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Pricing tomorrow's cost of carbon today

New York City versus 5 Big Oil Companies: the dates that make the difference to the dollars

PAL calculates over $6billion could be payable to New York City, crucially depending on the date when losses are deemed to have started

PAL estimates that about $75million annually is payable to New York City from 2018

Preliminary Report

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Executive Summary

- **The PAL carbon pricing system is used from 1750, the start of the Industrial Revolution, to calculate the compensation payable to New York City by the 5 Big Oil companies for the loss and damage caused by their CO_2 emissions since their incorporation in around 1880 to the present, corresponding to $6.278billion (see Table 1).**
- **This compensation figure can be mitigated substantially, but crucially depends on the date when losses were first deemed to have started, and could be as low as $1.438billion (see Table 1).**
- **PAL uses its future carbon price to project future losses incurred year on year of about $75million (see Fig.1) from 2018 onwards.**

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About PAL

Predict Ability Ltd (PAL) is the world's only company to have scientifically determined the true dollar cost of CO_2 emissions. This has been scientifically calculated from the loss and damage caused by extreme-weather-related events attributable to manmade climate change triggered by emissions from burning fossil fuels. This carbon price is the foundation stone upon which PAL has developed and productised a comprehensive and sustainable solution for combatting climate change. Published by PAL in June 2016, the book *Predicting the Price of Carbon: How to crack the climate change code for good*[1] by Richard H. Clarke, Director of Research at PAL, addresses the goals and strategies for tackling climate change and sets out the methodology of PAL's algorithm-based carbon-pricing system. The underlying research and findings compare well with a recent, major, evidence-based study in the US by Hsiang et al[2].

This unique carbon-pricing system is embodied in PAL's suite of complementary products and services. It covers every aspect of evaluating loss and damage caused by manmade climate change to provide dollar-costed Carbon Pricing, Enhanced Carbon Auditing plus the associated current and projected Carbon Liability across all sectors. Example applications include:

Carbon Value-at-Risk Metrics: Using their analytically verifiable cost of CO_2 emissions, PAL can put an accurate $ value on corporations' current carbon footprint *and* their future carbon liability risk. The revolutionary technology behind PAL's IP enables a huge range of unprecedented capabilities e.g.:

1. Monetized carbon auditing of big-ticket projects such as nuclear power plants
2. Measurement of carbon liability of, say, proven reserves of oil companies
3. Assessment of carbon liability Value at Risk (VaR) for asset managers across all industry and energy types including renewables.

Enhanced Carbon Auditing (ECA): PAL's bespoke audits provide in-depth financial analysis of the real $ carbon costs impacting any enterprise. Effective carbon costing for Life Cycle Assessments (LCA) of projects involving all manner of major infrastructure or development planning can optimise decision-making and reduce costs.

Carbon Pricing: PAL's real-time carbon pricing data factors in the true cost of loss and damage caused by CO_2 emissions – past, present and future. A problem specific to carbon pricing is that a one-size-fits-all carbon price is too blunt an instrument for encouraging behavioural change. PAL's spectrum of prices based on regional factors (PAL's Universal Carbon Price) and impact (PAL's Carbon Intensity Weighting) is more effective as well as future-proof.

Catastrophe Loss Modelling: PAL's computing engine, PALgamma, provides algorithm-based forecasting of extreme weather-related disaster trends and loss events. It clearly identifies, in dollar terms, the financial impact of man-made climate change, as well as the most likely proximities and timelines of future loss events.

For further information, please visit predictability.ltd.uk or email contact@predictability.ltd.uk

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As part of New York City's programme to deal with climate change, Mayor de Blasio has overseen a wide-scale divestment of fossil fuel investments connected with the city's pension funds etc. In 2017, the Mayor added impetus by bringing forward a suit against five of the largest oil companies ('The 5 Big Oil': BP, Chevron, ConocoPhillips, ExxonMobil, Shell) to compensate the city and its boroughs for past climate-related losses and to provide for future infrastructure to enable New York City to adapt to sea level rise. This is exactly the sort of situation in which PAL is so well placed to advise. Some key questions are:

1. When did the losses attributable to CO_2 emissions begin?
2. How much loss has there been?
3. How much of that loss is related to New York City?
4. What proportion of New York City's losses is attributable to the 5 Big Oil companies?
5. How much compensation should these oil companies reasonably pay for past losses?
6. How much compensation should these oil companies reasonably pay for future losses?

From PAL's perspective, the questions need to be framed in terms of risk. Firstly, New York City does have a significant risk factor: flooding, especially in the event of a storm surge like that caused by Superstorm Sandy. Although the ratio of New York City's risk to the global risk is declining (as the world develops) the yearly risk in dollar terms is likely to remain substantial, as Fig.1 shows.

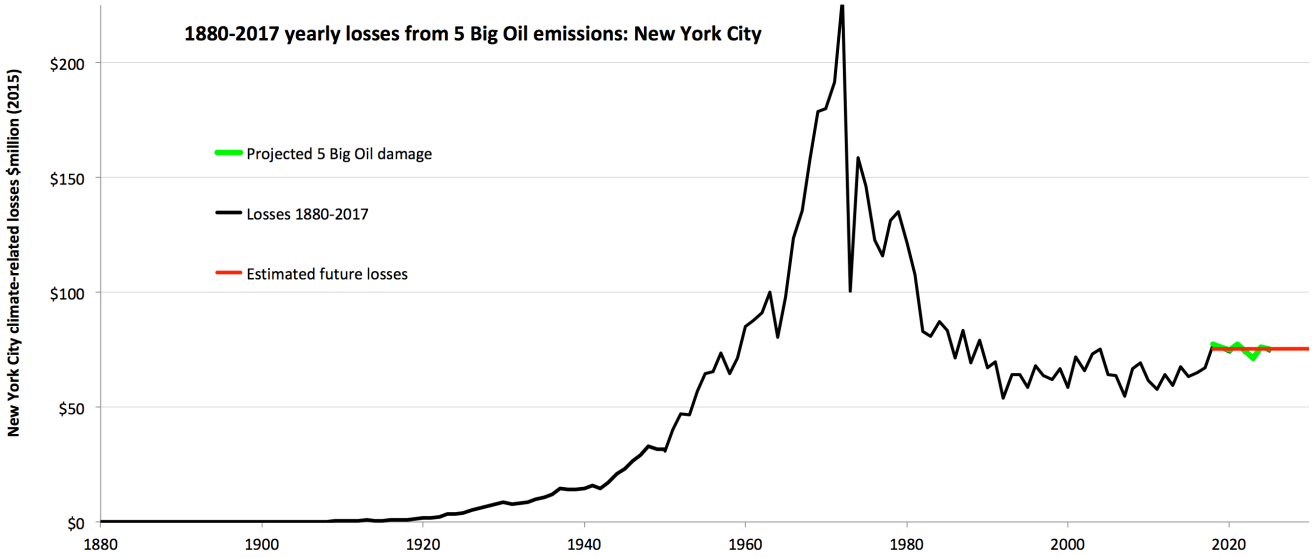

Fig. 1 New York City climate-related losses attributable to CO_2 emissions from the 5 Big Oil companies, is down from its 1973 'oil crisis' peak.

Fundamental to assessing New York City's climate-related losses attributable to the 5 Big Oil companies, and thus their liability in damages, is establishing a start date for calculations to begin. Crucially, there are several options, and the 5 Big Oil companies' fiscal liability varies very substantially across the range of dates.

This sensitivity to start date is exemplified in Table 1 below using: 1880[c] when the Big Oil industries started; 1896 when the Nobel Prize winning physical chemist Svante Arrhenius clearly identified our global warming vulnerability[1]; 1910, the year in which the Model T Ford automobile overtook the number of horse-and-carriages in New York City; 1950 that heralded the 'great acceleration' of global growth and CO_2 emissions; 1977 when it is alleged Exxon management was informed by its scientists that there was an "overwhelming" consensus that fossil fuels were responsible for atmospheric carbon dioxide increases. Eliminating all further doubt, 1988 marked a watershed whereby the world could no longer claim ignorance about greenhouse gas emissions causing global warming: the UN sponsored IPCC was established "…to prepare, based on available scientific information, assessments on all aspects of climate change and its impacts, with a view of formulating realistic response strategies." The resulting Kyoto Protocol in 1997 set internationally binding emissions reduction targets.

Table 1.

Climate-related losses to New York City attributable to the 5 Big Oil companies depend crucially on when the losses are deemed to have started (based on carbon pricing from 1750, the start of the Industrial Revolution)

Date when losses are deemed to have started	Losses to New York City attributable to 5 Big Oil companies - $billion (2015) - date to 2018
1880 (Big Oil industry begins)	6.278
1896 (Arrhenius publishes)	6.269
1910 (Model T prevails in New York City)	6.232
1950 (post-WW2 'great acceleration')	5.958
1977 (alleged that Exxon management informed)	3.132
1988 (IPCC established)	2.032
1997 (Kyoto Protocol)	1.438

In total, PAL estimates that the 5 Big Oil companies have collectively caused about 12.8% of New York City's climate-related losses since 1880. Using that figure, the total damages claimable from the 5 Big Oil companies from 1880-2018 is over $6billion (US$2015). Additionally, as shown in Fig. 1, the 5 Big Oil companies should compensate the New York urban conglomeration the sum of about $75million annually from 2018 onwards.

The case New York City makes is that the 5 Big Oil companies are responsible for 11% of all CO_2 emissions since the beginning of the industrial revolution. PAL's unique technology is able to identify, year by year from 1750, the nature, extent and dollar cost of the resulting losses suffered by New York City. It can also pinpoint the dollar amount reasonably attributable to each of those individual 5 Big Oil companies.

These results have been obtained using oil company emissions data cited by Ekwurzel et al[3].

Using PAL's universal carbon price and gamma risk ratio, the methodology used here can be extended to other cities, states and countries.

[c] Ekwurzel et al (Ref. 3) use 1880. Standard Oil began in 1870 and the average for the 5 Big Oil companies is 1888.

References

[1]*Predicting The Price of Carbon: how to crack the climate change code for good*, Richard H. Clarke, **Predict Ability Ltd** (2016).

[2]*Estimating economic damage from climate change in the United States*, Hsiang *et al.,* **Science** 356, 1362-1369 (2017).

[3]*The rise in global atmospheric CO_2, surface temperature, and sea level from emissions traced to major carbon producers*, Ekwurzel, B., Boneham, J., Dalton, M.W. et al. **Climatic Change** (2017) 144: 579. https://doi.org/10.1007/s10584-017-1978-0.

Requesting the Full Report

Please contact PAL to receive a quotation for an exclusive copy of the Full Report. This includes summary analyses for New York, Boston, Providence, Virginia Beach, Houston, New Orleans, San Francisco, Oakland and San Juan. Claims are apportioned for each of the 5 Big Oil. Other major cities can be included on request.

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