

# **The Ecological Case for Basic Income: A challenge for convergence**

Michael Howard  
Department of Philosophy  
University of Maine  
[mhoward@maine.edu](mailto:mhoward@maine.edu)

Presented at the North American Basic Income Guarantee Congress, McMaster University, Hamilton, Ontario, May 24-27, 2018

## **Draft: Do not quote without permission from the author**

In this paper I examine two rival arguments for a basic income. The first, which we may call the “green growth” perspective, proposes a carbon fee (or cap and auction) to reduce carbon emissions, and distributing the revenue as dividends, constituting a partial basic income. This perspective is compatible with that of Keynesians who see basic income as a way to stimulate economic growth.

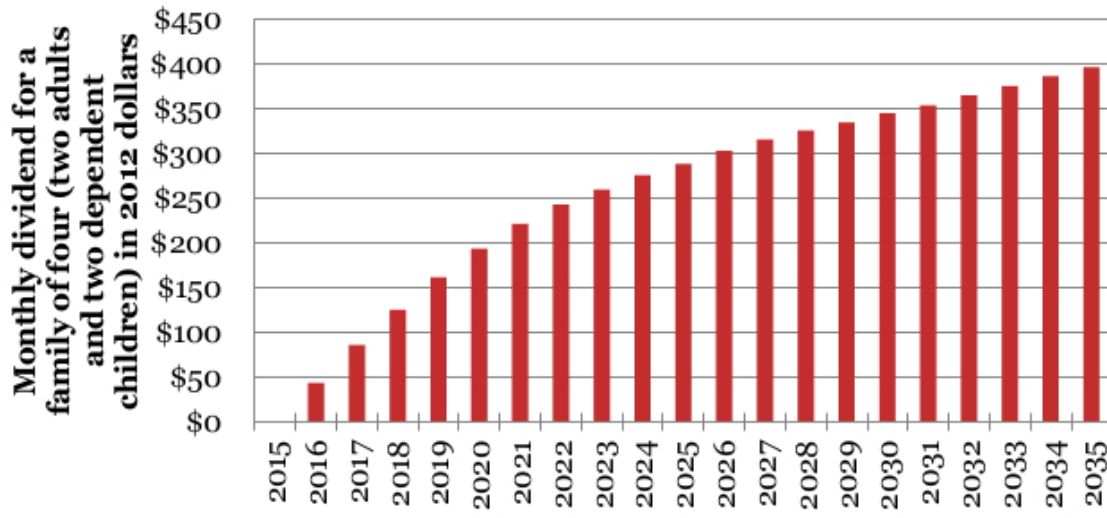
The second argument, which we may call the “degrowth” perspective, can include the carbon fee and dividend, but goes further, arguing that avoiding ecological disaster will require at least a temporary end to economic growth. Basic income from a degrowth perspective may prove instrumental for implementing degrowth policies without economic calamities.

These rival positions have different implications for the relevance of basic income for ecological ends.

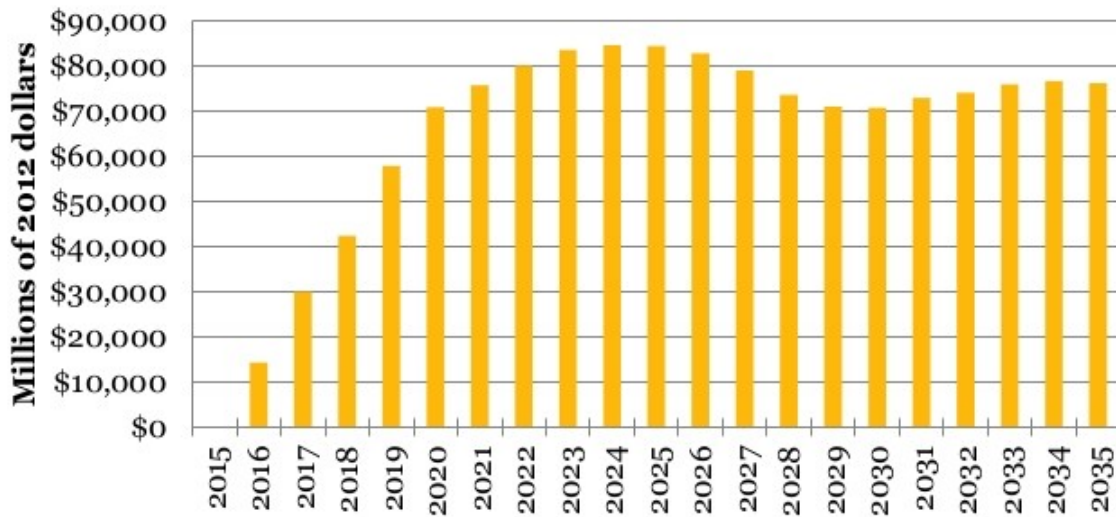
### **Green Growth**

I begin with an illustration of a green growth proposal for a carbon dividend, a kind of partial basic income, the Citizens’ Climate Lobby’s carbon fee and dividend (CF&D) policy. Citizens’ Climate Lobby (CCL) proposes an initial fee of \$15 per metric ton of CO<sub>2</sub>e (Carbon dioxide equivalent emissions), increasing by \$10/year. A similar proposal (starting at \$10/ton) [modeled by Regional Economic Modeling, Inc.](#) (REMI) would yield a monthly dividend by 2035 of about \$400 per family of four (see graph).

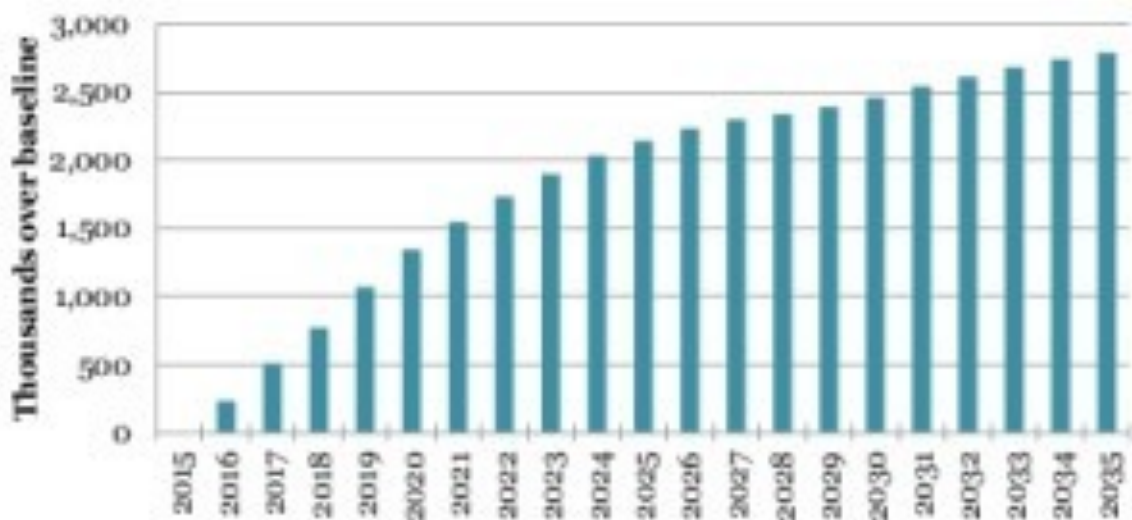
## Monthly Dividend by Family



REMI also projects that the policy will add to GDP, compared to no carbon tax, because of “a net increase in jobs and more consumer spending from the dividend,” adding “a cumulative increase in national GDP ... of \$1.375 trillion” (see figure below).



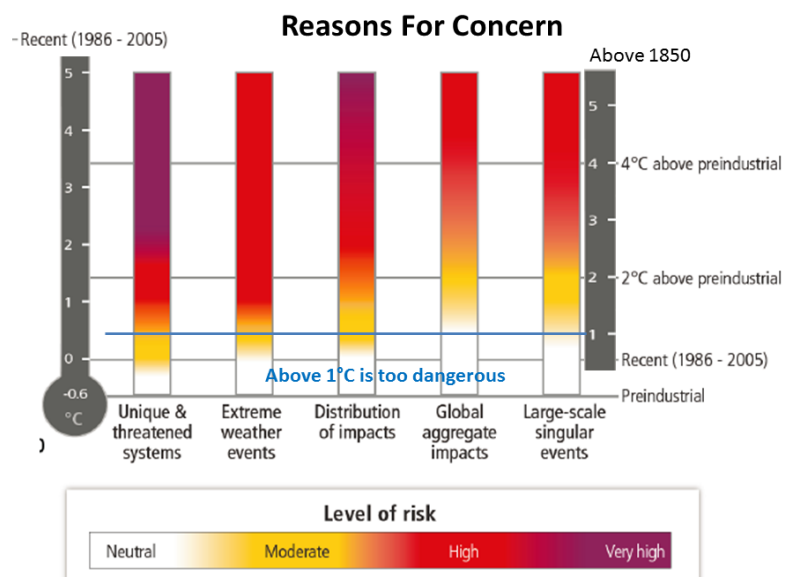
There would also be “over a million jobs created within 4 years, over 2 million within 9 years” (see figure).



CO2 emissions are projected to be 31 percent below 1990 levels by 2025, and 50 percent below 1990 levels by 2035, roughly double the emissions reductions projected for Obama’s Clean Power Plan.

This plan clearly exemplifies the green growth perspective. It aims at significant reductions in carbon emissions, while allowing—even enhancing—economic growth and job growth. But is it ambitious enough to reduce carbon emissions rapidly enough to avoid environmental disaster? It is worth recalling what is likely to happen if the earth’s temperature rises 2 degrees Centigrade (2C) above pre-industrial levels.

The following chart<sup>1</sup> illustrates what the Intergovernmental Panel on Climate Change considers to be among the most important risks at different levels of temperature rise:



Box SPM 4

IPCC WGII AR5 Summary for Policymakers

And the following slides show examples of what is threatened in each category:

1. Unique and threatened systems (eg., coral bleaching)



2. Extreme weather events: Typhoon Haiyan<sup>2</sup>



Drought, Lake Mead<sup>3</sup>



Sand Fire, California, 2016



Sea level rise; flooding, Bangladesh<sup>4</sup>



### 3. Distribution of Impacts; Hurricane Katrina<sup>5</sup>

The impacts of climate change are likely to fall more heavily on the poor.



Puerto Rico 2017:



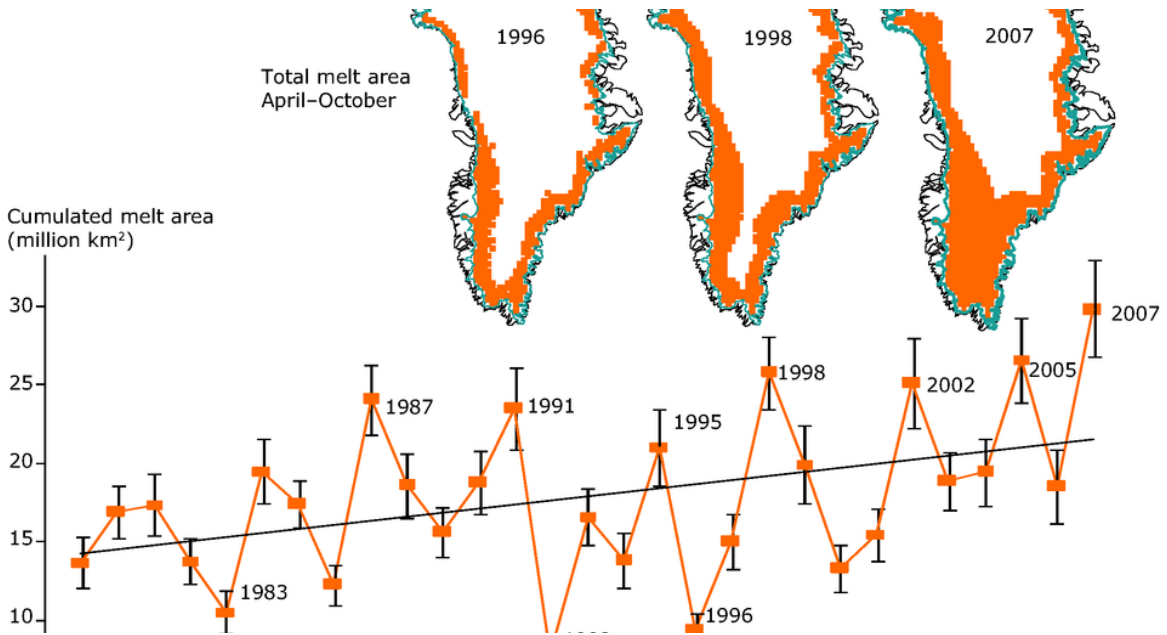
“The Ominous Story of Syria’s Climate Refugees,” Scientific American, Dec. 17, 2015<sup>6</sup>:



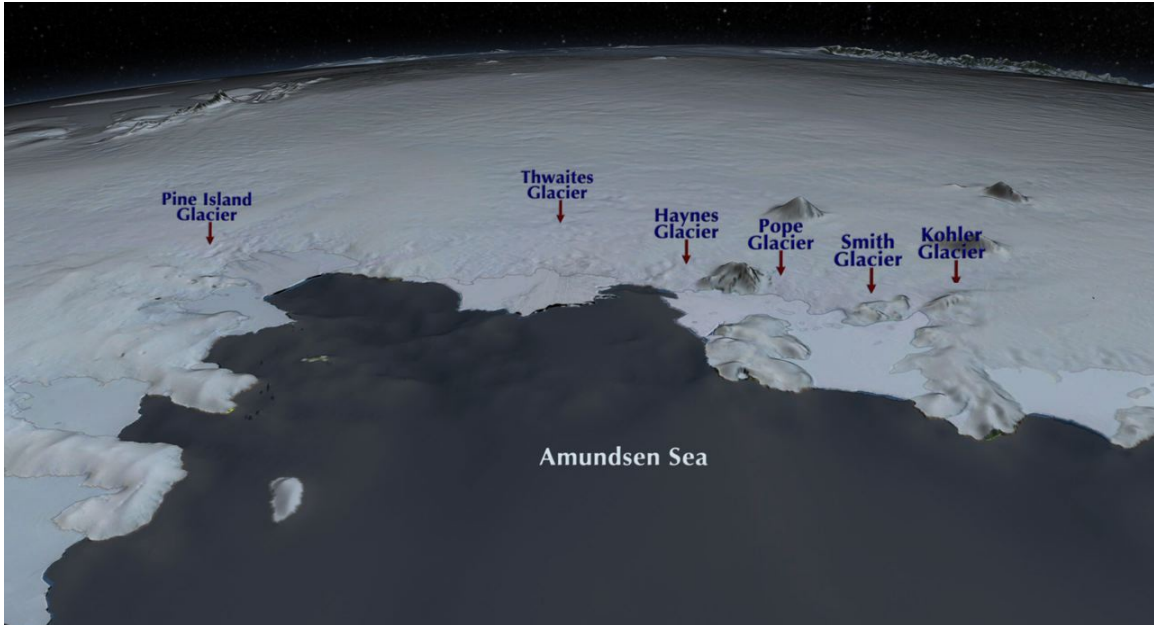
4. Global Aggregate impacts, i.e., impacts on biodiversity and the global economy:



5. Large-scale singular events, such as the melting of the Greenland and Antarctic ice sheets<sup>7</sup>:





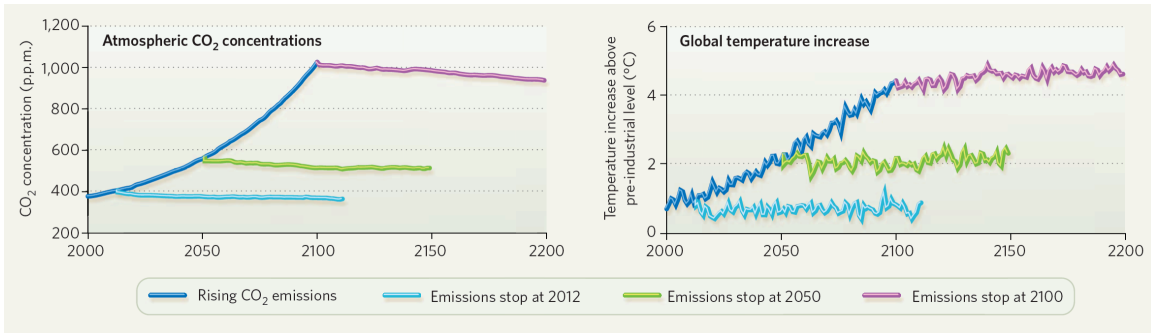


Sea level rise, Maldives<sup>8</sup>:



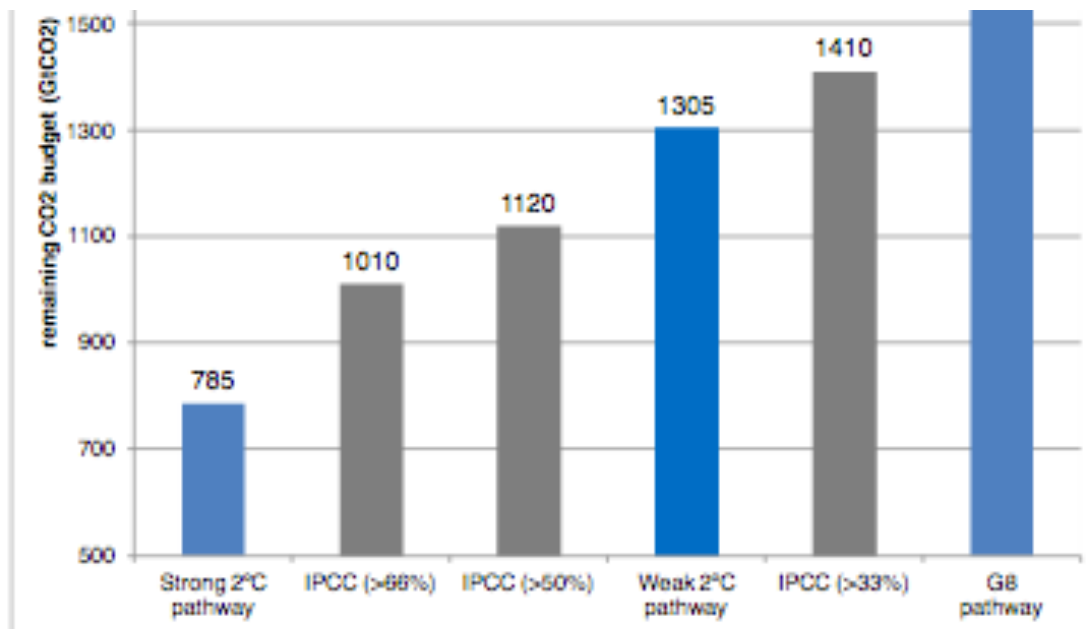
These are the consequences we are anticipating if global temperature exceeds 2C. What is needed to keep temperatures below 2C? I will develop an estimate in line with the scientific consensus, in terms of the concept of carbon budgets. I will show what the carbon budget globally should be per capita, and then discuss what should be a fair allocation of emissions reductions to stay within our carbon budget.

As the following graphs demonstrate<sup>9</sup>, because CO<sub>2</sub> stays in the atmosphere for a very long time, the elevated temperatures corresponding to higher levels of CO<sub>2</sub> will also continue or even increase for centuries.



(after Lowe et al. 2009. Environmental Research Letters 4: 014012; figure used in Monastersky 2009. Nature 458: 1091-1094.)

The following graph shows six carbon budgets.<sup>10</sup> The grey bars correspond to 3 IPCC scenarios, and the blue bars to 3 scenarios discussed by Athanasiou et al., of Eco-Equity. A carbon budget is a total amount of carbon dioxide that can be emitted into the atmosphere (in these cases from 2014), relative to a particular risk of staying below 2°C. So, for example, the budget of 1410 Gigatons of CO<sub>2</sub> is the amount of CO<sub>2</sub> that can be emitted globally, with a more than 33 percent chance of staying below 2°C. The G8 pathway, the budget corresponding roughly to the pledges made in the Paris Accord, has less than a one third chance of keeping the global temperature below 2°C.



from Athanasiou et al

Of particular interest to us are the two bars on the left, which would give us more than a 66 percent, or better, chance of staying below 2°C. To calculate a carbon budget per person, I will use an average of these two budgets. In order to stay below 2°C, the carbon budget over the next 30 years (commencing in 2014), should be an average of **3 tons of CO<sub>2</sub> per person per year**. To arrive at this figure, I assume a carbon budget between

785-1010 billion metric tons. I divide by the world population (assumed to be 8 billion, a middle figure between the current population and what is projected for mid-century). I then take 80 percent of that figure over the next 30 years (leaving only 20 percent for the last half of the 21<sup>st</sup> Century before getting to zero net carbon. I divide that figure by 30 to get the annual budget per capita.

Here is how actual CO2 emissions per capita in 2014<sup>11</sup> compare to a 3 ton per capita budget:

- Global average: **5 tons**
- US **16.5**
- Canada 15.1
- Mexico 3.9
- China 7.5
- EU 6.4
- India 1.7
- Sub-Saharan Africa .8

With business as usual, the total carbon budget will be exhausted in less than 30 years after 2014.

### **Fair allocation**

Who bears responsibility for emissions reductions? Athanasiou et al., and Simon Caney,<sup>12</sup> propose a combination of two principles, “polluter pays” and “ability to pay.”

The idea that polluters should bear responsibility for the costs of their pollution is relatively straightforward, but implementation raises many questions. Do we count past polluters, and if so, how far back do we go? To the start of the industrial revolution, to 1950 (encompassing polluters who are still living), or to 1990 (when there was international agreement that global warming was a problem requiring collective action)?

Similarly, what shall we count as an ability to pay? The rough idea is that the responsibility should be carried by those who can do so without excessive sacrifice. Who should be excluded from responsibility for pollution on account of their poverty? Only those whose incomes fall below \$2 per day? Then many extremely poor people would still be held responsible for contributing to the solution, at the expense of their own basic needs. Athanasiou et al. propose a “development threshold” of \$7500 per year. Those who fall below this are exempted from the costs of reducing emissions. There are people below this threshold in every country, but the proportion below the threshold is greater for some countries than others. Thus it is possible, taking account of past emissions (from some starting point), and the numbers of people below the threshold, to set a “responsibility/capacity” index for each country.

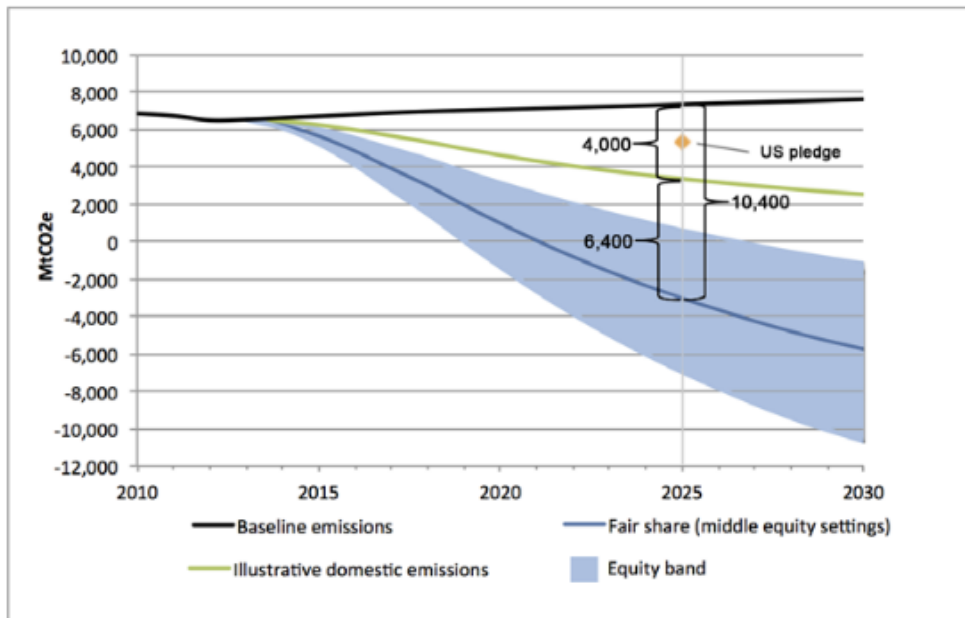
Following Athanasiou et al.<sup>13</sup>, I will examine two such indices for the United States:

1. **“LOW EQUITY”** (Responsibility since 1990)  
 US: **90% below 1990 levels by 2025**  
 (46% domestic, 44% internationally supported)
2. **“MIDDLE EQUITY”** (Responsibility since 1950 + threshold)  
 US: **149% below 1990 levels by 2025**  
 (46% domestic, 102% international)

Note that even the “low equity” scenario, which ignores ability to pay, as well as all past emissions before 1990, still would require the United States to reduce its emissions by 90 percent below 1990 levels by 2025. This would be a nearly impossible goal, if it were to be achieved only by domestic emissions reductions. Fortunately, because some countries (eg., India) are currently using much less than their fair share, the US can meet its responsibility by reducing emissions domestically by, say 46 percent—still a demanding target, but doable—while taking responsibility for the cost of the other 44 percent elsewhere. For example, the US could pay into a Clean Development fund, that would pay countries like India to forgo emissions to which they would otherwise be entitled within the carbon budget.

The middle equity scenario pushes responsibility back to 1950, and includes the development threshold. Here, the US has a responsibility to reduce emissions by 149 percent below 1990 levels, a physical impossibility. But again, the responsibility can be met by reducing domestic emissions by a manageable amount, while assuming responsibility for even more of the cost of emissions reductions elsewhere.

The following graph illustrates these scenarios, (along with a high equity setting):



from Athanasiou et al.

The yellow dot corresponds to the US pledge in the Paris Accord (which President Trump has vowed to pull out of). The brackets illustrate the domestic emissions reductions

(46%) and international obligations for the middle equity setting, and the upper and lower parts of the blue shaded area correspond to the low and high equity settings respectively. The US pledge is about half what is needed for its domestic emissions reductions.

The following chart compares these low and middle equity settings with both the US Paris pledge<sup>14</sup>, and the CCL proposal discussed earlier:

	2025	Low	Middle	Equity		2035		
USParis Pledge	26-28% below 2005 = 15-17% below 1990							
REMI/CCL	31% below 1990					50%		
EcoEquity	90%	6700Mt CO2e	149%	10,400 MtCO2e				
domestic	(46%)	(4000)	(46%)	(4000)				
International	(44%)	(2700)	(102%)	(6400)				

Note that the EcoEquity target of 46 percent below 1990 levels is considerably more demanding than the CCL proposal discussed earlier, not to mention the Paris pledge, which is about half what CCL aims for.

What level of carbon tax might bring carbon emissions to 46 percent below 1990 levels by 2025? Starting in 2017, and using the carbon tax calculator developed by the Carbon Tax Center,<sup>15</sup> I calculated that reaching this target would require a carbon tax starting at \$35 per ton, and increasing by \$35/ton/year, reaching \$280/ton by 2025. This would incidentally yield a per capita annual dividend of \$2668—considerably greater than the Alaska Permanent Fund dividend—and a household dividend of \$6884. I hasten to add that this calculation is quite speculative. We have no experience of carbon taxes in this range, and ramping up so quickly. So projections from past changes in the market prices of carbon fuels are not reliable. More than likely, producers and consumers could not shift to alternatives as rapidly as such a tax would require, and the tax would simply suppress demand, and could throw the economy into recession.

Therefore, a carbon tax would need to be complemented by other policies to hasten the transition to an economy free of fossil fuels, policies to incentivize home insulation, fuel efficiency standards, appliance efficiency standards, subsidies for renewable energy and public transportation, etc.<sup>16</sup> Is green growth still a real possibility? Pollin and Chasman argue that the investments needed will lead to a different kind of growth. However their

environmental target (40 percent reduction below *current* levels in 20 years) is not ambitious enough to stay below 2C. Victor and Sers<sup>17</sup> argue that the level of investment required would effectively stop economic growth.

## Degrowth

Whatever combination of policies we envision, they would have to reduce the carbon intensity of the economy—the grams of CO<sub>2</sub> per dollar of GDP—at an unprecedented rate. At the current rate of reduction of carbon intensity, 0.7 percent annually, and assuming the projected 0.7 percent annual increase in population, **income growth would need to stop**, to keep emissions from rising. To **reduce** emissions substantially, carbon intensity would need to decline by more than 10 times the rate since 1990.<sup>18</sup> Is this compatible with economic growth? Or will it require reduced consumption (globally, but particularly by the affluent), i.e., will it require “degrowth”? We here confront what Tim Jackson has called the dilemma of growth: with continued economic growth, we face ecological disaster. But with slow, zero, or negative growth, we face economic disaster, in the form of high unemployment and rising inequality.<sup>19</sup> The political repercussions lead some to dismiss degrowth as politically infeasible. (Halstead; Pollin; Pollin and Chasman)

I will not attempt here to make the case for degrowth over green growth. I note only that the burden of proof is on the advocates of green growth to show how the environmental goals can be achieved in the limited time we have, without also reducing consumption among the affluent. I will conclude with a brief sketch of what a case for basic income might look like from a degrowth perspective.

Degrowth will force us to address property ownership and distribution of (fixed or declining) income. Poverty reduction could no longer be dealt with by lifting all boats by means of a growing economy. Without growth, poverty alleviation, as well as reduction of inequality more generally, will require redistribution of wealth and/or income. Maintaining quality of life without growth will require more income security, which a basic income can provide. With lower inequality, resulting from increased taxation of the wealthy and transfers to middle and lower income groups, there is less need for positional goods. So their loss will not mean a loss of welfare. If there is less growth, and less job growth, there may be a need for more work sharing, which becomes more feasible if, in addition to wages, people have income not conditional on work. Such income can come from a wider sharing of “unearned income”, by which I mean the income that comes from ownership of assets such as land, stocks and bonds, and other resources.

## Convergence?

Is there a possibility of convergence of these rival ecological perspectives on the topic of basic income? Consider the following two views. First, Naomi Klein, who is closer to the degrowth perspective, from her book, *This Changes Everything*: We need to choose

“the right early policy battles—game-changing ones that don’t merely aim to change laws but change patterns of thought. That means that a fight for a **minimal carbon tax** might do a lot less good than, for instance, forming a **grand coalition to demand a guaranteed minimum income**. That’s not only because a minimum income ... **makes it possible for workers to say no to dirty energy jobs** but also because the very process of arguing for a universal social safety net opens up a space for a full-throated **debate about values**—about what we owe to one another based on our shared humanity, and what it is that we collectively value more than **economic growth** and corporate profits.”

We have seen that a carbon tax can yield a dividend that is not so minimal, but it will in any scenario fall short of subsistence. Klein invites us to think of a full basic income as a policy enabling a radical change in the economy, away from fossil fuels altogether, and away from dependence on growth. This might be the very politics that could unite progressive movements, and provide an alternative to the reactionary politics that is rising in response to surging migration (partly climate related) and stagnant economies still in the grips of austerity politics.

But consider this retort from Ted Halstead, a leader of the conservative Climate Leadership Council, which has proposed a carbon fee and dividend (significantly lower than that of CCL, and tied to deregulation, but promising to be at least as effective as Obama’s Clean Power Plan in reducing emissions):

“today’s green-left movement, which deserves much credit for sounding the climate alarm, also deserves blame **for framing it in a manner that alienates much of the public**. Take Naomi Klein, one of the movement’s celebrity authors, whose book *This Changes Everything: Capitalism vs. the Climate* advocates de-growth, reduced consumption, and an overthrow of the global economic order. Based on Kahneman’s insights [about **cognitive bias** and **loss aversion**], this is precisely the wrong message to motivate people. These prescriptions are so profoundly at odds with the worldview of those on the opposite end of the political spectrum that it is little wonder why they are tempted to dismiss climate science altogether.”<sup>20</sup>

Critique of degrowth is not only from conservatives. Robert Pollin (2015), an advocate not only of carbon taxation, but also of investing 1.5-2 percent of GDP in renewable energy alternatives, points out how most of the work of getting off fossil fuels will need to be through investment in alternatives, even if there is degrowth, and degrowth would itself come at a high, perhaps politically unsustainable, cost.

“We know that annual global CO<sub>2</sub> emissions need to fall from the current level of 32 billion tons to 20 billion tons within 20 years. Now assume that global GDP contracts by 10 percent over the next two decades, following a de-growth scenario. That would entail a reduction of global GDP four times larger than what we experienced over the 2007–09 financial crisis and Great Recession. In terms of CO<sub>2</sub> emissions, the net effect of this economic contraction, considered on its own, would be to push emissions down by precisely 10 percent—that is, from 32 to 29 billion tons, exactly the global emissions

level when the Copenhagen climate summit convened in 2009. So the global economy would still not come close to bringing emissions down to 20 billion tons by 2035.

“Clearly, even under a de-growth scenario, the overwhelming factor pushing emissions down will not be a contraction of overall GDP but massive growth in energy efficiency and clean renewable-energy investments (which, for accounting purposes, will contribute toward increasing GDP) along with similarly dramatic cuts in fossil-fuel production and consumption (which will register as reducing GDP). Moreover, any global GDP contraction would result in huge job losses and declines in living standards for working people and the poor. Global unemployment rose by more than 30 million during the Great Recession. I have not seen any de-growth proponent present a convincing argument as to how we could avoid a severe rise in unemployment if GDP were to fall twice as much as it did during 2007–09.”

It is clear that there are serious differences of strategy between advocates of green growth and advocates of degrowth. The former seek a moderately sized carbon dividend, and continued growth, the latter a substantial basic income. The former seek a broad alliance including environmentally sensitive business leaders, the latter a left alliance against growth, inequality, and poverty, that challenges some fundamental features of capitalism itself.

I conclude, despite these differences, with a recommendation for convergence in the short term. All parties can agree on the importance of a carbon fee and dividend. Some will see it as the sole measure, and resist going further. Others can favor it as a first step, and push to increase it, and to complement it with other measures. In the meantime, those seeking more than a carbon tax (whether massive public investments, or degrowth) can educate about the need to do more, including the promotion of a basic income as part of the solution to “prosperity without growth.”

---

<sup>1</sup> From the AR5 Synthesis report, p. 73: “Risks associated with Reasons For Concern at a global scale are shown for increasing levels of climate change. The colour shading indicates the additional risk due to climate change when a temperature level is reached attributable to climate change. Yellow indicates that associated impacts are both detectable and attributable to climate change with at least medium confidence. Red indicates severe and widespread impacts. Purple, introduced in this assessment, shows that very high risk is indicated by all key risk criteria.”

p. 72: **Unique and threatened systems:**

“Some ecosystems and cultures are already at risk from climate change (high confidence). With additional warming of around 1°C, the number of unique and threatened systems at risk of severe consequences increases. Many systems **with limited adaptive capacity, particularly those associated with Arctic sea ice and coral reefs**, are subject to very high risks with additional warming of 2°C. In addition to risks resulting from the Magnitude of warming, terrestrial species are also sensitive to the Rate of warming, **marine species** to the rate and degree of ocean acidification and coastal systems to sea level rise.”

**2. Extreme weather events:**



---

“Climate change related risks from extreme events, such as heat waves, heavy precipitation and coastal flooding, are already moderate (high confidence). With 1°C additional warming, risks are high (medium confidence). Risks associated with some types of extreme events (e.g., extreme heat) increase progressively with further warming (high confidence).”

### 3. Distribution of impacts:

“Risks are **unevenly distributed between groups of people and between regions**; risks are generally greater for disadvantaged people and communities everywhere. Risks are already moderate because of regional differences in observed climate change impacts, particularly for crop production (medium to high confidence). Based on projected decreases in regional crop yields and water availability, risks of unevenly distributed impacts are high under additional warming of above 2°C (medium confidence).”

4.

### Global aggregate impacts:

“Risks of global aggregate impacts are moderate under additional warming of between 1°C and 2°C, reflecting impacts on both the **Earth’s biodiversity and the overall global economy** (medium confidence). Extensive biodiversity loss, with associated loss of ecosystem goods and services, leads to high risks at around 3°C additional warming (high confidence).

Aggregate economic damages accelerate with increasing temperature (limited evidence, high agreement), but few quantitative estimates are available for additional warming of above 3°C.”

5.

### Large-scale singular events:

“With increasing warming, **some physical and ecological systems** are at risk of **abrupt and/or irre-versible changes** (see Section 2.4). Risks associated with such tipping points are moderate between 0 and 1°C additional warming, since there are signs that both **warm-water coral reefs and Arctic ecosystems** are **already experiencing irreversible regime shifts (medium confidence)**. Risks increase at a steepening rate under an additional warming of 1 to 2°C and become high above 3°C, due to the potential for **large and irreversible sea level rise** from ice sheet loss. For sustained warming above some threshold greater than ~0.5°C additional warming (low confidence) but less than ~3.5°C (medium confidence), **near-complete loss of the Greenland ice sheet would occur over a millennium or more, eventually contributing up to 7 m to global mean sea level rise.**”

<sup>2</sup> Typhoon Haiyan, the Philippines,

<http://beforeitsnews.com/mediadrop/uploads/2013/46/f0a86f56cbd875df90120bcbb1887c cf5dd474cc.jpg>

Wikipedia: “**Typhoon Haiyan**, known as **Typhoon Yolanda** in the Philippines, was one of the strongest [tropical cyclones](#) ever recorded, which devastated portions of [Southeast Asia](#), particularly the [Philippines](#), on November 8, 2013.<sup>[1]</sup> It is the deadliest [Philippine typhoon](#) on record,<sup>[2]</sup> killing at least 6,300 people in that country alone.<sup>1</sup> **Haiyan is also the strongest storm recorded at [landfall.](#)**”

---

<sup>3</sup> 40 year lows

<https://kssunews.wordpress.com/2014/02/19/californias-drought/>

Driest in hundreds of years

“According to B. Lynn Ingram, a professor of Earth and Planetary Science and Geography at UC Berkley, this last year could possibly be the driest water year that California has seen within the past 500 years. Ingram has studied California’s tree stump rings, and determined that California hasn’t been this dry since 1580. In just 2013, [Northern California had 4 inches of rain](#) and Southern California had just 3.5 inches of rain, which for Southern California, is ten inches less than normal.” 2014

<sup>4</sup> <http://o.aolcdn.com/pslca/gallery/i/f/floods/lg5.jpg>

. “A United Nations panel estimated recently that **a three-foot (one-meter) rise in sea levels would submerge 20 percent of the country beneath the Bay of Bengal.**”

[http://ocean.nationalgeographic.com/ocean/photos/sea-level-rise/sea-level03-wading-bangladesh\\_16594\\_600x450.jpg](http://ocean.nationalgeographic.com/ocean/photos/sea-level-rise/sea-level03-wading-bangladesh_16594_600x450.jpg)

5

[http://news.nationalgeographic.com/news/2005/09/photogalleries/hurricane\\_katrina\\_aftermath/images/primary/katrina\\_flood\\_32.jpg](http://news.nationalgeographic.com/news/2005/09/photogalleries/hurricane_katrina_aftermath/images/primary/katrina_flood_32.jpg)

<sup>6</sup> “Climatologists say Syria is a grim preview of what could be in store for the larger Middle East, the Mediterranean and other parts of the world. The drought, they maintain, was exacerbated by climate change. The Fertile Crescent—the birthplace of agriculture some 12,000 years ago—is drying out. Syria's drought has destroyed crops, killed livestock **and displaced as many as 1.5 million Syrian farmers.** In the process, it touched off the social turmoil that burst into civil war, according to a study published in March in the *Proceedings of the National Academy of Sciences USA*”

<sup>7</sup> The IPCC reports, “For sustained warming above some threshold greater than ~0.5°C additional warming (low confidence) but less than **~3.5°C (medium confidence), near-complete loss of the Greenland ice sheet would occur over a millennium or more, eventually contributing up to 7 m to global mean sea level rise.**”

**On Antarctica:**

“Although the Amundsen Sea region is only a fraction of the whole West Antarctic Ice Sheet, the region contains enough ice to raise global sea levels by 4 feet (1.2 meters).

Image Credit:

NASA/GSFC/SVS”

“A conservative estimate is that it could take several centuries.

The region contains enough ice to raise global sea levels by 4 feet (1.2 meters). The most recent U.N. Intergovernmental Panel on Climate Change (IPCC) report estimates that by 2100, sea level will rise somewhere from just less than 1 foot to about 3 feet (26 to 98 centimeters). But the vast majority of these projections do not take into account the possibility of major ice loss in Antarctica. Rignot said this new study suggests sea level rise projections for this century should lean toward the high-end of the IPCC range.

---

The Amundsen Sea region is only a fraction of the whole West Antarctic Ice Sheet, which if melted completely would raise global sea level by about 16 feet (5 meters).”

<https://www.nasa.gov/jpl/news/antarctic-ice-sheet-20140512/>

Senator Angus King, 11.10,2016, Margaret Chase Smith Lectureship on Public Affairs, reported that

**The entire Antarctic ice sheet: 212 ft of sea level rise. Greenland: 20 feet. Starting to melt for the first time in 100,000 years, & Melting is accelerating.**

**15,000 years ago: Orono was under 10,000 ft. of ice, and the ocean level was 300 feet lower.**

John Englander & Bob Corell, climate scientists accompanying King to Greenland: “a foot of sea level rise in the next 10 to 15 years and one foot per decade thereafter for the rest of the century.” =8 feet

<https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1743&context=mpr>

<sup>8</sup> [http://images.nationalgeographic.com/wpf/media-live/photos/000/165/cache/sea-level04-maldives-island\\_16595\\_600x450.jpg](http://images.nationalgeographic.com/wpf/media-live/photos/000/165/cache/sea-level04-maldives-island_16595_600x450.jpg)

From IPCC, AR5, Summary for Policy Makers:

“There has been significant improvement in understanding and projection of sea level change since the AR4. Global mean sea level rise will continue during the 21st century, very likely at a faster rate than observed from 1971 to 2010. For the period 2081–2100 relative to 1986–2005, the rise will likely be in the ranges of 0.26 to 0.55 m for RCP2.6, and of 0.45 to 0.82 m for RCP8.5 (medium confidence)

10

(Figure SPM.6b). Sea level rise will not be uniform across regions. By the end of the 21st century, it is very likely that sea level will rise in more than about 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience a sea level change within  $\pm 20\%$  of the global mean. {2.2.3}

..... it is virtually certain that global mean sea level rise will continue for many centuries beyond 2100, with the amount of rise dependent on future emissions. The threshold for the loss of the Greenland ice sheet over a millennium or more, and an associated sea level rise of up to 7 m, is greater than about 1°C (low confidence) but less than about 4°C (medium confidence) of global warming with respect to pre-industrial temperatures. Abrupt and irreversible ice loss from the Antarctic ice sheet is possible, but current evidence and understanding is insufficient to make a quantitative assessment.”

{2.4

<sup>9</sup> “CO2 lasts ‘for ever’

*The removal of all the human-emitted CO2 from the atmosphere by natural processes will take a few hundred thousand years (high confidence)” (AR5 Ch6 6.1.1.1.)*

IPCC AR5, Summary for Policy Makers:

“Warming will continue beyond 2100 under all RCP scenarios except RCP2.6. Surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO2 emissions. A large fraction of anthropogenic climate change resulting from CO2 emissions is irreversible on a multi-

---

century to millennial timescale, except in the case of a large net removal of CO<sub>2</sub> from the atmosphere over a sustained period.”

<sup>10</sup> The Paris Climate Accord committed nations to attempt to keep global temperature from exceeding 1.5 degrees C, a safer target than 2C. Thus, my discussion of a 2C target is hardly ecologically demanding. From *Eco\_Equity*:

“Re 1.5C: The IPCC provides less explicit information on the likelihood of exceeding 1.5°C, but based on the information given, it is possible to conclude that the Strong 2°C path’s chance of keeping warming below 1.5°C is “more unlikely than likely” (less than 50%) and the Weak 2°C and G8 paths are both “unlikely” (less than 33%)”

reference:

<sup>11</sup> World Bank 2014

<sup>12</sup> Athanasiou, Tom, Paul Baer, Sivan Kartha (2014). National Fair Shares: The Mitigation Gap—Domestic Action and International Support. A Climate Equity Reference Project Report. <http://www.ecoequity.org/wp-content/uploads/2014/11/National-fair-shares.pdf> ; Simon Caney, 2008. “Cosmopolitan Justice, Responsibility, and Global Climate Change,” in *The Global Justice Reader*, ed. Thom Brooks. Oxford: Blackwell Publishing. 689—713. First published in *Leiden Journal of International Law* 18 (2005).

<sup>13</sup> “Low Equity”= Polluter Pays, without Ability to Pay

Medium and High factor in Ability to Pay, with a threshold, and progressivity  
“The low case is a “No Progressivity” setting in which all income within a nation counts toward its capacity. There is no income threshold below which individual income is exempted from national capacity, either on the basis of a poverty exclusion or a development exclusion. Rather, when calculating capacity, each dollar of income – even for the poorest of the world’s people – counts as much as each dollar of the world’s richest. This setting is inconsistent with the conventional progressive approach that virtually all societies have adopted for the purpose of income taxation, and it is difficult (if not impossible) to justify in equity terms. Nonetheless we include it here as a lower bound.”

•

“The medium case is a “Weak Progressivity” setting in which there is a low income threshold below which individual income is exempted from the calculation of national capacity. In this report, this weak case is used to define “Medium Progressivity” cases, in which the “development threshold” is set at \$7,500 (approximately \$20/day). This level is just a bit above a global poverty line that reflects empirical observations, so it too should be taken as a low estimate of “medium” progressivity.”

“In all cases, the pathway is the Strong 2°C pathway, progressivity is set to Weak Progressivity (\$7500 development threshold, no luxury threshold), and responsibility is set to historical responsibility since 1950.”

<sup>14</sup>See <https://www.theguardian.com/science/2016/sep/26/us-climate-change-emissions-miss-2025-target-research>

for the Paris pledge, and citations that this would not be reached.

---

Note, based on EPA data on GHG emissions, 26-28% reductions below 2005 levels are equivalent to 15-17% below 1990 levels.

<https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/index.html#allsectors/allgas/econsect/all>

<sup>15</sup> Carbon Tax Center. CTC Carbon Tax Model (in faq 15). Accessed in April 2016.  
<https://www.carbontax.org/faqs/>

<sup>16</sup> See for example Pollin, R., and Chasman, D. (2015) *Greening the Global Economy*. Cambridge, MA: MIT Press; and Pollin, R. (2015). Think We Can't Stabilize the Climate While Fostering Growth? Think Again. *The Nation*. October 27.  
<https://www.thenation.com/article/think-we-cant-stabilize-the-climate-while-fostering-growth-think-again/>

<sup>17</sup> Victor, P.A., and Sers, M.R. (2018). The Energy-emissions Trap. *Ecological Economics*. v. 151. September. 10-21.  
[https://www.sciencedirect.com/science/article/pii/S0921800917317044?dgcid=STMJ\\_73515\\_AUTH\\_SERV\\_PPUB\\_V41](https://www.sciencedirect.com/science/article/pii/S0921800917317044?dgcid=STMJ_73515_AUTH_SERV_PPUB_V41) “the renewable investment rate by 2050 is significantly larger than the current energy investment rate. For declining intermittent renewable EROI [energy return on investment], the renewable investment rate crowds out other forms of investment leading to a declining economic growth rate.”

<sup>18</sup> Tim Jackson, *Prosperity without Growth: Economics for a Finite Planet*. Washington, DC: Earthscan, 2011).

<sup>19</sup> Pressman, Steven and Robert H. Scott, III. “Thomas Piketty, Growth, Distribution and the Environment.” In Peter Victor and Brett Dolter (Eds.), *Handbook on Growth and Sustainability*. Cheltenham, UK: Edward Elgar, 2017: pp: 356-371.

<sup>20</sup> [https://www.clcouncil.org/wp-content/uploads/2017/02/Unlocking\\_The\\_Climate\\_Puzzle.pdf](https://www.clcouncil.org/wp-content/uploads/2017/02/Unlocking_The_Climate_Puzzle.pdf)  
“Daniel Kahneman won the Nobel Prize in economics for showing how cognitive bias leads to behavior inconsistent with economic rationality. In particular, “one of the main difficulties with climate change is its lack of immediacy or salience.... Another impediment is disinformation. As Kahneman explains, “people will score it as a draw, even if there is a National Academy on one side and some cranks on the other.”... The greatest cognitive barrier distorting our climate-related decisions, however, is the lack of short-term benefits, combined with Kahneman’s theory of “loss aversion,” which refers to people’s strong preference for minimizing losses over acquiring gains. ... From the perspective of Kahneman’s loss aversion theory, personal emissions reductions are a triple-blow: first because the loss is immediate and significant; second because the gain is distant in both time and relation to self; and third because the so-called gain is really more of a draw than an advance.””