor to zero sits with an industry-administered scheme. No single point in the chain is responsible for the result. The result is preserved by structure, not by intent. That structure is replicated, with local variations, in every country that has signed both the UNFCCC and the international standards regime governing construction product disclosure.

There is one further structural feature worth naming. Every country with a meaningful resource-export sector has an economic incentive to keep the cost of its extraction practices off the product-level disclosure that travels with the export. New Zealand's primary income is export, and timber is part of that export base. The same is true, on different scales and with different species, of Canada, Sweden, Finland, Germany, Brazil, Indonesia, Russia, and the United States. Two facts coexist in each of these jurisdictions: the research apparatus is honest, and the disclosure layer is exempt. The export economy benefits from the exemption. The architectural reform must therefore come, at least initially, from the importing jurisdictions — the EU, the UK, and major American metros operating Buy Clean — because those are the markets that consume the comparator output without the export-side incentive to preserve the gap.

7.4.5 Who pays for the asymmetry

$NECO_2$ is funded by the Building Research Levy, a statutory charge under the Building Research Levy Act 1969 collected on every building consent over $20,000 at a rate of $1 per $1,000 of contract value. Every New Zealand homeowner, developer, and commercial client who has built or renovated above the threshold has paid into the system that produced the repository. BRANZ's 2026 funding round allocates $11.5 million across 22 levy-funded projects. $NECO_2$, LCAQuick, and the broader low-carbon tools programme sit inside that envelope, alongside an additional MBIE building levy that funds related ministry functions.

In November 2025, the Minister for Building and Construction announced the repeal of the Building Research Levy Act 1969 and the consolidation of the two levies into a single, contestable funding pool, on stated grounds of transparency and accountability. The reform itself acknowledges, in the language of its own announcement, that the existing arrangement has not delivered the level of transparency it should have. $NECO_2$ was a flagship deliverable of the legacy system, and is rightly being recognised in that capacity. It is also, on the analysis of this section, an artefact of the legacy system's upstream architectural problem.

The Earth Day finalist announcement, the ISC award shortlisting, the MBIE endorsement, the Master Builders backing, and the Architects' Institute support are all doing reputational work that the underlying numbers, in their current EN 15804 framing, do not yet support. The taxpayer paid for a tool that, by virtue of the standard it implements, presents the most-favoured material on a different scale to its structural competitors. That is not an indictment of the people who built the tool. It is a description of what happens when a high-quality implementation is bolted onto an architecturally exempt standard.

7.4.6 What full-boundary $NECO_2$ would look like

A version of $NECO_2$ corrected on the lines of this chapter would not require new science. It would require four changes to surface science that BSI, NIWA, MfE and BRANZ already hold.

1. Surface module C and module D figures alongside A1–A3 in the early-design comparator, by default, with no additional clicks. The biogenic credit and the biogenic release should appear on the same screen.

2. Add an SOC efflux line for harvested timber entries, populated from Scion LTSP data and Manaaki Whenua national soil carbon monitoring, with the existing uncertainty range disclosed. 'Uncertain' is not 'zero'. Lift the bed and study the bugs.

3. Add a foregone-sequestration line, calculated against an explicit counterfactual stand age and yield class, drawn from the National Planted Forest Inventory. Display the counterfactual transparently so that users can challenge the assumption rather than inheriting it.

4. Replace the binary FSC/PEFC LULUC factor with a continuous factor that reflects rotation length, prior land use, and soil order, drawing on the same Manaaki Whenua S-Map and soil carbon monitoring infrastructure that already feeds the National Inventory.

None of these changes invents a new measurement. Each one connects a measurement that already exists in one branch of the Crown research system to a tool that is consumed in another branch. The architectural problem is the disconnection. The architectural fix is the connection.

7.4.7 Section conclusion

$NECO_2$ is a well-built tool, governed in good faith, implementing an international standard with rigour. It is also, by virtue of that standard, a public-facing instance of the regulatory asymmetry this chapter describes. A government that has spent thirty years funding world-class soil and forest carbon science through Manaaki Whenua, Scion, AgResearch, Plant & Food, and NIWA, that submits an annual UNFCCC inventory in which soil carbon loss from afforestation is reported as a real number, and that has now consolidated those institutes into a single Bioeconomy Science Institute, has produced a publicly endorsed, taxpayer-funded materials comparator in which the same numbers appear as zero or do not appear at all.

The gap between the two systems is the section's finding. The reform of the Levy Act, announced in November 2025 and to take effect through 2026, is the moment when the connection could be made in this jurisdiction. $NECO_2$ v2, designed as a full-boundary instrument, would universalise the register of information to a standardised format that lets concrete, steel, aluminium, and timber be compared on the same scale. That is what an FDA-style nutrition label for construction materials would look like. The data to build it is already paid for. It is sitting one Crown agency over.

Environmental impact versus extraction practices.

They know.