Point Versus Non-Point Climate Impacts and the Profit Potential of Uneven Geographical Devaluation

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> The concept of dormant capital, capital lying fallow, can only refer to its barren existence in one of these aspects [as fixed or circulating], and it is a condition of capital that part of it always lies fallow. . . . During crises—after the moment of panic—during the standstill of industry, money is immobilized in the hands of bankers, billbrokers, etc.; and, just as the stag cries out for fresh water, money cries out for a field of employment where it may be realized as capital.
> –Karl Marx[1]

As of April 2018, the concentration of carbon dioxide in the earth's atmosphere stood at 410 parts per million (ppm), 46 percent above preindustrial levels. That figure is nearly halfway to 560 ppm, or the doubled level of preindustrial atmospheric carbon dioxide that scientists have proposed as a rough upper limit for what human civilization can withstand. Nearly three-quarters of the increase (95 of 130 ppm) has occurred in the six decades since Charles David Keeling began making his famous measurements atop the Mauna Loa volcano. At the current global annual rate of 10 gigatons (Gt) emitted, reaching the upper limit is only six decades away. Meanwhile, the six warmest years in recorded history have all occurred since 2010.[2]

In an earlier paper I argued that "global warming is going to devalue our current built environment," and that the question was "not whether widespread devaluation will occur, but how: by the effects of climate change, or by

intentional, deliberate policies."[3] If devaluation by rising temperatures and sea levels, increasingly intense floods, droughts and heat waves, widespread crop failure, wildfires, and so on was otherwise inevitable, then there was no reason not to enact policies that would proactively dismantle and replace fossil fuel–dependent infrastructures and practices. This, I argued, was "a logic that everyone should be able to understand, regardless of political or ideological leanings."

Although growing numbers of activists and social movements have embraced the premise that "we must leave as much fossil fuel in the ground as possible, for as long as possible,"[4] it is nonetheless clear, eight years later, that my logic was either flawed, unpersuasive, or both. The biophysical effects of global warming have indeed grown more conspicuous, and more quickly than projected, and the threats posed to cities, agriculture, and infrastructures of all kinds are well documented.[5] But the capitalized value of the built environment in the US remains robust, having "recovered" from the Great Recession alongside the stock market and gross domestic product.[6] Similarly, the rate of global greenhouse gas emissions has not slowed, and it is still driven far more by capital accumulation (i.e., economic growth) than by diplomatic accords or regulations. In the US, political responses have been contradictory: the military and most executive branch agencies of government have candidly documented the current impacts and future threats that climate change poses to the nation and the world, but many elected officials and the Republican Party in particular persist in denying the issue categorically. The most farsighted and comprehensive policy efforts to mitigate and adapt to climate change have been forged at municipal, state, and regional scales, where jurisdictional authority is high but potential influence is limited.[7]

Research and events since 2010 have shown that the relationship between climate change and devaluation is more complex and contradictory than my earlier article stated. Here I argue that climate change impacts on the built environment have qualitatively different relationships to devaluation depending on the temporal scales at which they occur. In cases where the status quo ("business as usual") means slow, incremental degradation—with any more severe impacts occurring decades in the future—capital is effectively indifferent or blind to the problem. For investors, CEOs, and economists, everything depends on the discount rate one uses to determine the net present value of future events, and their discount rate is simply too high.[8] On the other hand, capital can comprehend abrupt change—whether physical destruction in a flood or a wildfire, or devaluation via policy changes or economic implosion. For purposes of accumulation, violent destruction may be preferable to proactive transition to a non-fossil-fuel-based built environment, since the latter would result in enormous (and uninsured) "stranded assets" on the balance sheets of some of capital's most powerful players.

Point Versus Non-Point Climate Impacts

In a recent book, David Harvey distinguishes between

> (1) the physical *destruction* and degradation of use values, (2) the forced monetary *depreciation* of exchange values, and (3) a concomitant *devaluation* of values as the only "rational" way to overcome the irrationality of overaccumulation. . . . Each of the forms involved—use value, exchange value and value—is subject to a specific form of negation, and one form does not automatically imply the other.[9]

Harvey does not distinguish between destruction and degradation as mechanisms of devaluation, however, and his only example is the damage inflicted on human bodies by exploitative labor conditions and contaminated environments. The implication is that both destruction and

1. Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (London: Penguin, 1993), 621.

2. NOAA National Centers for Environmental Information, *State of the Climate: Global Climate Report for Annual 2017*, January 2018, https://www.ncdc.noaa.gov/sotc/global/201713.

3. Nathan F. Sayre, "Climate Change, Scale, and Devaluation: The Challenge of Our Built Environment," *Washington and Lee Journal of Energy, Climate, and Environment* 1.1 (2010): 104, https://scholarlycommons.law.wlu.edu/jece/vol1/iss1/7.

4. Sayre, "Climate Change," 84 (emphasis in original). However, I do not claim any credit for persuading activists of the same. See Naomi Klein, *This Changes Everything: Capitalism vs. the Climate* (New York: Simon & Schuster, 2014).

5. For a comprehensive summary of the scholarly literature for the US, see Jerry M. Melillo, Terese Richmond, and Gary W. Yohe, eds., *Climate Change Impacts in the United States: The Third National Climate Assessment* (Washington, DC: US Global Change Research Program, 2014): 841, https://nca2014.globalchange.gov/report.

6. Outstanding aggregate mortgage debt as of the fourth quarter of 2017 totaled $14.903 trillion, surpassing its previous peak of $14.795 trillion in the 3rd quarter of 2008. See Board of Governors of the Federal Reserve System (US), *Mortgage Debt Outstanding*, All holders [MDOAH], retrieved from FRED, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/MDOAH. The US municipal bond market was worth $3.9 trillion as of March 2018, up from $2.7 trillion at the end of 2008. See Municipal Securities Rulemaking Board, *Muni Facts* (March 2018), www.msrb.org/msrb1/pdfs/MSRB-Muni-Facts.pdf; *Municipal Finance, before the Committee on Financial Services*, House of Representatives, 111th Cong. (2009), https://www.federalreserve.gov/newsevents/testimony/wilcox20090521a.htm.

7. Fifty-eight percent of US cities are actively making adaptation plans. See Susan L. Cutter, William Solecki, Nancy Bragado, JoAnn Carmin, Michail Fragkias, Matthias Ruth, and Thomas J. Wilbanks, "Urban Systems, Infrastructure, and Vulnerability," in Melillo, Richmond, and Yohe, eds. *Climate Change Impacts in the United States*, 287, 288.

8. Nicholas H. Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007). That a fixed investment will be valueless 50 or 100 years from now is, from the point of view of capital, to be expected even without any climate change impacts.

9. David Harvey, *Marx, Capital, and the Madness of Economic Reason* (New York: Oxford University Press, 2018), 86 (emphasis in original).

degradation produce "a concomitant devaluation" because of the necessary dependence of value on use value. My earlier paper made the same assumption. But what if *how* use value is lost—abruptly or incrementally—determines whether it negates value, at least in the case of the built environment?

Specifying (and perhaps modifying) Harvey's terms, I propose that destruction results from what could be termed "point sources" of climate impacts (or point impacts): discrete events that are abrupt, devastating, and conspicuous.[10] Hurricane Sandy inflicted an estimated $65 billion in damages in New York City alone, for example.[11] The cost of wildfire suppression in the US has increased 541 percent since the mid-1980s, from an average of $376 million to $2.032 billion per year.[12] Impacts of this type occur at specifiable points in time, although they are also determined (both physically and probabilistically) by ongoing "background" conditions that change only slowly, such as sea surface temperatures and the moisture content of trees. Their infrequent and extreme character is why, generally, point impacts are difficult to attribute (in the causal, scientific sense) to climate change per se.

By contrast, degradation results from "non-point sources" of climate impacts (or non-point impacts): changes that are slow, incremental, and often under-recognized. Thawing permafrost now costs the state of Alaska an extra $10 million per year to maintain its roadways, for instance, and a projected 2,400 miles of major roads and highways in the Gulf Coast region will be inundated by 2100 due to sea-level rise.[13] Heat-related production losses in the livestock sector exceeded $1 billion in 2011, and increasingly frequent heavy rainfall events are shortening the planting season in Iowa and prompting farmers there to install additional drainage infrastructure at a cost of $500 per acre.[14] Degradation is keyed to drivers and processes that scientists understand well (such as the greenhouse effect and the hydrologic cycle) and can therefore be attributed to climate change with greater confidence, even if the precise rate of change—and thus the timeline for more severe or cumulative impacts—remains difficult to predict.

Of course, there are climate impacts that complicate this distinction. Drought, for example, is a protracted event with a beginning, duration, and endpoint that may be difficult to specify. In relation to devaluation, however, the difference between destruction and degradation does not hinge solely on an impact's material attributes; rather, it concerns whether and how physical change translates into economic change. Precisely because of its temporal ambiguity, drought functions as a non-point impact until some entity (usually a government agency) declares an "official" emergency that triggers relief payments; thereafter, the drought functions as a point impact. But most other non-point impacts lack any such temporal definition (physical or discursive) whereby their economic consequences can be identified and transacted. A hotter-than-usual summer may diminish crop yields or increase the cost of air conditioning for the owner of a building, but these effects are difficult or impossible for the farmer, the building owner, or scientists to attribute to climate change as distinct from normal variability. Similarly, non-point impacts are unlikely to devalue underlying capital assets in ways that are distinguishable from the normal rate of amortization, "wear and tear," or background market variability. Thus, much as government agencies have difficulty regulating non-point sources of pollution, capital struggles to find traction in accounting for (let alone confronting) non-point climate impacts.

Securitizing Risk, Profiting from Destruction

The example of drought articulates a dynamic zone where the relations mediating capital, climate, and the built environment are subject to ongoing change and struggle. Because these relations are historically and geographically conditioned, they are at least potentially contingent and path dependent. It happens, for example, that the impacts of drought on agricultural producers in the US are subject to government disaster relief programs. Flood insurance is also largely provided through (or subsidized by) the federal government, whereas private insurance policies protect homeowners and businesses against losses resulting from other "natural" disasters. These are institutional arrangements inherited from before the era of climate change, when such disasters could still be unproblematically considered "acts of God." The fact that non-point climate impacts are not subject to insurance is also an accident of history, albeit a readily understandable one.

The insurance sector performs essential roles in structuring and making visible the value embedded in the

10 In borrowing the terminology employed for regulating pollution sources, I am intentionally transposing from the spatial to the temporal dimension. Point sources of pollution are spatially discrete, whereas non-point sources are spatially diffuse and thus difficult to locate. Point climate impacts are temporally discrete, whereas non-point climate impacts are temporally diffuse.

11 Cutter et al., *Climate Change Impacts*, 287.

12 For federal government agencies only, in unadjusted dollars, comparing the six-year periods 1985–1990 and 2012–2017. The average annual number of wildfires in the US has actually declined 10 percent from 1985 to 2017, but the average size has increased 244 percent and the costs of suppression per acre have increased 246 percent. Calculated by the author using data available here: *Federal Firefighting Costs* (Suppression Only) (Boise, ID: National Interagency Fire Center, 2018), https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf.

13 Henry G. Schwartz, Michael Meyer, Cynthia J. Burbank, Michael Kuby, Clinton Oster, John Posey, and Edmond J. Russo et al., "Transportation," in Melillo, Richmond, and Yohe, eds. *Climate Change Impacts*, 130–49, 132, 135.

14 Jerry Hatfield, Gene Takle, Richard Grotjahn, Patrick Holden, R. Cesar Izaurralde, Terry Mader, and Elizabeth Marshall et al.,"Agriculture," in Melillo, Richmond, and Yohe, eds. *Climate Change Impacts*, 150–74.

built environment in capitalist society. Naively stated, insurance is designed to prevent the devaluation of an insured's invested capital, by providing an equivalent amount of money (exchange value) to replace the lost (use) value. In practice, of course, the replacement capital has to come from someone, and when claims come due insurers and the insured often struggle over the losses each party must absorb. After all, insurers seek to profit from the business of selling their "anti-devaluation" service. One of the ways they protect themselves from insolvency when disaster strikes is by purchasing their own insurance, known as reinsurance, to cover the cost of payouts from a single event above some negotiated threshold.

In a series of remarkable articles, geographer Leigh Johnson has described how the reinsurance industry responds to climate change. What she has found effectively turns the logic of my earlier argument inside out. Rather than steering capital away from built environments imperiled by climate change, and into others so as to reduce overall risk exposure (as would be expected, given structural market incentives), reinsurers have instead innovated ways to turn both the risks and the damages of point impacts into profit opportunities.

At the center of Johnson's tale is the simple yet decisive fact that reinsurance policies are renegotiated annually. For this reason, reinsurers such as Munich Re and Swiss Re effectively use the same discount rate as bankers, CEOs, and economists, assessing their decisions as a function of liabilities, assets, and the probabilities of various disasters over the coming 12-month period.[15] If major disasters deplete reserves built up during periods of calm, they also serve to enable (or compel) premium increases in subsequent years. The profitability of reinsurance crucially depends on these post-disaster increases. Thus, there is a structural "contradiction between the value-preserving purpose of the insurance form and the devaluation of real property necessary to sustain accumulation within the industry."[16] The potential of climate change to increase the frequency and intensity of disastrous events such as hurricanes, then, is both cloud and silver lining; for reinsurers, "external, ecological sources of devaluation . . . —if 'managed' properly—could repeatedly reset conditions for profitable accumulation."[17]

In an insidious further twist, the reinsurance industry has been financialized in the past decade or so, giving reinsurers access to the vast capital stocks of global banks, hedge funds, and institutional investors, who in return can tap into the nearly $2 trillion in annual revenue flows generated by non-life-insurance premiums.[18] Rather than mergers or simple equity, the mechanisms linking reinsurance to finance capital are so-called catastrophe bonds, which are securitized in much the same fashion as the infamous mortgage-backed securities that helped precipitate the Great Recession.[19] As Johnson writes, securitized catastrophe risk "allows mobile capital on a search for yield to reframe spatial liabilities as tradable assets."[20]

Subjecting point climate impacts to the logics and mechanisms of finance capital has profoundly perverse ramifications. These catastrophe bonds, or "cat bonds," are attractive to (certain kinds of) investors both because they are unaffected by other forces bearing on the behavior of financial markets,[21] and because the very high risks—hundreds of billions of dollars for a massive earthquake or hurricane in large, wealthy urban areas, for example—serve to justify correspondingly high returns. Not surprisingly, then, catastrophe bonds select for "high-paying peak peril regions": places and types of fixed investments that combine high exposure (the probability of a disaster multiplied by the economic value of the exposed assets) with high capacity to pay the associated premiums.[22] Finally, high rates of return can be sustained only if, from time to time, actual disasters trigger policy claims and large payouts that remind primary insurers of the need for reinsurance. "Without continuing catastrophic damages, returns for investors fall because premium rates generally decrease and (re)insurance firms draw on internal capital or are able to access other reinsurers' capital cheaply."[23] Because these "services are only necessary insofar as the physical world continues to generate devaluation events," the industry depends "on cyclical catastrophic external devaluations."[24]

15 Leigh Johnson, "Catastrophic Fixes: Cyclical Devaluation and Accumulation through Climate Change Impacts," *Environment and Planning A* 47 (2015): 2503–21. Proponents of market-led solutions to global warming ought to consider changing this banal detail with legislation that would force reinsurers to write fixed-rate policies of 25–50 years in duration. Such a step would be far more effective for internalizing the costs of climate change than schemes to quantify "natural capital" by pricing "ecosystem services."

16 Johnson, "Catastrophic Fixes," 2504.

17 Johnson, "Catastrophic Fixes," 2513.

18 Johnson, "Catastrophic Fixes," 2505.

19 Leigh Johnson, "Geographies of Securitized Catastrophe Risk and the Implications of Climate Change," *Economic Geography* 90 (2014): 155–85.

20 Johnson, "Securitized Catastrophe Risk," 155.

21 Catastrophe bonds are not so much counter cyclical as *acyclical*; in industry lingo, they have "zero beta" due to their "ontological disconnection from the behavior of financial markets." Johnson, "Securitized Catastrophe Risk," 173.

22 Johnson, "Securitized Catastrophe Risk," 181.

23 Johnson, "Securitized Catastrophe Risk," 167.

24 Johnson, "Catastrophic Fixes," 2510, 2517.

25 Model projections of climate change impacts on agriculture are illustrative: through 2050 there is little effect from the emissions scenario employed, with the most grievous global-scale impacts set to occur around 2080. Martin L. Parry, Cynthia Rosenzweig, Ana Iglesias, Matthew Livermore, and Günther Fischer, "Effects of Climate Change on Global Food Production under SRES Emissions and Socioeconomic Scenarios," *Global Environmental Change* 14.1 (April 2004): 53–67.

Conclusion: Recurrent Destruction and Uneven Geographical Devaluation

The distinction between point and non-point climate impacts acquires significance in light of Johnson's findings. The most profound threats that climate change poses to humanity—those scientists associate with the doubling of atmospheric carbon dioxide—are non-point impacts whose consequences assume apocalyptic proportions only in the longer run: rising sea levels, ocean acidification, and temperature increases that disrupt agricultural production, for example.[25] But such slow, prolonged degradation is effectively indistinguishable, from capital's point of view, from the expected amortization of any fixed investment, regardless of the climate. As Johnson points out, if a firm's insurance policy permits it to rebuild in a different location, then having an existing factory or similar fixed investment (one that has already been amortized in whole or in part) destroyed by a point impact is actually desirable, especially if non-point impacts are gradually undermining the plant's viability.[26] In this view, catastrophic destruction liberates capital from its "fallow" condition, letting it loose in money form to seek out new opportunities for accumulation.

What is emerging, in other words, is a set of institutional arrangements that selectively decouple the biophysical effects of climate change from the devaluation of capital. The resulting geographies are likely to cleave along lines of wealth and ownership, with private capital relatively insulated and the public sector disproportionately burdened. The fact that point impacts can be insured—buffering the primary insured's capital while creating profit opportunities for reinsurers and finance capital—means that destruction may not negate value for private capital, even if it wreaks short-term havoc on human lives and the use values on which they depend. In contrast, public infrastructural investments in transportation, energy, water provision, and so on generally lack insurance against destruction and in any case are often more seriously threatened by non-point degradation.[27] These disparities are likely to grow as catastrophe bonds make more capital available for rebuilding and new underwriting in areas where high concentrations of value are becoming even more vulnerable to extreme events. . . . In this context, if a series of major catastrophes then prompted investors to retreat, the state would find itself as insurer of last resort for a built environment that had ironically become *less* adapted to climate extremes.[28]

Thus, the "concomitant devaluation" that in theory should accompany the destruction or degradation of use values is far from guaranteed in the case of climate change and the built environment today. Abrupt destruction by point impacts may not negate value at all, at least not for private capital, and gradual degradation by non-point impacts may effectively disappear into the background noise of business as usual. The aggregate picture is patently absurd from a use value perspective, not to mention unethical. It would be far more rational to decouple the built environment from fossil fuels rather than pretend it can be decoupled from the effects of climate change. But that would require another kind of point impact altogether: the abrupt writing off of assets that would be "stranded" by a wholesale shift to non-fossil-fuel energy sources. Consider, for perspective, the relative magnitudes at stake. The estimated value of all US transportation facilities in 2010 was $4.1 trillion.[29] A lot of money, to be sure, but not much at all compared to the $27 trillion in fossil fuel reserves that the world's major oil companies have "booked" to satisfy investors of their long-term profitability.[30] These are reserves that have not yet been extracted, values capitalized but not yet realized and thus purely notional assets. But for capital, such devaluation without destruction or degradation would be an outcome far worse than countless real catastrophes.

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Johnson, "Catastrophic Fixes," 2513.

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Take, for example, the 13 major US airports that have at least one runway fewer than 12 feet above sea level—already within reach of a moderate storm surge and highly vulnerable to sea-level rise over the longer term. See Schwartz et al., *Climate Change Impacts*, 134.

28
Johnson, "Securitized Catastrophe Risk," 181. Furthermore, Johnson foresees what she calls "splintering protectionism: a patchwork of high-risk, high-reward areas where insurance is available only to those with the ability to pay rising premiums, leaving the state to manage the retreat and relocation of less remunerative properties and populations" (Johnson,"Catastrophic Fixes," 2503).

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Schwartz et al., *Climate Change Impacts*, 131.

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Klein, *This Changes Everything*, 148.

Noise Landscapes: Fallow Lands of Global Mobility

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Since 1945, humankind has entered the era of "Great Acceleration": a time of unprecedented growth in human activity on a global scale, reflected in metrics like material consumption, global trade, transportation, telecommunications, natural resource extraction, and energy use. The increased scope and intensity of this activity is such that it has begun to alter the earth system, producing phenomena like the atmospheric concentration of greenhouse gases responsible for global warming. Observing such changes led Nobel Laureate Paul Crutzen to coin the now widely used term "Anthropocene" in the early 2000s.[1]

The Great Acceleration is at the root of the major ecological, urbanistic, and cultural challenges of our time, in which ecosystems, food chains, and the climate are severely out of balance. Several indicators point towards a critical system overload.[2] And the "imperial lifestyle" developed in this period transfers the negative externalities of material processes associated with human activity onto other regions, countries, and continents. As more and more countries adopt the same lifestyle, its unsustainable character becomes apparent.[3] This means that the end of the Great Acceleration may be drawing near, raising the question of how to secure the best possible future for humankind in whatever period follows. Here we argue that an enlightened spatial view of the impact of human action on the one hand, connected to an urbanistic agency aimed at introducing resilience into urban systems on the other, are paramount.

Fallow lands are central to this discussion, as we contend that the anthropogenic activity of the Great Acceleration is the systemic source of the phenomena discussed above. Ever shorter economic cycles trigger the need for an ever-expanding terrain to support the control-and-command centers of the global economy. This terrain often has widespread fallow sectors.[4]