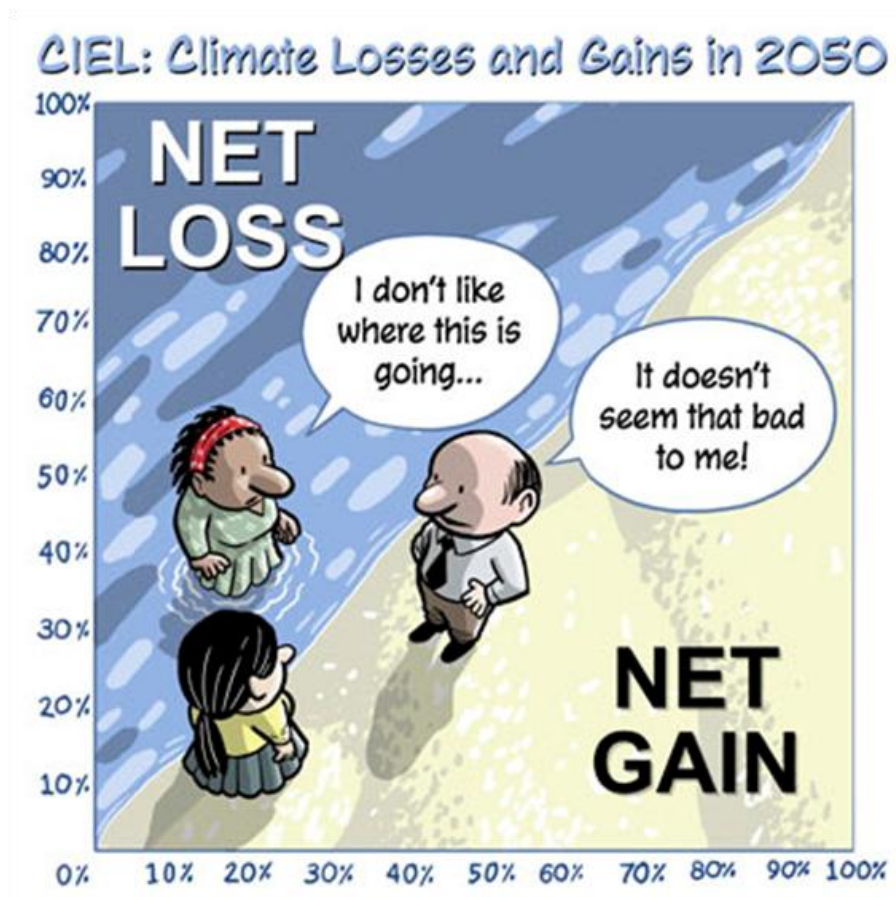


SEI-CIEL for the Caribbean: The Climate Impact Equity Lens



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Learn more about SEI-CIEL on our website: <http://www.SEI-CIEL.org>.

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Overview

SEI's Climate Impact Equity Lens (SEI-CIEL) is a new tool for calculating net impacts from climate change in a way that highlights important differences in the distribution of costs and benefits. The SEI-CIEL Excel tool, which allows users to graph their own net impact, is available for download at <http://www.sei-ciel.org>. This summary report focuses on results for the Caribbean region. (For a more detailed explanation of the SEI-CIEL model see Stanton and Bueno (2011) and Stanton et al. (2011).)

CIEL looks at climate impacts for real people, not regional averages.

Policymakers rely on economic analysis of impacts to the “average” person in each large world region. CIEL makes it possible to compare individual impacts among the diverse global population, and to compare impacts for a single individual as they change from 2025 until 2200.

Different people will experience different impacts from climate change. In every world region, the average person is not a good representative of the diversity of climate vulnerability and emission reduction savings (that is, the money saved in a business-as-usual scenario by failing to reduce greenhouse gas emissions). CIEL takes account of these important differences by characterizing people by their income, economic vulnerability, coastal exposure, water availability and region of residence.

With less than 1 percent of global population, many living on small islands, the Caribbean still possesses a wide diversity of individuals, each with a different vulnerability to climate change and different emission-cost savings. The most vulnerable people in the Caribbean will see net losses by 2050. By 2100, only the small minority with the least vulnerability to climate change will still have net gains. Even in a small region like this one, there will be a wide diversity of impacts.

There are both damages and savings from allowing climate change to continue.

Climate damages come from higher temperatures, more acidic oceans, and changing weather patterns. Climate savings come from not having to pay to reduce greenhouse gas emissions; there are real costs to investing in green technology and alternative energy, costs that could be avoided by allowing greenhouse gas emissions to continue growing.

Today, there are both net winners and net losers from climate change in the Caribbean. And throughout most of the 21st century, there will still be a large group of net winners, even as the number of net losers grows, and the losses that they experience get bigger and bigger. Balancing these interests is a central challenge for global climate negotiations.

Climate damages, net of savings, will increase over time.

Today, for the majority of people in the Caribbean savings from not reducing emissions are greater than damage costs. But with each passing year more and more of these “net winners” will become “net losers”, with larger damage costs that dwarf much smaller savings.

By 2100, almost everyone in the Caribbean region will be a net loser from climate change. For our best hope of a successful climate policy – a policy that by 2100 will benefit the majority of people around the world – it is imperative that the net losers from climate change are represented at the negotiating table. The voices of the most vulnerable must be heard. Without their perspective there is a danger that the least vulnerable among us may lead the world, disastrously, into a climate policy that will do too little, too late.

CIEL in the Caribbean

In the two dozen island nations of the Caribbean, most people are far more vulnerable than the average person for the wider Latin America and Caribbean region. While the average income for the Caribbean is a little bit higher than for the rest of the larger region (\$5,600 versus \$5,000¹), the distribution of income is very wide: Haiti has the lowest income per capita in Latin America and the Caribbean (\$440); Cayman Islands has the highest (\$52,000). The Caribbean also has a high share of income from vulnerable industries. Tourism contributes about half of the GDP of Aruba, Netherlands Antilles, Saint Lucia, and Turks and Caicos Islands, and significant shares elsewhere; agriculture makes up 28 percent of GDP in Haiti, and 18 percent in Dominica; and fisheries are important both to Caribbean income and for subsistence. On most of the islands, a significant share of the population is vulnerable to sea-level rise and storm surge damages from climate change; in Bermuda (sometimes included as part of the Caribbean) more than 80 percent of the population lives below 5 meters elevation above sea level, on the Cayman Islands, 60 percent, and several other islands are not far behind. On many island, fresh water is extremely scarce, especially as compared to the rest of Latin America.

Still, in the Caribbean, just like in every region of the world, there is a great diversity of climate vulnerability. The nine markers shown in Figures 1, 2 and 3 display this diversity, represented by choosing plausible characteristics for individuals living in nine different Caribbean nations. Table 1 displays the characteristics of these nine sample Caribbeans. Their household incomes range from \$300 per person in Haiti to \$80,000 in Cayman Islands; the share of income from economic sectors vulnerable to climate change ranges from 100 percent in Anguilla and Dominica, to 0 percent in Cayman Islands, Puerto Rico, Trinidad and Tobago, and the British Virgin Islands. In Anguilla and Dominica, the sample person lives below 1 meter of elevation above sea level; in Cayman Islands, Dominican Republic, Haiti, Trinidad and Tobago, and the British Virgin Islands, at more than 5 meters above sea level. Water is abundant in the local area of the sample persons from Anguilla and the British Virgin Islands, stressed in Cayman Islands, and scarce (less than 1,000 m³ per person per year) for the other six individuals.

Table 1: Characteristics of 9 sample persons from the Caribbean

Caribbean	Income per Capita	Share of Income from Vulnerable Sectors	Elevation of Home	Water Availability
Anguilla	\$15,000	100%	<1m	Abundant
Cayman Islands	\$80,000	0%	>5m	Stressed
Cuba	\$4,000	50%	<4m, >3m	Scarce
Dominica	\$2,000	100%	<1m	Scarce
Dominican Rep.	\$5,000	50%	>5m	Scarce
Haiti	\$300	90%	>5m	Scarce
Puerto Rico	\$35,000	0%	<3m, >2m	Scarce
Trinidad & Tobago	\$20,000	0%	>5m	Scarce
Br. Virgin Islands	\$40,000	0%	>5m	Abundant

In the CIEL climate vulnerability index (described in detail in Stanton and Bueno 2011), which estimates individual vulnerability on a scale from 1 (most vulnerable) to 0 (least vulnerable), the nine Caribbean sample people range from 1.00 in Dominica to 0.07 in the British Virgin Islands.

¹ These data for income per capita are for 2005 and come from the CRED model, see Ackerman et al. (2011).

REAL PEOPLE IN CIEL



Lourdes Ayala Santos

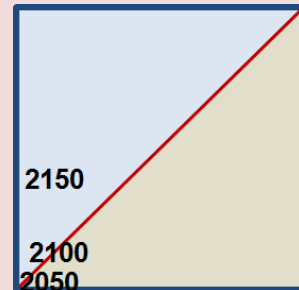
Age: 51
 Vega Baja, Puerto Rico

Lourdes Ayala Santos works for an engineering firm, and because her husband lost his job, her income now supports both of them and their two teenage children; their per capita household income is less than the Puerto Rican average. Like most Puerto Ricans, they have running water and electricity at home; they also have two cars.

Their home is near the coast, close to Playa Puerto Nuevo, at about 13 meters above sea level. Conscious about the environment, they use no air-conditioning and have “energy-saver” appliances, plus a solar water heater. She’s also aware of the problems that drought or contamination could cause to the water supply, and worries about how poorly water is treated.

She says she has seen climate-change impacts already: erosion, dried-out land, and changes in the sea and in the flora and fauna. Yet children and youth are not getting educated about climate change in the schools, she notes – because of government ignorance.

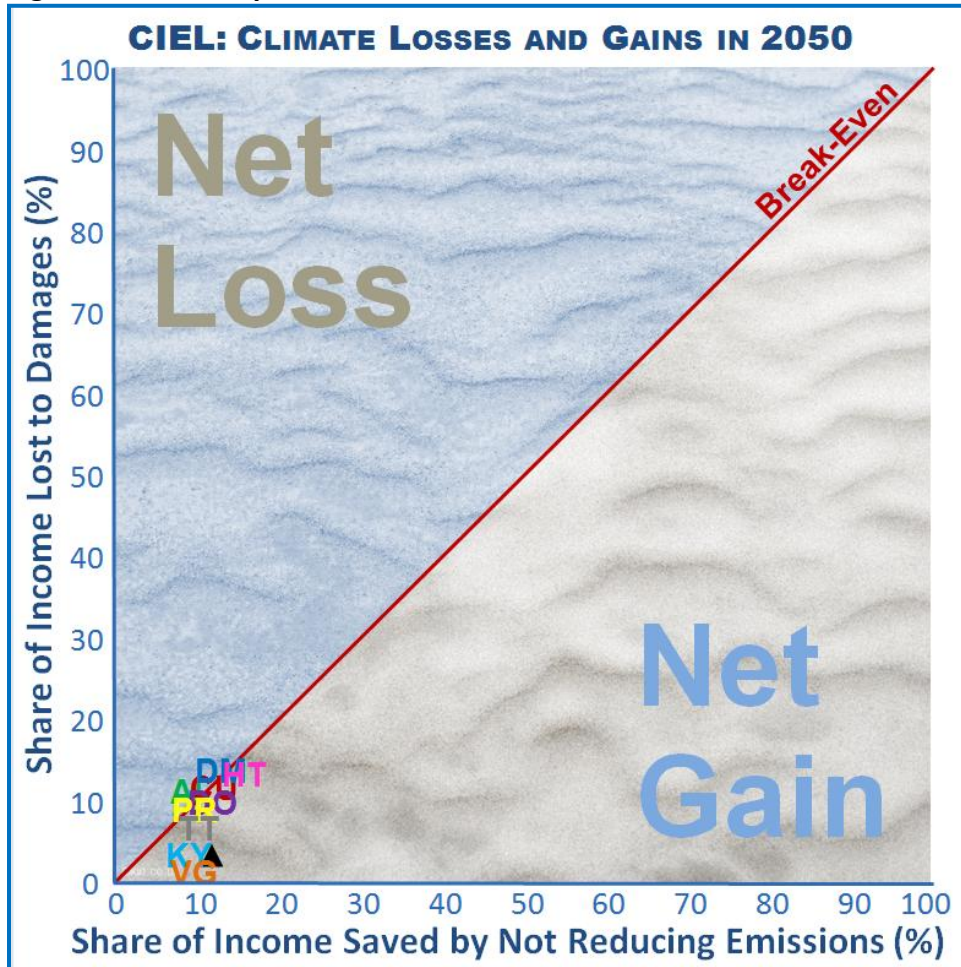
“The future is theirs,” she says. “There are no intensive campaigns, no legislation, because they figure we’re far from the poles and will have time to regenerate our ecosystems. But they’re wrong – if we keep going like this, we won’t just have drought; we’ll have no water at all. We won’t have to worry about species going extinct, because they’ll be gone already. We won’t have to worry about our health, because we won’t be alive. I worry about my children, because although I have educated them about what could come in the future, they alone can’t change things. We need to work as a team to save our planet.”



SEI-CIEL FOR THE CARIBBEAN: THE CLIMATE IMPACT EQUITY LENS

In 2050, all nine sample people have fairly similar net impacts: from about a 1 percent net loss (climate damages are greater than savings from not reducing emissions) in Anguilla, Cuba and Dominica down to a 8 percent net gain in the British Virgin Islands (see Figure 1). In the Caribbean, climate damages are important, even in the next forty years – damages as high as 14 percent of income (for the Dominican) in 2050, no small impact – but savings from avoided emissions reductions are about the same size, or a little larger.

Figure 1: Nine sample individuals in the Caribbean, 2050



Note: AI=Anguilla; KY=Cayman Islands; CU=Cuba; DM=Dominica; DO=Dominican Republic; HT=Haiti; PR=Puerto Rico; TT=Trinidad & Tobago; and VG=British Virgin Islands. Black triangle=Latin America/Caribbean average.

In *The Caribbean and Climate Change: The Costs of Inaction*, Bueno et al. (2008) found that preventable climate damages could reach 5 percent of Caribbean GDP by 2025 and 10 percent by 2050 – and noticeably more in certain islands. The main sources of the damages are destruction to property from more intense hurricanes; loss of tourism income as a result of the changing climate; and infrastructure damage due to rising sea levels and more-destructive storm surges. According to Bueno and coauthors, the highest climate damages as a share of GDP are expected in Haiti, Grenada, Turks and Caicos, Saint Kitts and Nevis, and Dominica; the smallest damage impacts, in Puerto Rico, Martinique, and Guadeloupe.

REAL PEOPLE IN CIEL



Wolde Kristos

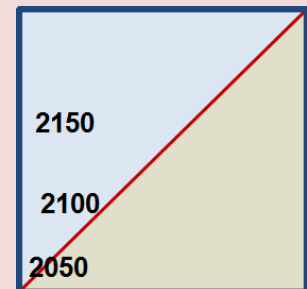
Age: 40
 Bluefields, Westmoreland, Jamaica

Wolde Kristos (in the middle, standing between the former Minister of Agricultural and Fisheries and the former CEO of the Fisheries Division) works in tourism in Jamaica, running birding excursions and eco-tours, and also does some work in community development. With three adults and three children, his household’s per capita income is well below the Jamaican average. They have a car, and also electricity and municipal water, but no air conditioning.

The water supply is steady and clean, he says, but he worries about pollution – human and animal waste getting into the water supply. Sea-level rise also worries him; though his home is about 30 meters above sea level, he is still exposed to storms, and the hurricanes seem to be getting more intense.

“If we keep all our mangroves,” he says, “we don’t have to worry about flooding affecting us.” But this is also a fishing community, he notes, and people’s livelihoods could be affected by sea-level rise.

Asked about the most visible climate impacts, he says the coral reefs are bleaching, and the weather has become unpredictable. And he says he’s worried about the future: “I’m concerned that life as we know it will change, and we will see the loss of coastal communities like ours.”

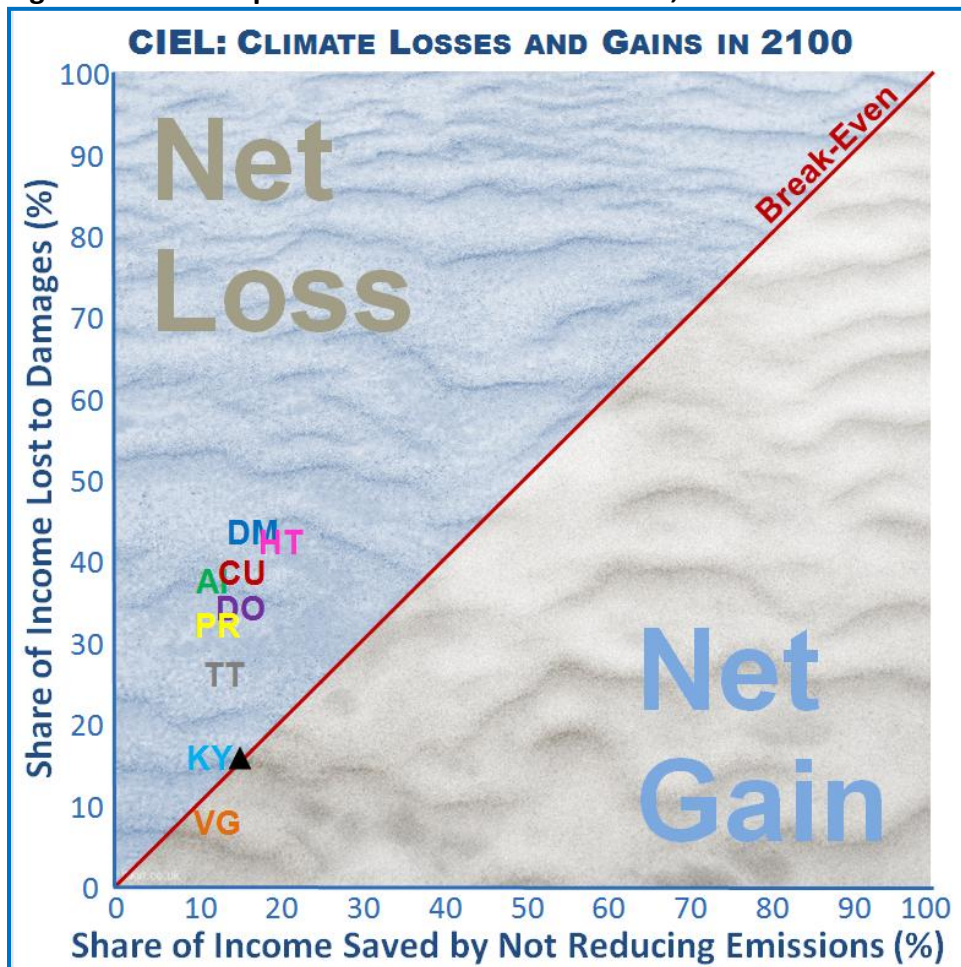


SEI-CIEL FOR THE CARIBBEAN: THE CLIMATE IMPACT EQUITY LENS

By 2100, the CIEL graph for the Caribbean looks very different (see Figure 2). Only the person from the British Virgin Islands is still experiencing net gains from climate change. For the average person for the Latin American and Caribbean region (shown as a black triangle), 2100 climate damages and savings from not reducing emissions are almost exactly equal: 16 percent damages, and 15 percent savings.

Among the sample persons shown, the person from Cayman Islands falls closest to the regional average, with 16 percent damages and 12 percent savings. The other seven individuals have significantly more costs than benefits (net losses of 13 to 27 percent) from failing to stop climate change.

Figure 2: Nine sample individuals in the Caribbean, 2100



Note: AI=Anguilla; KY=Cayman Islands; CU=Cuba; DM=Dominica; DO=Dominican Republic; HT=Haiti; PR=Puerto Rico; TT=Trinidad & Tobago; and VG=British Virgin Islands. Black triangle=Latin America/Caribbean average.

The Cuban, Dominican and Haitian in this sample have the highest 2100 climate damages – all upwards of 40 percent losses in income – and the highest net losses from climate change. All three suffer water scarcity and receive the majority of their income from economic sectors that are particularly vulnerable to climate change. The person from Dominica is the most vulnerable of the nine sample Caribbeans. She lives at less than 1 meter of elevation above sea level, and her household makes just \$2,000 per person per year.

REAL PEOPLE IN CIEL



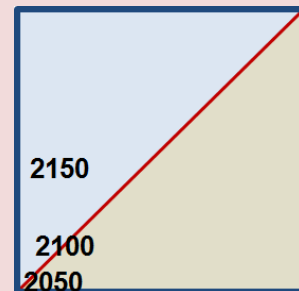
Fiordaliza Mateo de Aracena

Age: 54
 Santo Domingo, Dominican Republic

Fiordaliza Mateo de Aracena lives with her husband and two grown sons – one of them disabled – on a household per capita income below the Dominican average. Fiordaliza is a college graduate, but she is currently unemployed. Her family has no car; they all get around on public transportation, or take taxis.

They have electricity at home, and running water – though she worries about water contamination. Their home is well above sea level, above 25 meters, but they’ve had short-term flooding due to poor drainage systems and overflowing rivers. Still, they’re much better off than Haitians who’ve come into the country and live with no municipal services, sanitation or health care, she says.

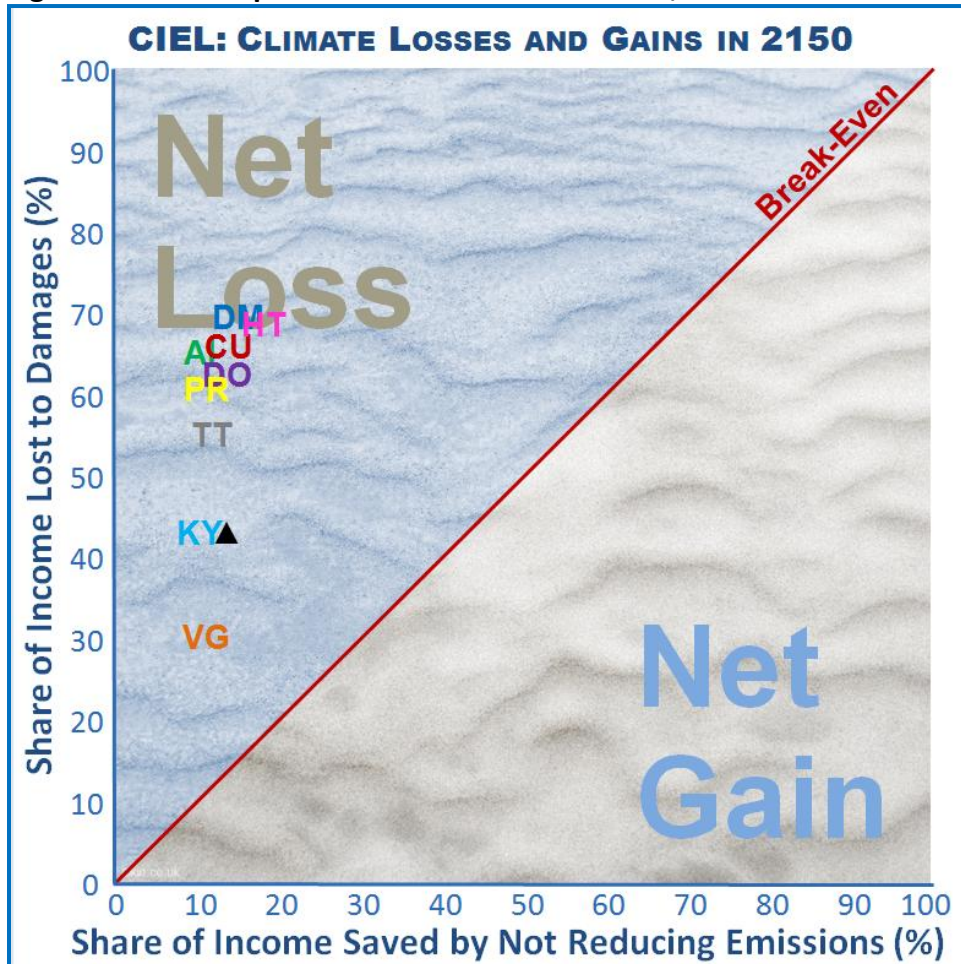
Climate change, she says, has manifested itself in precipitation changes: The rainy seasons are different, and the rains are erratic, with dry periods followed by torrential rains. When it’s not raining, there can be serious enough droughts that rivers run dry. It has also gotten hotter, and some produce, such as grapefruits, will hardly grow in the region anymore.



SEI-CIEL FOR THE CARIBBEAN: THE CLIMATE IMPACT EQUITY LENS

By 2150, all nine sample Caribbeans suffer net losses from climate change, and none have damages that amount to less than 30 percent of their income (see Figure 3). Savings from not lowering emissions range from 10 to 18 percent of income, but these benefits are not sufficient compensation for the costs of failing to stop climate change. As is the case for 2100, most of these sample individuals are worse off than the average person for the Latin American and Caribbean region (note the black triangle).

Figure 3: Nine sample individuals in the Caribbean, 2150



Note: AI=Anguilla; KY=Cayman Islands; CU=Cuba; DM=Dominica; DO=Dominican Republic; HT=Haiti; PR=Puerto Rico; TT=Trinidad & Tobago; and VG=British Virgin Islands. Black triangle=Latin America/Caribbean average.

Even in the Caribbean islands, one of the areas of the world with the greatest vulnerability to climate change, different people will experience climate change differently. Income, economic vulnerability, coastal exposure, and water availability all differ greatly: no one should expect to have the average impact from climate change. The diversity of experiences in such a small area – 40 million people, less than 1 percent of global population – illustrates the importance of considering the distribution of impacts in forming climate policy. Around the world, the diversity of climate vulnerability and patterns of energy use is even greater. Climate policy based on what’s best for regional “average” people would permit a great deal of suffering by the most vulnerable.

References

- Ackerman, F. and Stanton, E.A. (2011). *Climate Economics: The State of the Art*. SEI Report. Somerville, MA: Stockholm Environment Institute-U.S. Center. Available at <http://sei-us.org/publications/id/417>.
- Ackerman, Frank, Elizabeth A. Stanton, and Ramon Bueno. 2011. *CRED v.1.3 Technical Report*. Somerville, MA: Stockholm Environment Institute-U.S. Center, October. <http://sei-us.org/publications/id/411>.
- Bueno, Ramón, Cornelia Herzfeld, Elizabeth A. Stanton, and Frank Ackerman. 2008. *The Caribbean and Climate Change: The Costs of Inaction*. Somerville, MA: Stockholm Environment Institute-U.S. Center. <http://sei-us.org/publications/id/86>.
- Stanton, Elizabeth A., and Ramón Bueno. 2011. *The CIEL Backgrounder: Understanding the Climate Impact Equity Lens*. SEI report. Somerville, MA: Stockholm Environment Institute - U.S. Center, November 23. <http://sei-us.org/publications/id/421>.
- Stanton, Elizabeth A., Ramon Bueno, and Marion Davis. 2011. *Real People, Real Impacts: The Climate Impact Equity Lens*. Somerville, MA: Stockholm Environment Institute - U.S. Center.