

STATEMENT OF  
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to the COMMITTEE ON THE BUDGET  
of the UNITED STATES SENATE

HEARING on  
Rising Seas, Rising Costs: Climate Change and the Economic Risks to Coastal Communities  
March 1, 2023

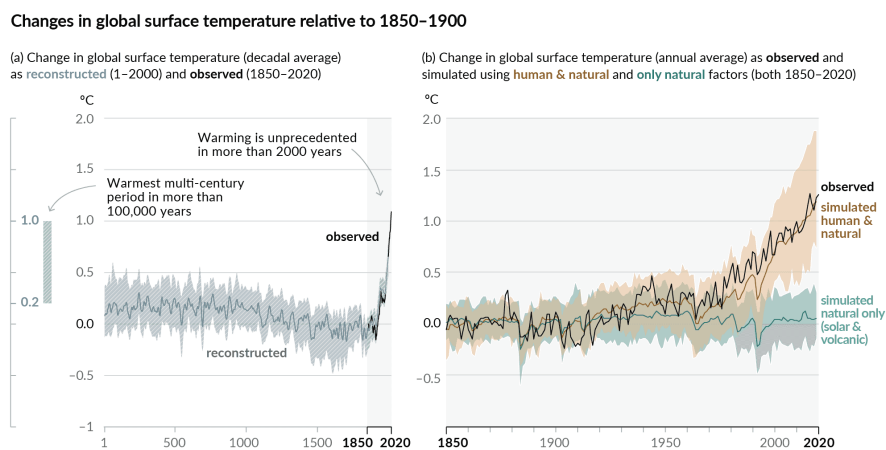
My testimony focuses societal factors as key drivers of climate and weather related economic loss in coastal communities. Climate change is real, and it is important. Practical policies that prioritize disaster risk reduction and address underlying vulnerabilities promise to reduce economic losses while providing robustness and resilience to future climate change. Currently, there is widespread use of implausible emission scenarios to estimate the economic risks of climate change. These scenarios are anchored into use by a dynamic system of conflicts of interest between climate change scientists and the financial industry. Policymakers need plausible estimates of risk to inform the development of feasible action for coastal resilience. A brief bio is at the end.

I have five key points that are stated below and expanded upon in further pages.

1. Climate change is an important and serious international concern.
2. Social factors are the leading cause in the historical increase in frequency and costs of coastal loss events related to weather and climate extremes.
  - Growth in population along the coast, the associated concentration of wealth, and inflation explain the historical increases in the costs of hurricane loss events.
3. Therefore, practical policy responses for reducing the costs and human suffering associated with coastal disasters would directly address underlying vulnerabilities in the built environment and within the most vulnerable communities. This approach also offers robustness and resilience to future climate change.
  - Difficulties with public insurance programs for wind and flood are tightly bound to social, economic, and market factors.
4. Reducing coastal risk makes good sense and it is also difficult. It is imperative that policymakers are working with plausible scenarios of future risk.
  - Common estimates of climate change economic risk rely on emission scenarios that are highly implausible or at the very upper bounds of plausible.
5. A dynamic system of conflicts of interest among climate change researchers, advocacy organizations, and financial industry has anchored in the use of implausible emissions scenarios
  - The activities of the climate change science community are not easily differentiated from the interests of the financial industry.
  - Dramatic climate change media reporting influences investment opportunities

## 1. Climate change is an important and serious international concern.

For over thirty years, the IPCC has provided assessments of the physical scientific basis of the climate system and climate change. These assessments are detailed and extensive, including documentation of changes in climate that have been detected and attributed to human causes. Figure 1 shows an increase in global surface temperature relative to a base period.



*Figure 1: IPCC Figure SPM.1; Illustration of observed changes in global surface temperature relative to 1850-1900*

Hurricanes are the leading cause of economic loss to coastal communities caused by weather and climate extremes. In August 2021, the IPCC released its 6<sup>th</sup> Assessment Report (AR6). I briefly outline some findings about hurricanes from their recent report. The IPCC uses the technical term tropical cyclone (TC) to refer to what are called hurricanes in the North Atlantic basin.

Hurricane activity exhibits significant natural variability on annual, decadal, and multi-decadal time scales. Technological advancement created differences in data recording techniques over the hurricane record. Historically and notoriously, the combination of differences in data collection practices and variability in hurricane activity supports a great deal of scientific debate about the existence of trends in the hurricane record.

- Accordingly, the IPCC finds that “[i]dentifying past trends in TC metrics remains a challenge” (p.1585) because the instruments used to collect hurricane data has changed over time.

Landfalling hurricane data is considered reliable to the year 1900. This is because it is believed that by at least that time there was enough population dispersed along the east and gulf coast to ensure that any landfalling event would have been recorded.

- The IPCC finds that the subset of hurricane data corresponding to those hurricanes directly impacting the United States “shows no trends in the frequency of landfall events” (p.1585).

Commonly, observed trends related to landfalling hurricane frequency and severity are limited to the past 40 to 50 years. This is because of a lull in hurricane activity around the 1970’s and

1980's. As a result, trend analyses beginning during the 1970's or 1980's will show an increasing trend. However, long term trend analyses of landfalling hurricanes does not show an increase in frequency of events. This is also the case if only the subset of the strongest storms are evaluated.

- The IPCC states, “there is still no consensus on the relative magnitude of human and natural influences on past changes in Atlantic hurricane activity... it remains uncertain whether past changes in Atlantic TC activity are outside the range of natural variability.”

Global landfalls provide similar findings<sup>1</sup>.

Figure 2 uses data from NOAA to illustrate that no increasing trend of hurricane landfalls is found over the long-term data set but breaking up the data will give trends.

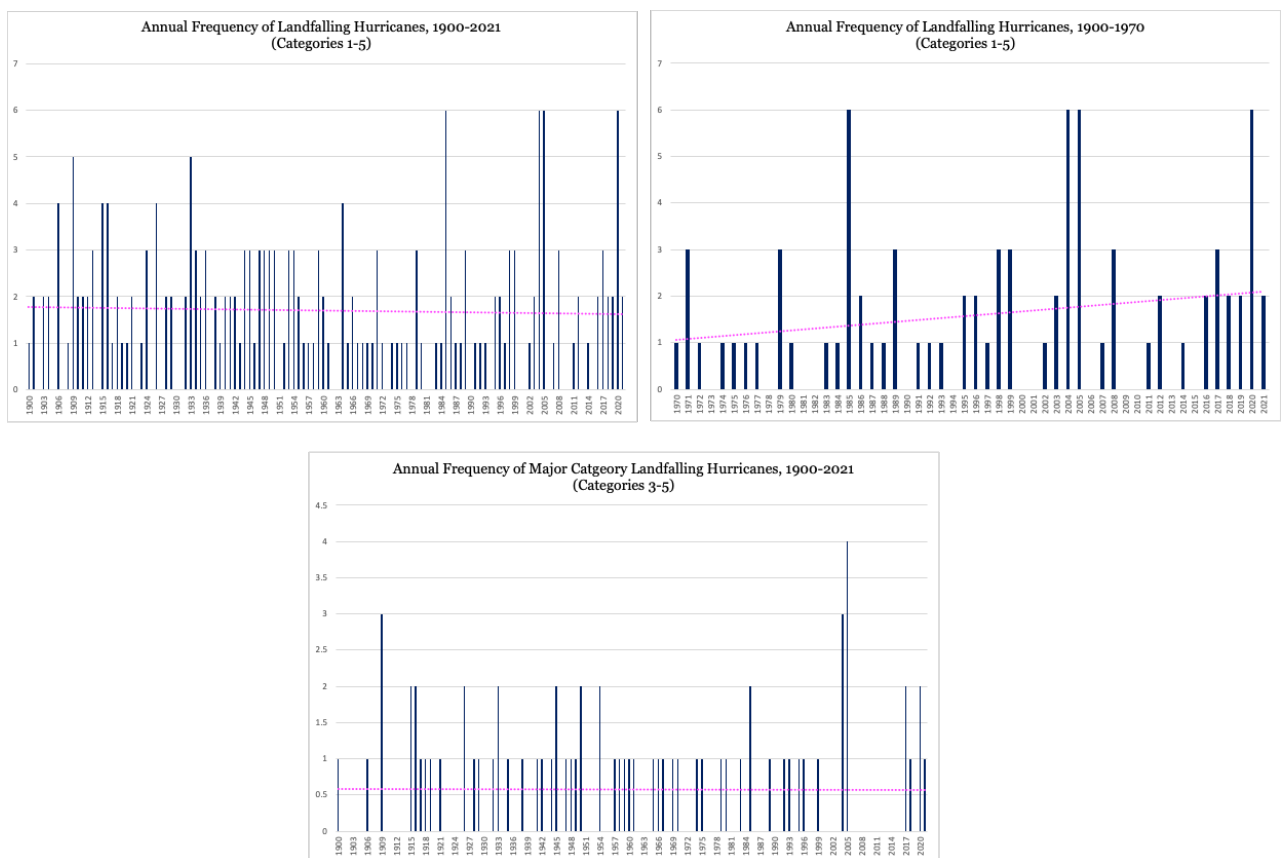


Figure 2: United States hurricane landfalls. (upper left) All landfalls from 1900-2021. (upper right) Landfalls from 1970-2021. (bottom) Landfalls of major category hurricanes, 1900-2021

<sup>1</sup> Weinkle, et al. 2012. Historical Global Tropical Cyclone Landfalls. *Journal of Climate*. 25(13): 4729–4735. <https://doi.org/10.1175/JCLI-D-11-00719.1>

**2. Social factors are the leading cause in the historical increase in costs of coastal loss events related to weather and climate extremes.**

Population in US coastal counties rapidly increased over the latter half of the 20<sup>th</sup> century. Today, at least 52% of the nation’s population lives in coastal counties.<sup>2</sup> Of this total coastal county population, about 60% reside along the hurricane prone Atlantic and Gulf of Mexico coasts.

Population in many of these counties continue to grow. For instance, southeastern North Carolina, where I live and work, experienced a combined population increase of greater than 16% from 2010-2020.<sup>3</sup>

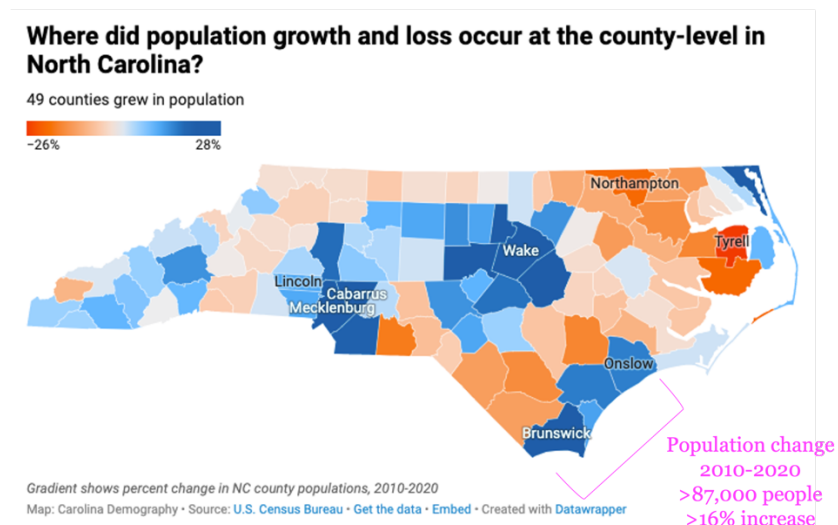


Figure 3 North Carolina Population Change, 2010-2020 (Source: Carolina Demography)

Increases in population is accompanied by increases in housing units and concentrations of wealth in the form of tangible assets (i.e., stuff). This means that as population continues to concentrate along the coast there is greater exposure to damage from hurricane landfalls.

Because of these background changes in society, analyzing trends in the record of hurricane losses requires adjusting for population, wealth, and of course, inflation. Such adjustments are often referred to as normalization. These adjustments provide an estimate of the economic losses from a historic storm should that storm occur today<sup>4</sup>.

Figure 4 shows normalized US hurricane losses in 2018 dollar values. There is no increasing trend in losses after adjusting for changes in social factors.

<sup>2</sup> <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/facts/coastal-population-report.pdf>

<sup>3</sup> <https://www.ncdemography.org/2023/02/20/looking-at-population-change-across-ncs-census-tracts/>

<sup>4</sup> Weinkle et al. 2018. Normalized hurricane damage in the continental United States 1900–2017. *Nature Sustainability*. 1:808-813. <https://www.nature.com/articles/s41893-018-0165-2>

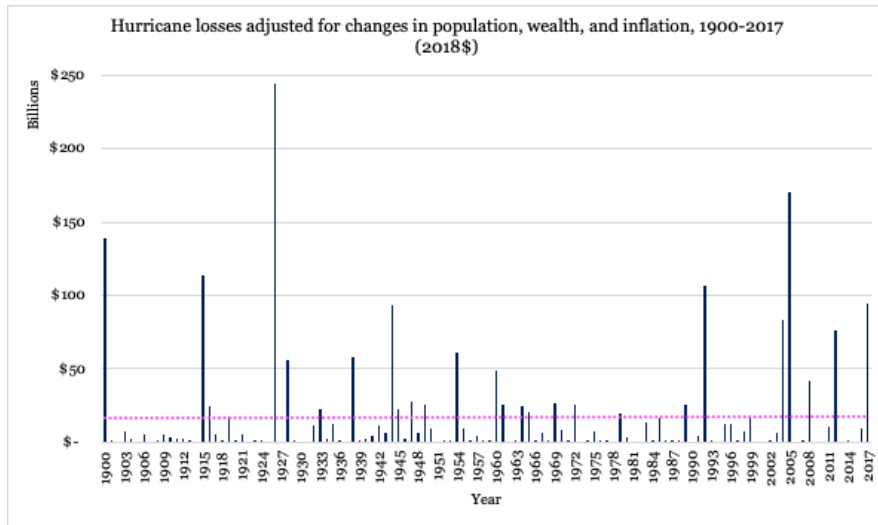


Figure 4 Normalized United States hurricane losses, 1900-2017.

**3. Therefore, practical policy responses for reducing the economic risks to coastal communities would directly address underlying vulnerabilities in the built environment and within the most vulnerable communities. This approach also offers robustness and resilience to future climate change.**

US hurricane disasters are associated with high levels of economic loss. Disasters are indicative of policymaker choices about who wins, who loses, and how society is structured<sup>5</sup>.

If the goal is to reduce disasters and attribute responsibility for damages, then attribution must focus on place-based vulnerabilities<sup>6</sup>. The decision to use climate change as a focal point for discussing coastal disasters is a decision to deflect attention from the social and political causes of vulnerability and loss.

Land use decisions are a highly localized issue. Our system of federalism makes it difficult to hold local commissioners accountable to national land use policy objectives<sup>7</sup>. As well, Supreme Court interpretations of private property rights significantly reduced the ability of states to restrict even the riskiest of coastal development<sup>8</sup>. Otherwise successful national land management policies such as, the Coastal Barrier Resources Act, has been slowly undermined through legislators’ efforts to curry the favor of their constituency<sup>9,10</sup>. There is much historical

<sup>5</sup> <https://www.routledge.com/Interpretations-of-Calamity-From-the-Viewpoint-of-Human-Ecology/Hewitt/p/book/9780367350796>

<sup>6</sup> Lahsen and Ribot. 2022. Politics of attributing extreme events and disasters to climate change. WIREs Climate Change. 13: e750. <https://doi.org/10.1002/wcc.750>

<sup>7</sup> <https://journals.sagepub.com/doi/10.1177/0002716205284676>

<sup>8</sup> *Lucas v. South Carolina Coastal Council* (1992)

<sup>9</sup> <https://doi.org/10.2112/JCOASTRES-D-18-00114.1>

<sup>10</sup> PUBLIC LAW 115–358

evidence suggesting that decision makers at all levels of government make choices that increase loss potential rather than curtailing building practices<sup>11</sup>.

Decisions made today that prioritize disaster risk reduction produces coastal communities that are robust and resilient to future climate change.

When making policies about improved disaster risk reduction practices, questions inevitably arise around, ‘How safe is safe enough?’ Answering this question and questions related to it is inherently political, reflecting conflicting value prioritizations in society and different risk perspectives.

Studies demonstrate that the adoption of building codes that are more resistant to wind and accommodating of storm surge produce reduced losses that are greater than the cost of implementation<sup>12,13</sup>. However, these benefits are not necessarily evenly distributed across space and time. Decision making about the adoption of building codes is a continuously negotiated process<sup>14,15</sup>.

The public would be well served by increasing the visibility and accessibility of the political and policy processes around building codes.

- *Difficulties with public insurance programs for wind and flood are tightly bound to social, economic, and market factors.*

There is a tendency to conflate problems with public insurance programs with climate change impacts or advocacy for climate change policy. This is misleading.

Housing is an important, if not foundational, component of the US economy. This goes well beyond basic homeownership as a means of wealth accumulation for the middle class to include the broad and complex financial arrangements tied to the development, sale, and maintenance of a house<sup>16</sup>. The complexity of the financial arrangements tied to housing are not well represented in debates about public insurance programs for windstorm and flood cover<sup>17</sup>.

The dubious wisdom of these public insurance programs and their pricing methods has been debated since their inception in the late 1960’s, and even earlier. However, these programs grew up alongside the continued growth of the housing market and urbanization of the coasts. As

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<sup>11</sup> *In Re Upstream Addicks and Barker (Texas) Flood-Control Reservoirs v. USA* (Fed. Cl. 2021)

<sup>12</sup> <https://doi.org/10.3368/le.94.2.155>

<sup>13</sup> [https://www.fema.gov/sites/default/files/2020-07/fema\\_ms2\\_interim\\_report\\_2017.pdf](https://www.fema.gov/sites/default/files/2020-07/fema_ms2_interim_report_2017.pdf)

<sup>14</sup> <https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29NH.1527-6996.0000358>

<sup>15</sup> <https://www.nahb.org/blog/2020/12/FEMA-Study-Shows-Resilience-Value-of-Building-Codes-but-Understates-Cost-Impact>

<sup>16</sup> Aalbers, M. 2016. *The Financialization of Housing: A political economy approach*. Routledge. <https://www.routledge.com/The-Financialization-of-Housing-A-political-economy-approach/Aalbers/p/book/9781138092907>

<sup>17</sup> Taylor and Weinkle. 2020. The risksapes of re/insurance. *Cambridge Journal of Regions, Economy and Society*. 13(2):405–422. <https://doi.org/10.1093/cjres/rsaa015>

result, the affordability of windstorm and flood cover has knock-on effects on the housing market. Indeed, one of the major successes of these programs is in their fostering growth in housing- a key component of the US economy.

The primary critique facing these public insurance programs is usually regarding the extent to which they provide subsidized rates and thereby implicitly encourage risky building practices in coastal areas. Research in sociology demonstrates that increasing estimates of coastal risk used for setting insurance rates signals, not just risk, but new forms of loss that is not inherent to the geophysical risk. Homeowners understand changes in risk estimates and insurance pricing as threats to their ability to retire, help pay their children's college tuitions, and remain in the community in which they were raised<sup>18</sup>. As a result, policymaker efforts to increase rates are regularly met with new demands and policy ideas to rework subsidies<sup>19,20</sup>.

Whatever this continued saga has in store, it is worth knowing that efforts to relate these fraught insurance programs to climate change are misleading.

Market judgements of risk may change based on any number of background factors such as, rapid increases in inflation, loss experience, investment yields, and changes in risk estimation practices. Market judgements of risk can fluctuate rapidly- far more rapidly than the public's ability to absorb the costs of these changes or rearrange the built environment.

In recent decades, market judgements of risk include climate change assumptions, most notably at levels of reinsurance and insurance linked securities. However, public insurance programs do not yet include estimates of climate changed risk. This divergence in risk estimation methods has exacerbated conflict around public insurance programs<sup>21</sup>. Demands to incorporate climate change in insurance pricing may reflect environmental advocacy concerns and/or a like-mindedness with the perspectives and priorities of the insurance industry.

#### **4. Reducing coastal risk makes good sense and it is also difficult. It is imperative that policymakers are working with plausible scenarios of future risk.**

Real world decisions to reduce coastal risk is time consuming, costly, and acrimonious. For instance, the US Army Corps of Engineers spent 3 years and \$3 million in the development of a Miami-Dade Back Bay Coastal Storm Risk Management feasibility study<sup>22</sup>. Their primary recommendation was a \$4.6 billion infrastructure project that was swiftly, broadly, and vehemently objected to by the Miami community. In 2022, the Corps went back to the drawing

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<sup>18</sup> Elliott, R. 2021. Underwater: Loss, Flood Insurance, and the Moral Economy of Climate Change in the United States. Columbia University Press. <http://cup.columbia.edu/book/underwater/9780231190275>

<sup>19</sup> <https://www.eenews.net/articles/hundreds-of-thousands-drop-flood-insurance-as-rates-rise/>

<sup>20</sup> Public Law 113-89

<sup>21</sup> Weinkle, J. 2015. A public policy evaluation of Florida's Citizens Property Insurance Corporation. Journal of Insurance Regulation. 34(2). <https://naic.soutrnglobal.net/Portal/Public/en-US/RecordView/Index/23481>

<sup>22</sup> <https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll7/id/14453>

board. If the feasibility study is allowed to continue after August 2023, the study cost will increase to \$8.2 million<sup>23</sup>.

Managing coastal risk should not be made more difficult than it is already. This means that those providing decision makers with estimates of climate changed risks should take care to provide plausible estimates.

But this is not what occurs.

- *Common estimates of climate change economic risk rely on emission scenarios that are highly implausible or at the very upper bounds of plausible.*

The emission scenarios used by the IPCC has a long and complicated history<sup>24</sup>. There is much that can be critiqued about the way these scenarios are used in the research community, in national climate assessments, and by the IPCC itself.

The most used emission scenarios, known as RCP8.5 and its update SSP5-8.5, are regularly interpreted as society's trajectory without policy action to decarbonize the economy. It is frequently referred to as business as usual even though none of the emission scenarios have any probability or likelihood of occurrence attached to them. The embedded assumptions are known to be detached from contemporary knowledge about energy markets and economic growth<sup>25,26</sup>. These scenarios are not plausible.

Frequently, climate change analyses compare impacts under RCP8.5 and a scenario with less change in the planet's energy balance (or "forcing"), RCP4.5 or SSP2-4.5. These are often framed as a 'mid-range' estimate of climate change. These scenarios are at the upper bounds of plausibility.

Scenario plausibility is judged<sup>27</sup> by assessing its CO<sub>2</sub> emission growth rates against observations and the International Energy Agency (IEA) Stated Policies Scenario (STEPS) near-term projections. The IEA STEPS "explores where the energy system might go without a major additional steer from policy makers<sup>28</sup>." RCP8.5/SSP5-8.5 produces emissions growth rates that dramatically exceed observations and near term projections.

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<sup>23</sup> <https://www.saj.usace.army.mil/MiamiDadeBackBayCSRMFfeasibilityStudy/>

<sup>24</sup> Pielke and Ritchie. 2021. Distorting the view of our climate future: The misuse and abuse of climate pathways and scenarios. *Energy Research and Social Science*. 72:101890. <https://doi.org/10.1016/j.erss.2020.101890>

<sup>25</sup> Ritchie and Dowlatabadi. 2017. Why do climate change scenarios return to coal? *Energy*. 140: 1276-1291. <https://doi.org/10.1016/j.energy.2017.08.083>

<sup>26</sup> Burgess et al. 2021. IPCC baseline scenarios have over-projected CO<sub>2</sub> emissions and economic growth. *ERL*. 16:014016. <https://iopscience.iop.org/article/10.1088/1748-9326/abcd2/pdf>

<sup>27</sup> Pielke, et al. 2022. Plausible 2005–2050 emissions scenarios project between 2 °C and 3 °C of warming by 2100. *ERL*. 17(2):024027. <https://iopscience.iop.org/article/10.1088/1748-9326/ac4ebf>

<sup>28</sup> <https://www.iea.org/reports/global-energy-and-climate-model/stated-policies-scenario-steps>



There is widespread use of emission scenarios that are implausible or at the very upper bounds of plausible to characterize economic risks from climate change. They are used by:

- The Federal Reserve<sup>29</sup>
- Office of Management and Budget<sup>30</sup>
- International central bank stress testing<sup>31</sup>
- An influential tool that estimates flood risk to US real estate<sup>32</sup>
- State climate risk assessments<sup>33</sup>
- Leading providers of catastrophe risk models<sup>34</sup>
- Leading providers of financial analytics<sup>35</sup>
- The burgeoning industry in climate analytics<sup>36</sup>
- And so on...

##### **5. A dynamic system of conflicts of interest among climate change researchers, advocacy organizations, and financial industry anchors the use of implausible emissions scenarios.**

Social scientists have provided excellent documentation on how researcher COI created biases and hindered effective policy action in a range of issues such as, cigarette smoking, chemical exposure, and climate change<sup>37</sup>. Funding influences research activities and universities stand to gain from the funding, relationships, and prestige secured by their researchers<sup>38</sup>. Researcher conflicts of interests (COI), especially when undisclosed, undermines scientific integrity and threatens public trust in science<sup>39</sup>.

Currently, there are significant COIs among climate change researchers and the financial industry (insurance, banking, and investments).

An interdependence began to develop between climate change science and the reinsurance industry early in the 1990's when industry interest drove investment into research on weather and climate extremes notably, hurricanes<sup>40</sup>. Currently, the reinsurance industry boasts vast international networks of academic and government research consultants, in addition to its own directly employed army of geophysical scientists. This means that much of the research that the

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<sup>29</sup> <https://www.federalreserve.gov/publications/files/csa-instructions-20230117.pdf>

<sup>30</sup> [https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB\\_Climate\\_Risk\\_Exposure\\_2022.pdf](https://www.whitehouse.gov/wp-content/uploads/2022/04/OMB_Climate_Risk_Exposure_2022.pdf)

<sup>31</sup> <https://www.ngfs.net/en/ngfs-climate-scenarios-central-banks-and-supervisors-september-2022>

<sup>32</sup> <https://www.nature.com/articles/s41558-023-01594-8>

<sup>33</sup> <https://ncics.org/programs/nccsr/>

<sup>34</sup> <https://www.air->

[worldwide.com/siteassets/Publications/WhitePapers/documents/air\\_climatechange\\_us\\_hurricane\\_whitepaper.pdf](https://www.air-worldwide.com/siteassets/Publications/WhitePapers/documents/air_climatechange_us_hurricane_whitepaper.pdf)

<sup>35</sup> <https://www.spglobal.com/esg/solutions/the-climate-service>

<sup>36</sup> <https://www.unepfi.org/industries/banking/the-climate-risk-landscape/>

<sup>37</sup> [https://en.wikipedia.org/wiki/Merchants\\_of\\_Doubt](https://en.wikipedia.org/wiki/Merchants_of_Doubt)

<sup>38</sup> <https://rowman.com/ISBN/9780742543713/Science-in-the-Private-Interest-Has-the-Lure-of-Profits-Corrupted-Biomedical-Research>

<sup>39</sup> Institute of Medicine 2014. Conflict of Interest and Medical Innovation: Ensuring Integrity While Facilitating Innovation in Medical Research: Workshop Summary. Washington, DC: The National Academies Press. <https://doi.org/10.17226/18723>.

<sup>40</sup> <https://www.jstor.org/stable/43924773>

insurance industry uses to legitimize their estimates of risk is developed by their own researchers<sup>41</sup>.

More recently, the inclusion of climate change risk in investment decisions has expanded COI among climate change researchers and some of powerful financial entities and investors. Political leaders and advocacy organizations are also in the mix. A \$40 billion<sup>42</sup> industry of climate analytics enlists academic researchers as consultants. Here are just three examples:

- Central bank stress testing scenarios are developed by researchers who are also lead authors on IPCC reports<sup>43</sup> and have important roles in organizing the international modeling community in the development of IPCC scenarios<sup>44</sup>. Funding for central bank scenario development and the most recent meeting of the scenario modeling community comes from influential organizations including, Bloomberg Philanthropies, ClimateWorks, and the Bezos Earth Fund<sup>45</sup>.
- McKinsey & Company used a climate consultancy to produce a series of widely influential reports on climate change financial risks. In defense of their use of RCP 8.5 the report cited a peer-reviewed publication written by its own consultants<sup>46</sup>. The researchers did not declare their COI as consultants for McKinsey or their association with the asset management firm, Wellington<sup>47</sup>. Shortly after publication of the article one of its authors landed a political position<sup>48</sup> while the authors' home institution announced coordinated efforts with Wellington to influence SEC regulatory decisions<sup>49</sup>.
- The *Risky Business Project*, an academic-industry research collaboration was organized by three wealthy politicians with the goal to “mak[e] the climate threat feel real<sup>50</sup>.” Research products are important components to national climate and sea level rise assessments<sup>51</sup>, and a policy advocacy tool used to evaluate real estate flood risk<sup>52</sup>. Core members of the research collaboration move seamlessly between private consulting<sup>53</sup>, policymaker science advisory positions<sup>54</sup>, and academic researcher.

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<sup>41</sup> Weinkle, J. 2020. Experts, regulatory capture, and the “governor's dilemma”: The politics of hurricane risk science and insurance. *Regulation & Governance*. 14(4):637-652. <https://doi.org/10.1111/rego.12255>

<sup>42</sup> <https://www.prnewswire.com/news-releases/cervest-secures-30-million-in-series-a-funding-to-launch-worlds-first-ai-powered-climate-intelligence-platform-and-lead-new-40-billion-market-301295454.html>

<sup>43</sup> <https://www.ngfs.net/en/ngfs-climate-scenarios-central-banks-and-supervisors-september-2022>

<sup>44</sup> <https://www.iamconsortium.org/>

<sup>45</sup> <https://www.iamconsortium.org/event/fifteenth-iamc-annual-meeting-2022/#sponsors>

<sup>46</sup> McKinsey & Company. 2020. McKinsey on Climate Change.

<sup>47</sup> <https://www.woodwellclimate.org/project/woodwell-wellington/>

<sup>48</sup> <https://www.whitehouse.gov/ostp/news-updates/2021/09/01/white-house-office-of-science-and-technology-policy-announces-dr-philip-duffy-as-climate-science-advisor/>

<sup>49</sup> <https://www.woodwellclimate.org/corporate-climate-risk-assessment-should-be-standardized-and-transparent/>

<sup>50</sup> <https://www.nytimes.com/2015/02/01/business/energy-environment/climate-changes-bottom-line.html>

<sup>51</sup> <https://www.forbes.com/sites/rogerpielke/2020/01/02/how-billionaires-tom-steyer-and-michael-bloomberg-corrupted-climate-science/?sh=7495c44c702c>

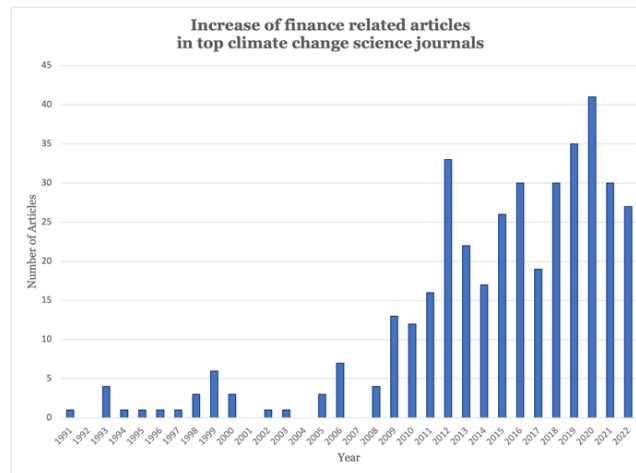
<sup>52</sup> <https://firststreet.org/research-lab/published-research/2022-first-street-foundation-flood-model-methodology-addendum/>

<sup>53</sup> [https://rhg.com/data\\_story/climate-impact-lab/](https://rhg.com/data_story/climate-impact-lab/)

<sup>54</sup> <https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html>

- *Currently, the activities of the climate change science community are not easily distinguished from the interests of the financial industry.*

Figure 5 shows the annual number of articles mentioning financial terms in its abstract from leading climate change research journals<sup>55</sup>. The graph shows a substantial increase among researchers in their interest and involvement with topics related to finance. The increase in mentions suggests the climate change science community and the financial industry are entwined.



*Figure 5 Peer reviewed climate change research shows a substantial interest in the financial industry*

- *Dramatic climate change media reporting plays a role in creating investment opportunities.*

There are several indications that climate change media reporting has a growing role in creating investment opportunities. Financial executives point to media hype as a leading factor in driving investment profit related to climate risk<sup>56,57</sup>. Economic researchers develop methods to use media reporting on climate change to guide investment decisions<sup>58</sup>.

Media reporting shapes public perceptions but it is itself shaped by the political elite. What is more, researchers are often rewarded by their institutions for media attention. Thus arises the potential for a circular system whereby climate change research that supports financial industry interests drives media reporting supporting financial industry interests.

<sup>55</sup> Web of Science. Date February 22, 2023. ((TS=(financ\* or insurance or bank\* or asset)) AND SO=("nature" or "nature climate change" or "climatic change")) AND TS=("climate change")

<sup>56</sup> <https://www.artemis.bm/news/media-reporting-of-disasters-drives-cat-bond-alpha-opportunity-john-seo-fermat/>

<sup>57</sup> <https://youtu.be/bfNamRmje-s>

<sup>58</sup> [https://pages.stern.nyu.edu/~jstroebe/PDF/EGKLS\\_ClimateRisk.pdf](https://pages.stern.nyu.edu/~jstroebe/PDF/EGKLS_ClimateRisk.pdf)

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I am an associate professor and director of the graduate program in Coastal and Ocean Policy in the Department of Public and International Affairs at the University of North Carolina Wilmington. I hold a doctorate in Environmental Studies from the University of Colorado Boulder and a master's degree in Climate and Society from Columbia University. My research focuses on issues related to coastal risk, climate science, and policy, and I have published in a range of peer-reviewed journals.