The Tree of Many Sales

How Often the Same Physical Carbon Is Sold, Counted, and Claimed as a Benefit — and the One Time It Is Recorded as a Debit

THE FINDING

One physical tonne of carbon in a commercial plantation tree is counted as a benefit three to six times in the books, and as a debit zero times in the chain that booked the benefits.

There is no magic carbon. The atmosphere does not see three to six tonnes. The accounting systems each count the same tonne as if it were separate.

A Divergent Resource Logic Companion Paper
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PART I

The Carbon

1. Is There Magic Carbon?

The question that prompted this paper was casual. How many times can the same tree be sold? On working through it, the question reformulated itself. The tree is not what is sold multiple times. The carbon is.

A commercial plantation tree contains a measurable physical quantity of carbon. It absorbs a measurable quantity of CO_2 from the atmosphere over its rotation. That carbon has prices set by several markets and an analytical price set by the Social Cost of Carbon literature. And that same physical carbon, once sequestered, is counted as a benefit by between three and six different accounting systems before the tree is even harvested, and several more after harvest into the wood product, the building it enters, and the corporate sustainability reports of the entities along the chain.

There is no magic carbon. The atmosphere does not see three tonnes when one tonne was sequestered. But the accounting systems each treat the same tonne as a separate benefit, and the sum of the benefits exceeds the physical asset by some multiple. This paper documents the multiple.

Then, at end-of-life, the carbon returns to the atmosphere. Approximately sixty to seventy percent of construction-and-demolition wood waste in the United States is landfilled (EPA Advancing Sustainable Materials Management report series); New Zealand wood waste similarly flows to landfill at substantial rates documented by the Ministry for the Environment. In landfills, anaerobic decomposition produces methane, with a global warming potential approximately twenty-eight times CO_2 on the hundred-year horizon and eighty-four times on the twenty-year horizon (IPCC AR6 WG1 Chapter 7). The methane release is not subtracted from any of the benefit counts. It appears in national greenhouse-gas inventories under UNFCCC reporting as a separate aggregate line item, borne by the Crown or federal taxpayer, not directly allocated to any participant in the originating revenue chain.

Counted as a benefit three to six times. Counted as a debit zero times in the books that booked the benefits. That is the finding.

2. The Physical Carbon in a Tree

Before counting how many times the carbon is sold, the physical asset has to be specified. The following figures are working estimates from forestry-extension and academic literature, anchored on a commercial loblolly pine (Pinus taeda) at a 25-year rotation, southern U.S., average site index. Numbers will vary by species, region, site productivity, and rotation length. Specific figures are subject to the verification pass described in Section 11.

Carbon pool	Carbon content (tonnes C)	CO_2-equivalent (tCO_2e)	Notes
Above-ground biomass (stem, branches, foliage)	0.5 – 1.0	1.8 – 3.7	Main merchantable timber stock
Below-ground biomass (roots)	0.1 – 0.25	0.4 – 0.9	Approximately 20–25% of above-ground
Soil organic carbon (per-tree hectare share)	0.04 – 0.07	0.15 – 0.25	Derived from DRL Codex SOC efflux range at typical stem density
TOTAL per tree at harvest, full-boundary	**0.6 – 1.3**	**2.3 – 4.8**	**Approximate; central working figure ≈ 4 tCO_2e**

CO_2-equivalent is calculated from carbon content by the standard factor of 44/12 ≈ 3.67 (the molecular weight ratio of CO_2 to C).

The atmospheric drawdown across the rotation — the net cumulative CO_2 pulled from the atmosphere over twenty-five years to grow the biomass — is approximately equal in magnitude to the standing stock at harvest, in the range of 2.5 to 5.0 tCO_2e per tree. Stephenson et al. (2014, Nature, 507:90–93) documented that carbon accumulation accelerates with tree size across 403 species; older trees absorb at higher annual rates than younger ones. For commercial plantation at 25-year rotation, the absorption figure tracks the stock figure within the working range.

Central working figure for the rest of this paper: one commercial plantation tree at harvest carries approximately 4 tCO_2e of physical carbon, representing approximately 4 tCO_2e of atmospheric drawdown across its rotation. This is what is physically there.

3. The Price of That Carbon

The same physical tonne of CO_2-equivalent sells at radically different prices depending on which market is buying it. Working ranges from publicly reported price data; specific prices at any given date should be verified from registry and exchange records.

Market or analytical framework	Price per tCO_2e (USD)	4 tCO_2e tree valued at
Voluntary forestry credits (Verra VCS, Gold Standard, ACR, CAR)	3 – 20	12 – 80
California Compliance Offset (CARB IFM)	10 – 40	40 – 160
New Zealand NZU (NZ ETS)	20 – 55	80 – 220
EU ETS allowances (LULUCF interacts; not direct forestry sale)	60 – 100	240 – 400
Social Cost of Carbon — EPA 2023 central estimate	190	760
Social Cost of Carbon — DRL Codex range (per SCC literature)	51 – 250	200 – 1,000

Two findings sit in this table.

First, the same physical tonne of carbon is priced between USD 3 and USD 250 depending on the accounting system asking. The spread is roughly two orders of magnitude. The tonne does not have a single price; it has whatever price the institution buying or analysing it has agreed to pay.

Second, the gap between voluntary forestry credit prices and the Social Cost of Carbon is itself a finding. Forestry credits routinely sell for under USD 20 per tonne while the EPA's 2023 central SCC estimate sets the analytical cost of a tonne at USD 190 — roughly ten times the voluntary forestry price. The gap is the difference between what the industry sells the carbon for and what the public bears as the cost of it being released. That gap is one of the structural features that makes the asset class viable: the seller captures a price that does not reflect the full social cost, and the difference accumulates against the climate.

4. How Many Times the Same Carbon Is Counted as a Benefit

This is the load-bearing section. The physical carbon is fixed: one tonne sequestered means one tonne removed from the atmosphere. The accounting systems are not fixed. The same physical tonne is treated as a separate benefit at multiple accounting heads, each of which captures value or claims a benefit independently. The following counts are the accounting events through which the same physical tonne passes.

#	What is claimed	Who claims it	Accounting head
1	Carbon credit issued and sold to an emitter	Covered emitter (compliance) or voluntary corporate purchaser retires the credit against their reported emissions	Voluntary or compliance offset registry (VCS, GS, ACR, CAR, CARB IFM, NZU, ACCU)
2	National-inventory LULUCF removal under UNFCCC reporting	Host country claims the sequestration in its national greenhouse-gas accounts	UNFCCC National Inventory Report; LULUCF sector
3	Embedded sequestration in the wood product under biogenic-neutral EPD	Wood-product manufacturer markets the product as low-carbon on the strength of the same sequestration	EN 15804 / ISO 21930 EPD, biogenic carbon module
4	Building certification credit (LEED, BREEAM, Green Star, Homestar, DGNB)	Building owner / developer receives certification rating informed by the wood material's biogenic-neutral footprint	Green-building rating systems' material-credit calculations
5	Corporate scope 3 embodied-carbon reporting	Developer, owner, tenant, ESG fund holding the building each count the same wood carbon against their net-zero or science-based targets	GHG Protocol Scope 3 categories 1, 2, 11; SBTi targets; corporate ESG disclosure
6	Procurement-program performance	Federal, state, or Crown procuring entity counts the building toward its low-carbon procurement program	U.S. federal Buy Clean; GSA low-embodied-carbon procurement; NZ Crown procurement; EU GPP

Six counts. Each is the same physical tonne. Each is recorded as a separate benefit. Most operators capture three to four of the counts; sophisticated operators with credit-eligible plantations selling into certified green buildings under low-carbon procurement programs capture all six.

Some of these counts have offsetting accounting under "corresponding adjustments" rules in Article 6 of the Paris Agreement, intended to prevent double-counting between project-level credits (Count 1) and

host-country national inventory (Count 2). The corresponding-adjustment system is recent in implementation (effective 2024 onward for most jurisdictions), uneven in coverage, and does not reach Counts 3 through 6 at all, because those operate outside the national-inventory framework altogether. Counts 3 through 6 are EPD, building-certification, corporate-scope-3, and procurement systems, each of which treats the wood material at biogenic-neutral on the strength of the underlying sequestration without reference to whether that sequestration has already been sold as an offset.

That is the magic carbon. There is one physical tonne. There are between three and six tonnes of claimed benefit against it. The difference is not real carbon. The atmosphere is not aware of Counts 3 through 6. The accounting systems are.

5. The Picture

The same finding visualised. Each bar is the same physical tonne, counted again under a different accounting head. The final bar, in red, is the methane debit at end-of-life, which is not allocated to any of the benefit counts and which is borne by the Crown or federal taxpayer under national-inventory reporting.

Accounting head	tCO_2e claimed	Visual scale (1 block ≈ 1 tCO_2e)
Physical carbon in the tree (atmospheric drawdown)	1	▮
Count 1 — Offset credit sold	+1 (cumulative 2)	▮▮
Count 2 — National LULUCF inventory removal	+1 (cumulative 3)	▮▮▮
Count 3 — Biogenic-neutral EPD embedded sequestration	+1 (cumulative 4)	▮▮▮▮
Count 4 — Green-building certification credit	+1 (cumulative 5)	▮▮▮▮▮
Count 5 — Corporate scope 3 reporting	+1 (cumulative 6)	▮▮▮▮▮▮
Count 6 — Low-carbon procurement performance	+1 (cumulative 7)	▮▮▮▮▮▮▮
TOTAL claimed benefit against 1 physical tonne	**3 – 7**	**(most operators 3–4; full stack 6–7)**
End-of-life methane debit, not allocated to benefit counts	**−5 to −20**	**▮▮▮▮▮ to ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮**

Reading the picture: the green block at the top is the one tonne of physical carbon the tree actually contains. Each subsequent row adds another tonne of claimed benefit to the cumulative count, even

though no additional physical carbon has been sequestered. By the time the same tonne has passed through Counts 1 through 6, the books claim seven tonnes of benefit against one tonne of physical work.

The red row at the bottom is the methane debit at end-of-life, scaled to its global warming potential. On a 100-year horizon, one tonne of carbon released as methane in a landfill is approximately equivalent to 28× that tonne measured as CO_2; on a 20-year horizon, approximately 84×. After accounting for the fraction of wood-waste carbon that actually converts to methane (typically modelled at 50% under IPCC inventory methodologies, with the remainder either retained in the landfill or released as CO_2), the effective debit is in the range of 5 to 20 tCO_2e per tonne of carbon landfilled.

The debit, in both magnitude and allocation, is the point. It exceeds the entire stack of benefit claims for the same physical tonne. And it is allocated to no participant in the chain that captured those claims.

6. What the Tree Is Worth, by Multiple

Combining the carbon stock (Section 2), the carbon price (Section 3), and the counting multiplicity (Section 4), the economic finding is this:

Valuation lens	Physical asset	Counted as a benefit (3–6×)
Voluntary forestry credit @ USD 10/tCO_2e	USD 40 (4 tCO_2e × 10)	USD 120 – 240
NZU @ USD 35/tCO_2e	USD 140	USD 420 – 840
EU ETS @ USD 80/tCO_2e	USD 320	USD 960 – 1,920
EPA SCC @ USD 190/tCO_2e (analytical cost)	USD 760	USD 2,280 – 4,560

The right column is the figure that matters. The same physical four tonnes of carbon, with its physical price at any given market, is monetised or counted as a benefit at three to six times that price across the chain. The tree is not worth four times its physical carbon; the tree is worth approximately one times its physical carbon as a sale, and the carbon is counted as a benefit three to six times across the entities that capture the claims downstream.

This is the most direct answer to the original question of the paper. A tree cannot be worth four times its physical carbon in any rigorous sense. It is, however, counted as a benefit three to six times by independent accounting systems, and those counts each translate into market or reputational value for the entity capturing the claim. The aggregate value extracted from the carbon claims, across the chain, exceeds the physical asset by the multiplicity factor documented above.

The corresponding debit, scaled to GWP and allocated to the atmosphere via landfill methane, exceeds the entire benefit stack. It is borne by no participant in the chain.

PART II

The Asset-Level Stack

7. The Tree as the Asset That Carries the Carbon

Part I documented the carbon as a separable asset, counted across multiple accounting systems. Part II documents the tree as the underlying asset that carries that carbon, and the legally and commercially distinct monetisation events that operate against the tree across its lifecycle. The two analyses are the same configuration viewed from different angles. Part I follows the carbon; Part II follows the asset. They produce different counts because they are different framings.

In the United States, the available asset-level stack documents at sixteen events. In New Zealand, it documents at twelve. The structural sequence is the same across jurisdictions. The specific instruments differ. Other jurisdictions — Australia, Canada, the European Union, Brazil, the United Kingdom — operate analogous stacks with locally specific instruments; country sections for those jurisdictions are planned for subsequent drafts.

The events are grouped by lifecycle stage. Each event is numbered for reference. Statutory citations are given where the mechanism is statutory; program names and administering agencies are given where the mechanism is programmatic. The events are not all mutually exclusive in every operator's portfolio, but they are mutually distinct as mechanisms.

8. Country Section — United States

Stage 1 — Land tenure

Event US-1 — Use-value property tax assessment

All major U.S. timber-producing states offer some form of use-value or current-use property tax assessment for qualifying forest land. Program structure, qualification thresholds, rollback provisions, and the magnitude of reduction vary by state. Examples include Georgia's Conservation Use Valuation Assessment, North Carolina's Present Use Value, and Mississippi's Forest Land Assessment. The carrying cost of the asset is reduced through a state-level tax preference.

Event US-2 — §631 capital gains treatment of timber sales

Internal Revenue Code §631(a) and §631(b) allow qualifying timber transactions to receive capital-gains treatment rather than ordinary-income treatment. The §631 election remained in the Code through the Tax Reform Act of 1986 while broader capital-gains preferences for individuals were repealed. The federal effective tax rate on qualifying timber transactions is materially below the ordinary-income rate that applies to most business activity.

Event US-3 — §194 reforestation expensing and amortisation

Internal Revenue Code §194 allows timber growers to immediately expense up to ten thousand dollars per qualified timber property annually, with the remainder amortisable over seven years. The cost of establishing the asset is partially federally subsidised through tax expenditure.

Event US-4 — §170(h) conservation easement deductions

Internal Revenue Code §170(h) allows federal income tax deductions for qualified conservation contributions, including easements on timber land. Depending on how the easement is drafted, the same land may continue to be commercially harvested under the easement's terms. Where the structure is used, the deduction operates against the same hectare that may later generate the downstream stack.

Stage 2 — Planting and growth

Event US-5 — Federal cost-share programs (USDA NRCS)

USDA's Natural Resources Conservation Service administers cost-share programs that include practice components relevant to forestry, including the Environmental Quality Incentives Program (EQIP) and, under specified signups, the Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) tree-planting practices. Federal payments may cover a significant portion of qualifying establishment costs.

Event US-6 — State-level cost-share and forestry-agency programs

State forestry agencies in major timber-producing states administer additional cost-share programs. Examples include Georgia's Forest Land Protection Program, Alabama's Treasure Forest Program, and Mississippi's Forest Resources Development Council programs. Stacking with federal cost-share is permitted by program design in several jurisdictions, under specified rules.

Event US-7 — Carbon credit issuance during growth

Where the operation qualifies under one of several forestry carbon-credit protocols, the landowner may generate credits under that protocol's rules. The CARB IFM protocol issues California Carbon Offsets; voluntary registries (VCS, Gold Standard, ACR, CAR) issue credits under various forestry methodologies. This is Count 1 of the carbon-counting analysis in Part I.

Event US-8 — Recurring credit issuance under improved-forest-management designations

Under several protocols, credits may be issued, sold, and replenished as the forest is managed under improved-forest-management designations that allow continuing harvest. The credit stream is recurring rather than one-time under those protocols.

Stage 3 — Tax-advantaged corporate structures

Event US-9 — Timber REIT structure

Following the REIT Modernization Act of 1997 amendments, timberland holdings may be structured as Real Estate Investment Trusts. The structure permits the entity to avoid federal corporate income tax at the holding level provided the REIT satisfies the relevant income, asset, and distribution tests. Timber REITs are not entirely tax-free in every sense; the structure shifts federal income tax from the entity to the unitholder.

Event US-10 — TIMO management fee structures

Timber Investment Management Organizations have pooled institutional capital from ERISA pension funds, university endowments, sovereign wealth funds, and insurance companies since the 1978 ERISA prudent-investor amendments. TIMO fee structures typically include a percentage of assets under management plus performance components on harvest revenue.

Stage 4 — Harvest

Event US-11 — Stumpage sale or harvested log sale

Timber is sold as standing timber or harvested logs. §631 treatment applies to qualifying sales.

Event US-12 — Domestic price floor through trade protection

Antidumping and countervailing duties on Canadian softwood imports under the Lumber V proceedings have supported a domestic price floor since 2017. Section 232 tariffs imposed on softwood timber and lumber and on related product categories in October 2025 took effect in stacked schedules. Specific rates at any given date should be verified against current Commerce Department and Section 232 schedules before citation in published versions.

Stage 5 — Processing

Event US-13 — Co-product allocation at the sawmill

Sawmill processing generates sawdust, wood chips, and bark as co-products, with emissions typically allocated by economic value. The structural sawn product bears a small fraction of total process emissions despite being the reason the process exists.

Event US-14 — Biomass and renewable-energy classification of residues

Sawmill residues and harvest slash qualify under multiple programs as renewable biomass eligible for renewable-energy credits, biomass-power-generation incentives, and pellet-export markets. The same physical material is treated as a co-product for one accounting purpose and as a renewable-energy source for another.

Stage 6 — End product and certification

Event US-15 — Biogenic-neutral EPD and wood-product premium

Environmental Product Declarations for wood products typically treat biogenic carbon under the net-zero convention. The net-zero treatment supports marketing of the product as low-carbon and may command a premium in markets where low-carbon claims are valued — federal procurement, ESG-classified projects, sustainability-rated buildings. This is Count 3 of the carbon-counting analysis in Part I.

Event US-16 — Building certification credits and downstream asset uplift

LEED, BREEAM, Green Star, and DGNB submissions may credit wood as biogenic-zero or biogenic-negative under those rating systems' material-credit rules. The certified building may capture market value in higher rents, sale prices, ESG-fund classification, or procurement preference. This is Counts 4, 5, and 6 of the carbon-counting analysis in Part I.

9. Country Section — New Zealand

The New Zealand stack documents at twelve events. The architecture is structurally similar to the U.S. stack but uses different instruments and operates under different administering bodies.

Stage 1 — Land tenure

Event NZ-1 — Forestry rights and Crown forestry licences

Forestry rights registered under the Forestry Rights Registration Act 1983 and Crown Forestry Licences under the Crown Forest Assets Act 1989 permit holding and harvesting rights to be separated from underlying land title.

Event NZ-2 — Forestry tax treatment under the Income Tax Act 2007

The Income Tax Act 2007 contains forestry-specific provisions including the cost-of-bush regime and the treatment of forestry income and expenditure. Establishment, maintenance, and other forestry expenditure are deductible under the relevant sections, with timing rules that may permit deferral of net taxable income until harvest.

Event NZ-3 — Overseas Investment Office regime

The OIO administers approvals for foreign acquisition of sensitive land under the Overseas Investment Act 2005. Forestry land has been a substantial category of OIO approvals, with foreign-owned forestry interests reported across multiple years.

Stage 2 — Planting and growth

Event NZ-4 — Te Uru Rakau afforestation grant programs

The One Billion Trees program administered by Te Uru Rakau (Ministry for Primary Industries) between 2018 and 2024 provided direct grants and partnership funding for afforestation. The Afforestation Grant Scheme and successor instruments have supported establishment costs for new forests.

Event NZ-5 — NZ ETS forestry registration and NZU issuance under post-1989 forest land

The NZ ETS, administered by the Environmental Protection Authority under the Climate Change Response Act 2002, permits owners of post-1989 forest land to register and earn NZUs for sequestered carbon. NZUs may be sold to covered emitters or held against future liabilities. This is Count 1 of the carbon-counting analysis in Part I, in NZ form.

Event NZ-6 — Averaging accounting and stock-change accounting options

Post-1989 forest owners may elect between averaging accounting and stock-change accounting under the NZ ETS rules. Under averaging, the operator earns NZUs up to the long-term average carbon stock of the forest and is not required to surrender NZUs at harvest within the averaging period.

Stage 3 — Institutional structures

Event NZ-7 — Limited Partnerships and Portfolio Investment Entities

Forestry investment is commonly held through Limited Partnerships under the Limited Partnerships Act 2008 or through Portfolio Investment Entities under the Income Tax Act 2007. Combined effect is that institutional capital may be deployed into NZ forestry under structures that minimise entity-level tax friction.

Stage 4 — Harvest

Event NZ-8 — Stumpage sale or log sale, including export

New Zealand is a net log exporter, with a substantial share of harvest sold as unprocessed logs into Asian markets. Domestic price formation is tied to the export market rather than supported by trade protection of the U.S. kind.

Stage 5 — Processing

Event NZ-9 — Co-product allocation at processing facilities

NZ processing facilities use the same co-product allocation conventions as elsewhere. Where logs are exported unprocessed, the co-product allocation is performed offshore at the receiving mill.

Stage 6 — End product and certification

Event NZ-10 — Biogenic-neutral EPD and wood-product premium

EPDs registered for NZ wood products typically treat biogenic carbon under the net-zero convention. This is Count 3 of the carbon-counting analysis in Part I, in NZ form.

Event NZ-11 — Building-level disclosure under NCO2 and Homestar

NCO2 (BRANZ) and Homestar (New Zealand Green Building Council) operate under conventions that omit soil organic carbon efflux, end-of-life methane, and foregone sequestration from building-level reported figures. The same liabilities are measured and disclosed at the national level under the LULUCF ledger in NZ's greenhouse-gas inventory, where they sit against the Crown's books. This is the ledger-split finding documented separately at fullboundarycarbon.org/pages/behind-the-curtain, and it is Counts 4 and 6 of the carbon-counting analysis in Part I, in NZ form.

Event NZ-12 — Homestar credits and asset uplift

Buildings certified under Homestar receive ratings that may confer market value in higher rents, sale prices, or procurement preference under Crown procurement guidance promoting low-carbon construction. This is Count 5 of the carbon-counting analysis in Part I, in NZ form.

Notes on the NZ stack

The NZ stack documents at twelve events versus the U.S. sixteen. The absence of a U.S.-style trade-protection event reduces the count by one. The cost-of-bush regime achieves a structurally similar deferral effect to §631 but through different mechanics, counted here as one event rather than two. The absence of a §170(h)-equivalent conservation easement deduction and the absence of a U.S.-style recurring IFM credit issuance protocol distinct from the NZU mechanism account for the remainder of the difference. The structural sequence — tenure, planting, growth-phase credits, corporate structure, harvest, processing, certification, with externality at end-of-life — is identical.

The New Zealand State Forests Act 1885 and the climatal-reserves legislation of 1889 established Crown reserves explicitly for climate-protection purposes, predating modern carbon accounting by more than a century. The 1889 reserves were not biogenic-neutral instruments; they were climate-protection instruments resting on the explicit recognition that standing forest performs climate work that harvested forest does not. The institutional knowledge has not been forgotten; the accounting convention has overwritten it.

PART III

Synthesis

10. The Two Analyses Are the Same Finding

Part I documented six counts against one physical tonne of carbon. Part II documented sixteen events in the United States and twelve in New Zealand against the underlying asset. The two analyses produce different numbers because they are different framings, but they describe the same configuration.

The carbon-counting analysis is the answer to the climate question: how many times is the same physical carbon sold or counted as a benefit, and is there a debit to balance the benefits? The answer is three to six benefits, one debit larger than the entire stack of benefits, debit allocated to no participant in the benefit chain.

The asset-level stack is the answer to the economic question: who profits from the configuration, through which legally distinct mechanisms, against the same biological substrate, across multiple rotations? The answer is sixteen mechanisms in the U.S. and twelve in NZ, operating in parallel against the same hectare, across rotations measured in decades, with the corresponding cost not directly allocated to participants in the revenue chain.

Together they describe a configuration in which a single biological asset carries one tonne of physical carbon, generates three to six tonnes of claimed carbon benefit, supports twelve to sixteen distinct revenue mechanisms across its lifecycle and across rotations, and releases the carbon as methane at end-of-life with a debit borne by parties outside the revenue chain. Whether the configuration is described in carbon terms or in economic terms, the finding is the same.

11. The Rotation, The Externality, and Comparison to Oil

Plantation forestry is rotation-system. After harvest, the land is replanted and the cycle restarts. The land carries forward most preferences from Stage 1. The establishment-support programs are typically available again. Carbon credits or NZUs begin a new issuance baseline. The preferential tax treatment of timber transactions continues to apply. A single hectare planted in 1988 has had thirty-eight years to accumulate the stack of events and the chain of carbon counts. The same hectare replanted will accumulate them again.

The externality, in both the carbon and the economic analyses, is the methane release at end-of-life. In landfills, anaerobic decomposition produces methane with global warming potential approximately twenty-eight times CO_2 on the hundred-year horizon and eighty-four times on the twenty-year horizon. Under prevailing accounting conventions, this release is not subtracted from any of the credits, EPD claims, building certifications, corporate scope 3 reports, or procurement-program performance metrics

that monetised or counted the same carbon during the asset's life. The cost is socialised; the revenue and the claims were privatised at every stage.

Oil and gas is the closest structural analog. The industry monetises through multiple legally distinct mechanisms against the same underlying resource: depletion allowance under §613A, intangible drilling cost deductions under §263(c), the master limited partnership structure analogous to the REIT or NZ Limited Partnership, federal lease subsidies, export-credit support, military procurement supporting domestic refining. Oil pays substantial federal severance and royalty payments at extraction with no clean forestry equivalent. Oil faces explicit carbon costs in EU markets through CBAM, in California through cap-and-trade, and via fuel taxes that capture the embedded CO_2 content of the product. Forestry, under the biogenic-neutral convention, has none of these counter-mechanisms operating systematically against its stack in either of the jurisdictions documented here.

12. What Changes Under Full-Boundary Disclosure

If the three liabilities documented in the DRL Codex — soil organic carbon efflux, end-of-life methane, and foregone sequestration — are restored to disclosure at the point of sale, the stacks documented here do not collapse, but they shift.

In the carbon-counting analysis, Counts 1 through 6 would have to be reported net of the SOC efflux that occurs at harvest and the methane that occurs at end-of-life. Most current claims would be reduced; some would invert into net debits where lifecycle emissions exceed growth-phase sequestration. The arithmetic of "three to six tonnes of claimed benefit" would correct toward the physical one tonne, with the harvest and end-of-life liabilities subtracted.

In the asset-level analysis, the biogenic-neutral EPD events (US-15, NZ-10) and the building-certification events (US-16, NZ-11, NZ-12) would require recalculation. The wood-product premium resting on the net-zero claim would re-align toward the full-boundary footprint. The other events — use-value assessment, §631, §194, cost-share programs, REIT structure, TIMO fee streams, stumpage sales, trade protection, co-product allocation, biomass classification, and their NZ equivalents — do not depend directly on biogenic-neutrality. They remain available as policy mechanisms even when the carbon accounting is corrected. They become, however, recognisable for what they are: a stack of policy preferences operating against a biological asset, no longer masked by the biogenic-neutrality convention.

The disclosure correction does not dismantle the industry. It reveals the resulting structure. That is the auditor's task.

13. Limitations and Honest Framing

This paper separates three types of content. The reader should distinguish them.

First, documented law and program structure. Statutory citations, REIT and PIE rules, EQIP and Te Uru Rakau program structures, NZ ETS forestry rules, EPD biogenic conventions, Article 6 corresponding-adjustment requirements: these are anchored to statute, regulation, or public program records and are firm in the underlying drafting.

Second, working estimates of typical magnitude. Carbon stock per tree, atmospheric drawdown across the rotation, market and SCC prices, cost-share percentages, NZU prices, AD/CVD and Section 232 rates at specific dates, premium magnitudes for low-carbon EPDs, methane GWP values and landfill conversion factors: these are documented in primary sources, but the specific numerical magnitudes vary across operators, jurisdictions, contracts, sites, species, rotation lengths, and time periods. The current draft uses working estimates where firm verification is pending. Numerical refinement is a verification pass before final publication.

Third, the analytical framing of the carbon-counting analysis and the asset-level stack as coordinated structures. These framings are the paper's interpretation. They are offered as the most useful framings of the configuration documented. Other framings are possible. The paper does not claim that every plantation operator captures every count, that any individual operator has engaged in misconduct, or that the configuration was deliberately assembled by any single party. The configuration emerged across decades of separate statutory, regulatory, and program-level decisions, and the paper describes the result rather than characterising the process by which the result emerged.

The political register of the carbon-counting finding is sharper than several other findings in the DRL corpus. The corpus posture — configuration-descriptive, primary-source-anchored, never characterising intent — applies with particular force in this paper. The temptation to use sharper language is greater here than elsewhere. The auditor's voice is deliberate.

14. Closing

The question that prompted this paper was casual: how many times can the same tree be sold? The answer, as the paper frames it, is that the tree is not what is sold multiple times. The carbon is.

One physical tonne of carbon, sequestered in one commercial plantation tree, is counted as a benefit three to six times across the chain of accounting systems that operate against forestry. It is sold once at the credit stage and counted again as a national-inventory removal, as embedded EPD sequestration, as a green-building credit, as corporate scope 3, and as procurement-program performance. The arithmetic of the chain produces between three and six tonnes of claimed benefit against one tonne of physical work.

And then, at end-of-life, the carbon is released as methane in a landfill, with a debit several times larger than the entire stack of claimed benefits, allocated to no participant in any of those claims, sitting instead on the Crown's books or the federal taxpayer's.

There is no magic carbon. The atmosphere does not see three to six tonnes when one tonne was sequestered. The accounting systems each count the same tonne as if it were separate. The slash pile is behind the hill. The credit was issued without the bill. The methane is on the atmosphere's books.

The auditor's task is to lay this out, anchored to primary sources, in the voice that an exit memo requires. That is what this paper attempts.

Source notes

Carbon stock and absorption: Stephenson et al. 2014 (Nature 507:90–93) for age-dependent carbon accumulation; USFS Southern Research Station rotation-age and biomass guidelines for loblolly pine; DRL Codex Appendix H for SOC efflux derivation. Carbon prices: Verra, Gold Standard, ACR, CAR registry-reported prices; CARB Compliance Offset auction and secondary-market data; EPA NZ ETS and Jarden NZU market reports; EU ETS auction data; EPA 2023 Social Cost of Greenhouse Gases technical support document; DRL Codex Section 4 for SCC range derivation.

Counting and double-counting: UNFCCC LULUCF reporting framework; Article 6 of the Paris Agreement and the corresponding-adjustments rulebook (CMA decisions 2/CMA.3 and subsequent); EN 15804 / ISO 21930 EPD product-category rules and biogenic carbon module; LEED, BREEAM, Green Star, Homestar, and DGNB rating-system material-credit documentation; GHG Protocol Corporate Standard, Scope 3 Standard, and Building Sector Guidance; SBTi targets and SBTi Forest, Land, and Agriculture (FLAG) guidance; U.S. federal Buy Clean Initiative; GSA Low-Embodied-Carbon Concrete and Steel guidance; NZ Government Procurement Rules; EU Green Public Procurement criteria.

United States statutory citations: Internal Revenue Code §170(h), §194, §263(c), §613A, §631(a), §631(b); REIT Modernization Act of 1997; Tax Reform Act of 1986; Employee Retirement Income Security Act 1974. Program records: USDA NRCS EQIP and CRP / CREP documentation; USFS Wood Innovations records; CARB IFM protocol; Verra VCS forestry methodologies. Trade citations: U.S. Department of Commerce Lumber V AD/CVD determinations; Section 232 proclamations; CRS Report R48781. Industry data: NCREIF Timberland Index; individual REIT 10-K filings; OpenSecrets federal lobbying disclosures. End-of-life data: EPA WARM v15; EPA Advancing Sustainable Materials Management report series; IPCC AR6 WG1 Chapter 7 for methane GWP values.

New Zealand statutory citations: Income Tax Act 2007; Climate Change Response Act 2002; Crown Forest Assets Act 1989; Forestry Rights Registration Act 1983; Overseas Investment Act 2005; Limited Partnerships Act 2008; New Zealand State Forests Act 1885 and climatal-reserves legislation 1889.

Program records: Te Uru Rakau afforestation grants and One Billion Trees disbursements; EPA NZ ETS registry records; Ministry for the Environment LULUCF inventory; BRANZ NCO2 documentation; New Zealand Green Building Council Homestar documentation; OIO published decisions. Cross-reference: fullboundarycarbon.org/pages/behind-the-curtain.

Voice and naming posture: this paper follows the DRL corpus posture of naming institutions only from their own disclosures, filings, lobbying records, or peer-reviewed outputs. Permitted verbs: classified, disclosed, funded, participated, authored, lobbied, voted, sold, issued, registered, administered, certified, counted, claimed, reported. The paper does not characterise intent.

Verification status of this draft: structural mechanisms and accounting heads are anchored to statutory, regulatory, or program-record sources. Typical-magnitude figures (carbon stock per tree, atmospheric drawdown, market and SCC prices, cost-share percentages, NZU prices, tariff rates, premium magnitudes, methane debit calculations) are working estimates pending the primary-source verification pass described in Section 13. v0.3 adds the Part I carbon-counting analysis as the document's lead finding; retains the Part II asset-level stack documented in v0.2 with U.S. and NZ country sections and Perplexity-review corrections folded in; and adds the Part III synthesis tying the two analyses together. Australia, Canada, EU, Brazil, and UK country sections are planned for v0.4 and beyond.