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How well do climate laws help reduce global warming?

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Abstract

The world's response to climate change has been weak, but more than nothing. There are hundreds of climate change laws in countries around the world – but how good are they at tackling the problem? We wanted to find out how well these laws are working. We used a database with information about climate laws in 133 countries across the globe.

We found that each new law reduces yearly carbon dioxide emissions by an average of 0.8% in the first 3 years, and 1.8% in the longer term. Some types of laws are better than others at reducing emissions. How well a country can implement a new law is also important! Some are much better at implementing laws, which means they are more likely to reduce emissions. We need to work together to create stronger laws to solve this global problem.

Introduction

Climate change has been in the news a lot lately. *Politicians* often talk about the laws that they're making to reduce *greenhouse gas* emissions and prevent *global warming.* But are they helping?

You might have heard of the *Paris Agreement*, which aims to avoid dangerous climate change by limiting global warming to under 2°C (ideally under 1.5°C!). Over 190 countries have signed it, yet we're still not on track to meet this goal. In fact, we aren't even close. Some scientists predict that global greenhouse gas emissions over the next 30 years will be too high, and that we are heading for 3°C instead of under 2°C.

But countries are taking some action – every country in the world has at least one climate change law, and there are over 1,800 laws worldwide! We wanted to find out what these laws have achieved. They must have had some impact, right? Global emissions would surely have been higher without them, but by how much?

More than 190 countries have adopted the Paris Agreement to take global action on climate change.

Photo: Yann Caradec

We think that once a new law comes into force, it starts to affect national emissions. Some laws may kick in immediately, whilst others may take longer. We wanted to find out exactly how much these laws help to limit global warming, and how long it takes.

Methods

We looked at all the national climate laws which were put into place in 133 countries between 1999 and 2016 (Fig. 1). We used a database called Climate Change Laws of the World. (You can check it out yourself at climate-laws.org/) This database includes:

- Lots of different types of laws – including *parliamentary acts* and *executive orders.*
- Laws that directly target climate change, and others that indirectly have an impact on climate change.
- The laws of every country in the world over the past 30 years or longer.

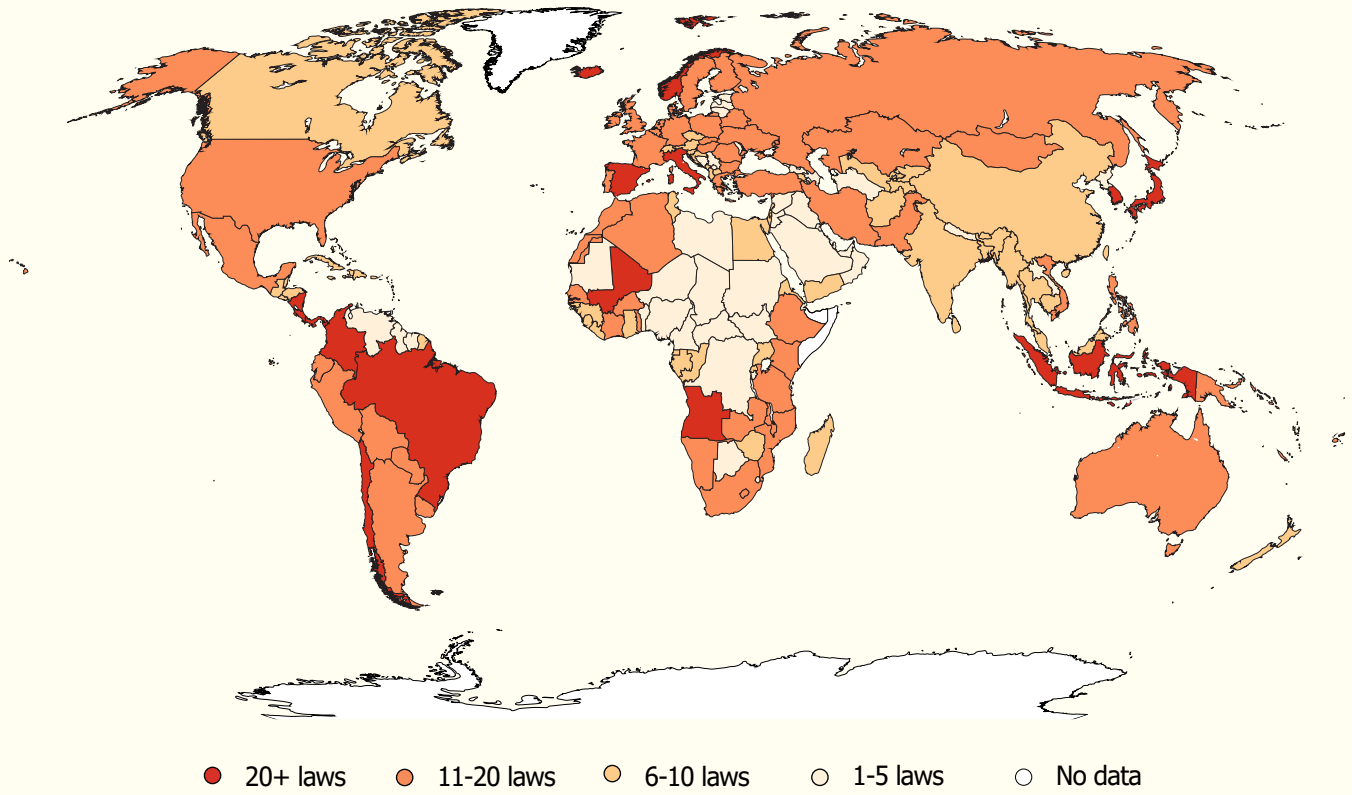
We used *statistical modeling* to investigate the link between new climate laws and greenhouse gas emissions.

When we did this research, there were over 1800 global laws. Some were not about greenhouse gas emissions but climate risks like heat waves and floods, and others were in countries we didn't cover. We therefore included 1,092 climate change reduction laws in our analysis.

We explored three questions:

1. What were the impacts of new climate laws on greenhouse gas emissions in the short term (within 3 years), and the long-term (over 3 years)?
2. How does a country's ability to *implement* a new climate law affect how much it reduces greenhouse gas emissions?
3. What type of law is more powerful in cutting emissions: parliamentary acts or executive orders?

Figure 1: We used the Climate Change Laws of the World database to find out information about climate laws in every country in the world. Here you can see which countries have the most climate laws and which have the least!



Results

We found out that:

- Each new law reduces yearly *carbon dioxide (CO_2)* emissions by 0.8% in that country in the short term, and by 1.8% in the long term.
- Countries with a stronger ability to implement these laws had a bigger fall in emissions in the long term – of 2.4%.
- In 2016 alone, climate laws led to 5.9 *gigatons* less CO_2 being emitted. That's more than the whole of the USA's emissions that year!
- From 1999 to 2016 (18 years), we've only saved 38 gigatons of CO_2 (Fig. 2) – that's only one year's worth of global CO_2 emissions. And the impact of these laws on other greenhouse gases is even lower!
- About 40% of climate laws are parliamentary acts and 60% are executive acts.
- Parliamentary acts are a more powerful way to cut emissions – they're responsible for most of the reductions.

One gigaton is equal to double the combined weight of all the humans in the world!

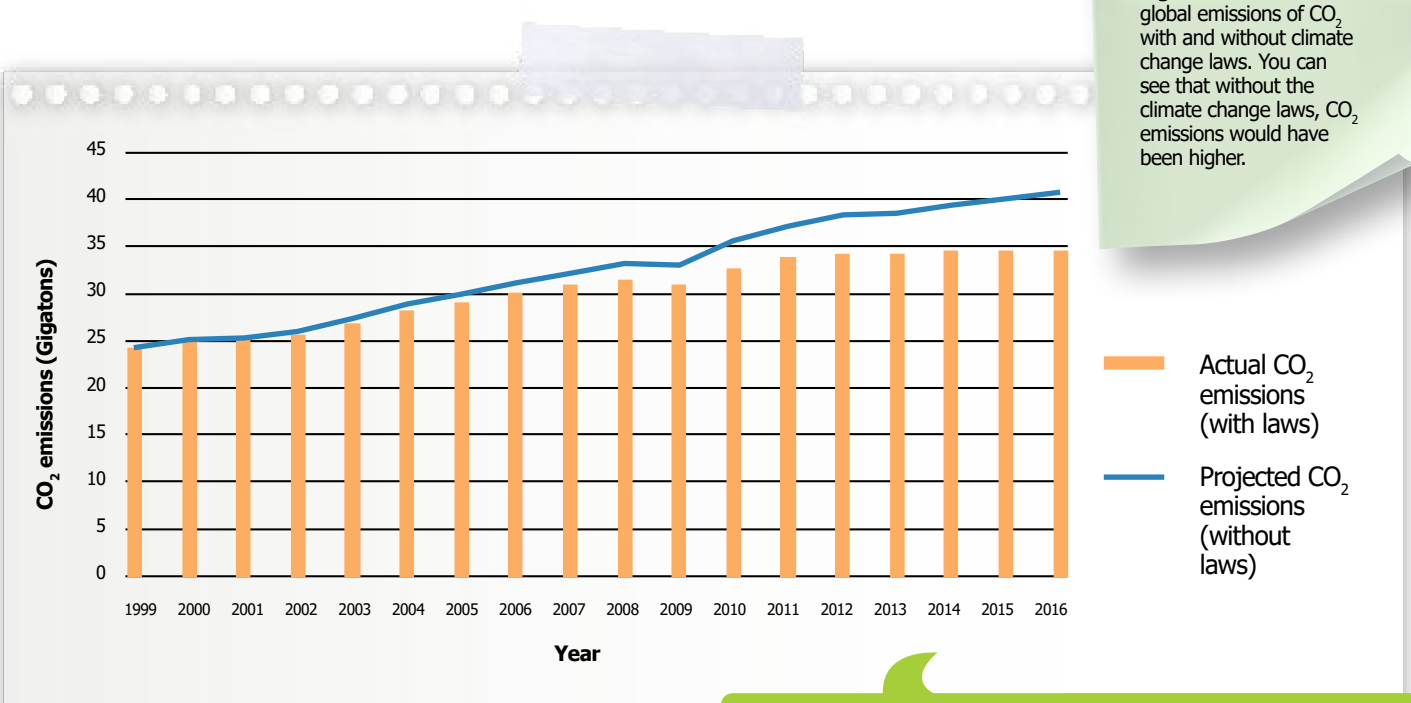


Figure 2: We modeled global emissions of CO_2 with and without climate change laws. You can see that without the climate change laws, CO_2 emissions would have been higher.

In 1999, the actual CO_2 emissions and the projected emissions were much closer than they were in 2016. What do you think they might look like now?

Discussion

Climate scientists have spent years trying to get politicians to agree to new climate laws. Climate change laws don't all come in the same shape and size. We measure the effectiveness of a climate change law by how much it reduces emissions. This depends on how well it is implemented by the country's government.

Some countries are doing well at making climate laws – for example, Brazil has 28, and Spain has 38! Some are very ambitious and tackle a lot of issues, whereas others aren't as good. Brazil's 28 laws have not all been implemented very well and have not helped Brazil to stop deforestation. We have painted a global picture of climate

change laws and their impact on global greenhouse gas emissions. Our findings show that they have made some difference, but we won't meet the goals of the Paris Agreement unless we do more. Across the world, we need stronger, better implemented laws!

Conclusion

The COVID-19 pandemic and lockdowns showed that politicians can make laws that will change people's behavior. When people had to stay at home, greenhouse gas emissions were reduced. However, the pandemic also negatively affected lots of countries' economies. Some politicians would like to help the economy and reduce emissions by spending more money on renewable energy, like wind farms and solar power, and they would like us to drive electric cars. Have you seen any signs of this where you live?

You can also help the environment by cutting down on energy use in your home. You can avoid leaving appliances on standby, switch to LED lightbulbs and and reduce the use of a car, for example.

Glossary of Key Terms

Carbon dioxide (CO_2) – the main greenhouse gas. It is released into the atmosphere when fossil fuels like coal, oil, or natural gas are burned.

Climate change – a change in climate patterns (temperature, rainfall) apparent since the mid 20th century and attributed largely to the increased levels of atmospheric carbon dioxide in the atmosphere. Scientists attribute climate change to man-made causes such as the burning of fossil fuel for energy.

Executive order – a rule or law made by governments (usually the leader of a country) without the approval of a lawmaking body (parliament, Congress).

Gigaton (also spelled gigatonne) – a unit of mass a billion times heavier than a metric ton. This is very heavy – an average African elephant only weighs about 5 metric tons!

Global warming – the term used to describe the increase in the overall average surface temperature of the Earth.

Greenhouse gases – all the gases in the Earth's atmosphere that trap heat, for example carbon dioxide (CO_2) or methane.

Implement – to turn a plan or decision into action.

Paris Agreement – in 2016, most of the countries in the world agreed on targets to help limit the impacts of climate change caused by humans.

Parliamentary act – a law which has been officially accepted by the lawmaking body of that country.

Politician – a person who has been elected by the citizens of a country to be part of the government or a member of parliament.

Statistical modeling – analyzing data to make estimates and answer scientific questions.

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Check your understanding

1. Why are some climate laws more effective than others?

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2. What's the difference between a parliamentary act and an executive order?

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3. Why do scientists care so much about greenhouse gas emissions? Can you think of some examples of greenhouse gases, what they do, and why they're important?

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4. What can you do to reduce your greenhouse gas emissions?

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5. Can you give an example of a law that does not directly target climate change but indirectly has an impact?

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