

# Building the Web in a Climate Emergency

Chris Adams, The Green Web Foundation  
[thegreenwebfoundation.org/frontconference](https://thegreenwebfoundation.org/frontconference)

Front Conference 2021 - @mrchrisadams

Hi!

I'm Chris.

Co-director, The Green Web Foundation

Organiser, [ClimateAction.tech](https://climateaction.tech)

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Front Conference 2021 - @mrchrisadams

Hello there, front conference. Thank you for having me here in Zurich.

As the slide suggests, my name is Chris, and I am one of the directors of the green web foundation, an NGO that exists to work towards an entirely fossil free internet by 2030.

I've spent the last 15 years working for a string of wacky environmental data themed startups, and the last three years running an online community, climateAction.tech, which, as the name also suggests, is a community for climateAction amongst techies.

I'll try my best to talk clearly and slowly in the time I have with you, but if you miss anything I see, this deck should also be online at the link you see on the screen now, with a full transcript of what I say today.

# What we'll cover together...

1. We're in a Climate Emergency
2. What we can do as web technologists
3. GOLD - a way to think about greening tech

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In the limited time I have with you, I'm going to try to cover these three topics.

We'll spend a bit of time talking about climate emergencies, how we got here, and how to handle the mental toll being in one can have.

Next we'll talk about some of the levers we have as professionals mobile technologists.

Finally, because I don't always get to speak to an audience this knowledgeable, I want to ask for our help refining a model I am developing for integrating an awareness of climate into our work as people who are paid to build digital services online.

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2. What we can do as web technologists
3. GOLD - a way to think about greening tech

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Are you sitting comfortably? OK, off we go!

# Climate Science 101

Professor Kimberley Nichols  
@KA\_Nicholas

[bit.ly/climate-science-101](https://bit.ly/climate-science-101)

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1. It's warming.
2. It's us.
3. We're sure.
4. It's bad.
5. We can fix it.

OK, this is your first tweetable slide.

I'm not sure if we still take photos of slides at conferences because it's been ages since I've been to an actual conference - but the link you see here is to a thread on twitter from Professor Kimberley Nichols, an actual climate scientist I really respect. At the link you see online explaining this mantra point by point, and I finished her book yesterday which I can highly recommend.

I'm sharing this as a TLDR with you, because previously when I'd give talks about the state of the climate, I'd usually spend a bunch of time trying to explain that climate is a problem, and show a bunch of stats and numbers.

These days, because you only need to turn on the news to see a climate impacts, like the sea on fire, or videos about towns being washed away in climate related floods. These are spectacular, but not so useful for action. So I'll hope you'll be ok with me sharing this mantra instead.

The earth is warming.

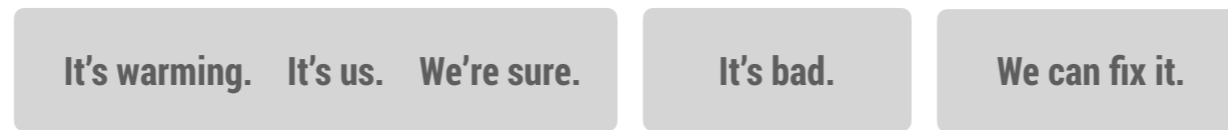
Yes, it's us.

Yes, we're sure.

Yes, it's bad.

BUT we can fix it.

# A model to help you work through it



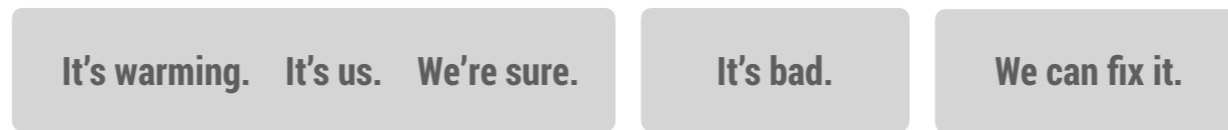
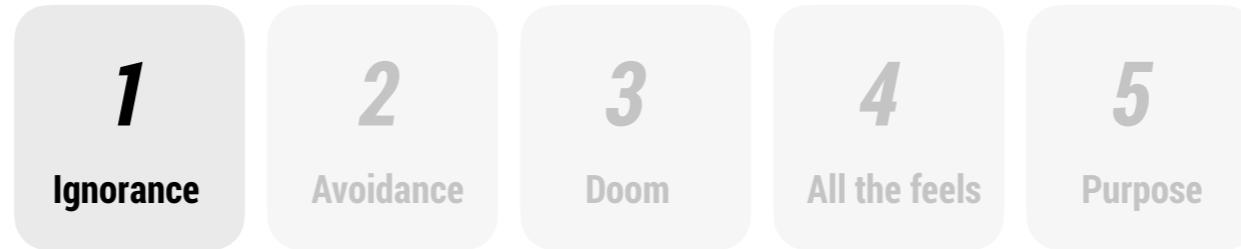
"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

In addition, I've found this model she shared really helpful to make sense of how we internalise news about our changing climate.

Has anyone here heard of the 5 cycles of grief before, when you hear bad news? Y'know... denial, bargaining, anger, depression, acceptance?

This is a little bit like that. Engaging with the subject of our changing climate can be emotionally exhausting. And knowing there's a process people work through, and stages you might recognise you're in, or see others in is useful.

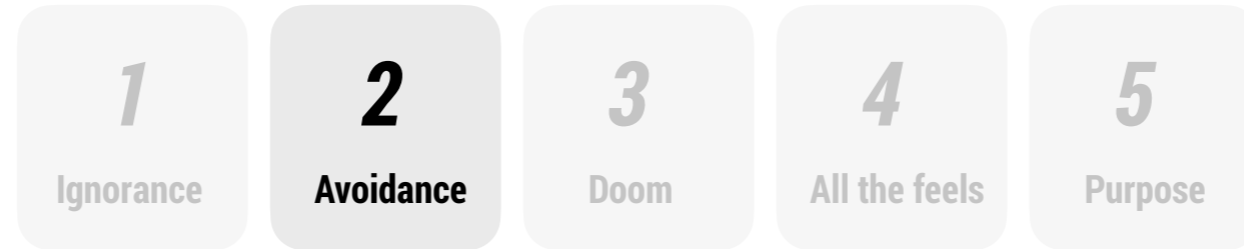
# A model to help you work through it



"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

We might start with **ignorance** around the subject. There are various valid reasons this might be the case - not least because historically, climate has been a subject that's been really poorly covered in the media.

# A model to help you work through it



It's warming. It's us. We're sure.

It's bad.

We can fix it.

"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

Next, when we have learned more about the changes, because it's so uncomfortable and distressing, a lot of us might resort to **avoidance**. We might avoid talking about it with others, especially at work or family gatherings.



# A model to help you work through it



It's warming. It's us. We're sure.

It's bad.

We can fix it.

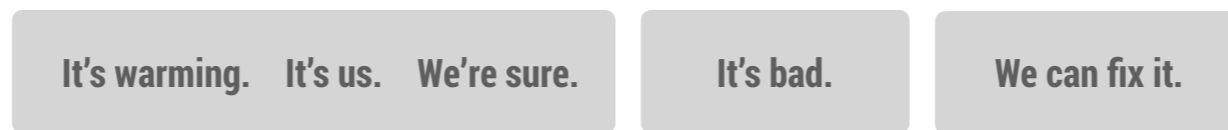
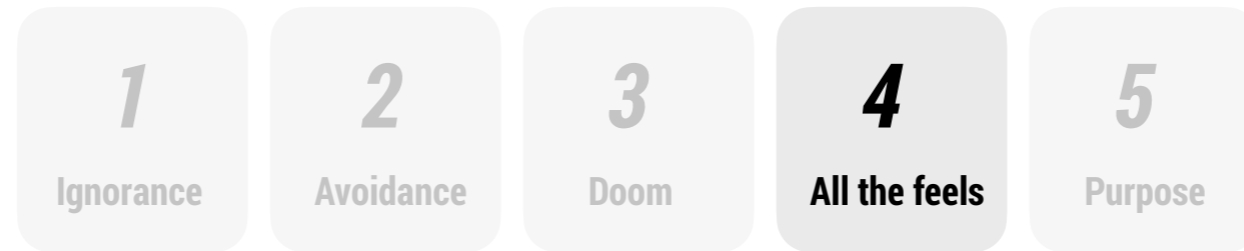
"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

Next, when we do learn more, it's easy to slip into a pretty depressed state, **doom** -

"oh jeez, we're done for. Why even try to change anything any more? Let's make the most of the time we DO have, and keep on my existing path".

While I can see how we get into this state, it's important to understand that is a form of denial and retreat, and it's important to understand that only certain groups, who are often white, and in the global north, who are not as exposed to worst of the climate crisis, who get to be all OK DOOMER about climate.

# A model to help you work through it

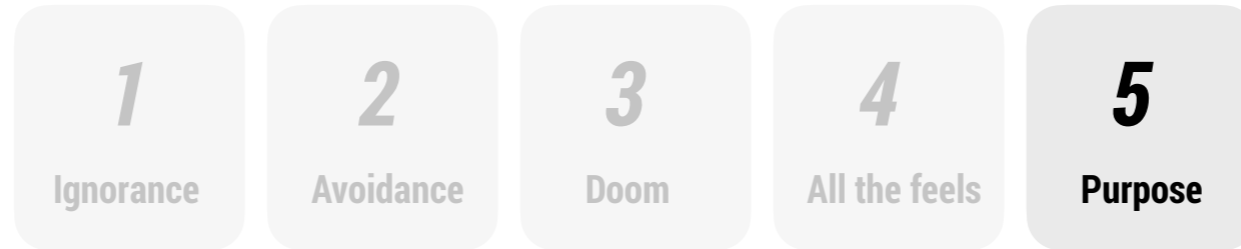


"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

With help and support from others, you might get through to the next stage - **all the feels**. Does what I am learning about climate mean I am bad person? How do I talk to children about this? What kind of changes would we need to face the scale of the challenges before me? There's so much to question! How am I supposed to retain my humanity in the face of this? What kind of society do I dare hope for now? This is a pretty overwhelming stage, and we're not really taught how to navigate this kind of uncertainty.

It's important to realise as you go through this whole process that you don't realise that you don't need to be perfect to act, but you do need to be brave.

# A model to help you work through it



It's warming. It's us. We're sure.

It's bad.

We can fix it.

"Radical Climate Acceptance" by Professor Kimberley Nicholas - @KA\_Nicholas

After a while, you end up at purpose in the end. You learn to harness the emotions you have, and you see the need for action, so you've decided to sound the alarm, and do something - you don't need to have a precise plan

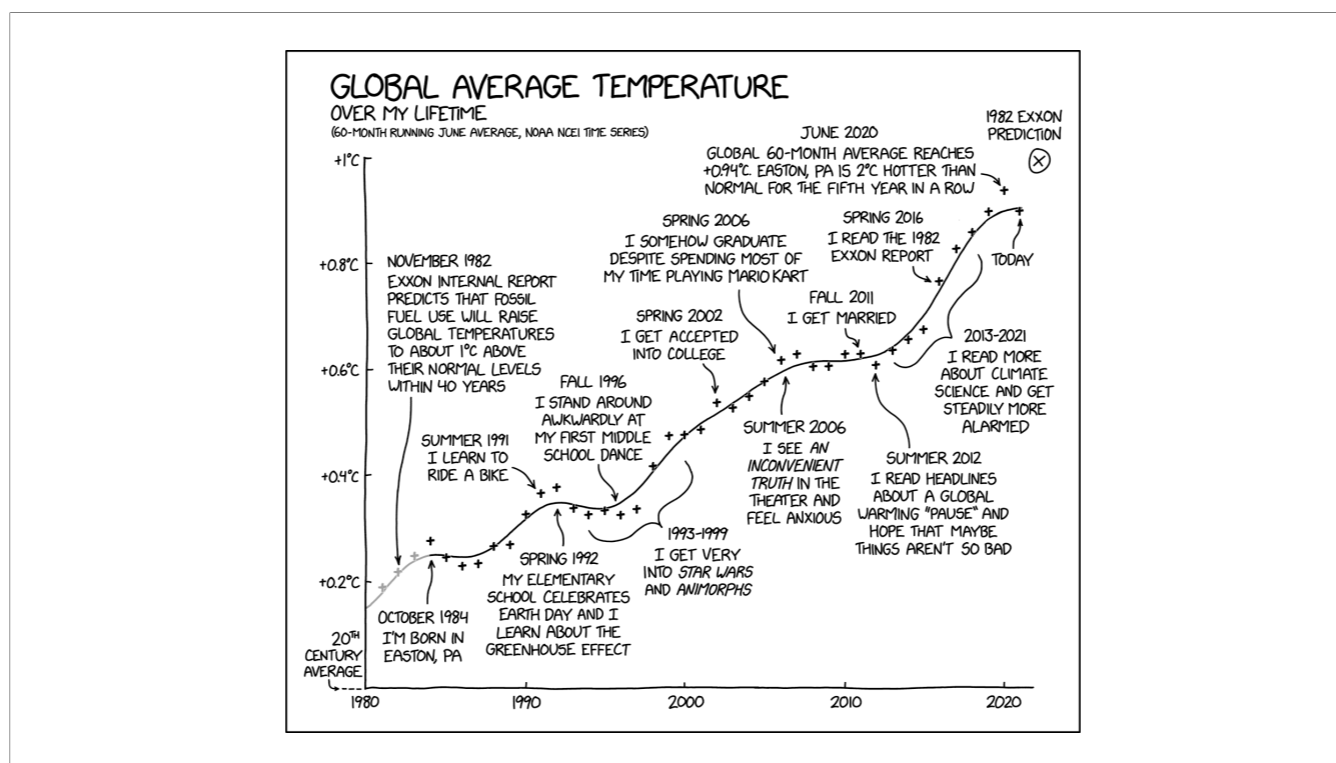
**We are in a climate emergency.**  
1940 jurisdictions, and local  
governments, covering 826 million  
people have declared climate  
emergencies so far.

When you get here, you'll find you're in good company. Hundreds of governments, cities and companies are sounding the alarm, and declaring climate emergencies, and starting to act. You're not alone.

**We are in a climate emergency.**  
**largely because we keep burning**  
**fossil fuels, instead of finding a**  
**path off them.**

It's important to know that one of the reasons we're in an emergency, that we often forget, is that we're here because we keep burning fossil fuels, instead of finding a way off.

This isn't an accident.



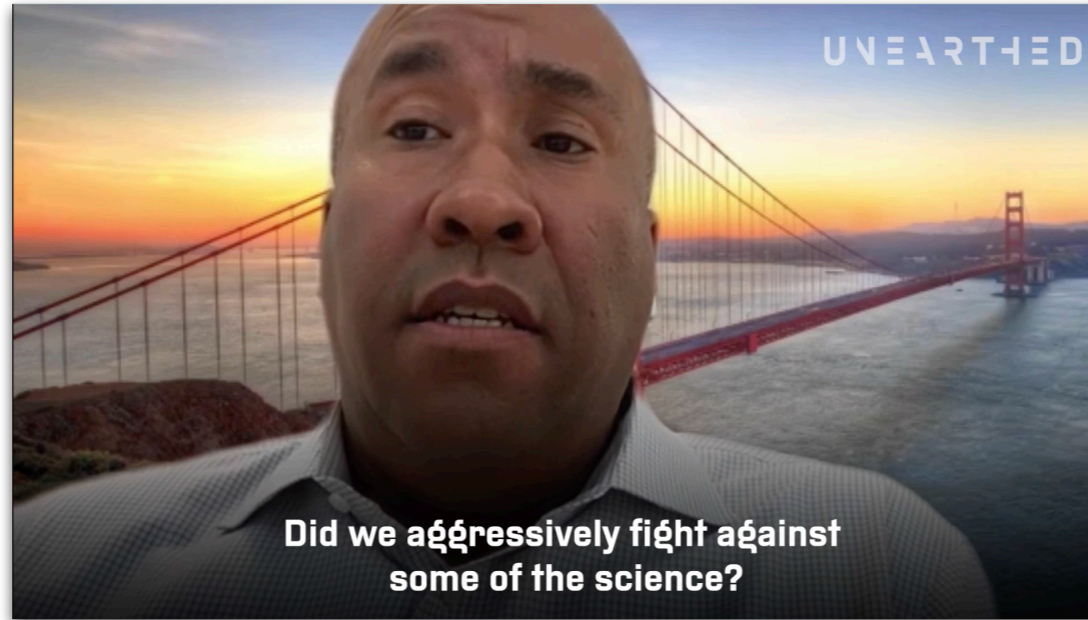
What's a tech conference without an XKCD cartoon these days?

This was released recently, and it's helpful for understanding this "not an accident" point.

Some groups have known about climate change for absolutely ages - longer than many of us have been alive. Check the date to the left of this chart, and then check the prediction one the top right.

Some groups have decided that it's better for business to delay action on climate, and sow doubt and uncertainty over the decades instead.

There were solar panels on the whitehouse in 1979, before they were taken off in the 1980s - roughly when the idea of corporate self interest as a guiding principle for the country took hold.



**Keith McCoy, Senior Director, Federal Relations, Exxonmobil**

This hasn't stopped. Earlier this year, Greenpeace caught out a senior employee at Exxon Mobil, posing as a group looking to hire him as a lobbyist, and they basically ended up with an hour long, speed confession in high definition on a recorded zoom call, where he explained a bunch of the tactics they use, and what impact they've had, and even what they're doing right now, in 2021 to sabotage the political process and slow down action.

OK, quiz time. What do you think the answer is to this rhetorical question here?

Did they aggressively fight against some of the science?

<https://www.youtube.com/watch?v=EvY2EgoveuE>

# Predatory Delay

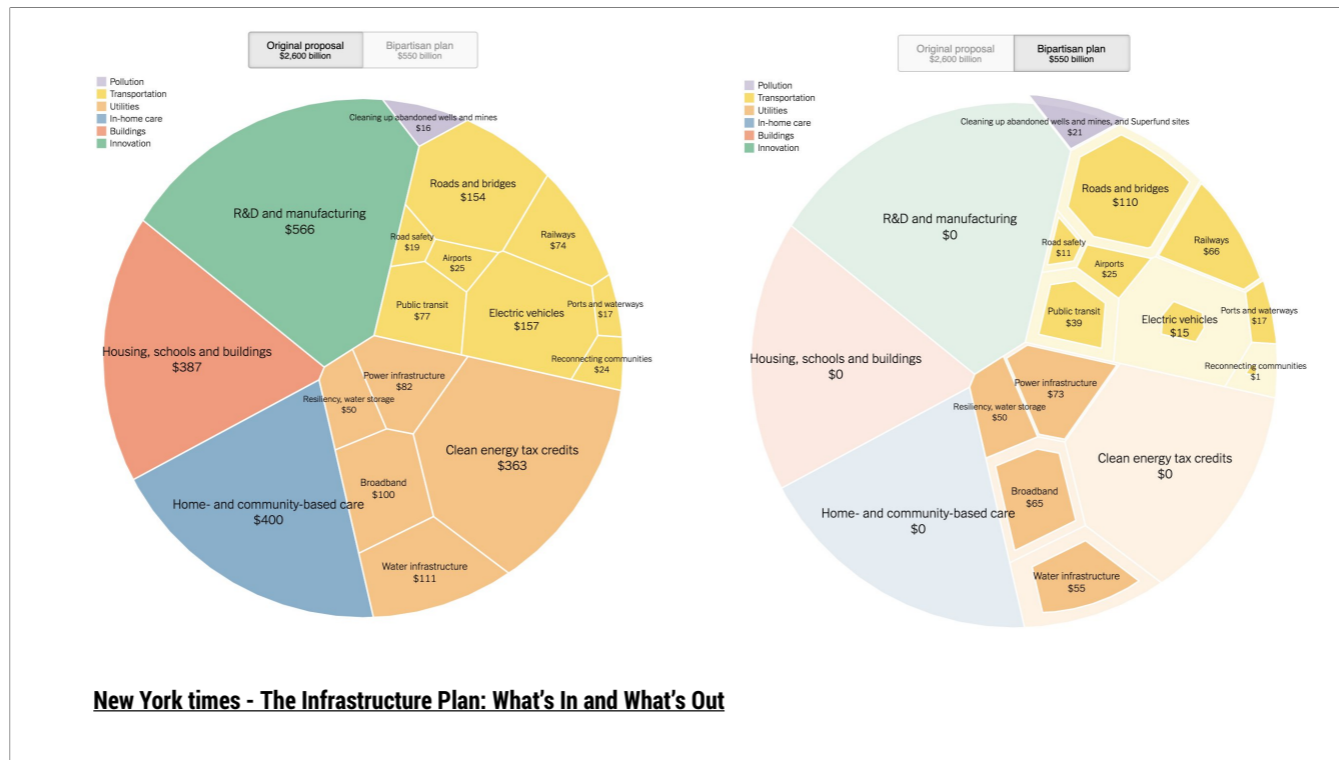
**“the blocking or slowing of needed change, in order to make money off unsustainable, unjust systems in the meantime.”**

Alex Steffen

There's a useful term for this kind of activity - a bit like how dark patterns became a useful term to talk about bad UX practices that work against interests of our users, Predatory Delay is a term to describe this behaviour

Blocking or slowing of needed in change, to make money off unsustainable, in just systems in the meantime.





Predatory delay is what does this to climate Action. Earlier this year, the US government was going to pass a historic infrastructure bill to fund loads investment in areas key for climate action. These would be good for humanity, but bad for fossil fuel companies.

Almost 2.6 trillion dollars of funding for investment, research and development, help to move to clean energy was proposed.

But after loads of aggressive lobbying, well... what you see on the right gives an idea of what predatory delay looks like in the political process.

## **Recap**

**We're in a climate emergency. Things are on fire.**

You're not alone, and many folk are bringing buckets of water to help.

**Predatory delay, and fossil fuels.**

Others are bringing buckets of petrol.

**You *don't* need to be perfect to engage.**

You *do* need to be brave, but there is help out there to get you through the harder parts.

So here's our recap.

We're in a climate emergency, and our house is on fire. You're not alone in caring, and there is a growing movement for climate Action, who are working to put it out.

Sadly, there are others that benefit from you staying disengaged, or stuck in a doom state, and they're working to keep you there so they can still make tonnes of money. To continue our fire metaphor, they're bringing buckets full of petrol instead of water.

You don't need to be perfect to engage, and there's help out there.

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Ok, now we've figured out we need to do something, what can we do?

What can techies do ?

# **What we can do as web technologists**

**Engage as members of society**

**Engage as professionals - embed the values of  
protecting life in our work.**

I think there's two ways I'd suggest, in this order.

First, I think we can engage as members of society - if you're at this conference, you're probably earning above median wages in your country and part of a professionally mobile group.

Secondly, and this is informed by psychology, I think it's worth embedding the principles around climate Action in our work, as we can point to examples of where we have seen this work on the web before.

## **Engage as members of society**

**Show up for the folks putting the work in already.**

So, first of all, remember there's a movement, and there are lots of people putting the work in because they're scared and need your help.



Fridays for future is an example - Fridays for future is a global movement of schoolchildren who every Friday protest for grown ups like us to work act on the climate crisis, because most of them are too young to vote, and they don't have the power get things changed by themselves.

Kids like Greta and the folks you see here turning up each week have done so much to change perception. But they's not all they've been doing.


Germany

# 'Historic' German ruling says climate goals not tough enough

Judges order government to strengthen legislation before end of next year to protect future generations

**Kate Connolly in Berlin**  
Thu 29 Apr 2021 16:44 BST

1,365



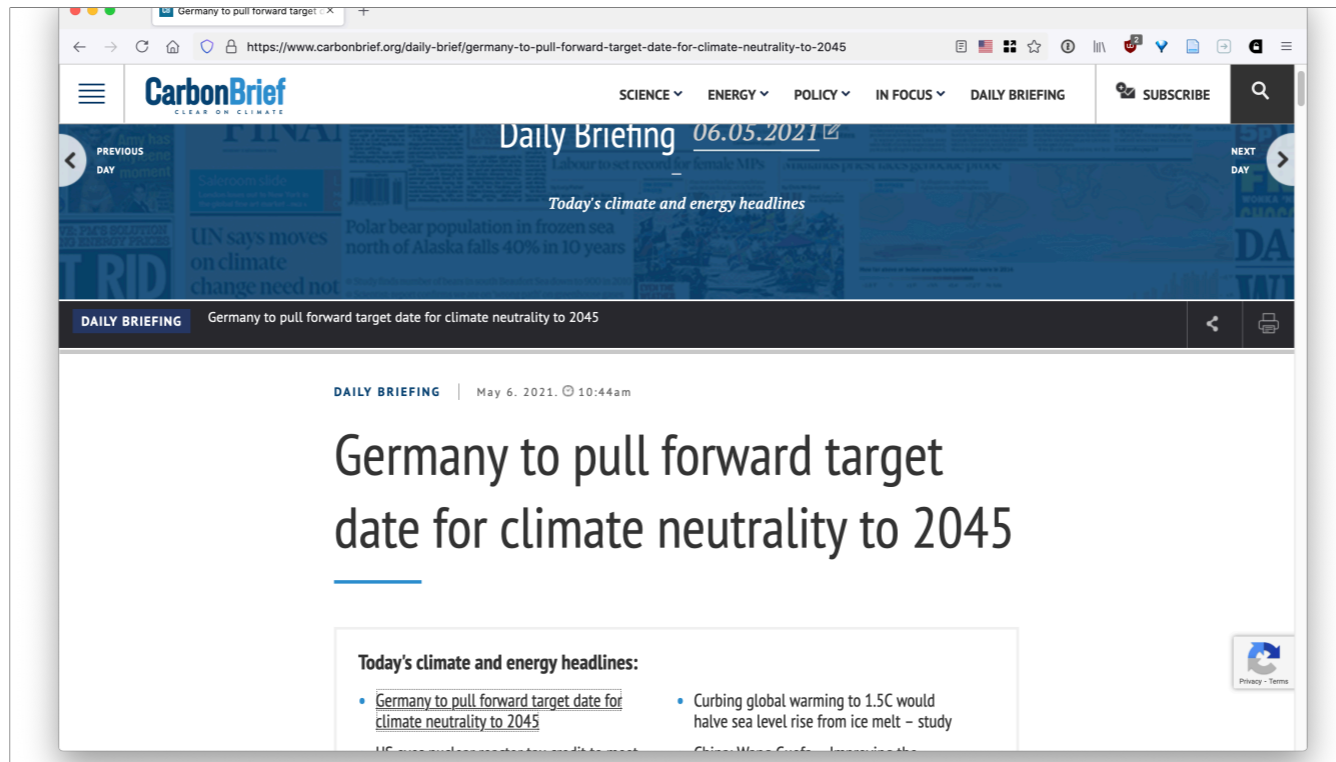
▲ Environmental activist Luisa Neubauer, one of the complainants, said the court's decision was 'a huge win for the climate movement'. Photograph: David Young/AP

Germany's supreme constitutional court has ruled that the government's climate protection measures are insufficient to protect future generations, after a complaint brought by environmentalist groups.

In a groundbreaking ruling, the judges of the Karlsruhe court, Germany's highest, said the government now had until the end of next year to improve its Climate Protection Act, passed in 2019, and to ensure it met 2030

They've been able to change perception enough to start influencing the public discourse, and it's important to understand that they've been using the law to buttress these changes in how we feel about climate, to translate it into action.

This is Lisa Neubauer, the "German equivalent to Greta" - her and a group of children essentially argued that government had a duty to care for children as citizens of the country, inaction was infringing their human rights, and they won a massive court case earlier this year.



This had a huge impact - they got the law changed to compel the government to act with more urgency on climate, 5 years ahead of what they would have done before.





And you don't just see this in Germany. I love this photo - it's Milleu defines - to the dutch equivalent of friends of the earth. This is what it looks like when bunch of normal people win a landmark lawsuit against a multinational oil company.

They used a similar argument, that Shell Oil, through their actions, are violating the rights of future generations of people in the Netherlands to live and have families.

And in May this year, the supreme court in the Netherlands essentially said yes, that's correct. It's unjust for a company to be allowed to do that. They pointed to the science and ordered the company to change their entire corporate strategy. We didn't know we could even do this before!

<https://en.milieudefensie.nl/news/yeah-milieudefensie-wins-revolutionary-lawsuit-shell-forced-to-go-green>

## **Engage as professionals**

**Embed the values of respecting and protecting life  
in our work.**

So one thing is to support these people already who are running up, protesting, and campaigning and working as hard as they are.

The other is to embed the values of respect and protecting life in our work itself, and I say that because we have had some success before here.

## **Lessons we can learn from other movements**

**Inclusive design, and the power of POUR in the accessibility movement.**

There's still a long way to go in the accessibility movement, but I'd argue that the fact that we are even talking about accessibility as much as we do now is a positive sign. We have concepts like inclusive design that we didn't have before, and increasingly, we talk about sites that are inaccessible as sites that are not good sites.

# Perceivable

# Operable

# Understandable

# Robust

I think ideas like POUR have helped.

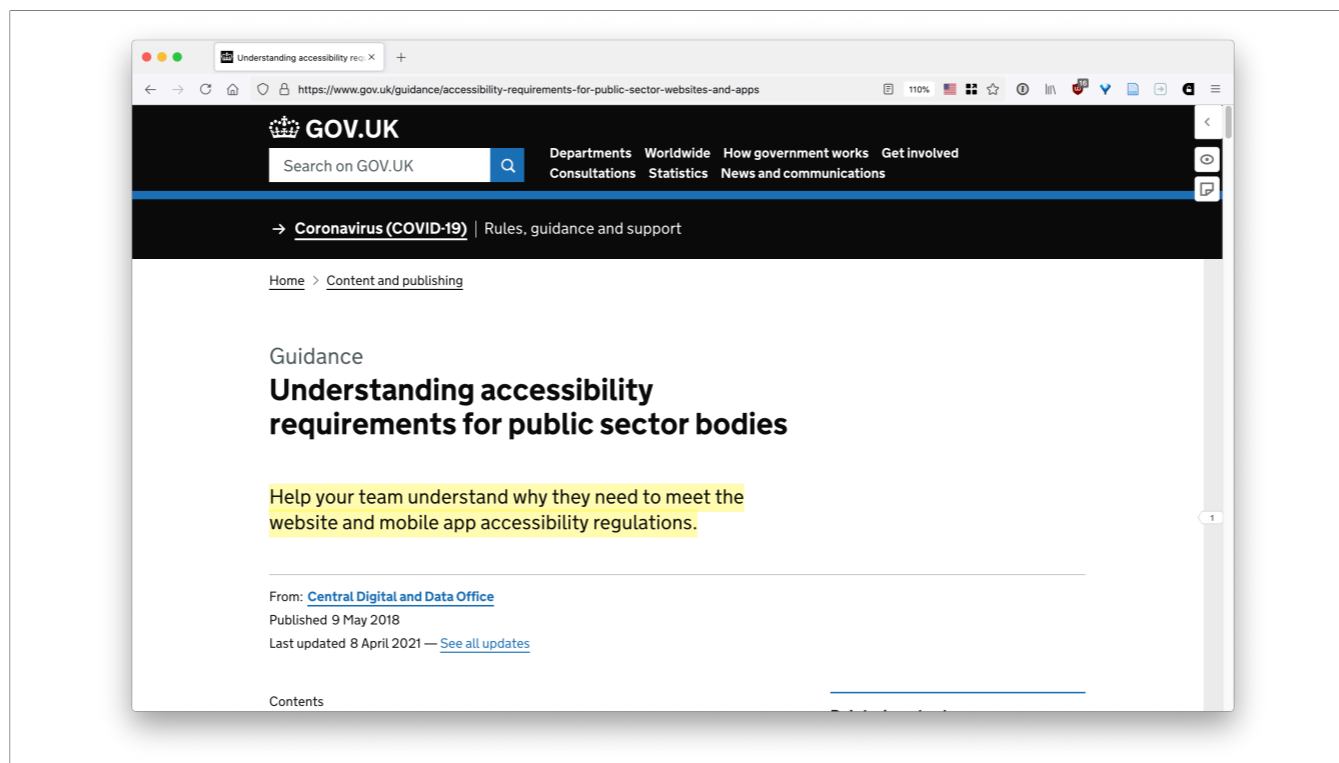
For a site to be accessible it has to be:

**Perceivable:** can I use the site without only being able to perceive the content with my eyes?

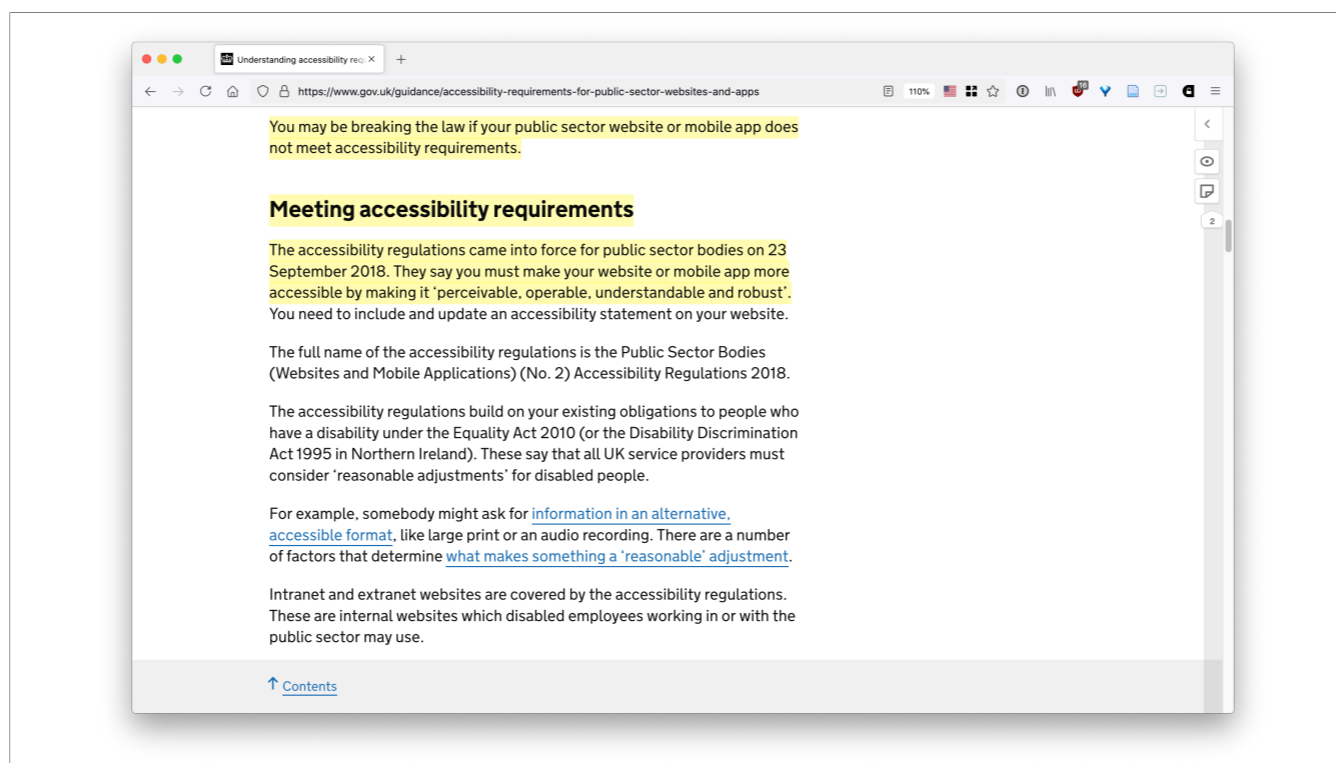
**Operable:** can I use the without only being able to use a mouse or touch screen?

**Understandable:** can I make sense of the language without being an industry insider?

**Robust:** can I still make use of the site in less than ideal conditions?

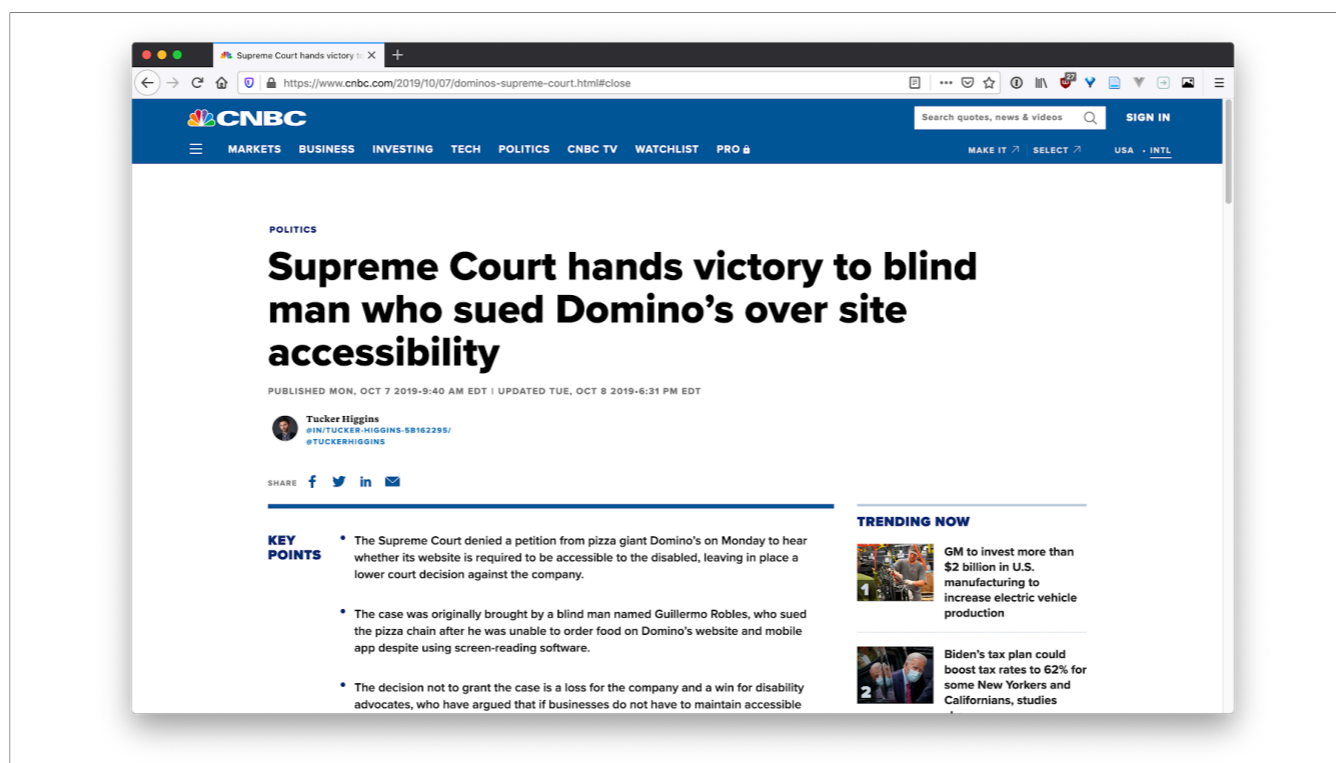


These form the WCAG guidelines, and they allow for people to write laws to make this the minimum standard people need to meet for a site to be considered working.



Having laws like make it easier to argue for this keeping the web open to the greatest number of people, and having shorthand terms to refer to this make it easier to assess and direct teams to keep sites inclusive.

Thesis the guidance from the UK's government digital service - they're explicit about needing this now.



And increasingly, this spills over to the private sector too.

Yes, there is still a long way to go, but there are levers available that were not there before.

Having accessibility guidelines like this made it easier to argue for Amazon to make their kindle accessible when New York public library made accessibility a condition of winning a 30m Us dollar contract.

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Front Conference 2021 - @mrchrisadams

I see ideas like POUR as fundamentally about respecting people, and avoiding harm through thoughtless design decisions, and this is the framing I think can work for embedding similar sensibilities around climate into how we work.

Inspired by POUR and the WCAG, I want to share a model, because I'm hoping someone will come forward and help me work this over the next 12 months. I think we need GOLD.



**Green**  
**Open**  
**Lean**  
**Distributed**

GOLD stands for

Green  
Open  
Lean  
Distributed

Let's look at these in detail

**Green**

**Open**

**Lean**

**Distributed**

**Green energy, and greener  
material inputs**

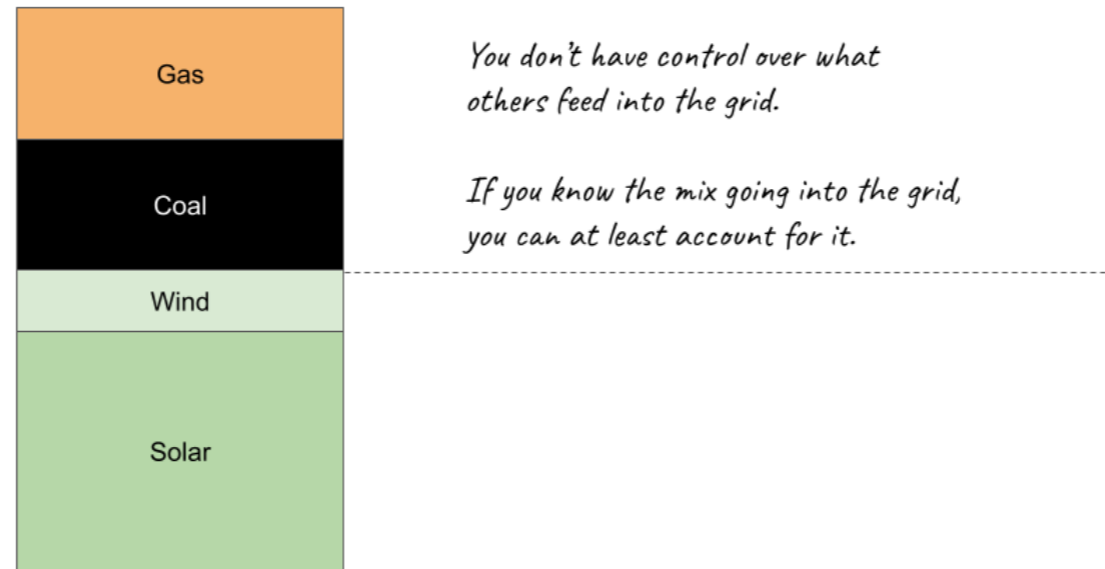
**For running computers**

**For making computers**

Green standards for green energy and inputs.

As we see, we need energy to run computers, but also for making computers

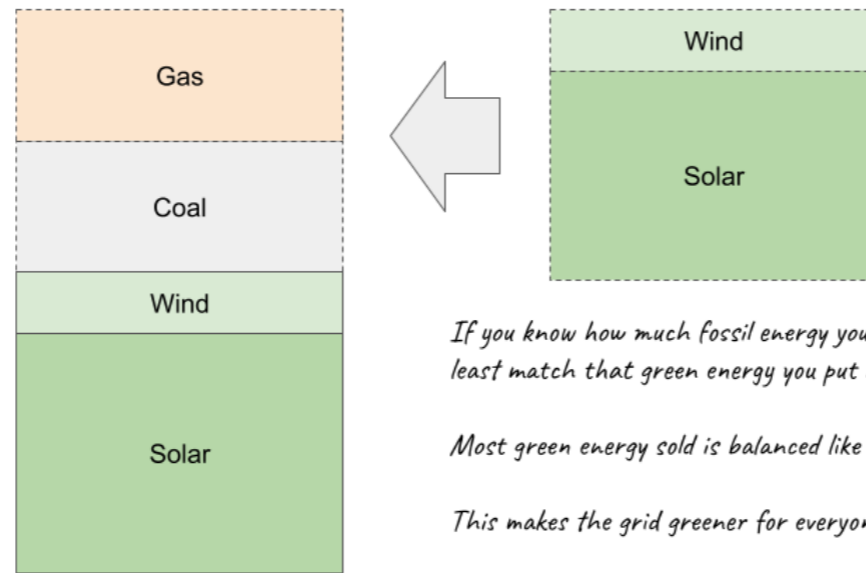
## Fossil energy versus green, non-fossil energy



Every time we use the internet for example, even if we don't mean to, we're burning fossil fuels, because the internet is the biggest machine in the world and it largely runs on coal still.

We need to stop this - we don't need to run the web on fossil fuels, and doing so

## Accounting for fossil fuel energy



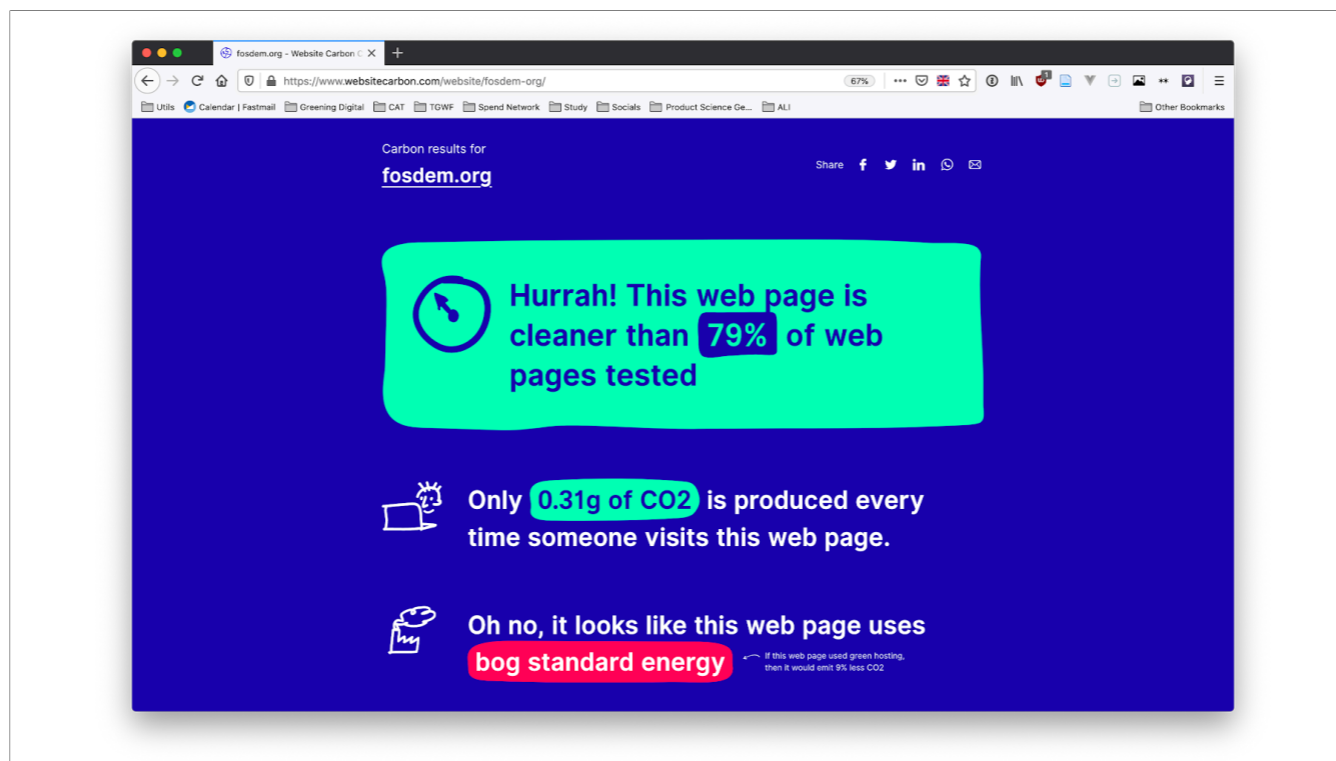
*If you know how much fossil energy you have used, you can at least match that green energy you put into the grid.*

*Most green energy sold is balanced like this a yearly basis.*

*This makes the grid greener for everyone over time.*

When we use websites or digital infrastructure using green energy, it doesn't mean a website is always running on green power 24/7. What it currently means is that at least as much money is going into the grid as was used by the grid.

Over time, this makes the entire energy grid greener for everyone.



My NGO, the green web foundation provided free datasets listing which websites run on green energy, and we also expose it over an API. This is what make it possible for website carbon to see if you're using bog standard energy or green energy when they check your site for example.

**Green**

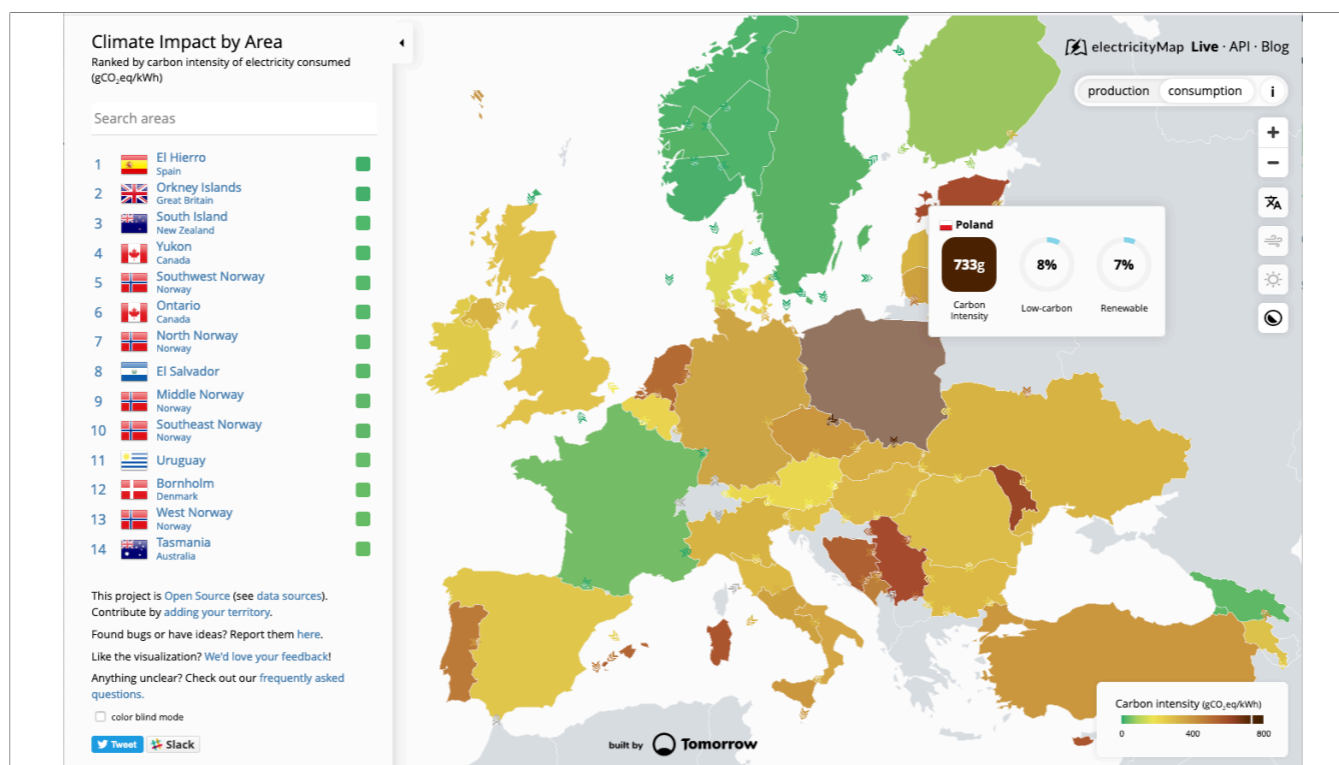
**Open data, open source,  
transparency**

**Open**

**Lean**

**Distributed**

Open here is about an approach, as opposed to being about just open source



If you want to figure out where is the greenest country to run servers, you can look at electricity map, an open source project, to see. They show in realtime how green each grid is and they make this information available over an API. Google use them now to work out when to power up fleets of machines to do complicated computing jobs now.

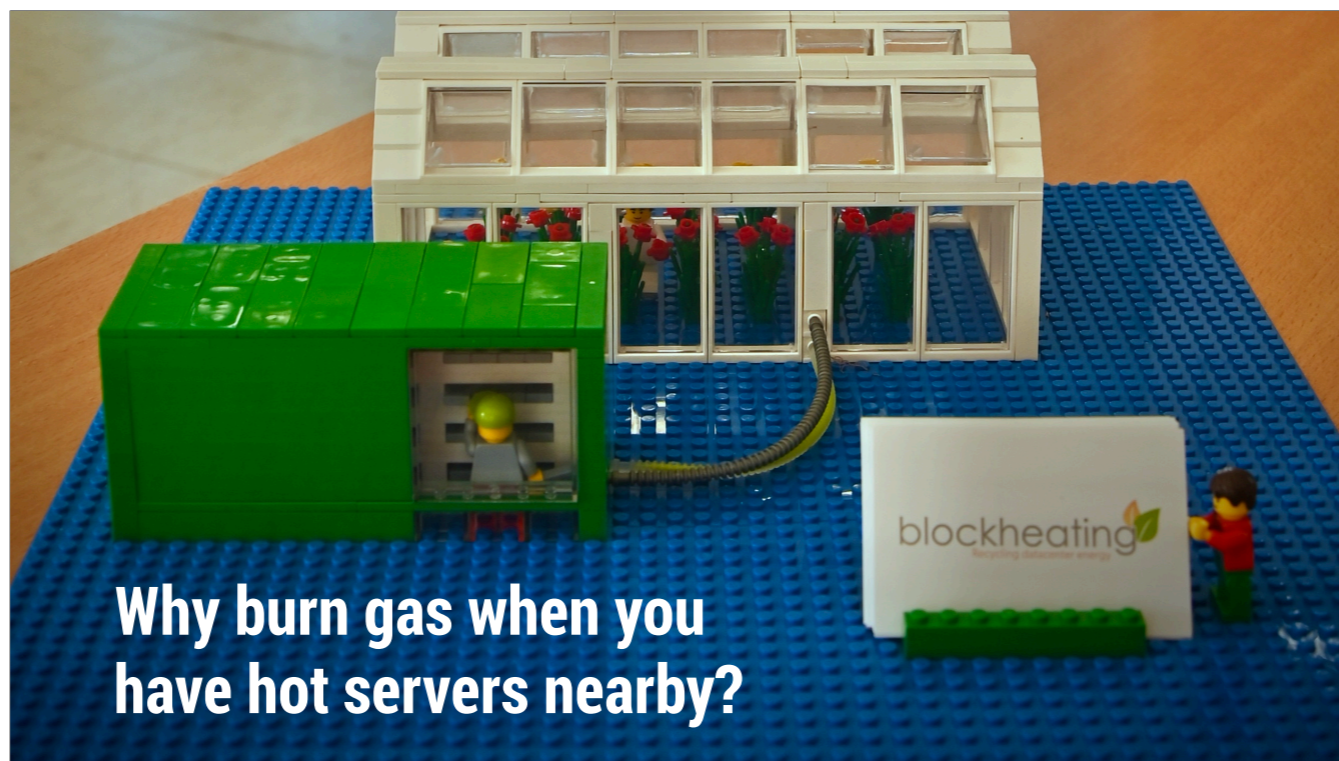


What you're looking at here is the heat exchanging part of a new datacentre in the Netherlands.

The Open compute project is an initiative by a number of big companies like Facebook and Microsoft to build open source server components, for a more efficient industry.

Because they're open, there are some cool ideas by start-ups in this field as well now.





Block heating is one such company. Rather than having massive out of down datacentres where all the heat from computers is wasted, or loads of energy is spent trying to vent it into the sky, they instead use end-of-life, recycled servers from big tech companies, put them in shipping containers, and then connect them to green houses to grow crops like tomatoes and cucumbers.

To get green houses hot enough for tomatoes to grow well, gardeners typically burn fossil fuels to heat them.

This way, using the waste heat from the servers takes a waste product, and turns it into something valuable for someone else, and using recycled servers saves them from landfill.

Green

Optimise for carbon  
emissions

Open

**Lean**

Distributed

Lean is a recognition that **all** energy has a cost in terms for climate pollution, so efficiency is important

**Stats for 2019 compared to 2010:**

**12x as much traffic**

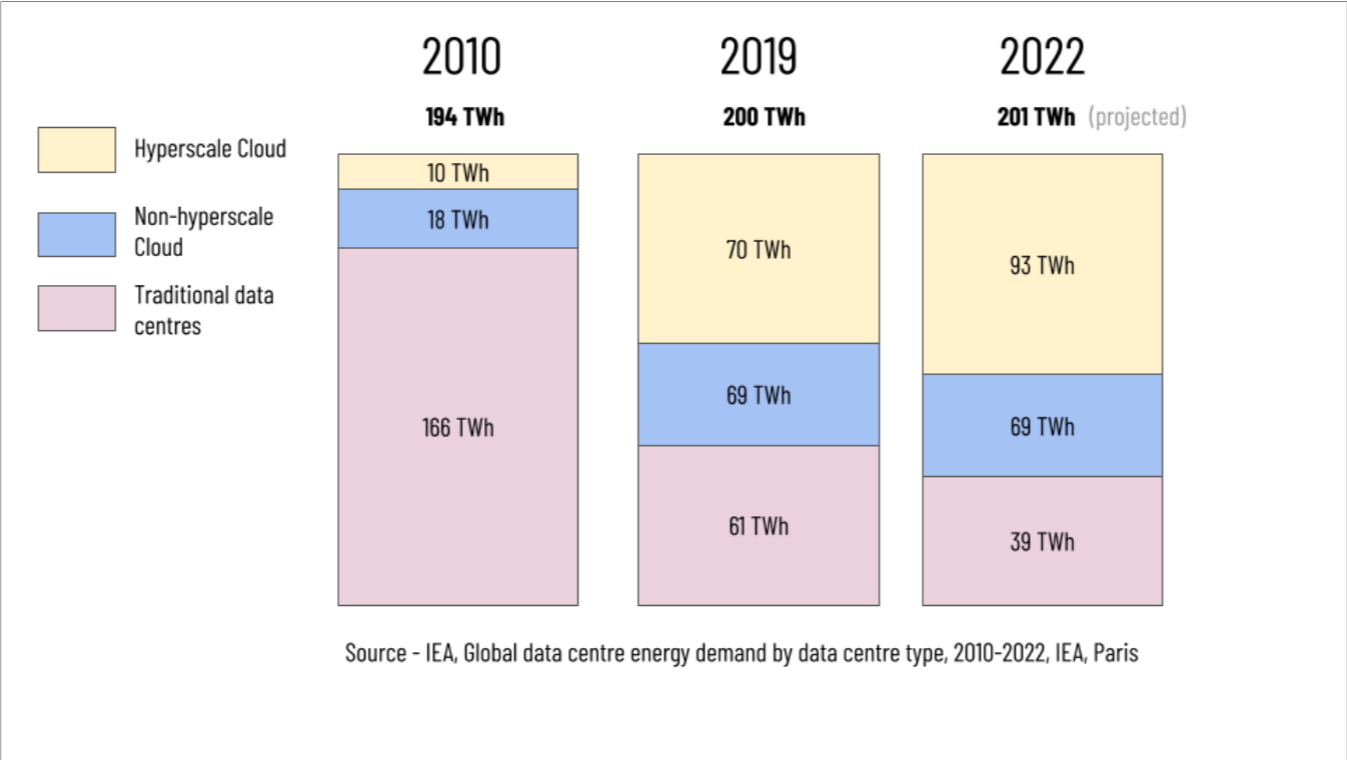
**7.5x the workloads**

**~1x the energy usage**

Global data centre energy demand by data centre type, 2010-2022

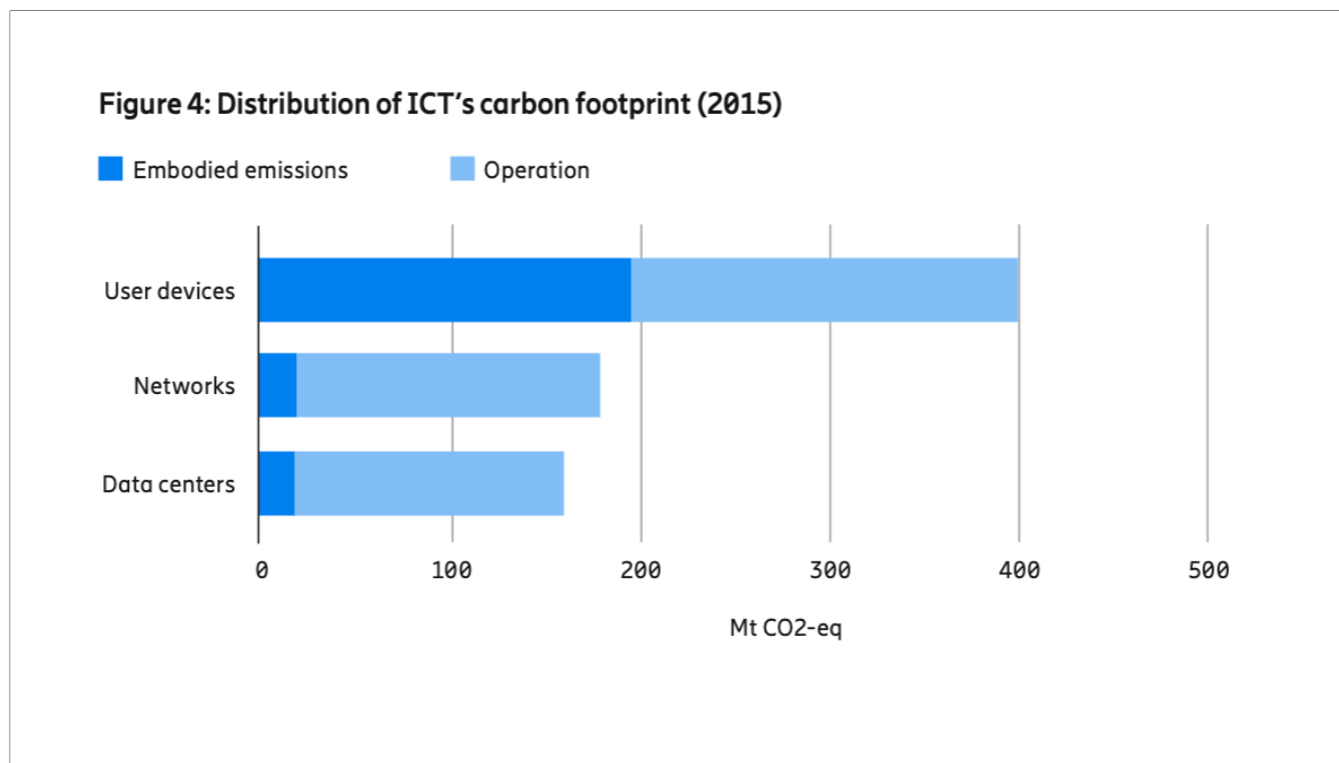
This is somewhere where we've seen some success already. Over the last ten years, energy usage as largely stayed the same, despite an uptick in use of the internet.

<https://www.iea.org/data-and-statistics/charts/global-data-centre-energy-demand-by-data-centre-type-2010-2022>



This is largely because we've been moving away from large number of traditional datacentres, and towards smaller numbers of much more efficient hyper scale style datacentres.

While centralising the web has it's own issues obviously, from a climate point of view, having less climate pollution per unit of compute is largely a win.



However, as we mentioned before it's not just running computers that causes carbon emissions.

Making computers from sand is very energy intensive too, and this chart shows.

Servers might be on 24/7, so we obviously care about running costs there.

But for user devices, we care more about making them live longer as a way to avoid waste.

**Back to  
laptops we  
can open up  
again.**



This is why I'm quite excited about a new wave of laptops which are being designed from the outset of be repairable, like the framework laptop pictured here.

It's basically the fairphone of laptops - with an open design, and emphasis on user repair.

Making a laptop last a couple of years longer can reduce the carbon footprint over its lifetime by around 25%, so this is a positive step.

**Green**

**Open**

**Lean**

**Distributed**

**Move work through time  
and space to avoid carbon  
emissions**

Finally, D stands for distributed.

We can use the internet to move work through time and space to use avoid pollution.

Let's see how.

## Can baking wait?

We recommend baking when more than a third of Britain's electricity is coming from wind, solar and hydro power – right now, between 15:00 - 15:30, it's 17%\*

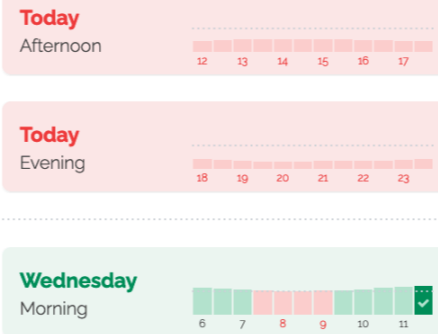
Follow the [forecast on Twitter](#) or ask - [Alexa](#), should I bake?

\* the UK average in 2019 was 33.0%

### The baking forecast

Here's the baking forecast for 29th - 2nd October

[Show only the good times to bake](#)



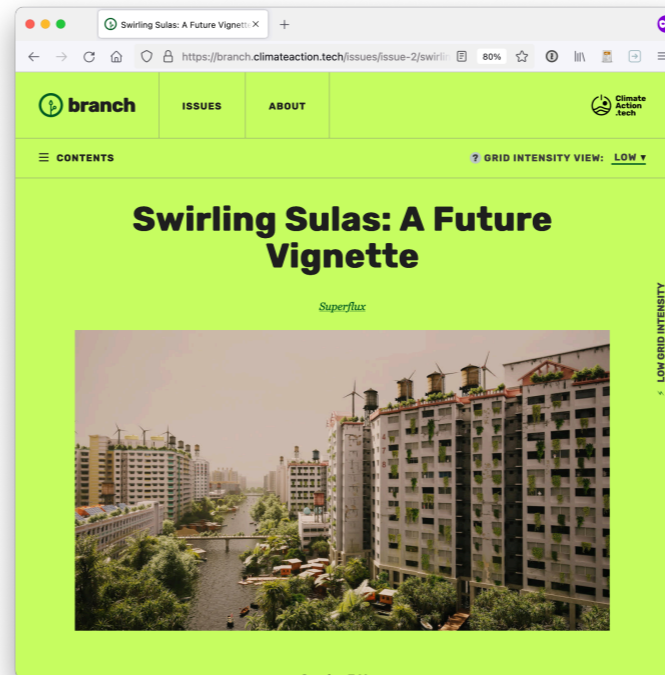
If you're in the UK, you might have heard of the baking forecast.

It's a cool project that looks at how energy on the grid is being generated, and because baking uses loads of electricity tells you when it's a green time to bake, when loads of wind and solar is powering the grid, or when it's not a good time to bake.

You can get a forecast to plan, for the greenest delicious baked goods.



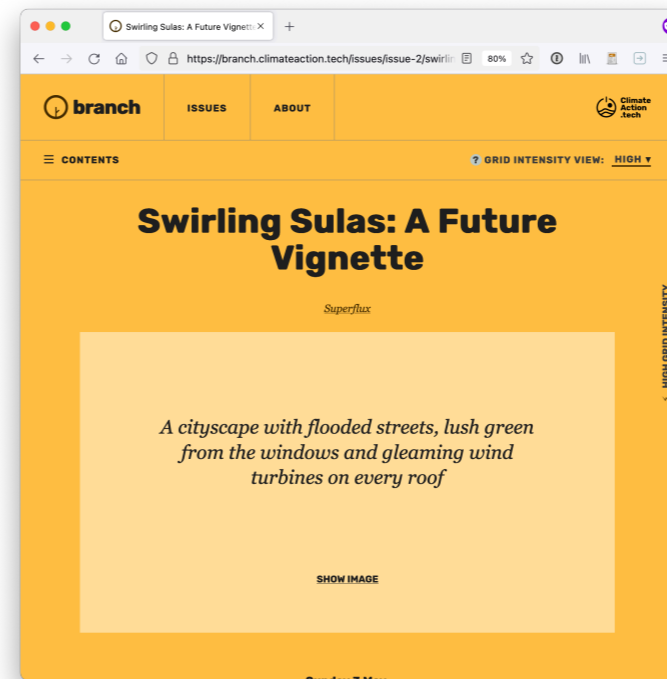
**Mostly renewables on  
the grid:  
serve full set of rich  
images and media  
elements**



I'm one of the editors of branch magazine, and we do a similar thing with the web itself.

When we know the grid powering the servers are green, and we think it'll be a green time to serve webpages, we send our our full fat rich web experience down the pipe to our users.

**Lots of fossil fuels on the grid:  
scale back design elements to stay inside carbon budget**



However, when we know there are lots of fossil fuels on the grid, we know doing that will result in higher carbon emissions from compute. So in addition to having a page weight budget to stay inside, we have a carbon budget for our pages too. We adapt the design to fall back to the lighter weight, images-free version.

This also forces us to think about the alt text from the get go, which is good for accessibility anyway.

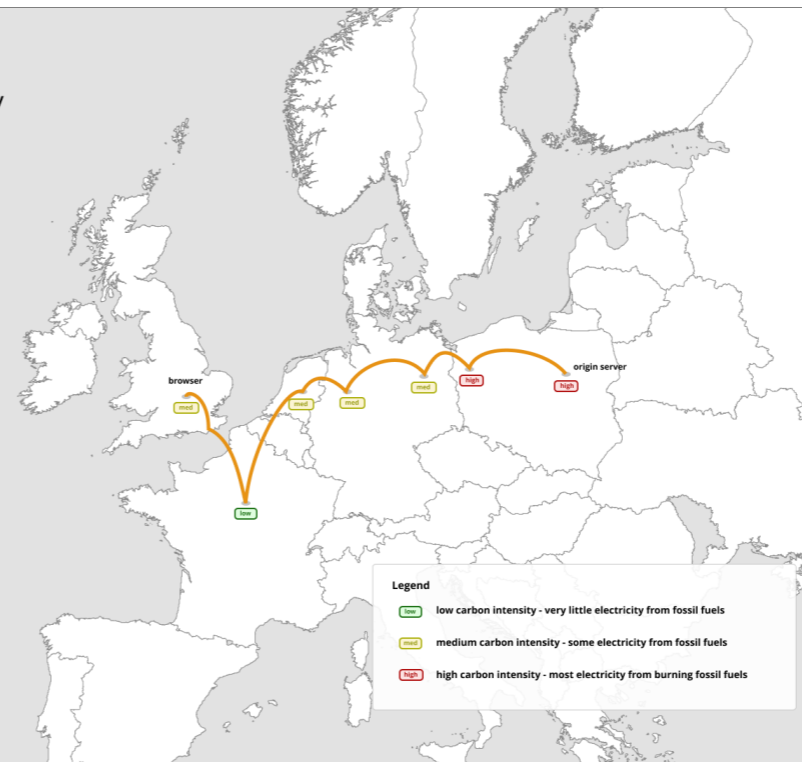
In the next issue we want to experiment with web workers to pull down content when we know energy is cheap and green - this is an example of shifting work through time when working online.

When we fetch data from servers, we rely on routers to route it to the next 'hop' along the way, as well as from the origin server.

This adds up - data transfer for the internet uses around 250 TWh of electricity each year - this is more than Spain uses!

Also when routes pass through areas where electricity mainly comes from burning fossil fuels, we have a higher carbon footprint for this transfer.

Because most electricity globally is still generated by burning fossil fuels, these emissions are hard to avoid with the design of the current internet.



We saw how looking at electricity map lets us move servers to where they are greener - that's a good example of moving work through space to another part of the world where energy is green.

But you can move work through space AND time with some of the new tech. Let's imagine we're connecting to this website in Poland from London.

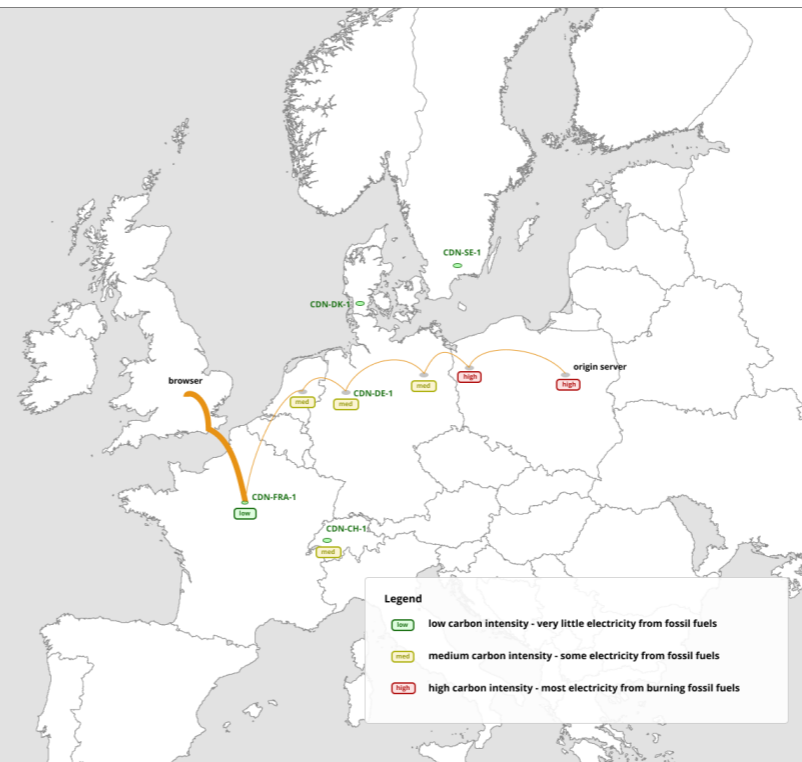
We have to hop across countries and every hop has a carbon footprint determined by how clean the grid is. France is full of nukes so it's green, and Poland has lots of coal so it's not green. Germany and England about in the middle, depending on the time of day.

One way to reduce this is to use CDNs to serve the same content from a closer cache instead of fetching it from the origin each time.

This saves hops, and improves the user experience making it feel faster.

If the nodes serving most of the traffic are running where electricity is low carbon, we save carbon here too.

Even if we can't cache everything, we can still serve most of our traffic from greener sources reducing the overall emissions.



One thing we can do, if we have a CDN, is serve traffic where it is closer, and ideally greener.

Let's imagine we have our CDN in France instead of Poland. We server more from the green grid.

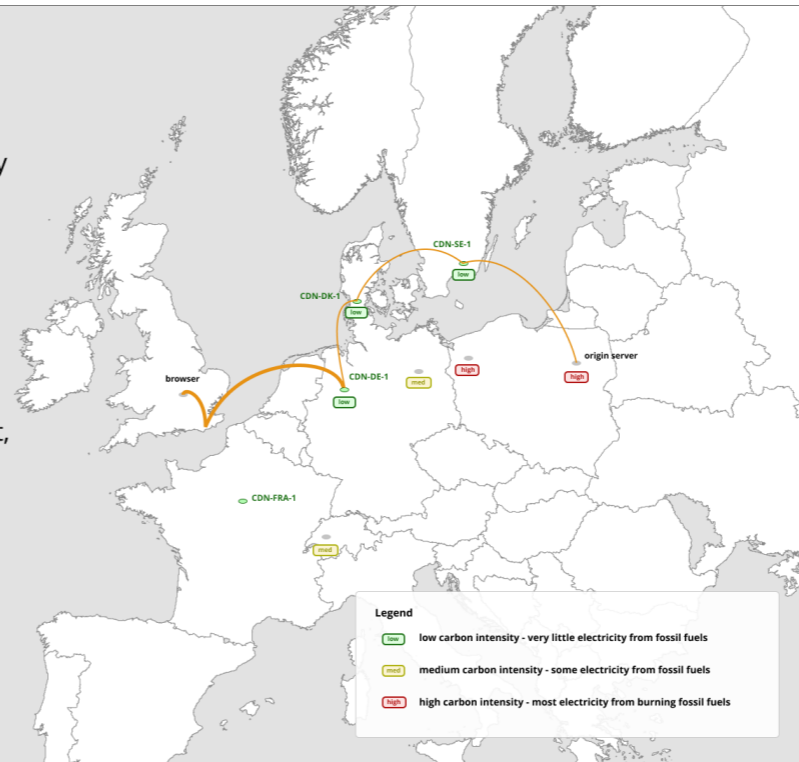
We might not be able to serve everything from France, but we can serve a lot, which means we only really on going through the less green routes for a small amount of traffic.

We **can and should** go further though.

If we know the carbon intensity of energy on the grid, we can tailor the way we serve traffic to match moments of over-supply on sunny or windy days, when energy is particularly cheap and green.

As long as the nodes are close enough, we can still serve quick responses, and save hops reducing the carbon footprint, but we also help actively balance the grid, making it easier to integrate more renewables into our energy system.

Even when some content can't be cached, we can still optimise for the greenest routes that serves the request in time.



However, if we build an awareness of how green the grid is into the internet itself, then it's possible to make routing decisions based on this information.

Let's assume that in the North of Europe, it's particularly windy that day. We can design for that, and route accordingly, resulting in a greener routing.

SCION is an open source internet architecture, running in production around the world, that can support this. It's designed and developed in Switzerland, and I'm super excited about it.

# What we've covered together...

1. We're in a Climate Emergency
2. What we can do as web technologists
3. GOLD - a way to think about greening tech

[thegreenwebfoundation.org/frontiersconference](https://thegreenwebfoundation.org/frontiersconference)

Front Conference 2021 - @mrchrisadams

OK, so this is what we covered.

# Thanks!



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**ClimateAction.tech**

**Online community for  
climate aware technologists**

OK,