



DIGITAL IS PHYSICAL

- representing the physical resources
your digital estate consumes

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Hannah Smith

A little about Hannah Smith



Director of Operations, [Green Web Foundation](#)



Co-founder of the [Green Tech South West](#) meet-up



Founder of [#LetsGreenTheWeb](#) run with [ClimateAction.tech](#)

Computer Science BSc and freelance web developer



THE INTERNET IS
THE WORLD'S
LARGEST
COAL-POWERED
MACHINE

BUT IT DOESN'T NEED TO BE

Photo by Chris LeBoutillier on [Unsplash](#)

OUR VISION

A JUST AND
SUSTAINABLE
INTERNET



HOW MIGHT WE DEFINE THIS?

The internet

- A tool that provides universal and meaningful digital connectivity for people.

Just

- Equitable decision-making, access and a safe, enriching online experience.

Sustainable

- The internet does not prevent others from meeting their basic needs, now or in the future and can endure.



Ways the internet can be unsustainable



Software requires a lot of infrastructure to run

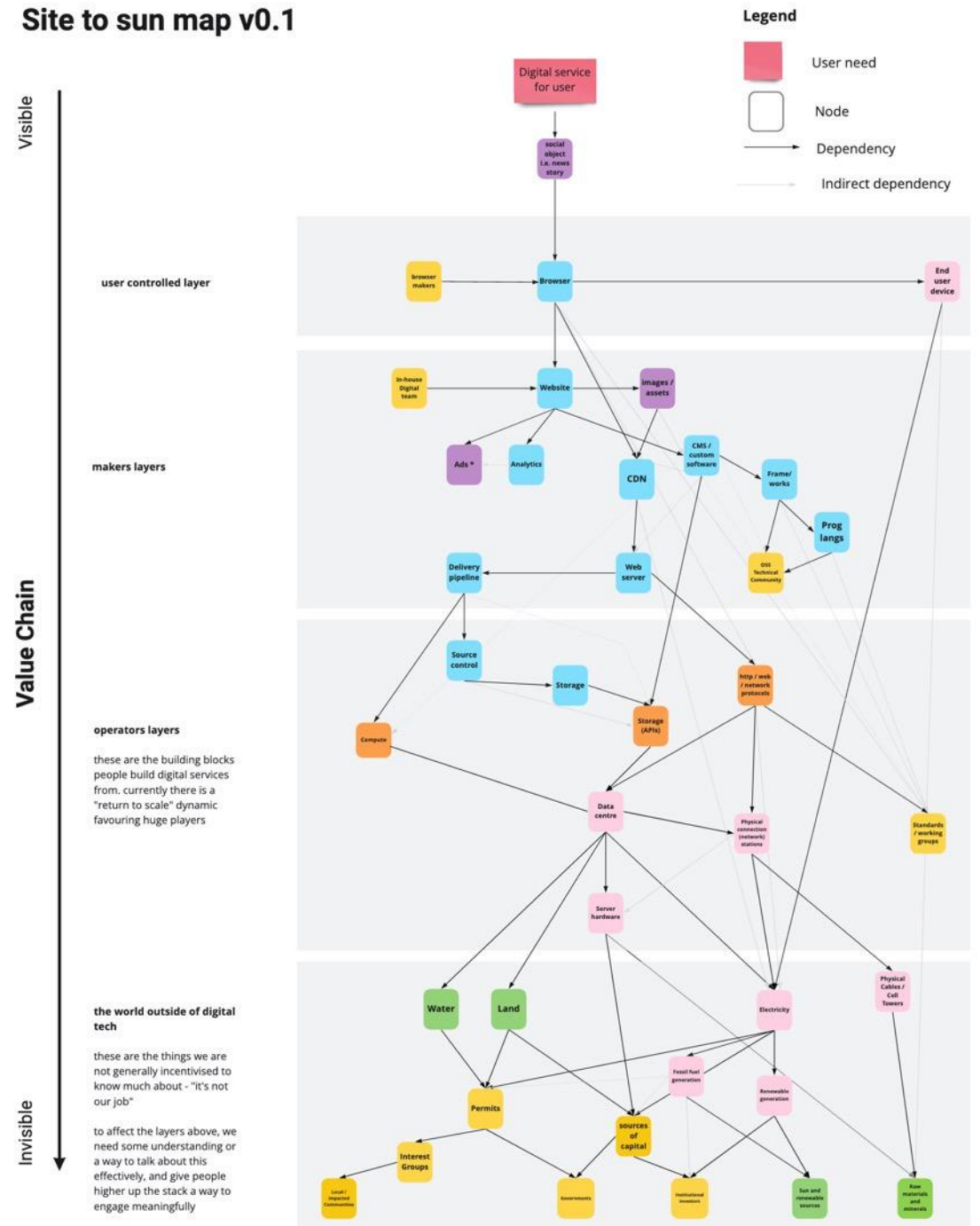
Software is light blue in the map

Everything below is infrastructure

Building and running this infrastructure uses natural resources

Site to sun map from [The Green Web Foundation](#)

Site to sun map v0.1



Natural resources such as

 Electricity

 Rare raw minerals

 Land and water

DIGITAL IS PHYSICAL

IT IS NOT IN
THE CLOUDS

IT IS TAKEN
FROM THE EARTH

(AND RIGHT NOW WE'RE TAKING TOO MUCH)






1. ELECTRICITY



How much CO2 does digital emit?

 Digital is responsible for 2.1% - 3.9% of global GHG emissions

 The world's 7th biggest polluter if it were a country

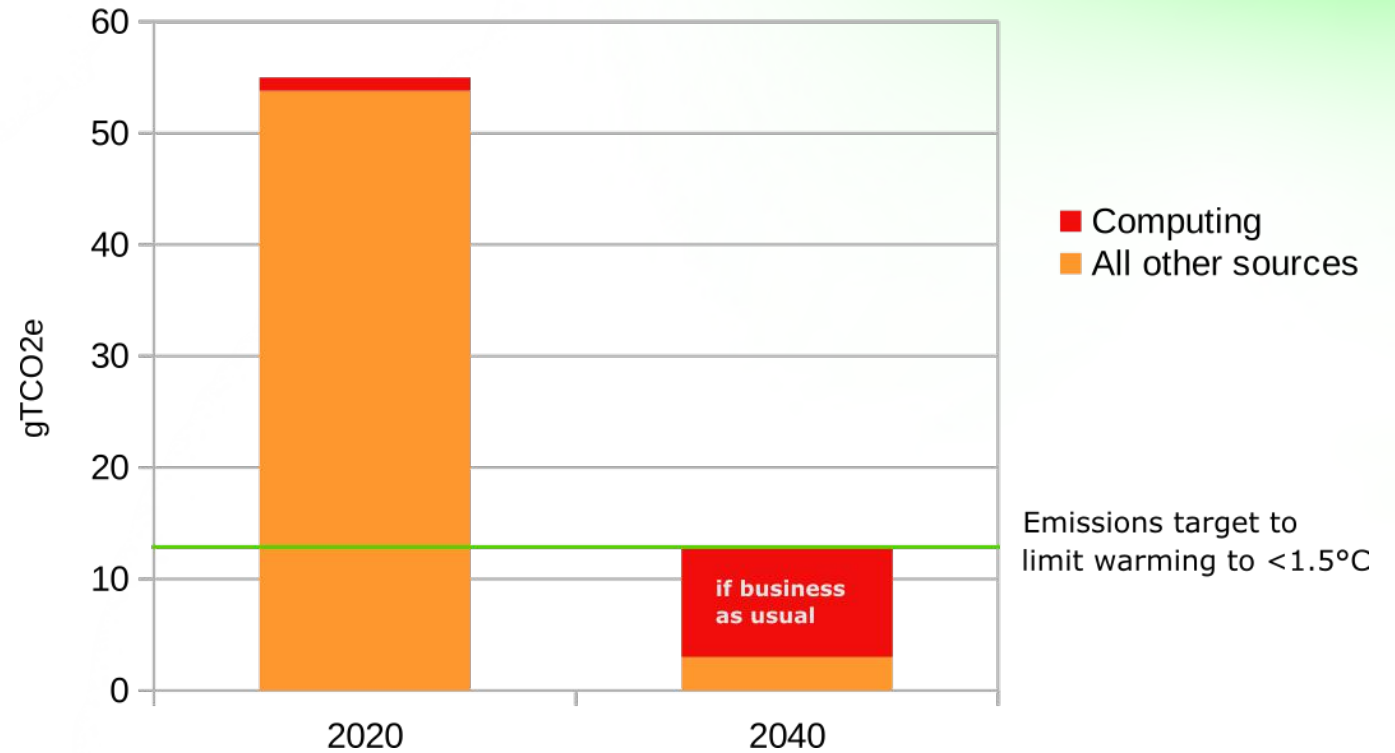
More than aviation and shipping sectors

Sources: <https://www.lancaster.ac.uk/news/emissions-from-computing-and-ict-could-be-worse-than-previously-thought>

Emissions are growing

By 2040 emissions from computing alone will be more than half the emissions level acceptable to keep global warming below 1.5°C

Contribution of emissions from production and operation of computing resources to total emissions



Is it ok that computing will
take more than half the
world's global carbon budget?



How does digital cause emissions?

Mainly from using electricity to power and build tech

The way we produce electricity can be clean or dirty (dirty = more CO₂)

If we know how much electricity something uses, we can estimate the associated carbon emissions along the supply chain

Global energy production

62%
of the world's electricity
from fossil fuels

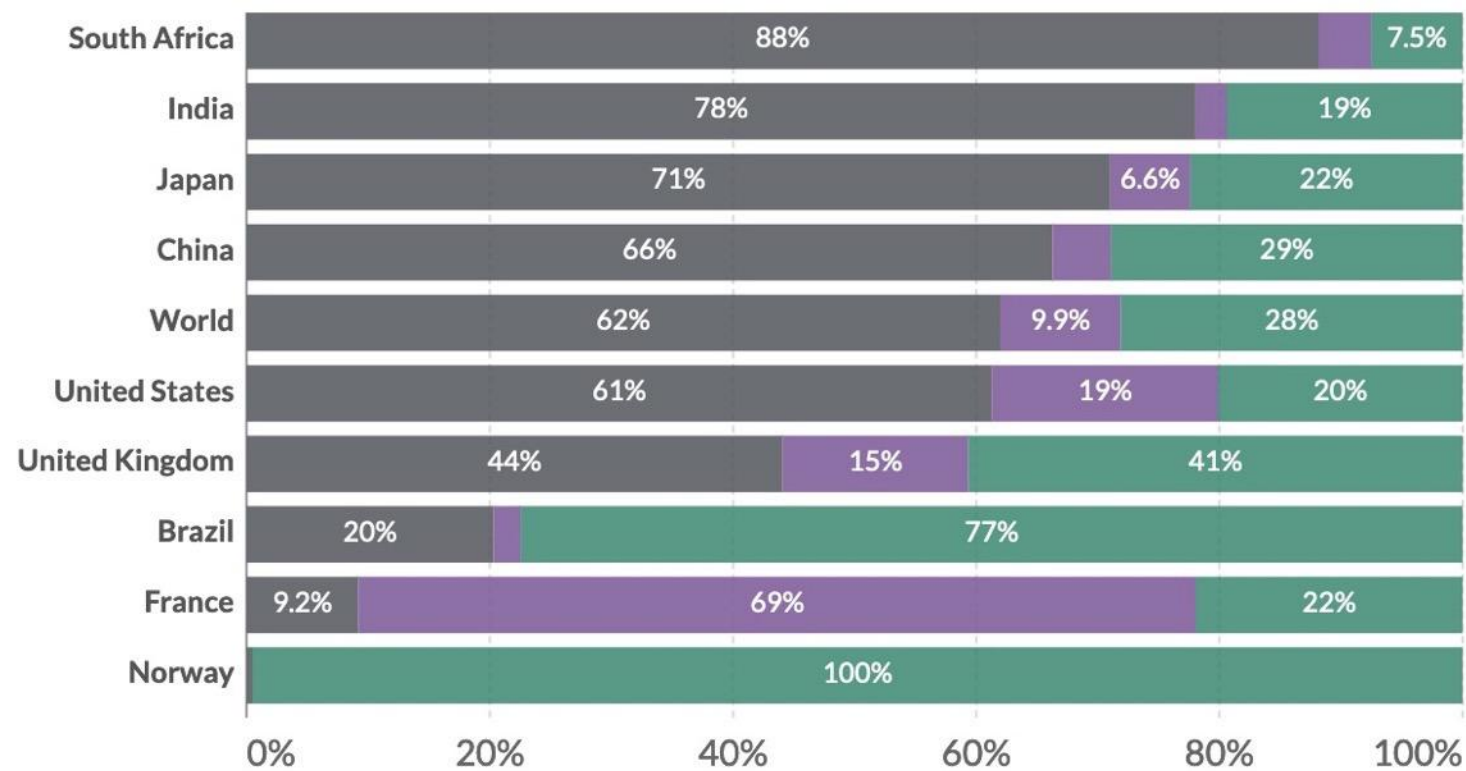
28%
from renewables

10%
from nuclear

Electricity consumption from fossil fuels, nuclear and renewables, 2021

[+ Add country](#) Relative

■ Fossil fuels ■ Nuclear ■ Renewables



Source: Our World in Data based on BP Statistical Review of World Energy (2022); Our World in Data based on Ember's Global Electricity Review (2022); Our World in Data based on Ember's European Electricity Review (2022)
OurWorldInData.org/energy • CC BY

Source: <https://ourworldindata.org/low-carbon-electricity-by-country>, 2021

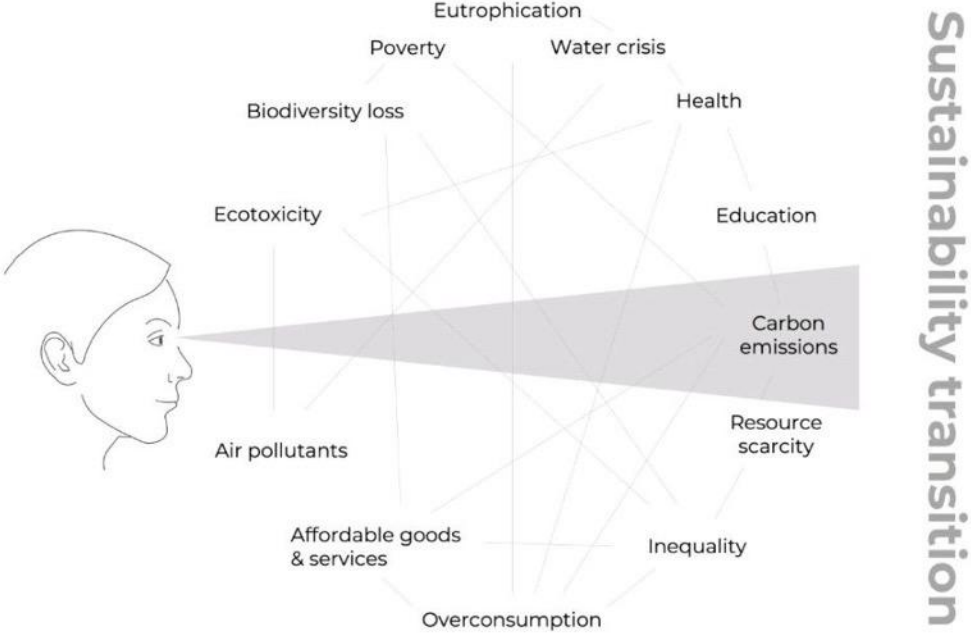


YOUR ENERGY USE
(scope 1 + 2)

USER'S ENERGY USE
(scope 3)

Sustainability is more than carbon emissions

Carbon Tunnel Vision



Graphic by Jan Konietzko

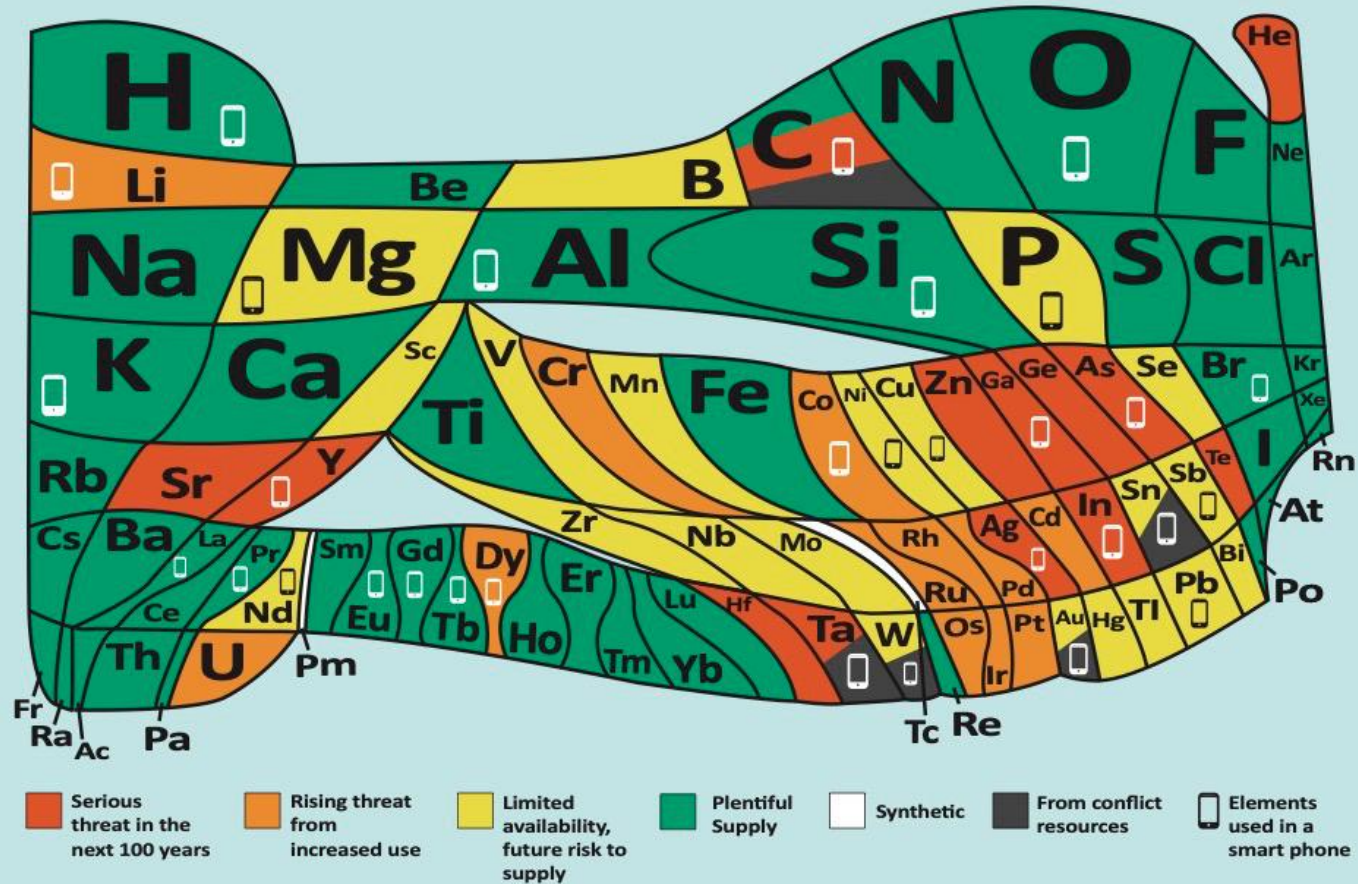


RARE RAW MINERALS



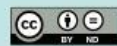
The 90 natural elements that make up everything

How much is there? Is that enough? Is it sustainable?



Read Support Notes and play the video game <http://bit.ly/euchems-pt>

Edition 3 (2023)



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 **EuChemS**
European Chemical Society

Inspired by WF Sheehan's A Periodic Table with Emphasis published in Chemistry, 1976, 49, 17-18



THERE IS NO SUCH
THING AS
SUSTAINABLE
MINING

BUT IT CAN BE MORE
SOCIAALLY RESPONSIBLE

Image by [652234](#) on [Pixabay](#)

Manufacturing hardware requires rare minerals

eg cobalt, lithium and gold

These are extracted from the earth

 Manufacture of a phone results in mining 1.2t of raw materials

 In 2019 50m tons of e-waste was produced, recycling is hard

Recycling e-waste is not as you might imagine



Agbogbloshie e-waste site 2019, [Agbogbloshie site demolition, social impacts in 2021](#)

Photo credit: [Muntaka Chasant](#)

Is the amount of waste
produced by manufacturing
internet devices ok?





LAND AND WATER



Intense water usage in Cerrillos, Chile

Google data centre in Cerrillos, an industrial and residential area in Santiago

One of the main concerns of the local community was water usage

Estimated to be 169 litres per second in an area facing a mega drought for years



Estimated that ChatGPT requires 500 ml of water for every 20 to 50 questions answered.





Data centers

Not floating in the cloud, these create impacts on local communities

[The Politics of Data Centers](#) Dr. Fieke Jansen

[Data Centre Activism](#) Sebastián Lehuedé

[Data centre water consumption](#) David Mytton

Should we prioritize the
needs of data centres over
communities & eco-systems?





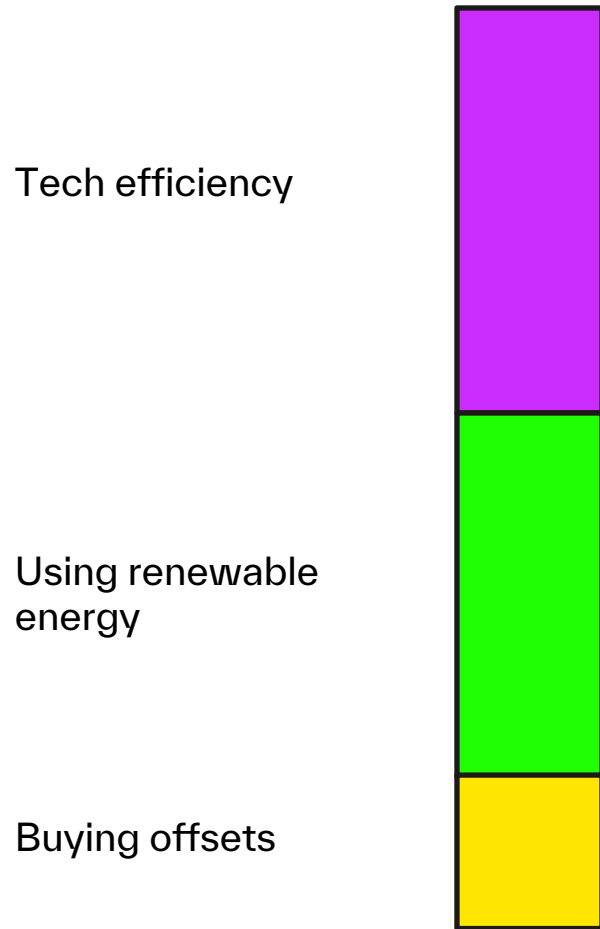
BONUS: SOCIAL IMPACTS



When we think about natural
resource use, we can't help
but consider social impacts



What people think building a sustainable internet involves



What it's more about



What people think building a sustainable internet involves vs what it might actually be,
by Hannah Smith



SUMMING UP

Building and running tech uses natural resources

 Energy

 Rare raw minerals

 Land and water

When we think about natural resource use, we should also consider

 Social impacts