

To: Commissioners, Commission on Human Rights of the Philippines
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Re: Amicus Submission in support of the PETITION Requesting for Investigation of the Responsibility of the Carbon Majors for Human Rights Violations or Threats of Violations Resulting from the Impacts of Climate Change

This is to offer, for your consideration by way of an amicus brief, supplementary material in support of my previously submitted expert opinion. I write here in my personal capacity. As before, my expert opinion is offered in support of the *PETITION Requesting for Investigation of the Responsibility of the Carbon Majors for Human Rights Violations or Threats of Violations Resulting from the Impacts of Climate Change*.

My previously submitted opinion was in the form of a declaration in support of an Amicus submission of Dec. 6, 2016 by the nonprofit group Our Children's Trust. My declaration was completed on Aug. 19, 2016 and was submitted to the Commission in conjunction with the OCT submission. I hereby reaffirm, and incorporate by reference, the analysis and opinion of my earlier declaration, and I attach it hereto as Exhibit A.¹

¹ By this I also reaffirm and reincorporate by reference two earlier works by scientific teams that I headed, which works I incorporated by reference in my earlier declaration. For the Commission's convenience these are: James Hansen, et al., *Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, PLOS ONE (2013) (hereinafter, "Dangerous Climate Change") and James Hansen, et al., *Ice Melt, Sea Level Rise and Superstorms: Evidence From Paleoclimate Data, Climate Modeling, and Modern Observations That 2 °C Global Warming Could Be Dangerous*, Atmos. Chem. Phys. (2016)(hereinafter, "Ice Melt"). See my Aug. 19, 2016 declaration, attached hereto as Exhibit A, at footnotes ##2 and 4. As well, these papers are available, respectively, at <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0081648> and at <http://www.atmos-chem-phys.net/16/3761/2016/>.

The OCT submission, among other things, urged the Commission on Human Rights to hold the so-called “carbon majors” liable for the harm and risk of harm they have imposed on Filipino children and future generations. By way of remedy, OCT urged, among other things, that the major coal, oil and gas companies -- those that bear a heavy measure of responsibility for the increase in atmospheric carbon dioxide that now disrupts our planet’s energy balance, threatening the viability of the climate system on which Filipinos and others depend – be held responsible not only to phase out emissions at a very rapid rate, but also to pay for efforts to draw down excess atmospheric CO₂.

Last month, the international journal Earth System Dynamics published a study by a team of 15 climate experts: *Young people's burden: requirement of negative CO₂ emissions*.² I served as lead investigator on the study, and lead author on the report – and I hereby incorporate by reference its analysis into this submission. See Exhibit B, attached. This work further specifies my answer to a central question relevant to this Commission’s inquiry, namely, what must be done by responsible parties, including by the carbon majors, to restore atmospheric CO₂ to a level that safeguards the fundamental right of Filipinos to a viable climate system.³ In brief, we affirm that the work that must be done requires not only a phase out of fossil fuel emissions worldwide within decades,

² Hansen, et al., *Young people's burden: requirement of negative CO₂ emissions*, Earth Syst. Dynam., 8, 577-616 (July 18, 2017), available at <https://www.earth-syst-dynam.net/8/577/2017/>.

³ This right and the associated responsibility of the fossil fuel industry, I must observe, has been recognized by the United Nations Special Rapporteur on Human Rights and the Environment. He stated recently that the obligations of business to respect human rights and of government to protect against their violation “extend to abuses caused by pollution or other environmental harm.” John H. Knox, *Report of the Independent Expert on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment*, Par. 79 (Feb. 3, 2015) available at <http://srenvironment.org/2015/03/02/annual-report-to-the-human-rights-council-2/>.

but also a drawdown of excess CO₂ from the atmosphere -- so as to reduce atmospheric CO₂ to < 350ppm within a century -- and we suggest a range of answers to the critical question, How much carbon⁴ must be drawn down from the atmosphere to restore earth's energy balance (and how much will that cost)?

There is not one single answer set to that compound question, in part because the drawdown requirement is a function of both historic and future emissions and thus depends on whether fossil fuel CO₂ emissions continue at a high, constant, or declining rate. Moreover, there is a considerable range of estimated costs for significant carbon drawdown. In Exhibit B to this submission, at pages 10-16, my colleagues and I attempt to specify that range.

I should note first, that, along with a different, albeit partly overlapping set of colleagues -- including leading economists as well as leading climate scientists -- I had previously determined that, had emissions declined, on an exponential basis, by 6 % yr⁻¹, commencing in 2013, then a total atmospheric drawdown, over several decades, of approximately ~100 PgC should have sufficed to return atmospheric CO₂ to <350ppm, and thus press global temperature back to the range of the Holocene period. *See Dangerous Climate Change* (ref. at nte 1, *supra*) at 10.⁵ We anticipated that a drawdown of ~100 PgC could be achieved through reasonably natural means, including through reforestation and improved agricultural practices, wherein such efforts also would secure

⁴ It is important to note that a ton of atmosphere carbon reflects 3.67 tons of carbon dioxide, so that when my colleagues and I calculate, for example, that a total atmospheric drawdown of ~100 PgC was required under a certain emissions reduction scenario, that amount was equivalent to a total drawdown of ~367 PgCO₂.

⁵ As we discussed, *id.* at 2-9, the temperature range and associated stable coastline of that Holocene period was conducive and essential to the development of human civilization.

significant co-benefits -- including water conservation, reduced soil erosion, and beneficial nutrient recycling. *Id.* at 10.

In our latest work we determined, again, that a drawdown of ~100PgC was “an appropriate ambitious estimate for potential carbon extraction via a concerted global-scale effort to improve agricultural and forestry practices.” Exh. B at 15. In the light of those co-benefits and the wide-range of activities such “natural” carbon drawdown is likely to entail, we elected not to attach a price to that first ~100PgC of necessary carbon drawdown. *See id.* at 14. I stress however that, on the basis of our analysis, no implication is warranted that such a level of carbon drawdown is likely to occur absent changes in policy at the local, state, national, international and business firm levels. Rather, we mean only to suggest that the requisite land use changes should be deemed sensible investments, from the long-run social and economic perspective, in terms of improved agricultural yield, enhanced forest products and services, etc., even *before* their necessarily beneficial climate consequences are taken into account.

In any event, systematic global emissions reductions did not commence in 2013. To the contrary emissions, temperature, and climate forcing trends all reflect our entirely unsustainable present path. *Id.* at figures 2, 5, 8 and 14, and accompanying text. Accordingly, we must anticipate and confront atmospheric carbon drawdown requirements that substantially exceed 100 PgC, if we are to prevent truly catastrophic consequences to the Philippines⁶ and other nations.

⁶ In this regard I note that, in virtue of the Philippines’ location and other relevant considerations of physical geography and development, Filipinos may be disproportionately vulnerable to the ravages of impending climate impacts, including amplified sea level rise and severe weather events. *See, for example, Kahana et al., Projections of mean sea level change for the Philippines, Met Office (Dec. 6, 2016)*

Again, the level and expense of the atmospheric carbon drawdown required to avert catastrophe and restore planetary energy balance will depend, in part, on present and future emissions, so that relevant decisions remain in significant part within the control of the targets of your present investigation.

Relevant to those necessary decisions then, as indicated in Exh. B at 13-15, if emissions reductions of 6%, on an exponential basis, commence (at long last) in the year 2021, then the requirement to extract atmospheric carbon in order to avert catastrophic climate change will be ~153 PgC. If, however, emissions do not steeply decline but, instead, remain at their present level, then the carbon extraction required grows to ~695 PgC. And if emissions grow at a rate of 2% per year (“modestly slower than the 2.6 %yr⁻¹ growth of 2000–2015” – *see* Exh. B at 12) then ~1630 PgC extraction will be needed to reach the level of <350ppm atmospheric CO₂ by 2100.

In terms of necessary expense, as denoted above we analyzed only the range of cost estimates for extraction requirements above the ~ 100 PgC that we estimated could be stored through improved forestry and agricultural practices. *Id.* at 15. Accordingly, if global emissions reductions of 6% commence in 2021, then an additional ~53 PgC by way of “technological extraction” would be required in order to return atmospheric CO₂ concentration to < 350 ppm, and thus potentially avert catastrophic warming. Our estimated cost for this level of extraction of this is \$8-18 trillion, or \$100-230 billion per year if spread evenly over 80 years.

available at http://www.precisrcm.com/DFID_Philippines_Reporting/Philippines_Sea_Level_Report_Oct_2016.pdf, and Rietbroeka et al., *Revisiting the contemporary sea-level budget on global and regional scales*, Proceedings of the National Academy of Sciences (Feb. 9, 2016) available at www.pnas.org/cgi/doi/10.1073/pnas.1519132113

If, however, fossil fuel emissions are not soon abated but instead continue in a range from constant emissions to that increasing by 2 %yr⁻¹, then extraction through technological means required to avert catastrophic climate change will be in the range of ~595 to 1530 PgC, at a cost of \$89-535 trillion, or \$1.1-6.7 trillion per year if spread over 80 years. For reference, total world military spending in 2016 was 1.7 trillion.⁷

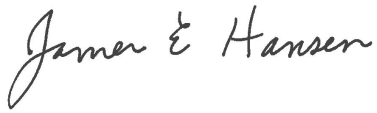
For the latter scenarios, my colleagues and I were forced to conclude that “rather than the world being able to buy its way out of climate change, continued high emissions would likely force humanity to live with climate change running out of control with all the consequences that would entail.” *Id.* at 16.

Based on the above, I must conclude, again, that it is critically important that fossil fuel emissions be phased out as rapidly as possible, and that the commencement of serious emissions reductions be undertaken without further delay. The carbon majors must be held to account for their historic emissions. But with respect to what should be sought in remedy, I note that, in my expert opinion and for all practical purposes, feasible carbon drawdown efforts can avert catastrophic climate impacts only where such necessary efforts are additional to a rapid phase out of fossil fuel emissions.

Accordingly, I urge the Commission to address both prongs of this ultimate problem with courage and determination. Thank you for your consideration.

⁷Stockholm International Peace Res. Inst., World Military Expenditures 1988-2016, at www.sipri.org/media/press-release/2017/world-military-spending-increases-usa-and-europe.

Respectfully submitted this 28th day of August, 2017.

A handwritten signature in cursive script that reads "James E. Hansen".

James E. Hansen, Director
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