Intertemporal Corporate Carbon Reporting

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As governments around the world reaffirm their commitments to reduce carbon emissions at national levels, numerous global corporations have recently issued their own carbon reduction pledges. Such corporate "Net-Zero by 20xx" commitments doubled in 2020 and, leading up to the IPCC COP26 meeting, show no sign of letting up in 2021. It is readily seen why many firms perceive the decision to join the "Net-Zero Club" to be clear in terms of costs and benefits. With pressure from institutional investors, customers and other corporate stakeholders building, firms can claim the "green mantle" by publicly setting the goal of complete decarbonization by 20xx, say 2050. Yet, a mere pledge that comes due in the year 2050 is generally beyond the accountability horizon of current executives. Furthermore, the announcements made thus far exhibit considerable variation in what exactly is being pledged because of ample latitude in measuring corporate carbon footprints and in reporting progress towards the target of full decarbonization.[1] The attendant lack of transparency has thus resulted in a rather low barrier to entry for membership in the "Net-Zero by 2050 Club".

This comment proposes a corporate carbon reporting framework that will strengthen the credibility and accountability of firms' decarbonization pledges. We refer to this framework as the *Intertemporal Corporate Carbon Reporting* (ICCR) standard. The signatories to this framework would commit to report the following information over time: (i) the firm's annual carbon emissions determined according to a core metric specified below, (ii) an initial forecast of the firm's future emissions trajectory up to the year 2050, and (iii) periodic revisions of the forecast emission trajectories for the remaining years up to 2050. Our ICCR standard aligns with the carbon pledge requirements described within the recently released SBTi Net Zero Standard Framework[2] and the UN Environment Program Finance Initiative's Guidelines for Climate Target Setting[3], while also adhering to the principles for effective disclosure as promulgated by the widely accepted Taskforce for Climate related Financial Disclosure (TCFD)[4] recommendations.

We do not regard the ICCR framework as a substitute for regulatory policies that could achieve the comprehensive decarbonization process envisioned in the Paris 2015 Climate Agreement. That said, recent studies have shown that carbon reporting mandates for publicly listed firms in the UK did have a significant real effect on firms' subsequent emissions.[5] We envision that the firms adopting our reporting framework would do so as part of their voluntary disclosures. Adherence to this framework should allow those firms that seek to project ambitious carbon reduction targets, and also expect to deliver on these targets, to distinguish themselves from others that simply seek the green label. We note that the current "Net-zero by 2050 Club"

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would already be become more transparent if a subset of its members were to adopt the ICCR framework.

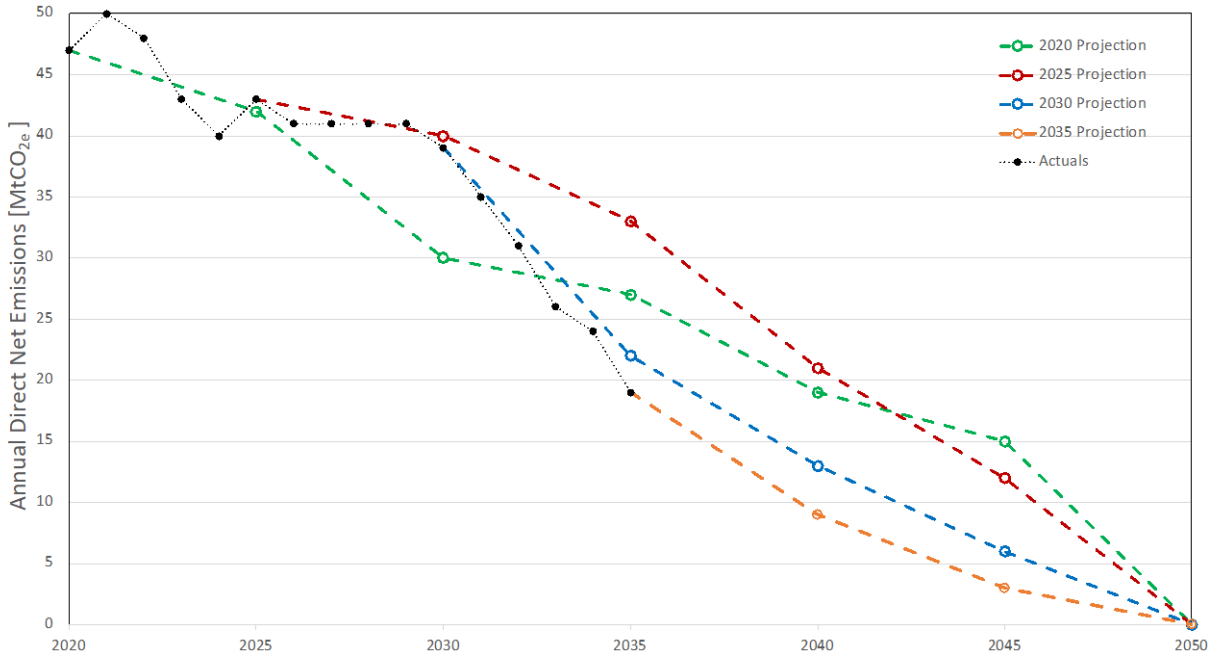

Figure 1: Illustration of the Intertemporal Carbon Reporting Framework

Figure 1 illustrates the intertemporal features of our reporting framework for a hypothetical signatory firm in the year 2035, assuming this firm adopted the ICCR framework in 2020. The firm's corporate carbon footprint, depicted on the vertical axis, is expressed in tons of CO_2 equivalents, where the aggregation weights for greenhouse gases other than CO_2 are determined according to IPCC guidelines. We advocate the reporting of a metric termed *Direct Net Emissions (DNE).* It is based on a firm's direct (Scope 1) CO_2 equivalents and subtracts any CO_2 equivalents removed from the atmosphere by the firm, or its intermediaries, during the past year. We regard the DNE metric as a core emissions metric because it is the aggregate DNE, obtained as the sum of all DNE figures across all economic entities (including firms and households), that determines the addition of greenhouse gases to the atmosphere in any given year. We henceforth refer to the DNE figure of an individual firm as that firm's annual carbon emissions.

The hypothetical firm represented in Figure 1 issued an initial forecast of its future emissions trajectory in 2020 (green curve). This trajectory is effectively determined by linearly interpolating the emission levels that the firm anticipates reaching at five-year milestones in the future. Between 2020 and 2025 the firm will then annually report its actual emissions. In our hypothetical example, the firm's emissions were above the linear interpolation for the years 2020-2025 in all but two years and the firm missed its 2025 interim target. In 2025 a revised, and less ambitious, forecast trajectory (red curve) was issued. It initiated at the actual emissions level in 2025 and stayed in effect until 2030. When future updated forecast trajectories are "spliced" together with actual DNE results up to that point in time, the public

obtains an intertemporal picture of forecasts, forecast revisions and the extent to which reduction goals were actually achieved.

A disclosure regime that includes interim reduction targets at multiple milestones will clearly mitigate the horizon issue that arises when management anticipates in 2020 that it will no longer be accountable for its initial pledge in 2050. Interim targets might be set in accordance with guidelines formulated by the SBTi, for example, which seeks to balance industry-specific reduction trajectories with the remaining global carbon budget up to the year 2050. While there is general concern that many of the recent corporate carbon pledges may have been overly optimistic, our ICCR framework provides some incentive to set realistic targets. Managers anticipate that they will be held accountable for the firm's actual emissions in comparison to their earlier self-selected targets, and this will happen in the near future. Similar to the internal accounting processes used within firms, the public will then be able to conduct "variance analysis", tracking to what extent actual achievements die meet the self-selected milestone targets.[6]

In calculating their carbon footprints, firms currently apply a wide range of rules in terms of emissions included in gross emissions and offsetting credits. In contrast, many firms currently orient their carbon footprint measures in accordance with the International Greenhouse Gas (IGHG) Protocol, distinguishing between direct (Scope 1) and indirect (Scope 2 and 3) emissions. The indirect emissions in the Scope 3 bucket principally pertain to a firm's entire upstream supply chain as well as all emissions associated with the use of the firm's products. To that end, the IGHG Protocol identifies 15 different Scope 3 categories as well as minimal boundaries for each category.[7]

The enormous complexity of reliably estimating Scope 3 emissions is well illustrated in the context of an automotive company.[8] On the upstream side, the IGHG Protocol suggests that companies estimate the carbon emissions associated with the manufacture of the tens of thousands of different components that go into the automobiles. On the downstream product use side, the Scope 3 estimate for a particular year should include the entire stream future tailpipe emissions generated by driving the automobiles. This inclusive definition leads Toyota to report that 98% of its emissions associated with a vehicle are indeed Scope 3 emissions.[9] According to its recent disclosures, the consumer products conglomerate Unilever estimates its downstream Scope 3 emissions simplistically by leveling a flat 46g of CO_2 charge "per use" on all its products, be they food items or skin care products.[10] Technology firms like Google indicate that they include only employee commuting and travel in the Scope 3 bucket.[11] Not surprisingly, recent independent analysis suggests that companies in the technology sector underreport their Scope 3 emissions by about half relative to the IGHG protocol standards.[12]

The major argument for including indirect emissions in corporate carbon footprints is that firms can exert influence over their component suppliers and the products they sell. Firms like Microsoft, for instance, have been explicit that the emissions of their suppliers, which are part of Microsoft's Scope 3 emissions, may become a criterion for supplier selection in the future.[13] This suggests that firms may want to adopt the ICCR framework illustrated in Figure 1 also for

Scope 3. In our opinion, such information should be disclosed in addition to forecasts and actual results about direct emissions. Our position here aligns with the disclosure principles of the Sustainable Accounting Standards Board (SASB), suggesting that disclosure items must be "actionable" by the firm, that is, the item must be within the operational purview of the entity.[14]

Returning to the example of Google, the firm claims to be already carbon neutral despite the significant Scope 2 emissions associated with the grid-based electricity consumed by its data centers. Google bases this neutrality claim on a carbon accounting construct that effectively swaps the "clean electrons" delivered to the grid by Google's renewable energy plants for the grey electrons that Google actually consumes at its grid-connected operational centers. In calculating its net carbon footprint, the firm thus subtracts so-called avoidance offsets from its gross Scope 2 emissions. The accounting logic here is that because the company supplied clean energy to the grid in some location, other energy consumers purchased less of the carbon-intensive energy generated in those locations.

Aside from supplying carbon-free energy to the market, such avoidance offsets can be generated, for example, from a forest that would have been logged, but instead was conserved. The general construct of avoidance offsets is that firm A that deducts as many tons of carbon-dioxide equivalents from its gross emissions count as were supposedly not emitted by firm B due to A's intervention and payment. Importantly, these types of avoidance offsets are generally based on a counterfactual claim, thereby leaving unresolved the question of "additionality" of the mitigating action.

In contrast to avoidance offsets, removal offsets emerge when either the firm or an intermediary directly removes carbon dioxide from the atmosphere. Removal offsets therefore constitute direct carbon reductions, in contrast to the indirect reductions recognized with avoidance offsets. One technology that has gained prominence in recent years for generating high-quality removal offsets is direct air capture, where CO_2 is removed from the ambient air and then sequestered in geological sites, where the gas will stay removed from the atmosphere for a long duration, that is, hundreds of years. Nature-based carbon sinks, like forests, soils, or oceans present other carbon removal opportunities.

Removal offsets may vary considerably in their expected duration. Since the DNE metric is an annual flow variable, we advocate for firms to include all direct removals in the offset figure, but to supplement this reported figure with information describing the duration profile of the entire portfolio of their removal acquisitions[15]. Firms will further enhance the credibility of their DNE figures by disclosing any certification received for their removal offsets. In addition to new ratings agencies emerging in this domain, the Taskforce on Scaling Voluntary Carbon Markets seeks to formulate minimum quality standards for carbon offsets, particularly with regard to the lingering issue of duration.[16]

The DNE metric we advocate is admittedly narrow with regard to both the count of gross emissions and the eligibility of offset credits. Yet, the inherently "fuzzy boundaries" of Scope 3

emissions and the frequently questionable constructs underlying avoidance offsets make broader metrics less reliable and less comparable across firms and industries. For the reporting of direct emissions, in contrast, many jurisdictions have already put in place established reporting and verification procedures. These are needed in jurisdictions that have adopted carbon pricing mechanisms, such as the European ETS or California's cap-and-trade program.

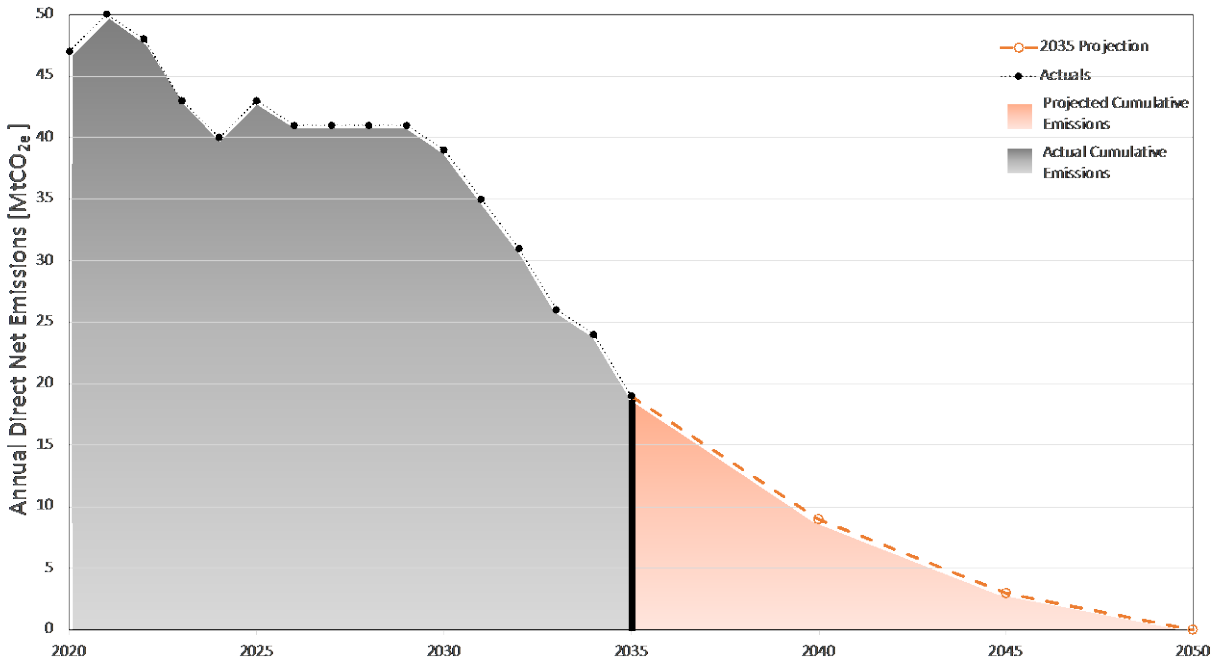

Figure 2: ICCR Framework and compatibility with carbon budgets

The ICCR framework outlined in this note entails an additional planning tool for policymakers. To illustrate, consider our earlier example of a firm that has delivered the actual results up to 2025 as shown in both Figures 1 and 2. In 2025, this firm now forecasts the remaining trajectory marked in the orange milestones up to 2050. The shaded area under the curve for the years 2035-40 can, in principle, be added up across all firms to obtain a forecast of the remaining total net emissions that the entire corporate sector projects up to 2050. In order to meet a given 1.x^{o} global warming goal, this total would have to be less than the remaining carbon budget that climate science assigns the world in 2035. If the sum of the individual carbon projections (orange shaded areas) were to exceed the carbon budget, regulatory policies would need to be tightened in order to enable achievement of the 1.x^{o} global warming goal.

We finally note that our arguments here are equally applicable if the reporting units are countries rather firms. Implemented consistently, the ICCR framework could prove helpful for countries seeking to reach agreement on their intended nationally determined contributions to future carbon reductions.

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