EconoFact Chats: Can We Mitigate Climate Disasters?

Galina Hale, UC Santa Cruz

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I'm Michael Klein, executive editor of EconoFact, a nonpartisan, web-based publication of the Fletcher School at Tufts University. At EconoFact, we bring key facts and incisive analysis to the national debate on economic and social policies, publishing work from leading economists across the country. You can learn more about us and see our work at www.econofact.org.

Michael Klein
We've all seen the heartbreaking images of death and widespread destruction from the fires in Los Angeles. These add to the scenes of other recent disasters that many people have suffered through, including Hurricanes Helene and Milton in Florida, typhoons in the Pacific, and flooding in Europe. To what extent is climate change responsible for these disasters? Can anything be done to mitigate the number and severity of these events? And what types of adaptations could help make these fires, storms, and floods less destructive? To address these questions, I'm pleased to welcome back to EconoFact Chats, Professor Galina Hale of the University of California at Santa Cruz. Galina has focused on these issues for years. While an economist at the Federal Reserve Bank of San Francisco, she co-organized a conference in 2019 entitled The Economics of Climate Change. This was the first Federal Reserve System conference on climate change. Galina, welcome back to EconoFact Chats.

Galina Hale
Thanks, Michael.

Michael Klein
Galina, I had Professor Jim Stock of Harvard on an earlier podcast, and he discussed evidence that climate change is happening, average temperatures are rising, and the source of this is human activity. Have we reached a tipping point with respect to rising world temperatures and climate change? And is there still scope for reversing this trend?

Galina Hale
That's a great question, Michael. According to recent data, the current global temperature is already 1.3 degrees Celsius, that's about 2.3 degrees Fahrenheit, above the pre-industrial level. And just to remind you, the Paris Climate Accord that the U.S. just withdrew from is aiming at 1.5 to 2 degrees Celsius by 2050. So we're more than most of the way to this number, and it's not even 2030 yet. With current trends, we are risking to substantially exceed the climate…this target for global warming. And the math is actually simple. The relationship between emissions and global warming, the physics of that, are really complex. But in the end, it boils down to a simple

rule of thumb. If we stop emitting, the temperatures stop rising. If we continue emitting, the temperature is going to continue to rise. This is because any benefits of accumulated greenhouse gas in the atmosphere dissipating over time is offset by the ocean is warming. And the warming ocean is like a thermostat that prevents any cooling.

Michael Klein
So, Galina, have we reached a tipping point where it's irreversible?

Galina Hale
Well, so, I think we have not yet reached a tipping point. Most scientists think about 3 degrees Celsius warming as the tipping point. At that warming level, the permafrost is melting, and some of the tropical forests can start burning, which all is going to emit a lot more greenhouse gas emissions that are completely out of our control. And so, if we pass 3 degrees, that's a point of no return. So, we're not there yet. But we're kind of on the path to 3 degrees if we don't make drastic reductions in greenhouse gas emissions.

Michael Klein
How does climate change contribute to severe storms and flooding?

Galina Hale
Warmer ocean temperatures are responsible for most of these changes. First, hurricanes form if the ocean surface temperature is above 80 degrees Fahrenheit or 26.5 degrees Celsius. And when average ocean temperature is rising, this threshold is breached more frequently. Moreover, warmer oceans also increase severity of all storms…and even the energy level of every wave, even in the absence of the storms. And that increases coastal erosion, and even increases dry weather flooding in coastal areas. In addition, with every degree of warming, the atmosphere is able to evaporate, absorb, and release 7% more water. This means that expanding atmospheric sponge, as the scientists term it, not only leads to more flooding when things are wetter, but also pulls extra moisture out of plants and soils when the dry conditions set in. Therefore, climate change is actually responsible for increased frequency of both floods and droughts.

Michael Klein
And the droughts, I guess, would help explain wildfires. But is there more to the prevalence of wildfires that we've seen recently, of course, most recently in Los Angeles, but elsewhere as well, that are linked to climate change?

Galina Hale
Yes. So my experience is mostly in California, but I know in Australia the patterns are very similar. It's kind of like a mirror image of the California climate. And there are a number of factors that contribute to increased frequency and severity of wildfires in California. First of all,

normally the weather we have in California is that there is a rainy season in the winter. And then there is a long period from March to October, November of pretty much dry season. And what happens then when the land is warmer than the ocean, the wind is blowing from the ocean to the land, bringing in wet air. But then as the temperatures change with the winter coming along, the land becomes cooler than the ocean, and then the wind blows from the land to the ocean. And historically, when the wind would start blowing from the land to the ocean, it would be in the wet season. So that wind also would be wet. The rains would start. But with climate change, the rains start later and later and later in the season. And so we get this period of time between August and November when the winds start blowing from land to the ocean, and this is a very dry wind. And so no matter what sets off the fire, this fire is much more likely to spread over dry land with the strong winds. And that's kind of what happened in Los Angeles, because even though it's January, normally we would have a lot of rain by January and land would be wet. But Los Angeles hasn't seen much rain this winter season yet. And so that's why we have such late and extreme fires. Also, when there is more rain in the winter, there is more grass that grows and more brush that grows, and then it dries by August, and that becomes fuel for wildfires to spread. And finally, when we have a longer dry season, the terrain gets to dry even more. So the later in the season the fires are now getting worse and worse. So those three factors all come from climate change, and they all are responsible for the fires being longer fire season, more severe and more frequent.

Michael Klein
And as you say, this is an example for California, but it holds in other places as well, the sort of the effects of climate change, making places more susceptible to wildfires, and then the winds spreading these in a terrible way. The Intergovernmental Panel on Climate Change says that the world is rapidly approaching a level of warming that will make it significantly harder to manage drought, to manage heat waves, to do something about rising sea levels, and to try to deal with other climate-related disasters. So is there only limited scope for mitigation?

Galina Hale
So as I mentioned, you know, the warming is leading to those disasters, and we are already at 1.3 degrees higher temperatures than we would have been without human impact on climate change. But there is all this scope for mitigation. The faster we reduce emissions to zero, and the more we invest in carbon sequestration, so we can actually reduce the concentration of CO2 in the atmosphere, we might be able to actually turn this trend around. And it's not easy, but reducing emissions is the first step. And the sooner we do it, the better. But, you know, we used to talk about climate change as kind of a future risk. Nowadays, it's no longer a future risk. It's here for pretty much every community in the world is exposed to actual climate risks today.

Michael Klein
What are the main ways in which mitigation through reducing emissions could occur?

Galina Hale
So people generally focus on energy production that produces a lot of greenhouse gas emissions when the fossil fuels are burned, and transportation, which also produces emissions when we use internal combustion engines and, you know, airplane engines and things like that. And those could be reduced through alternative energy, electrification, electrification of transportation. One thing that's frequently not talked about is the agricultural sector that contributes as much as the energy sector and transportation sector in terms of greenhouse gas emissions. And most of that comes from animal agriculture through both CO2 emissions and methane. So it's not the transportation of food that contributes mostly to greenhouse gas emissions, the actual production of animal products. And that could be reduced by, you know, shifting diets to more healthy, plant-forward diets. Or just like with energy, we produce alternative sources, we can have sustainable alternative sources of protein to replace the highly emitting industries, such as beef and dairy are the ones that are on top of the list.

Michael Klein
In fact, you have an EconoFact memo about that, right?

Galina Hale
Yes, I have…for those who want to learn more, there is an EconoFact memo about that with all the numbers and links.

Michael Klein
Well, there's always an EconoFact memo if you want to learn more about almost anything.

Galina Hale
Right.

Michael Klein
So it sounds like it's really important, along with mitigation, to focus on adaptation and building resilience. What kind of things can we do for that?

Galina Hale
You're exactly right. In the past two decades, we focused mostly on investing in climate mitigation, and that was the right thing to do. But now that climate change effects are here, we need to start putting a lot of money and effort into adaptation. And so we can think about physical adaptation to climate change, and it can take many forms, and those are specific to each location, depending on what kind of risks you're facing.

Michael Klein
So what about fire?

Galina Hale
So I'm very familiar with fire risks because I live in both fire and flood zone in California. So fire resilience, it can include buffer zones between forests and structures to make sure there are fire breaks, you know, installing water pipelines to allow for water breaks to the fire, making firemen's work easier. Also fire-resisting building materials, so not building everything just out of wood, which burns very easily. And then there are also construction tricks. For example, you don't want to have eaves that can trap coals that might be flying from the wildfire. And making sure also, that structure fire does not spread to become a wildfire. And in some cases, it just means not developing in high fire risk areas.

Michael Klein
So some of this would be for new construction, but some of it would have to be retrofitting existing houses, right? Would that be much more expensive?

Galina Hale
Not necessarily. So where I live, we actually had the fire department come to our house and do an inspection of whether our house is posing the risk and whether our house is vulnerable to the risk of the fire. One thing we have to do is remove all acacia plants because they're very, you know, they catch on fire very easily. We have to remove any flammable materials from the deck. You know, decks are recommended to be built from knotwood, something that doesn't burn as easily. So it's, as people do renovations to their houses with a normal kind of business, they can renovate with a thought about increasing fire resistance.

Michael Klein
What about floods, Galina?

Galina Hale
Flood resilience is, there's so many measures that we already know about. You know, in Florida, you have, you see all of them, for example, in place, you have pumps, seawalls, elevated structures, right? So whenever you build a house, you can build it on stilts to make sure that it will be above the flood. Also, we need to be limiting construction in the flood zones and potentially in the areas which, you know, forecasts would say would be flooded frequently, we might have to relocate people. So, you know, coastal areas where, you know, the beach gets washed out with the storms all the time, posing a risk to the houses that are on the beach front, those houses might be very vulnerable to flood and storms. And so, we might not be able to protect them. It might be necessary to relocate some of the communities.

Michael Klein
Yeah, we have some EconoFact memos on population shifts to places that actually have higher climate risk and part of that has to do with the provision of flood insurance or the lack of

provision of flood insurance. And if flood insurance is more expensive, really reflecting the actual likelihood of a cost, then people might be a little bit more reticent to do that. So, it seems like preventing destruction would be a lot cheaper than cleaning up after a disaster. Is that right?

Galina Hale
Absolutely. So, the World Bank estimates that the economic benefit from putting $1 in adaptation is between $2 and $10, depending on where you are. It's like everything, you know, think about preventing fire in your house. It might cost you some money. It's not going to cost you nearly as much as having your house burned down. So, that applies to everything. Preventing a disaster is always cheaper than cleaning up after the disaster.

Michael Klein
I've heard talk about nature-based solutions. What is that?

Galina Hale
So, nature-based solutions, initially, people mostly talked about that in terms of climate mitigation. So, trees, they do sequester CO2 from the atmosphere. And so, it's a nature-based mitigation solution. You just plant more trees. In fact, that doesn't work as well as we would hope because there are a lot of uncertainties related to how much CO2 a particular tree can sequester depending on the geography and all kinds of biology that I'm not a specialist [in]. What people talk about more these days is nature-based solutions to adaptation. For example, if you live in a tropical area and you want to protect yourself from flooding from the storm, a very effective way of doing it is to have mangrove trees and or coral reefs that can essentially break down the waves and reduce the increase in the water rise as a result of a storm and even a hurricane. You know, outside of the tropical areas, we can have rocky reefs, we can have kelp forests, wetlands, coastal wetlands. All of those are sponging up the excess water when there is a storm surge and protect the structures that are behind. And normally, those nature-based solutions, they're kind of expensive to implement. So if you were trying to restore a coastal wetland, for example, it can cost a lot of money. But then they're relatively cheap to maintain and they can provide longer-term protection. So they can even provide protection to your seawall, right? If you put some kind of nature-based barrier in front of your seawall, then the seawall is not going to be destroyed or breached as frequently. So these are ‘gray-green’ solutions, the gray meaning man-made and green meaning nature-based. And then nature-based solutions also have a lot of co-benefits. You know, if you're restoring, say, a kelp forest off the coast of California, you're providing habitat for fishes, you're providing even some CO2 sequestration by the, you know, water plants, the blue carbon. And there's all kinds of ecosystem services that this can provide. So nature-based solutions are very attractive for climate adaptation.

Michael Klein
So we've been talking about physical adaptation, but what about financial adaptation? One part of that, I guess, would be insurance. And in December, I talked with David Martlett of Appalachian State University, and they had just suffered terrible floods around Boone, North Carolina. And we discussed the market for flood insurance and how imperfect it is. What is the scope for financial adaptation?

Galina Hale
So the traditional insurance channel, unfortunately, is becoming more and more difficult, right? So where I live, I think on my house that we have owned for nine years now, three insurance companies dropped us in those years because they're just exiting California. They don't think premiums can cover the risks of fire and flood that our house is facing. So because of climate change, the frequency of the disasters is increasing. Also, the correlation of those risks, you know, traditionally or historically, you know, flood areas would be limited, fire areas would be limited. Now those are more severe. And so each event is then affecting more and more households, which means for the insurance company is a larger and larger payout. And either they have to raise premiums to cover those costs, or they just choose to leave the markets altogether, especially if they're not allowed to raise the premium because of some regulation. And so that traditional insurance becomes more difficult. We have new instruments in the market. You have catastrophe bonds that have a payout if, say, a wind speed exceeds a certain level, or even parametric insurance. The city of New York purchased an insurance against the hurricane if wind speed exceeds a certain number, the city of New York gets a payout on that insurance. They don't have to wait and prove all the damages before they get insurance payments. But for an average household, it becomes more difficult to protect themselves through insurance companies.

Michael Klein
So what's the relative role of government versus the private sector? It sounds like because catastrophic risk is very hard to insure, there is scope for the government, but it also seems like the costs are so high, we need some private sector involvement as well.

Galina Hale
Absolutely. So I think, in fact, we need more private sector involvement because in the end, financial institutions also have a stake in all of these disasters. For example, you know, if you have a mortgage on your house and if your house is damaged or destroyed, you're not going to be able to pay back the mortgage. So then the bank is going to suffer losses. So they need to recognize those risks and recognize that they actually benefit from investing in adaptation solutions, and insurance companies also benefit from investing in adaptation solutions and we need to spend a lot more money on them than the government can afford. So we need the government to provide incentives for financial institutions to make those investments because

sometimes even if these investments are profitable, our financial system is so highly concentrated that they're making profits already and they don't really have incentives to venture into the new areas of investments such as climate solutions, even if those are profitable because, you know, it creates a lot of organizational challenges for them.

Michael Klein
Is this also what economists call a free rider problem? Basically, everybody is waiting for somebody else to do the solving of the problem?

Galina Hale
I think it's partly a free rider problem. Partly it's the actual complexity of those adaptation solutions because there are many stakeholders that benefit and so you actually need to create financial instruments that allow for all different stakeholders to contribute. So insurance companies will pay some portion, say, of a seawall and the banks will contribute to some and then households should also contribute somewhat, and then the government will contribute for, you know, because there's public infrastructure being protected. And so we need the government to provide insurance and maybe some financial infrastructure for those complex financial instruments to actually get everybody to pitch in.

Michael Klein
So to conclude, Galina, I'd like to ask about the economic consequences of rising world temperatures beyond that of the disasters we've been discussing. What are some of these other costs?

Galina Hale
So I usually think of the climate change risks as falling into two categories. The acute risks, which are disasters, what we were discussing, and chronic risks, and those are like creeping up slowly. So chronic risks come from the rising temperature. And what I think people need to understand is that when the average temperature rises, it also means the extremes are happening more frequently. So cold places and cold times become colder, even though the average temperature rises, and hot places in hot times become hotter. So in the California Central Valley, which gets pretty hot in the summer, now 10 degrees Fahrenheit hotter than pre-industrial level. And so that creates a lot of risks, because if we have more days with a temperature above 100 degrees Fahrenheit, 40 degrees Celsius, in those days, people cannot work outside. And even beyond that, labor productivity tends to go down with a hotter temperature. There are studies that have shown that. And there are more days off that people take, and so in general, so you have less labor going into producing our output. And then also investment that we normally would put in innovation, increasing our capital capacity to produce more output, now some of that investment has to go to climate adaptation, to rebuilding, to some innovation in climate

mitigation measures, which does not contribute to our output. So you should expect the decline in steady-state economic growth rate because of this labor productivity and investment declines.

Michael Klein
And I imagine there are greater health risks, and so people will, you know, suffer greater morbidity and mortality. Which, you know, is terrible on its own, but also has an economic consequence.

Galina Hale
Absolutely. So even the size of the labor force, you know, is going to decline as more people are going to be affected by this changing weather and changing temperature and not be able to work as many days.

Michael Klein
Galina, thank you very much for talking to me today about this vitally important issue and for the insights you bring to this. Our listeners, I'm sure, will really appreciate the fact that you have explained this in such a clear and compelling way.

Galina Hale
I hope so, and you're welcome. It's always a pleasure to talk to you, Michael.

Michael Klein
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