

From:

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To: California Air Resources Board

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Reference: Comments from Professors Kaplan and Ramanna to Inform Implementation of Senate Bill 253 (Climate Corporate Data Accountability Act), as amended by SB 219

Dear Board members,

We offer the following comments to inform the implementation of the Senate Bill (SB) 253 (Climate Corporate Data Accountability Act), as amended by SB 219:

1. We wholeheartedly support initiatives that aim to improve the quality of greenhouse gas (GHG) emissions measurement and reporting. Valid and accurate metrics can steer investments, guide regulations, and assess the impact of climate, energy, and industrial policy action alternatives. They are also increasingly material to investors and to companies themselves. We advocate that entities produce comprehensive, consistent, comparable, and reliable reports using rigorous climate accounting practices that can be audited to “reasonable assurance” standards (analogous to entities’ financial reports produced under US GAAP) rather than using industry-based climate disclosures. Industry-based disclosures can, at best, be assured only with limited-scope audits, leading to such disclosures being (correctly) perceived as lower quality than financial reports. Unless climate reporting has the rigor and assurance of accounting statements, true accountability for, and sustainable reductions in, corporate supply-chain GHG emissions will be unachievable.
2. Our comments focus on the accounting foundations for reporting entity GHG emissions within SB 253.

Limitations of current emissions-counting approaches like the GHG Protocol

3. The GHG Protocol identifies three types of GHG emissions and gives explicit guidance for measuring and reporting them:
 - a. **Scope 1:** Direct emissions from sources owned or controlled by a company, such as its production and transportation equipment.
 - b. **Scope 2:** Emissions at facilities that generate electricity bought and consumed by the company.

- c. **Scope 3:** Emissions from upstream operations in a company's supply chain and from downstream activities by the company's customers and end-use consumers.
- 4. We support the inclusion of direct (or so-called Scope 1) emissions in SB 253. The only emissions that actually enter the atmosphere are these direct emissions, so their rigorous measurement is the basis of any sound accounting and reporting.
- 5. Scopes 2 and 3 essentially cover all GHG emissions indirectly linked to a company's operations. The GHG Protocol likely carved Scope 2 emissions out of Scope 3 because it was felt that Scope 2 emissions could be more easily identified, but for all conceptual and practical considerations, Scopes 2 and 3 are identical. Importantly, despite years of application, the measurement of Scopes 2 and 3 emissions have been, widely and correctly, criticized for their inaccuracy. We contend that this situation is due to inherent shortcomings in the very notions of Scope 2 and 3. In particular:
 - a. The construction of Scope 3 measures, which starts from the perspective of the reporting entity and looks up and down its value chain to imagine the identities of all its tier-n suppliers and customers and their associated emissions, is flawed. In practice, such information is unknowable, and entities are reduced to making guesstimates and using often outdated industry- and regional-average emissions, if at all, in fabricating their Scope 3 numbers. A similar process is advocated in the GHG Protocol's Product Life Cycle standard. Supporters of the GHG Protocol note that these approaches have long encouraged improved data quality, but the sheer impossibility of accurately calculating (and auditing) emissions numbers under these approaches creates little incentive for companies to actually improve their reporting accuracy over time.
 - b. The Scope 3 and Product Life Cycle standards also muddle upstream incurred emissions with downstream prospective emissions, effectively adding the known past to the unknown future. The result distorts an entity's accountability over controllable actions from its past actions and diffuses systemwide accountability over actions that can be controlled by downstream entities in the future. In addition, it is impossible to audit an action that has yet to occur.
 - c. Even if it were faithfully followed, the Scope 3 and Product Life Cycle processes are redundant across entities and economically wasteful, as each entity in a value chain must indulge in the same guesstimates up and down that chain. Any public policy that mandates such calculations risks violating basic cost-benefit considerations.
 - d. Perhaps most worrisomely, Scope 3 enshrines multiple counting of the same emissions by different entities. Because entities do not debit emissions liabilities as they sell associated inventories down a value chain, there is an overcounting of emissions in that chain. The result enables freeriding across entities as no one

entity need take its Scope 3 numbers seriously, and the system as a whole institutionalizes a deliberate overstatement of emissions that is incompatible with basic scientific methods. As a specific example, Scope 3 measurement requires that any reduction of Scope 1 emissions anywhere in a value chain will be counted by every single entity up and down the value chain, grossly overestimating the emissions actually reduced by a single company's actions.

- e. Scope 2 emissions are simply Scope 3 emissions from a particular type of supplier, causing Scope 2 reporting to have the same defects as Scope 3 reporting. Scope 2 reporting lets users or buyers estimate their upstream emissions values rather than relying on accurate and audited data from suppliers. This opens the door to chicanery and fraud in Scope 2 reporting. For instance, under the Scope 2 framework, buyers ignore transmission losses – meaning some emissions go unaccounted for, even though they still enter the atmosphere. Moreover, the Scope 2 approach allows for double counting of emissions savings from electricity generation, creating misleading reporting. Companies fool themselves and their customers into believing their energy is “clean” while atmospheric emissions continue to increase. Additionally, Scope 2 reporting does not reflect the full cradle-to-gate emissions associated with electricity production by ignoring the emissions created in the construction of the property, plant, and equipment used to produce electricity. The GHG Protocol confusingly separates operating and capital emissions and does not assign the latter to electricity outputs. The result is to make some forms of energy look cleaner than others, in violation of the underlying science. (For further reading, please see, for example, this 2024 [paper](#).)
- 6. We believe that these attributes limit the usefulness of corporate emissions reporting under current GHG Protocol standards. Indeed, notwithstanding the GHG Protocol appropriating the word “accounting” to describe what its standards do, the approaches advocated by the GHG Protocol fail to meet basic accounting criteria widely described in introductory financial accounting textbooks. For example, the approaches yield data that are not fungible, mutually exclusive, and collectively exhaustive across and within entities, violating basic accounting principles.
- 7. Our bottom line: Scope 1 is a useful concept. Scopes 2 and 3 are conceptually unsound and practically infeasible. They should not be included in any sensible legislation or regulation. We propose a solution below that improves on existing emissions counting approaches and accurately accounts for all direct and upstream emissions, including all those generated in power supply.

The E-ledger method: A solution for tracking value chain emissions

- 8. In a 2021 Harvard Business Review [article](#), we described a robust, accurate, and auditable accounting system for measuring an entity's total supply-chain GHG emissions that overcomes all these shortcomings: the E-ledger method. The conceptual framework

for this system is simple and analogous to how entities' cost and inventory accounting systems function today, and can be easily adopted by those trained in preparing and using accounting reports for decision-making. Entities include for-profit public and private companies, nonprofit organizations, and public-sector agencies, departments, and ministries. Our approach is materially different from the GHG Protocol's approach which, as described above, is inefficient, inaccurate, un-auditable, and requires redundant and repetitive counting of the same emissions.

9. Under the E-ledger method, each entity allocates its direct ("Scope 1" in the GHG Protocol's terminology) and purchased (akin to Scope 2 and upstream Scope 3) emissions (the E-liabilities) to its products and services. These allocations rely on the specifics of the entity's production process as well as the emissions balances of all production inputs as reported by the entity's suppliers. This should be based on **primary supplier-specific emissions data**, not industry averages, therefore giving entities and their customers an accurate picture of the emissions from their specific supply chain.
10. With this system, whenever an entity sells and delivers a product or service to a customer, the customer acquires not only the product/service itself but also "responsibility" (or the E-liabilities) for all the GHG emitted, from cradle to gate, by all the extraction, transportation, and operating processes used to generate that product or service. The E-liability method is dynamic and transaction-based, whereby entities automatically transfer the emissions embodied in their outputs to their customers (or beneficiaries) as those outputs flow from stage-to-stage of the supply chain. Every entity is thus accountable for its direct emissions and the cumulative sum of all upstream emissions in its purchased products and services, and can debit E-liabilities when the emissions in its products and services are transferred down a supply chain, similar to standard inventory accounting.
11. The E-liability approach produces, for every product and service in the economy, an accurate and auditable measure of its total "cradle-to-gate" emissions. This accounting algorithm solves the multiple problems outlined above inherent in the current GHG Protocol's Scopes 2 and 3 approach. First, it avoids the multiple-accounting problem by calculating direct (Scope 1) emissions only once, at the place and time they occur in a corporate supply chain. Second, it solves the multiple-counting problem by then debiting and crediting the emissions as the associated inventory to which they are attached moves through value chains. Third, it obviates the need for the ad hoc Scope 2 category by treating the electricity purchased from an energy supplier as another purchased input. Fourth, it recognizes the important controllability and measurement differences between upstream and downstream emissions (for robust principles on corporate disclosure of downstream emissions, please refer to this 2024 [paper](#)). Finally, the supply chain's direct emissions are calculated accurately, due to the system's inherent incentives against overstatement and understatement, not roughly approximated by arbitrary industry and regional estimates, and traced in ways that can be audited to the same standards used for financial statements.

12. The E-liability approach, when implemented across an entity's supply chain, can produce numbers that can be assured via a full-scope audit at a reasonable assurance threshold. Assurance happens once and only once, at two distinct stages: of the direct emissions at source, and of the allocation of direct and purchased emissions to outputs. The E-liability method is grounded in the well-established and generally accepted principles for inventory accounting, principles that are entirely familiar to investors and analysts. As a consequence, the E-liability approach can be implemented in parallel to an entity's existing financial-accounting infrastructure, making the accounting for GHG emissions **less expensive, more comparable, and more verifiable** as compared to the current ad hoc attempts at estimating Scopes 2 and 3 emissions.
13. Beyond the benefits of **more accurate and auditable reporting**, the widespread adoption of the E-liability accounting approach will **motivate entities to be more innovative** in their product design, purchasing, and sourcing decisions to **facilitate significant and enduring decarbonization** of their supply chain and operations. The innovations will be guided by a tangible and measurable goal to acquire input products and services that have been produced with lower GHG emissions. The Scopes 2 and 3 framework was seemingly designed for high-level rhetorical inspiration but not for motivating specific management decisions since entities are not accountable under Scopes 2 and 3 for the specific GHG emissions produced in their supply chains. This helps to explain the limited progress most entities have made during the past decade to decarbonize their supply chains despite widespread reporting under these concepts.
14. Additionally, the E-liability approach is compatible with entities reporting fungible, measured, and verifiable removal offsets (please refer to this 2023 [article](#)). Rights to carbon removals can be recognized as an E-asset and be tradeable as a removal offset, when the timing and magnitude of the offsets are both reasonably estimable and probable. An entity can "net" a given quantity of E-assets against its E-liabilities account when that quantity of GHG has been actually removed from the atmosphere and indefinitely sequestered. Together, E-assets and E-liabilities provide the basic accounting tools (E-ledgers) for entities to measure and manage their performance toward decarbonization targets, including net-zero goals. The E-ledgers on which they are recorded provide a fully auditable vehicle for stewarding an organization's environmental claims, mitigating the greenwashing that has plagued corporate reporting in this space.
15. The E-ledgers method inherently scales over time using the powerful computational principle of recursion. This entails solving a seemingly insurmountable problem, such as accurately calculating the embedded emissions of all products that transact in the economy, by breaking it down into manageable "subroutines" that iteratively improve outcomes. As more products are subject to this sort of recursive accuracy improvement, and with the passage of a few reporting cycles, the emissions data for most products transacted in the economy can approach the accuracy needed for decision-making in

competitive markets. (This approach is further described in a forthcoming [working paper](#).)

16. Sound emissions accounting enables a vibrant disclosure environment by providing a verified basis for **truing-up organizational performance**. Under the E-ledger method, companies can easily produce a standardized company-level report of their complete cradle-to-gate carbon footprint by aggregating the product-level emissions information, a process exactly analogous to how they produce an inventory report for their financial statements. Likewise, jurisdiction-level E-ledgers can be produced by this bottom-up consolidation of entity ledgers, allowing for robust accounting of emissions in any region for a given period. This plays a crucial role in supporting any policy efforts to achieve geological net zero.

E-ledger in practice

17. Since publication, the November 2021 paper has been recognized with the 2021 HBR-McKinsey Award as the journal's outstanding 2021 publication "for its practical and ground-breaking management thinking." The [E-liability Institute](#) - which we co-founded to drive the E-liability method into practice - has initiated pilot projects with several major organizations that have already demonstrated the feasibility and benefits of the E-liability approach.
18. Since its inception, the E-liability Institute has completed and published pilot studies with leading companies, such as [Giti Tire](#), [Heidelberg Materials](#), [Hitachi Energy](#), [Soprema](#), [Tata Steel](#), [IDG Security](#), and [BMW Group](#), that demonstrated the practical viability and scalability of the E-ledgers method across different sectors. The Institute also has current and proposed pilot projects with organizations in oil and gas production, healthcare delivery, cattle rearing, and heavy machinery, amongst others. We are happy to share relevant learnings from the pilots with you or even to initiate joint pilots if necessary.
19. Recognizing the need for software and assurance firms to support organizations on their journey from pilot to enterprise-wide implementation, the Institute is proactively engaging with firms in this space to support the development of scalable solutions. Information technologies such as tokenization and blockchain, combined with existing inventory and cost-accounting systems, can record, transmit, and provide an audit trail for E-ledger transactions.
20. The E-liability Institute has also published a **proto-standard** for emissions accounting based on the E-liability method. This guidance provides a detailed roadmap for organizations to calculate the embedded emissions in their outputs, to have their emissions accounts audited, and to ensure comparability in their reporting. The proto-standard can catalyze more-formal, public standard-setting. The proto-standard is prepared as a free-to-use global public resource, accessible [here](#).

21. The Institute is also working with several key players relevant to the development of a universal repository for product-level cradle-to-gate emissions data, including national scientific agencies, central banks, and international organizations. The data hub will gather product-level data at the lowest practicable level of aggregation spatially and over time. It will provide companies without immediate access to primary data on the embedded emissions of their inputs with reliable emissions figures, in the interim, and enable companies to report their own primary data on the embedded emissions of their outputs, enhancing overall dataset accuracy. This data hub, which will iteratively improve in accuracy, specificity of coverage, and timeliness, will be a trusted source of emissions data and can accelerate the adoption of the E-ledger accounting system described above.
22. To clarify, the E-liability Institute does not charge for any of its services, and its work is funded entirely by philanthropy, ensuring that it remains independent of commercial influence. The E-liability Institute is a systems catalyst, enabling markets and governments to evolve sensibly in balancing energy security, trade fairness, and other priorities.

Recommendations

23. With this background, we recommend that the Board:
- a. Eliminate any requirements to report Scopes 2 and 3.
 - b. Make direct emissions (Scope 1) reporting mandatory for firms above a certain materiality threshold.
 - c. Encourage entities to pursue pilot studies of the E-ledgers approach during a three-year trial period. The pilot studies can be shared, voluntarily, with organizations developing standards for supply-chain emissions accounting.
 - d. After the three-year period, consider mandating E-ledgers for entities above a certain materiality threshold.
24. For responses to specific consultation questions:
- a. For **Question 1**, please refer to paragraph 8. In addition, we recommend that the scope of SB 253 cover all entities, including for-profit public and private companies, nonprofit organizations, and public-sector agencies, departments, and ministries. The scope of transactions should be legal economic transfer of a good or service, one that is effected consensually between entities to a transaction. Transfer can occur through a bill of sale, invoice, or similar vehicle that complies with relevant jurisdictional guidance. The transfer test can be linked to the financial-accounting policy that the entities already apply for revenue recognition.

- b. For **Question 2**, please refer to paragraphs 8-10 and 16. E-ledgers across entities that have a subsidiary-parent relation may be consolidated under similar rules as used for financial accounting in the relevant jurisdictions, including rules that describe when one entity has “control” over another and rules that apply the “entity concept” (to eliminate intra-group transfers).
- c. For **Question 4**, please refer to paragraphs 9-10, 15, and 21. Under the E-ledger method, all entities record all material, direct emissions of GHGs using direct measurement or calculation. This must be assured at source to the reasonableness standard. In cases where suppliers do not provide primary emissions data described, the purchasing entity will record on its environmental ledgers the embedded emissions of the acquired inputs at the maximum applicable value of the emissions distribution for the input’s product category as described across generally accepted data sources.
- d. For **Question 7**, please refer to paragraphs 3-16.
- e. For **Question 8**, please refer to paragraph 12. Auditors should play a role in the transition to more accurate GHG accounting. Many entities don’t currently seek assurance for their environmental reports. Those that do purchase assurance services only for a “limited-scope audit” designed to produce a double-negative opinion that an entity’s reported GHG measurements are “not obviously false.” Such limited-scope assurance is well below the standard of the opinion provided for an entity’s financial report: that a reporting entity’s assertions (say, of the value of its inventory) “are fairly stated, in all material respects.” The emissions from direct and upstream activities, including energy purchases, can be measured to the “reasonableness” standard of accuracy by tracking direct emissions at each stage of a supply chain, assigning them to output products, and transmitting this information downstream to purchasing customers.
- f. For **Question 9**, please refer to paragraphs 17-22.

Please do not hesitate to contact us if you have questions or seek any clarifications on this letter. We remain at your service.

Yours sincerely,

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