How Will Climate Change Continue to Affect Us?

Our warming planet isn't just a threat to future generations; it's a threat to us right now. If we don't mitigate it, the continued rise in global temperature will have ripple effects throughout ecosystems and communities. In this episode of Crash Course Climate and Energy, we'll look at how climate change has already affected our planet, and what the future might hold.

0:01

Video narrator M Jackson appears on screen; animation of green creature eating mac and cheese; Crash Course Climate + Energy intro clip plays

Many of us have grown up with the knowledge that the threat of climate change is looming. But it's not some far-off danger anymore.

Climate change has already shown up at our doors, busted into our living rooms, and is now on our couch eating our mac 'n' cheese. It's happening; it's been happening; it will keep happening.

No matter how many polite hints we drop — and even if we throw everything we've got at decarbonizing our lifestyles — this unwanted guest isn't going to see itself out right away. It takes time for our changes to kick in, and, real talk: we can't fully undo the damage that has already been done.

But. It's not time to hand over the keys and surrender. There are ways to slow and solve this before it reaches a number of worst-case scenarios. But we will have to deal with the current effects of climate change along the way.

Hi hi! I'm M Jackson, and this is Crash Course Climate and Energy. [THEME MUSIC]

1:04

Clips of woman running in rain, bicyclist in deep puddles, world map pointing out average global temperatures, setting sun, snow covered land

So far, average global temperatures have already risen a full degree Celsius since before the Industrial Revolution, about 260 years ago. One degree. Dramatic pause. Alright, I get it: that might sound a bit melodramatic. All that leadup for just one degree?

Sure, one degree outside doesn't change whether you're wearing sweatpants or shorts to go jogging. But when the entire planet warms by one degree on average, that's a lot of energy added to the system. A lot of change.

Also, this is an average global temperature, which means some places have warmed less than one degree, while others have warmed more. For example, the average temperature in the Pacific Northwest of the United States has risen about 0.7 degrees Celsius.

Meanwhile, in the Arctic, the average temperature has gone up by about three degrees.

Depending on where you live, you might have already noticed some changes. The weird, warm days in winter, or the heat waves that won't quit in the summer. But local warming can have effects way beyond you wearing shorts on your ski trip to Alberta.

2:09

Photos of Bhuj and New Delhi India, failed crops; live clips of the Dixie Fire; clips of global high tide floodings

For example, in Spring 2022, India and Pakistan experienced a record-breaking heatwave, with temperatures in India consistently three to eight degrees Celsius above average. Add in a lack of rainfall, and this led to failed crops and at least 90 fatalities.

And scientists believe an event like this was 30 times more likely as a result of climate change.

Similarly, the 2021 Dixie Fire in California was among the largest and most destructive in the state's history. It swept through more than 3,800 square kilometers of land and damaged or destroyed more than 1,400 buildings.

The fire itself was started by a power line, which isn't climate change's fault. But before that came two years of below-average rainfall and drought, which were exacerbated by climate change.

Meanwhile, places that aren't being baked, are being flooded. As glaciers and ice sheets melt, the average global sea level has already risen by around 20 centimeters in the last 150 years. 20 centimeters doesn't sound super dangerous on its own — kiddie pools are deeper than that.

But this has already been enough to drown a number of low-lying Solomon Islands in the South Pacific. And in the U.S., high-tide flooding is happening up to eleven times more often around the Gulf Coast than it was in 2000.

3:30

Clips of weather radar maps for hurricane Ida; graph showing steady increase in extreme weather events globally

The United Nations Refugee Agency estimates that on average, more than 20 million people are displaced every year by sudden, extreme weather events like flooding, fire, and storms.

Now, when extreme storms happen, it's hard to point a finger and say, "That single weather event was for sure caused by climate change."

Instead, what we can say is, "Hey, that storm — the one we all just hid under our desks from — that storm was accelerated, made worse, by climate change."

What's happening is this: all that extra heat that's become trapped in the atmosphere has increased the frequency and intensity of extreme weather events. Basically, climate change has taken your local weather and fueled it up, making whatever weather you're experiencing, bigger.

Bigger droughts, bigger rain events, bigger cold snaps, bigger everything. All this is from the average global temperature going up just one degree Celsius.

Unfortunately, climate and weather scientists have been predicting how conditions are going to keep changing in the coming years and decades, and they've found that one extra degree probably won't be our stopping point.

4:42

Animation of a climate model for the globe with three dimensional grids showing activity among different regions;

One of the most powerful tools scientists have for making predictions like this are climate models. Basically, they take an area of interest — like, a country, or the entire globe — and split it into thousands of three-dimensional grid cells that represent the land, ocean, and atmosphere.

Then, they apply equations based on the laws of physics to those cells to represent how energy and matter — like heat and water — transfer between them.

So, if you have an extra hot cell near the equator, the math will describe how that heat will dissipate into the surrounding cells up into the higher latitudes.

Then, researchers run millions of calculations, and in the end, the models show how these cells — or different regions — will change and interact over time.

To check how accurate these models are, scientists do something known as hind-casting, where they run simulations into the past, and compare the results against historical measurements.

If predictions for the past are found accurate, it's likely future predictions will be too. After being tested and refined over and over again, these climate models don't have the most cheerful news for us.

5:51

Clips showing the various detrimental effects on the world, ecosystems, and weather by emitting greenhouse gases

Various models forecast that if we keep emitting greenhouse gases at the rate we've been going, the average global temperature will increase by two degrees Celsius over pre-industrial levels by 2100. And because of the way heat is moved around by wind and waves, some places will end up even hotter.

In the Persian Gulf, where it can already reach 40 degrees Celsius in the summer, scientists predict that temperatures will get even higher, becoming flat-out intolerable to the tens of millions of people who live there. People literally wouldn't survive outside in the heat.

The models also forecast melting tundra ecosystems, sea level rise, disrupted ocean and atmospheric circulation, and more frequent and intense weather disasters.

And because of the tricky interconnection of weather across the globe, we can also expect extreme cold weather events to become more common — more blizzards, more cold snaps, more ice storms. And as time goes on, each of these changes will have ripple effects.

6:56

Underwater clips of coral reefs and marine biodiversity; clips of an ocean in Kenya, ocean in Seychelles

If the planet warms by two degrees Celsius by 2100, average sea surface temperatures are expected to rise by a similar amount.

For as nice as warm water feels when you're swimming at the beach, warmer oceans make it tough for some organisms to survive. And while some animals can just try to swim somewhere else, tropical coral reefs can't move to escape the heat. So, they're predicted to die in huge numbers.

Scientists think that more than 99% of them could be gone by the end of the century. This also means the fish and other animals that call reefs home will die, and we would have massive –but preventable– loss in biodiversity on our hands.

Which isn't trouble just for the oceans. It's also trouble for the many low-income, coastal communities in places like Kenya and the Seychelles that rely on coral habitats for food and income.

So, if they disappear, these communities will be at risk of becoming more impoverished. Where will they get their food? And this is just one example of the ripple effects caused by a warming climate.

8:00

Animation of domino toppling; clips of barren crops, flooded town, aerial view of Mumbai India

You push over one domino, and the impacts are felt way down the line. Unfortunately, it doesn't take a big leap of imagination to see how economic and humanitarian impacts can add up, and how they'll change millions of lives around the world.

Experts estimate that the global GDP — that's the total value of the goods and services made by everyone on Earth — will actually be lower in 2050 than it is today, even though the population is growing and becoming more developed.

It's thought that global productivity will drop by more than 10%, thanks to everything from lower crop yields to the loss of infrastructure due to rising sea levels. And once that domino falls, so do the standards of living for many people, often worsening pre-existing inequities.

It's expected that in South Asia alone — which is an area particularly vulnerable to climate change — up to 800 million people will experience a significant drop in their standard of living, as higher temperatures affect everything from agriculture to how diseases spread.

9:08

Animations of a grieving family standing in knee-high water, then at an airport with belongings

These effects could leave some people unable to afford nutritious food, and others with serious illnesses like malaria, in areas that didn't used to be susceptible to such diseases.

Similarly, if we keep heading toward a two-degree-warmer world, by 2100, sea levels are expected to rise by as much as one meter.

And because of this, it's expected that around 630 million people worldwide will have to decide whether or not to leave their house, community, state, or even country as their homes are drowned or otherwise affected by high tide flooding.

This will be a decision that people will have to make on an individual, and family, basis — a choice between fleeing toward an uncertain future elsewhere… or trying to stay and weather the storm.

Like we've mentioned before, these effects won't be felt equally everywhere, either: Lower-income communities and parts of the world are expected to be the most affected by a warming planet.

Underscoring the inequity, these areas are often the least responsible for carbon emissions. And their systems are the least equipped to deal with the heat, sea level rise, or extreme weather events — a.k.a. everything those emissions bring with them.

10:23

Clips of glacier calving, rough waters; diagram illustrating a positive feedback loop for methane; graphic of a permafrost

And it gets messier still. You see, the Earth and individual climate systems are connected, so changes to one affect and exacerbate the other, and vice versa. This causes what's known as a feedback loop.

For example, as global temperatures increase, they're melting ice and permafrost in the Arctic. And as the ice disappears, it's releasing huge amounts of the greenhouse gas methane that's been underground for millennia.

If all that methane gets out, it'll mean even faster warming, catastrophic ice melt, and even more methane escaping. Basically, if the methane gets out, more methane gets out. A feedback loop.

Scientists estimate there's twice as much carbon currently locked away in permafrost as there already is in the atmosphere. So, the more we release, the faster we zoom toward two degrees and beyond.

Now, all of this is… well, it's a tough pill to swallow. But it's not too late to put some brakes on this climate train. Some of these effects will be unavoidable, but it doesn't have to be full-steam ahead to that two-degree-warmer world.

Climate scientists have evidence that if we pull the emergency brake and take major steps to reduce emissions, we could limit warming to just 1.5 degrees Celsius. And that half a degree matters a lot.

11:47

Quick clips of a sea surface, coral reef, water flowing from spout, wind farms, classroom, outdoor market, low-carbon innovations

It could help us avoid many of the worst effects of climate change. Seas wouldn't warm as much, saving some coral reefs and the communities that rely on them. Dry areas would have fewer issues with water scarcity, and heat waves would be shorter and less deadly.

And the push for carbon-neutral solutions will help in many other ways. Like with climate change itself, cleaning up our act also has ripple effects.

In countries without reliable access to electricity, the introduction of equitable, renewable energy like solar and wind power would help improve healthcare, education, and job opportunities.

And low-carbon sources of electricity for power and transport also tend to emit fewer pollutants, so would help improve air quality in growing urban areas, too.

12:36

M Jackson appears on screen and shakes a magic 8 ball; video credits displayed

It's the most beautiful, satisfying chain of falling dominos ever. And who knows what solutions future generations will bring?

So, there's strong evidence that the planet will continue to warm. But if you shake your Magic 8 ball and ask it exactly what the future holds, it's probably gonna say something like, "It's up to us."

And we all have a role to play. That's pretty wise stuff from a Magic 8 ball.

Reducing greenhouse gas emissions now will help reduce some of the worst impacts in the future — which is literally life-saving work, for you, for me, for future us. And climate action isn't all or nothing, either.

It's going to be a big task to reach carbon-neutrality by 2050. But even if we don't make it all the way, we can still keep working to limit how much the temperature rises.

Every half a degree matters and every little bit we can do will improve things for future generations — and for all of us, here, now.

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