

Climate Change & Tech, Good and Bad Bedfellows

Tech, Mapping, Emissions and The Future

Paul Johnston
Fun Art by JDHancock.com

Climate Change & Tech, Good and Bad Bedfellows

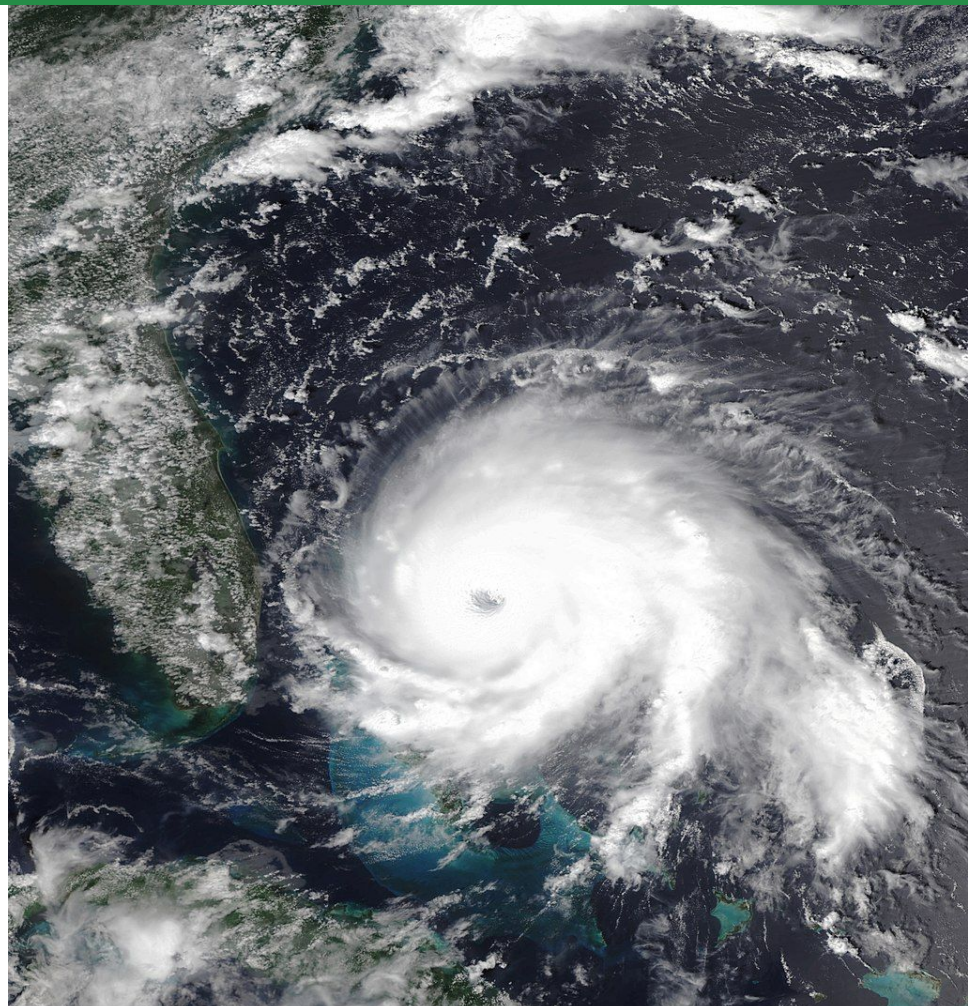
Tech, Mapping, Emissions and The Future

Paul Johnston
Fun Art by JDHancock.com

Hurricane Dorian

- 185mph winds
- =1st Strongest Atlantic Storm
- 70,000 left homeless (Bah.)
- 60+ dead, 400+ missing
- \$8+ Billion damage

Photo and data: https://en.wikipedia.org/wiki/Hurricane_Dorian



Typhoon Hagibis

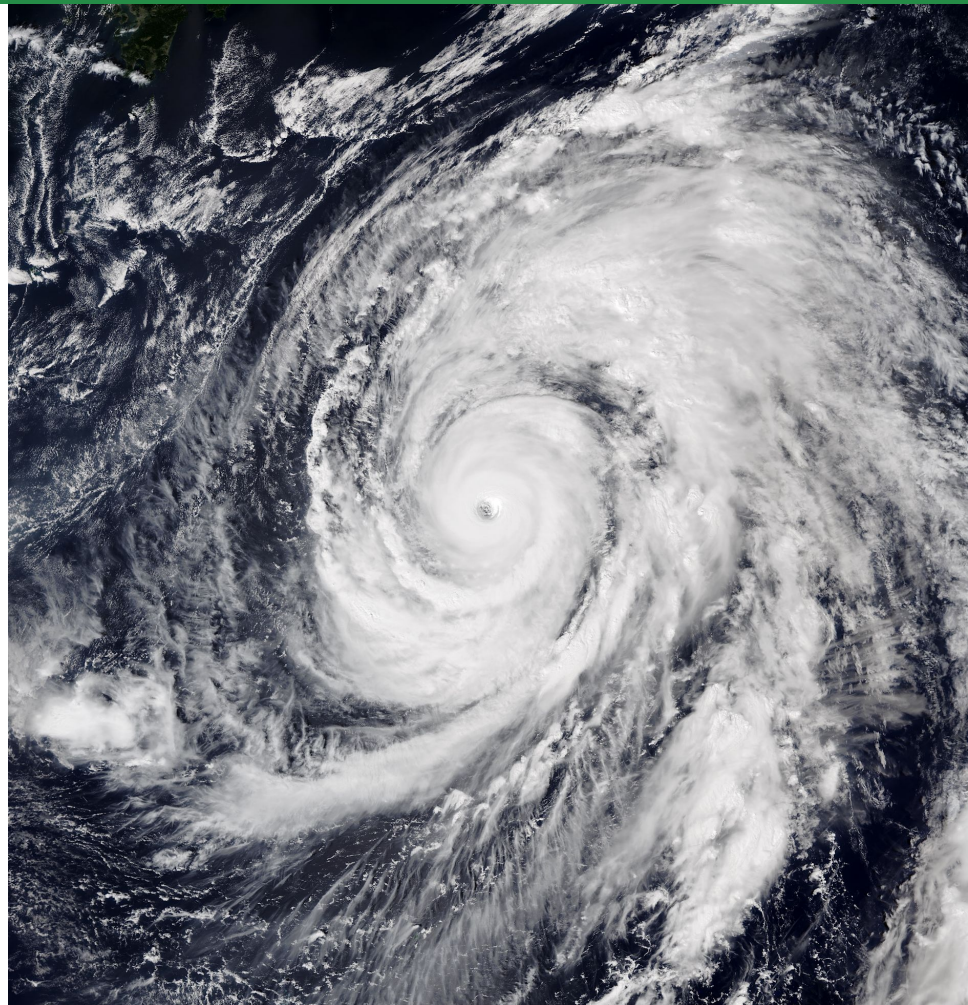
- 140mph winds
- Worst storm in *60 years*
- Almost 1000mm of rain in 24hrs
- 40 dead, 16 missing, 6m affected
- Typhoon “season” lasts longer

Photo: [https://en.wikipedia.org/wiki/Typhoon_Hagibis_\(2019\)](https://en.wikipedia.org/wiki/Typhoon_Hagibis_(2019))

Data: BBC News and Al Jazeera

https://twitter.com/Tom_Scott/status/1183408521389445120

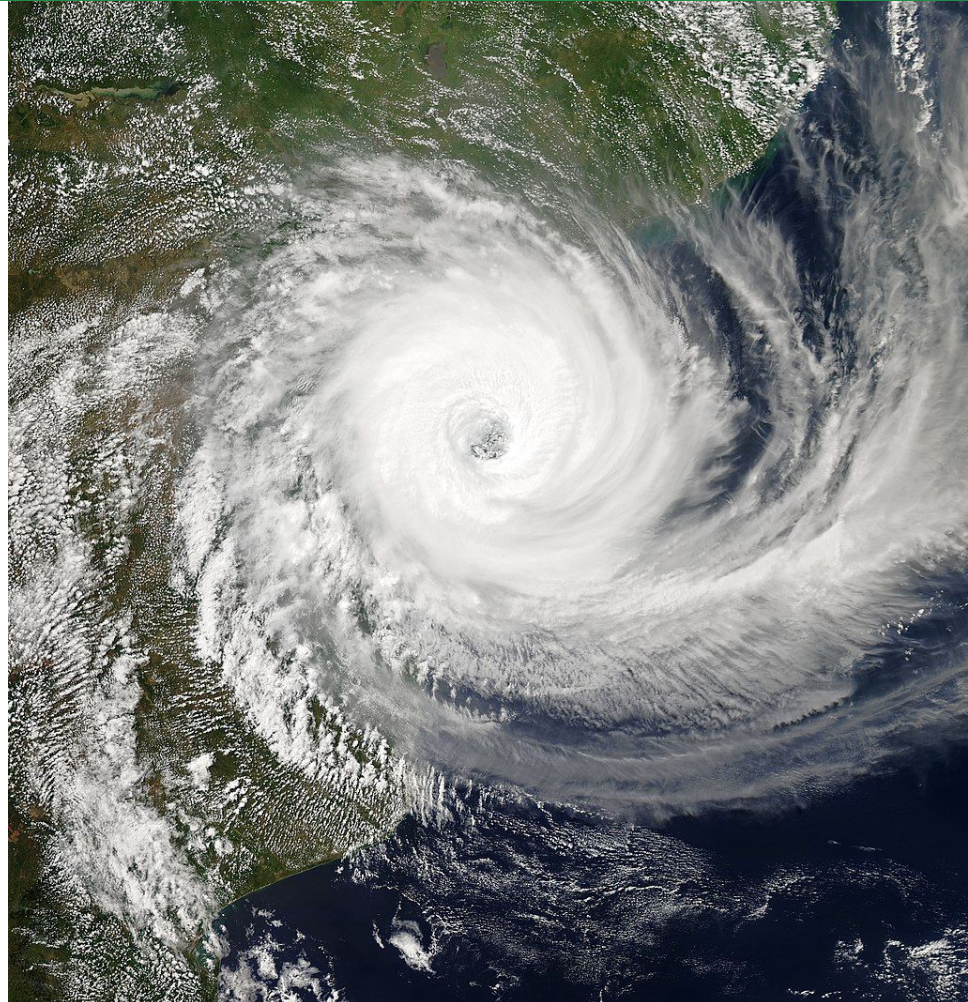
<https://www.bbc.co.uk/news/world-asia-50037907>



Cyclone Idai

- Madagascar, Mozambique, Malawi, Zimbabwe
- 125mph winds
- 2nd Deadliest in Indian Ocean
- 1300+ dead, 2000+ missing, 3m affected
- \$2 Billion in damage

Photo and data: https://en.wikipedia.org/wiki/Cyclone_Idai

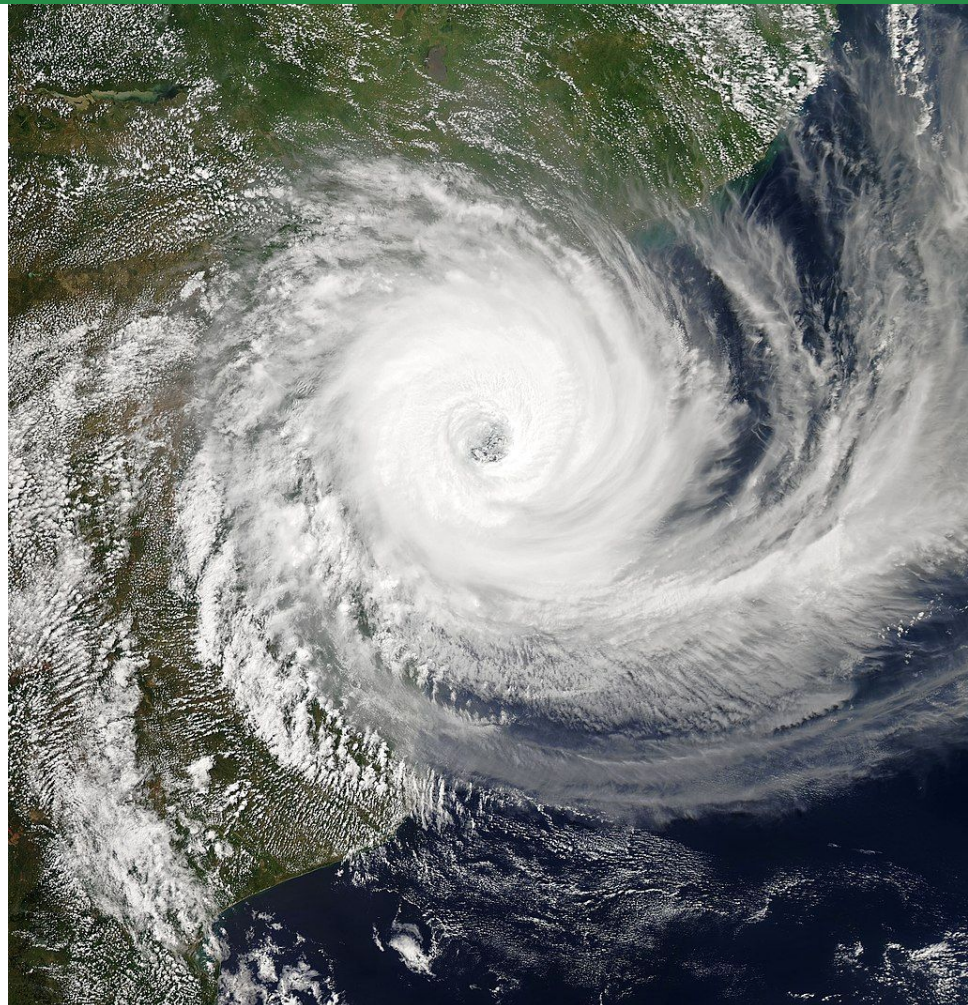


All of these “extreme weather events”
happened in 2019

Storms Ciara and Dennis

- February 2020 - 1 week apart
- >£400m in damage in UK alone
- Ciara: Cat. 5 “Atmospheric River”
 - “Exceptional”
- Dennis: Bomb Cyclone

Photos and data: https://en.wikipedia.org/wiki/Storm_Ciara and https://en.wikipedia.org/wiki/Storm_Dennis and <https://www.ft.com/content/440f4bb6-5276-11ea-8841-482eed0038b1>



Subtropical Storm Kurumi

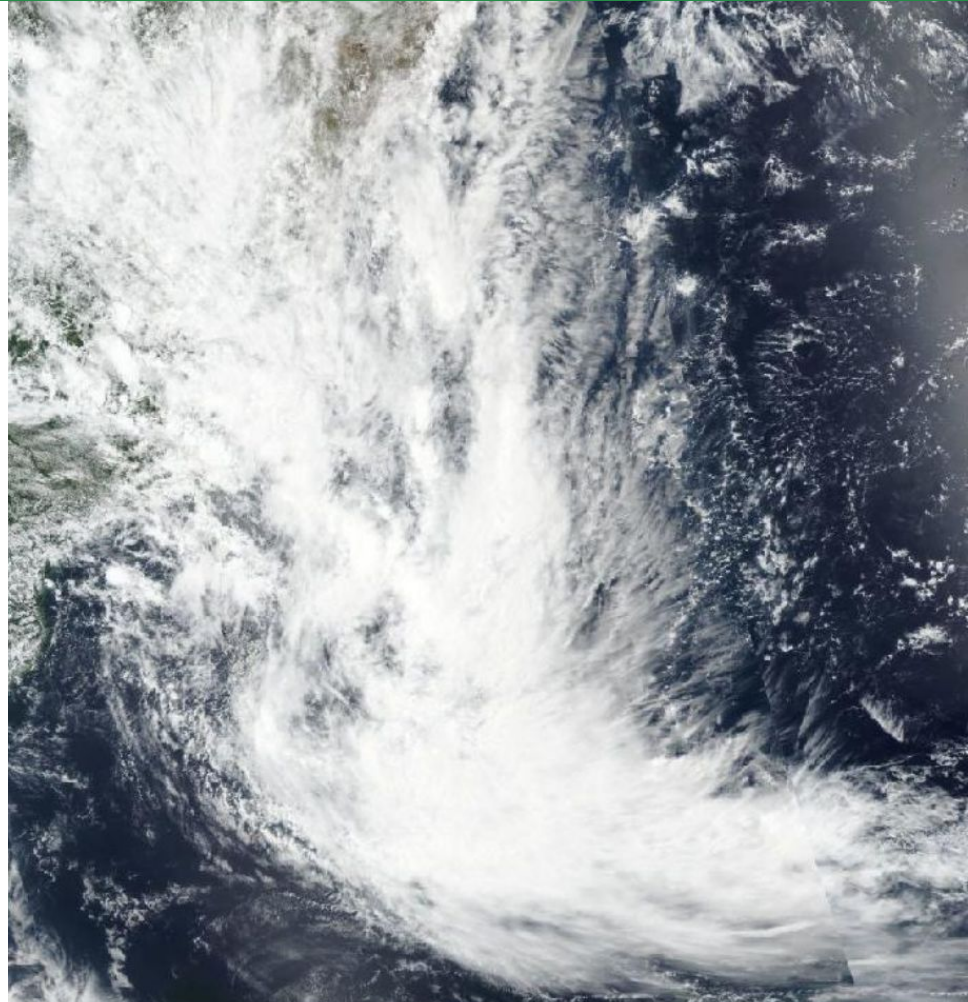
- January 2020
- Highest daily rainfall in Belo Horizonte in 110 years
- Flooding and landslides killed 30 and evacuated 2,600 people

Data:

<https://www.theguardian.com/world/2020/jan/29/brazil-counts-cost-highest-recorded-rainfall-110-years>

Photo:

<https://en.wikipedia.org/wiki/File:Kurumi%2020-1-24.jpg>



All of these “extreme weather events”
happened in 2020

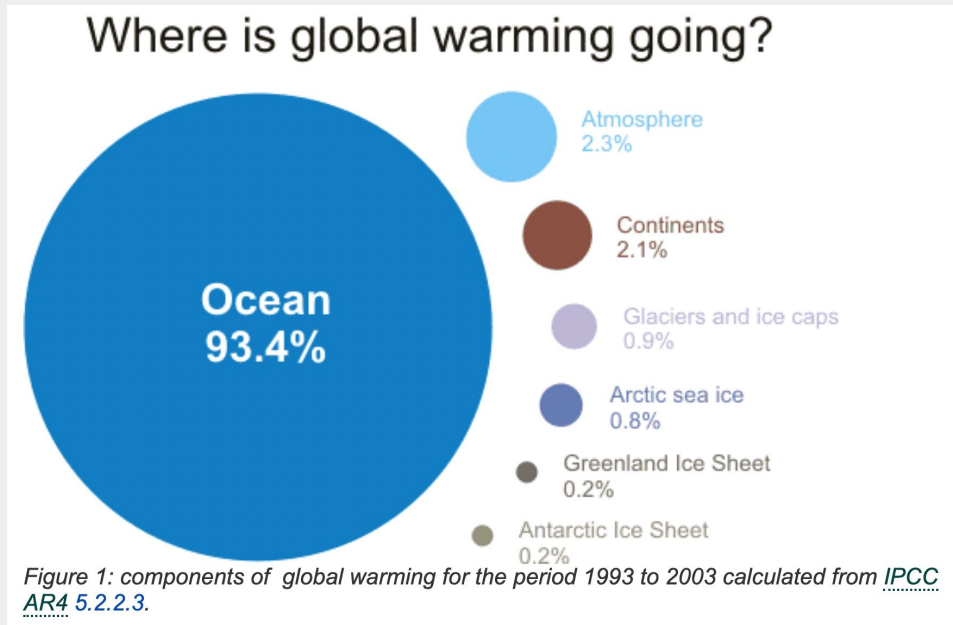
Climate Change leads to ocean warming which leads to:

- Stronger storms
- Slower storms
- Larger storms
- More rainfall
- Moving more slowly

Note: it doesn't lead to *more* storms

From:

<https://skepticalscience.com/Where-is-global-warming-going.html>



Wildfires are more likely

- Rising global temperatures
- Heatwaves more likely
- Associated droughts in some regions
- Australian wildfires “far worse than any prediction”

Data: <https://www.bbc.co.uk/news/science-environment-51590080>



The image is a screenshot of a BBC News article. At the top, the BBC logo is visible on the left, and navigation links for News, Sport, Weather, iPlayer, Sounds, and CBBC are on the right. Below the navigation is a search bar. The article is categorized under 'Science & Environment'. The main headline reads 'Australia fires were far worse than any prediction'. The author is identified as Victoria Gill, a science correspondent for BBC News. The article is dated 24 February 2020. There are social media sharing icons for Facebook, Messenger, Twitter, Email, and a general 'Share' button. A tag for 'Climate change' is present. The main image shows a charred forest with a rusted metal structure in the foreground. A caption at the bottom of the image states: 'The fires are estimated to have killed one billion animals'. The source 'GETTY IMAGES' is noted in the bottom right corner of the image area.

NEWS

Home UK World Business Politics Tech **Science** Health Family & Education Entertainment & Arts More

Science & Environment

Australia fires were far worse than any prediction

By Victoria Gill
Science correspondent, BBC News

© 24 February 2020

f m t e Share

Climate change



GETTY IMAGES

The fires are estimated to have killed one billion animals

Australian extremes

- Record Australian drought
- Followed by heaviest rainfall in Sydney for 30 years

Data:

https://en.wikipedia.org/wiki/Drought_in_Australia#late_2016%E2%80%93late_2019 and

<https://www.bbc.co.uk/news/world-australia-51439175>

NEWS

Sydney rains: Record rainfall brings flooding but puts out mega-blaze

10 February 2020



Australia fires



“Extreme Weather” is becoming the
new normal



Paul Johnston

CXO Consultant and Advisor

Tech and Sustainability

Interim CTO

Community Energy Director

ex-AWS

Climate Activist

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[@PaulDJohnston](https://twitter.com/PaulDJohnston)

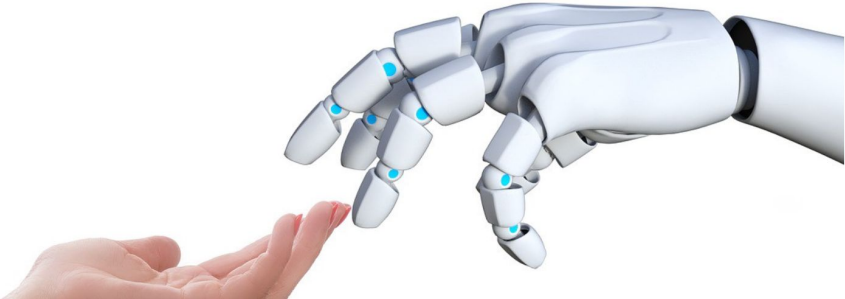
M

Become a member Sign in Get started

To fix Climate Change, stop being a techie and start being a human

 Paul Johnston [Follow](#)
Aug 29, 2019 · 11 min read

[Twitter](#) [LinkedIn](#) [Facebook](#) [Bookmark](#)



medium.com/PaulDJohnston

“Extreme Weather” is becoming the
new normal
...and this is affecting tech too

Data Centres taken out by Sandy

- More than 8 DCs in New York City
- Basements flooded
- Diesel pumps ran out of fuel

Data:

<https://www.datacenterdynamics.com/en/news/hurricane-sandy-takes-out-manhattan-data-centers/>



News

Analysis

Conferences

Opinions

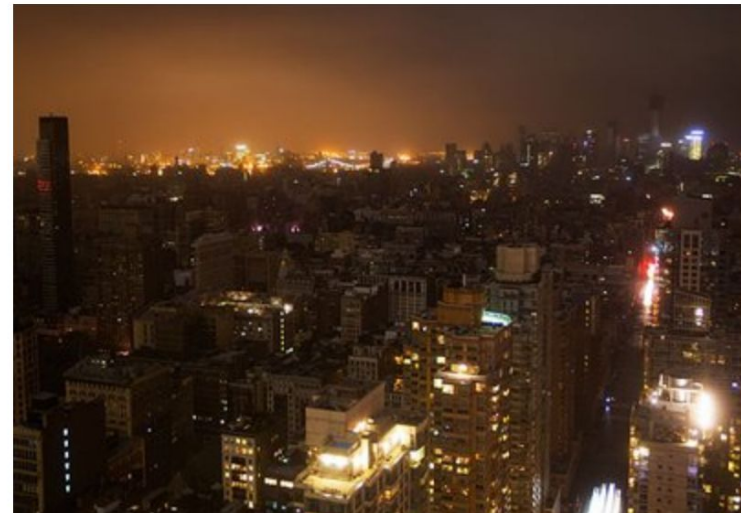
Videos

Web

[HOME](#) > NEWS

Hurricane Sandy takes out Manhattan data centers

October 30, 2012 By: Ambrose McNevin





Wildfires take O'Reilly offline

- Power outages caused shutdown
- Building was in evacuation zone
- Staff had to leave the area

Data:

https://www.vice.com/en_us/article/7x5j8z/the-california-wildfires-knocked-a-big-company-website-offline

MOTHERBOARD
TECH BY VICE

The California Wildfires Knocked a Big Company Website Offline

O'Reilly Media's website went offline "due to the fires and power outages in California," an unsettling reminder that the internet isn't immune from the ripple effects of the climate crisis and corporate negligence.

By [Jordan Pearson](#)

Oct 29 2019, 5:16pm



Share



Tweet



Snap

Climate Change:
One more reason to be in the cloud ;)

But...

The IPCC?
Paris?
1.5 degrees?



IPCC:

“Intergovernmental Panel on Climate Change”

Panel that assesses the science related to
Climate Change

195 Member Governments

Paris Agreement: 2015

Aim is to keep the global temperature rise by 2100 to well below 2 degrees* and pursue efforts to limit to 1.5 degrees*

*above pre-industrial temperatures

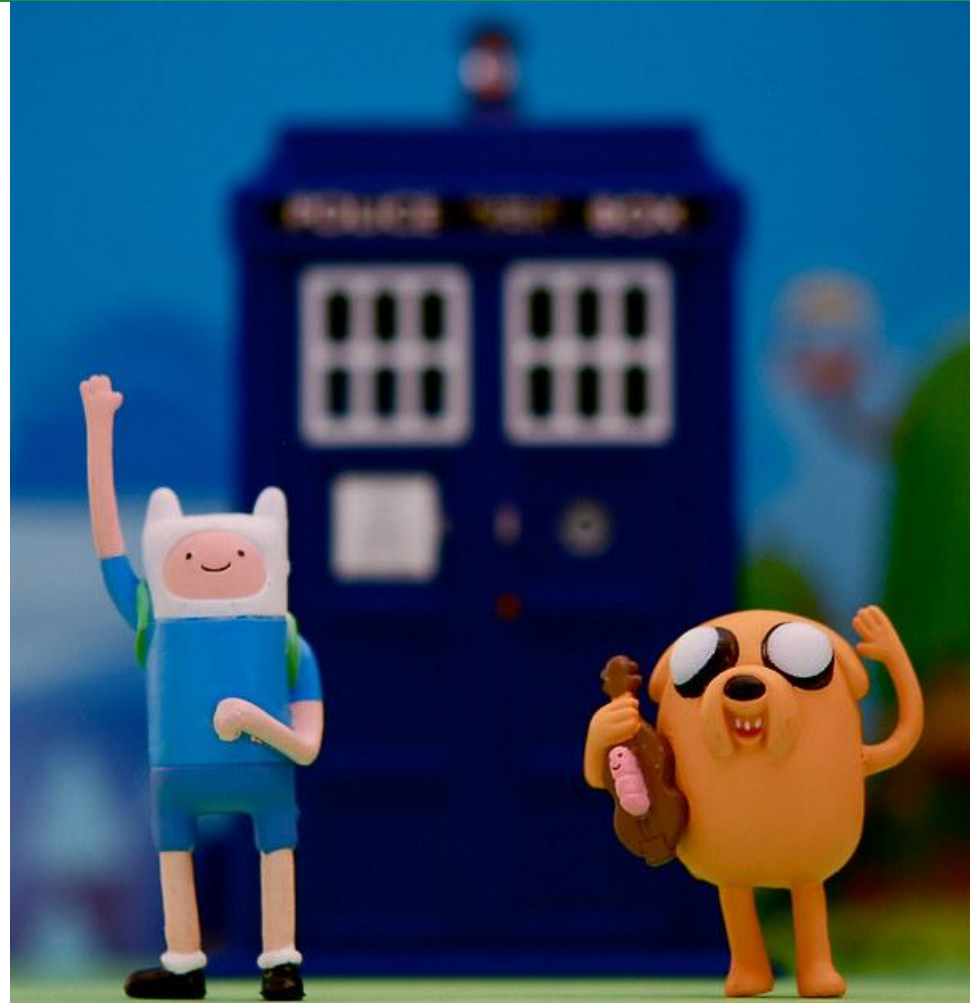
IPCC special report on the impacts of global warming of 1.5°C

October 2018

Includes illustrative pathways for reaching 1.5°C... “12 years”

<https://www.ipcc.ch/sr15/>

So... how are
we doing?



We're on course for 3.2 degrees

- Need 7.6% drop per year in emissions for next 10 years to hit 1.5 degrees
- UN update February 2020

Story:

<https://www.wired.co.uk/article/climate-crisis-temperature-target-paris-agreement>

Data: <https://news.un.org/en/story/2019/11/1052171>

Environment

It's time to say goodbye to our most ambitious climate target ever

For the last four years, avoiding 1.5 degrees of warming has been at the top of the climate agenda. But the goal is already out of reach. Where do we go next?



By MATT REYNOLDS
Friday 21 February 2020



Credit Getty Images / WIRED

In 2015, the world found its environmental rallying cry. A single line in the Paris Agreement – a pledge to “pursue efforts” to limit global temperature increase to 1.5 degrees above pre-industrial levels – became the bar against which efforts to stop climate change have been judged since.

“Our collective failure to act early and hard on climate change means we now must deliver deep cuts to emissions”, said Inger Andersen, UNEP’s Executive Director.

In December 2020, countries are expected to significantly step up their climate commitments at the UN Climate Conference - **COP26** - due to be held in Glasgow.

However, the urgency of the situation means, said Ms. Anderson, that they cannot wait another year: “they – and every city, region, business and individual – need to act now”.

Link: <https://news.un.org/en/story/2019/11/1052171>

AXA: 4C warming makes the world uninsurable

Michael Holder

Monday, December 18, 2017 - 1:40am



Insurance giant AXA has announced a quadrupling of its 2020 green investment target from \$3.53 billion to \$14.13 billion as the company's CEO warned more than 4 degrees Celsius of warming this century would make the world "uninsurable."

Launched at the One Planet Summit in Paris, Axa unveiled this week a raft of climate policy moves that also will see it further reduce its exposure to fossil fuel assets.

4C World “Uninsurable” - AXA

<https://www.greenbiz.com/article/axa-4c-warming-makes-world-uninsurable>

Major Investors are Divesting from Fossil Fuels

<https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter>



A Fundamental Reshaping of Finance

Dear CEO,

As an asset manager, BlackRock invests on behalf of others, and I am writing to you as an advisor and fiduciary to these clients. The money we manage is not our own. It belongs to people in dozens of countries trying to finance long-term goals like retirement. And we have a deep responsibility to these institutions and individuals – who are shareholders in your company and thousands of others – to promote long-term value.

Climate change has become a defining factor in companies' long-term prospects. Last September, when millions of people took to the streets to demand action on climate change, many of them emphasized the significant and lasting impact that it will have on economic growth and

Climate Change is already here

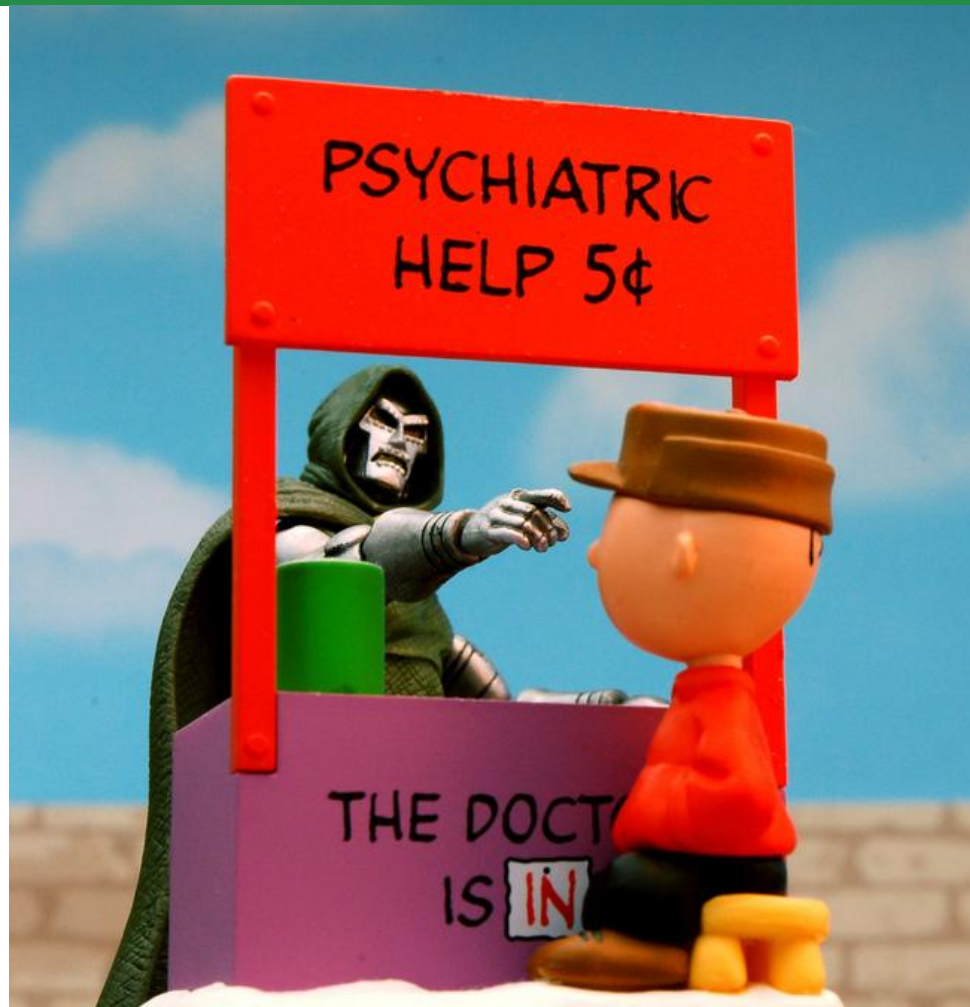
Change to our way of life is coming

(although what that change will be...?)

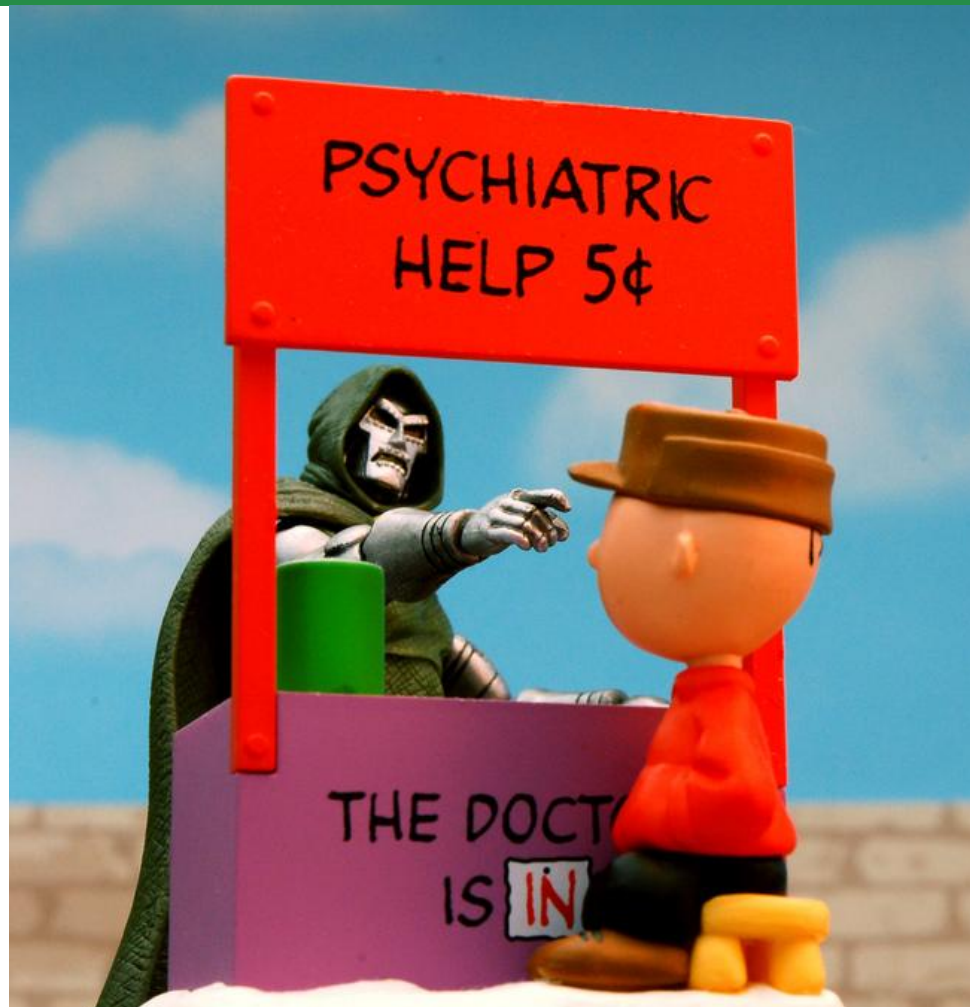
For many*, it's already changed

* mainly in the developing world

But what has
this got to do
with tech?



Tech has
started to
get all
“Climate-y”





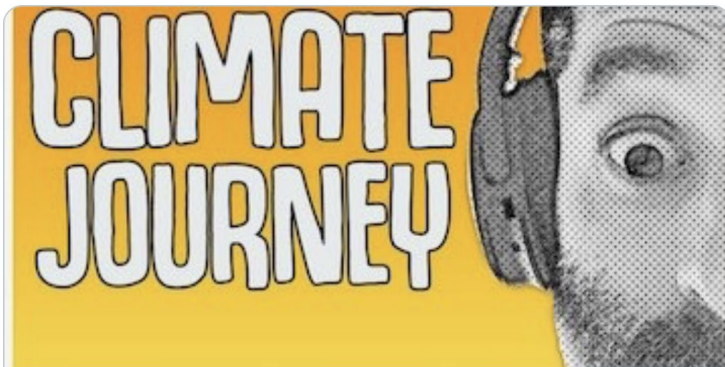
Jason Jacobs ✓

@jjacobs22



Not the product launch I would have predicted, but a product launch nonetheless. Introducing My Climate Journey!

medium.com/@jjacobs22/my-...



My climate journey: it's a thing.

When I wrote about the difficult decision to shut down Two Way Labs before it even got out of the gates, I mentioned how I was longing

medium.com

♥ 85 6:01 PM - May 10, 2019



💬 17 people are talking about this





Nat Friedman

@natfriedman



I'm interested in talking to people who are doing ambitious work to address climate change, using GitHub.

If this applies to you, or someone you know, please get in touch:
forms.gle/hyshsHDq4Leb16...



Climate Change on GitHub

We are interested in hearing from people who are working on ambitious projects to address climate change, using GitHub. Please get in touch!
docs.google.com

621 12:40 AM - Feb 23, 2020



354 people are talking about this



**bryan schreier**

@schreier



We [@Sequoia](#) are actively investing in Climate Tech and Sustainability (more to come). Why? Because it is both our responsibility and a huge business opportunity (h/t [@karaswisher](#)). We'd love to hear from more Climate Tech entrepreneurs:

climate@sequoiacap.com

♡ 1,130 9:58 PM - Jan 23, 2020

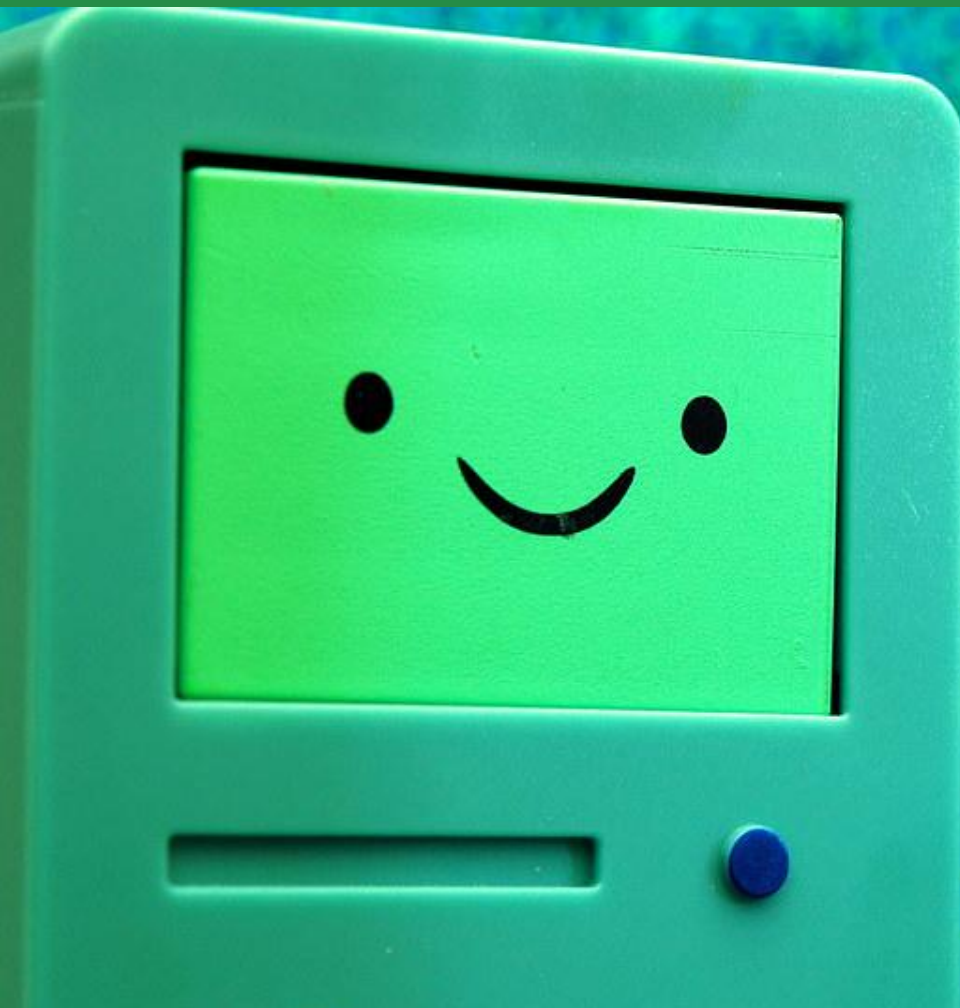


💬 [250 people are talking about this](#)



But are we on
the right side?





Technology often seems so

POSITIVE

But sometimes we should
probably ask...



Are we the baddies?

That Mitchell and Webb Look



“The sad truth is that most evil is done by people who never make up their minds to be good or evil.”

Hannah Arendt

Who Is Ultimately Most Responsible for Code That Accomplishes Something Unethical?



64,540 responses

Most developers feel that management is ultimately most accountable for unethical results of code. Just under 20% of respondents said that a developer who writes code used for unethical purposes is most responsible.

Source: <https://insights.stackoverflow.com/survey/2018/#ethics>

Often tech people are
ethically “Utilitarian”

An action should
maximise
happiness & wellbeing
for that person and
everyone affected



Utilitarianism
can lead to
**unintended
consequences**
especially for
third parties*

*it's worth reading some philosophy and ethics



Utilitarianism:

“Kill one to harvest
organs for five”

twitter.com/johnsnolan



Which is why a shift towards
employee activism
around Climate Change
in tech is notable

Employees of big companies joined the #ClimateStrike

Photo:

<https://twitter.com/AMZNforClimate/status/11764965087719505>

93



A typical AWS employee banner at the #ClimateStrike

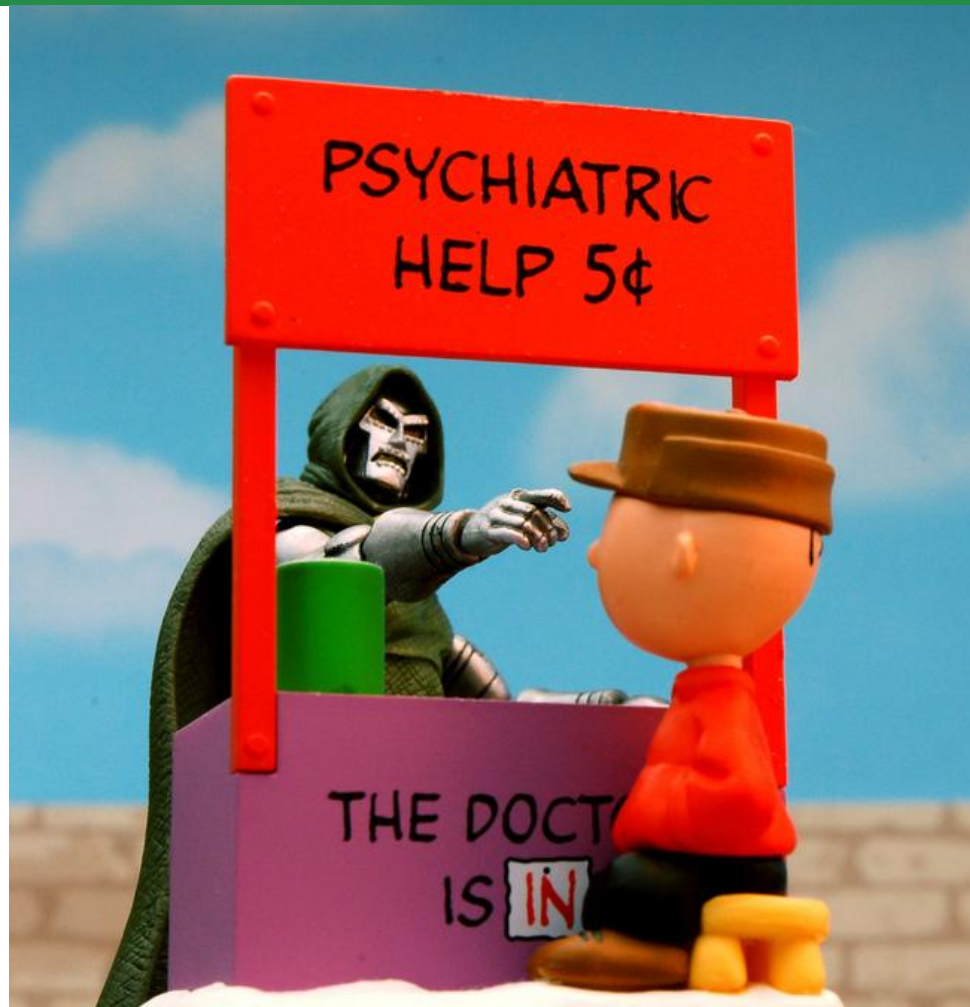
Photo:

<https://twitter.com/AMZNforClimate/status/11764965087719505>

93



Data centres
produce
about as much
greenhouse gas
as aviation



Aviation is bad!



LHR → JFK → LHR

More than 3 tonnes
CO₂ per person

Photo: twitter.com/profraywills/status/1046231254075465728



Cloud is more
efficient than
Data Centres



Jevons Paradox

Efficient Clouds means
more usage

So Cloud must be
powered in a
Sustainable way



Example: AI

Easier to create models
so we make more use of
them and more of them...
but the carbon footprint is
not small

<https://www.technologyreview.com/s/613630/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>

Training a single AI model can emit as much carbon as five cars in their lifetimes

Deep learning has a terrible carbon footprint.

by Karen Hao

Jun 6, 2019



Quick Aside: AI and ethics

China is using AI to regulate citizens to limit movement due to coronavirus

<https://www.nytimes.com/2020/03/01/business/china-coronavirus-surveillance.html>



The QR code inside the Alipay app. Green is good, and allows the holder to travel freely. Raymond Zhong/The New York Times

In Coronavirus Fight, China Gives Citizens a Color Code, With Red Flags

A new system uses software to dictate quarantines — and appears to send personal data to police, in a troubling precedent for automated social

Quick aside: Efficient DCs

Jessie Frazelle
wrote a great blog
about this
last week

<https://blog.jessfraz.com/post/power-to-the-people/>

Power to the People

Wednesday, February 26, 2020

When you upload photos to Instagram, back up your phone to “the cloud”, send an email through Gmail, or save a document in a storage application like Dropbox or Google Drive, your data is being saved in a data center. These data centers are airplane hangar-sized warehouses, packed to the brim with racks of servers and cooling mechanisms. Depending on the application you are using you are likely hitting one of Facebook’s, Google’s, Amazon’s, or Microsoft’s data centers. Aside from those major players, which we will call the “hyperscalers”, many other companies run their own data centers or rent space from a colocation center to house their server racks.

Most of the hyperscalers have made massive strides to get a “carbon neutral” footprint for their data centers. Google, Amazon, and Microsoft

So how good
are the major
cloud providers
at being
“green”?



Good News: Google Cloud and Azure are pretty sustainable (100% offset)

Bad News: AWS are not (50% “in 2018”)

Data centre ethics whitepaper 2018 updated 2020

bit.ly/2024wp

Cloud	Rating	Sustainable Servers?
Google	A-	100% with offsets today, with commitment to 'real time matching' (i.e. no carbon release)
Azure	A-	100% with offsets and energy certificates today, with commitment to be carbon negative by 2030
AWS	C-	100% with offsets only in four public regions today, elsewhere unknown with estimates in the less than 30-50% range. New commitment to carbon neutrality by 2030 and carbon zero (no carbon release) by 2040. The rating here would be higher but for the continuing lack of transparency on energy usage.
Oracle	C-	100% with offsets in a few regions <30% overall
IBM	C-	~50% overall
Alibaba	D-	Unknown but China a major market, and not known what energy is purchased

Microsoft will be carbon negative by 2030

Jan 16, 2020 | Brad Smith - President



<https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/>

Jeff Bezos launches \$10 billion Bezos Earth Fund, kicking off his own effort to fight climate change

BY ALAN BOYLE on February 17, 2020 at 10:33 am



<https://www.geekwire.com/2020/jeff-bezos-launches-10b-earth-fund-support-efforts-address-climate-change/>

CLIMATE CHANGE

More Than 350 Employees Risk Their Jobs to Call Out Amazon's Climate Failures



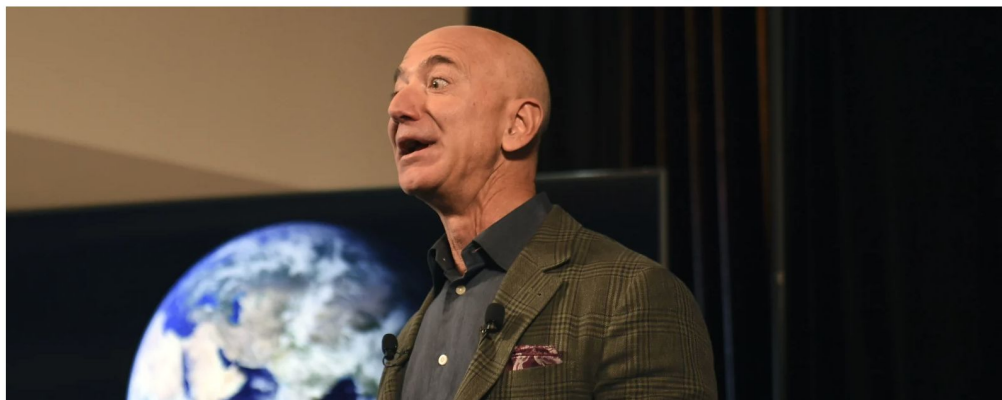
Brian Kahn

1/26/20 9:44PM • Filed to: AMAZON

20.5K

58

5



<https://earther.gizmodo.com/more-than-350-employees-risk-their-jobs-to-call-out-ama-1841243939>

FUEL THE FUTURE

DEVELOPERS → STORAGE → Build Platform

Production History → Production Data → Upward Features

REAL TIME DATA → Amazon Elastic MapReduce + Amazon ElastiCache → Running On

AMAZON S3

AMAZON EC2

AWS POLARDB

POTENTIAL FAULT DETECTED

FLOW EFFICIENCY 6.2% ↑

MAX PRESSURE 1200 psi ↓

Millions of customers choose the cloud with the most functionality, innovation, and experience.

aws is how

www.BuildOn.aws

JCDecaux

Amazon are in the Top 200

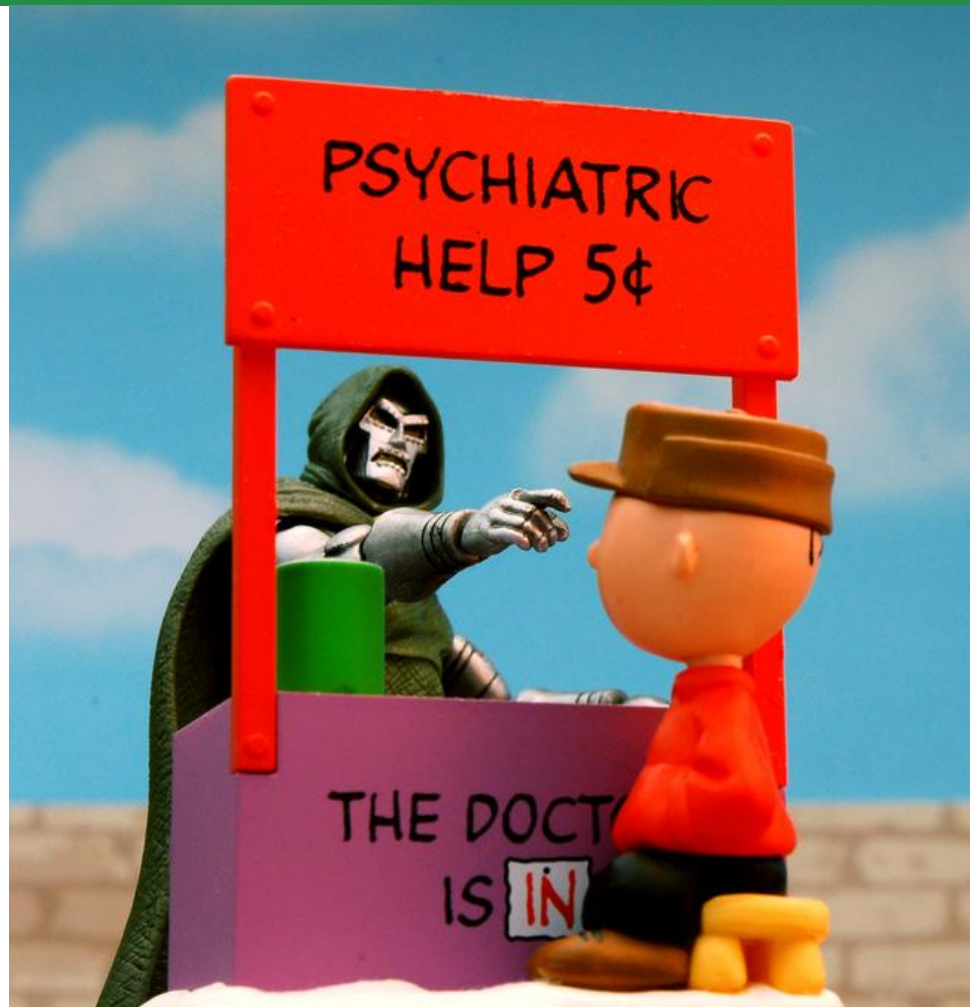


emitters of GHG worldwide

Greenwash!?



Tech has some
real problems it
needs to solve



Offsets

(make all the bad climate stuff magically disappear right?)

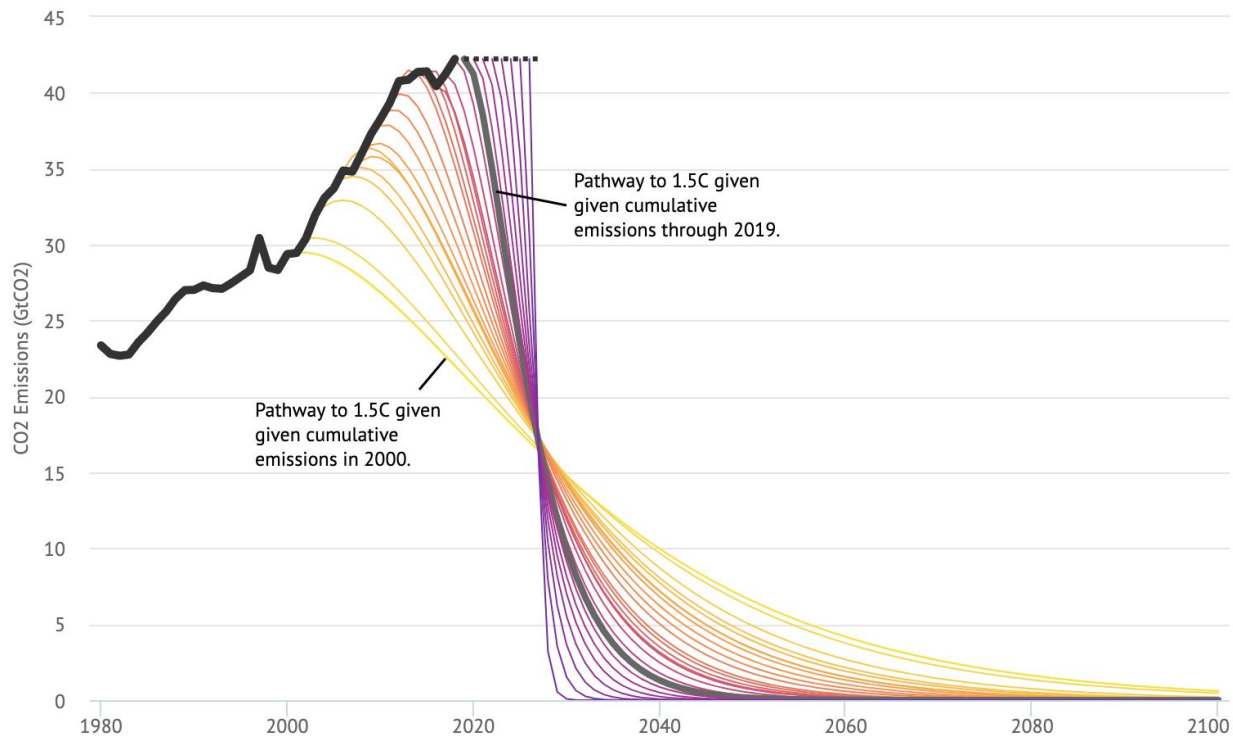


We have a global “Carbon Budget” and we
have to

REDUCE EMISSIONS BY A LOT

And almost certainly take Carbon out of
the atmosphere too

Limiting warming to 1.5C is increasingly difficult without large-scale negative emissions



Offsets are a
leaky planetary
patch

while we try to
come up with a
permanent fix



So... what can



do?



More “extreme weather” events...

Big companies being “green” ...


“Cloud” and Carbon Budgets...

This is all going to
“change the landscape”

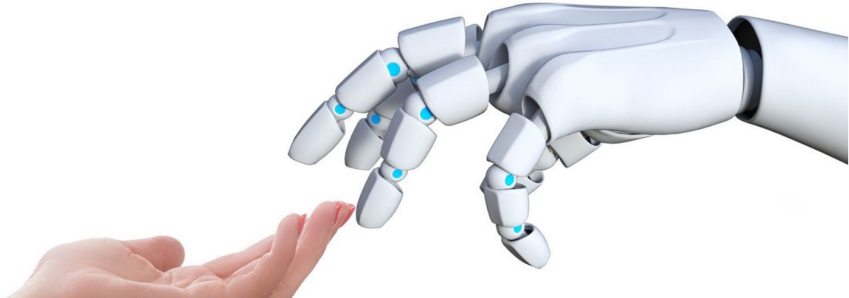
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To fix Climate Change, stop being a techie and start being a human

 Paul Johnston [Follow](#)
Aug 29, 2019 · 11 min read

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medium.com/PaulDJohnston

Waste Hierarchy



Waste Hierarchy

Don't build it!

**Most
Important**



Reduce

Reuse

Recycle



**Least
Important**

Sources of emissions*

Electricity 25%

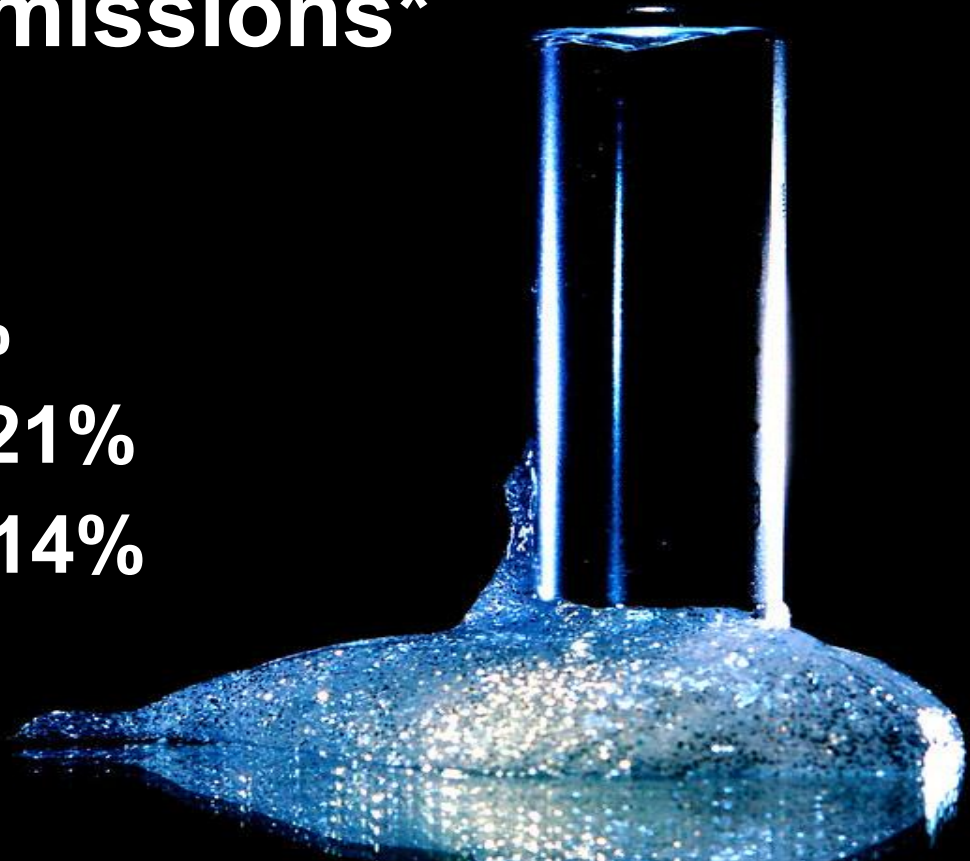
Agriculture 24%

Manufacturing 21%

Transportation 14%

Buildings 6%

*approximately



Sources of emissions*

Electricity 25%

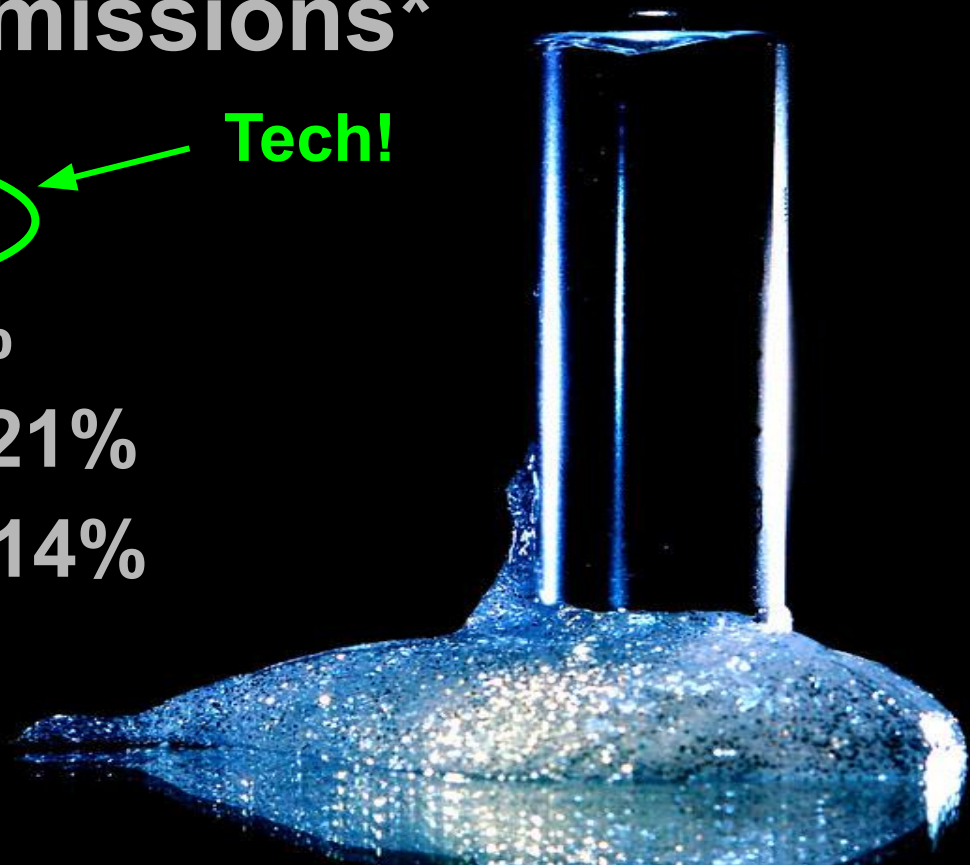
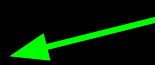
Agriculture 24%

Manufacturing 21%

Transportation 14%

Buildings 6%

Tech!



*approximately

More “extreme weather” events...

Big companies being “green” ...

“Cloud” and Carbon Budgets...

This is all going to
“change the landscape”

So what useful tools are there?

Wardley Maps

A useful strategy
tool

Free book online



Sign in

Get started

wardleymaps

CHAPTER ONE (START HERE)

On being lost

Chapter 1



swardley [Follow](#)

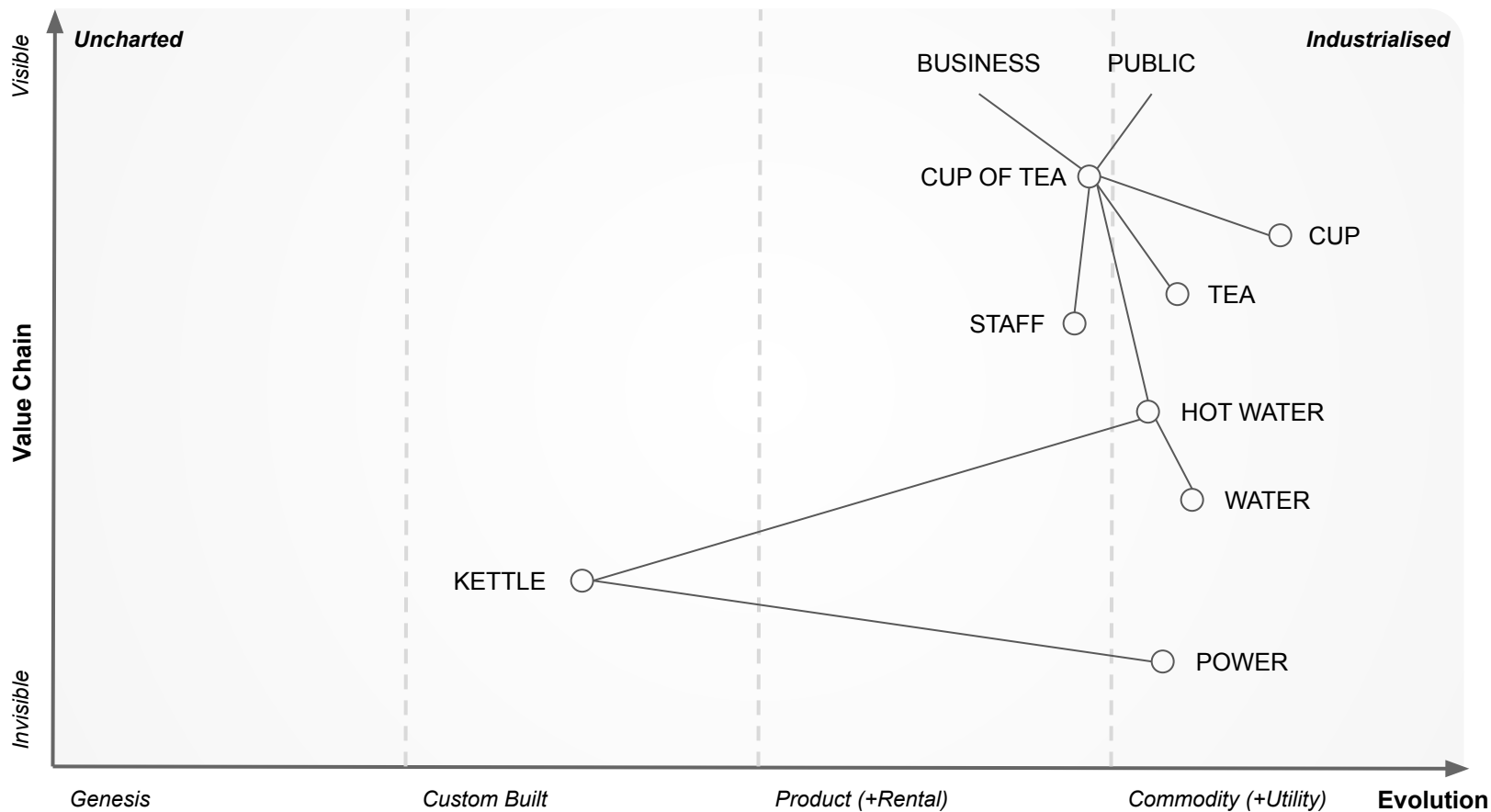
Aug 8, 2016 · 28 min read

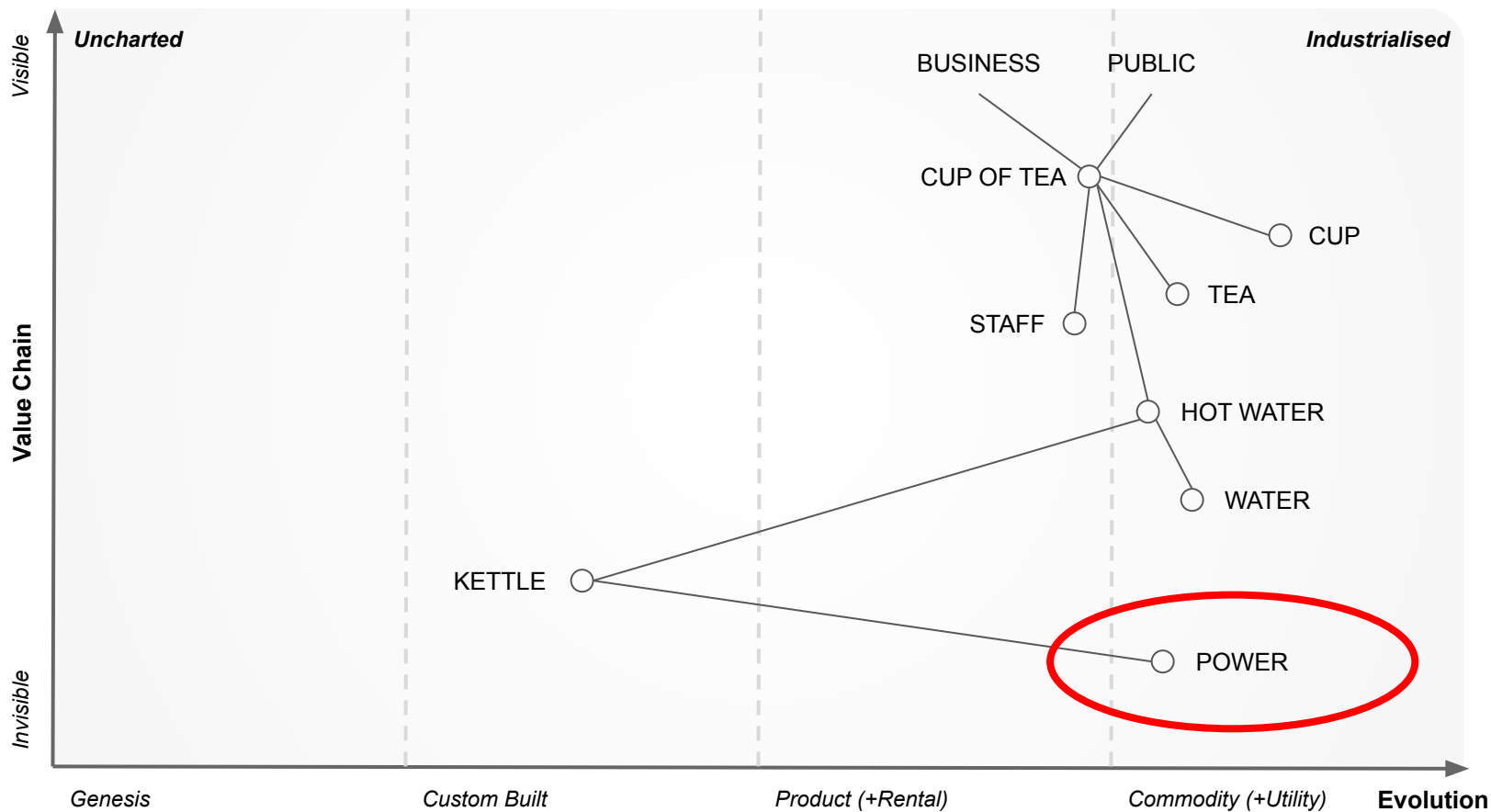


This is the story of my journey, from a bumbling and confused CEO lost in the headlights of change to having a vague idea of what I was doing. I say vague because I'm not going to make grand claims to the techniques that I discuss in this book. It is enough to say that I have found them useful over the last decade whether in finding opportunity, removing waste, helping to organise a team of people or determining the strategy for a company. Will they help you? That depends upon the context that you're operating in but since the techniques don't take long to learn then I'll leave it up to the

medium.com/wardleymaps

Let's have a nice "Cup of Tea"
and think about this...



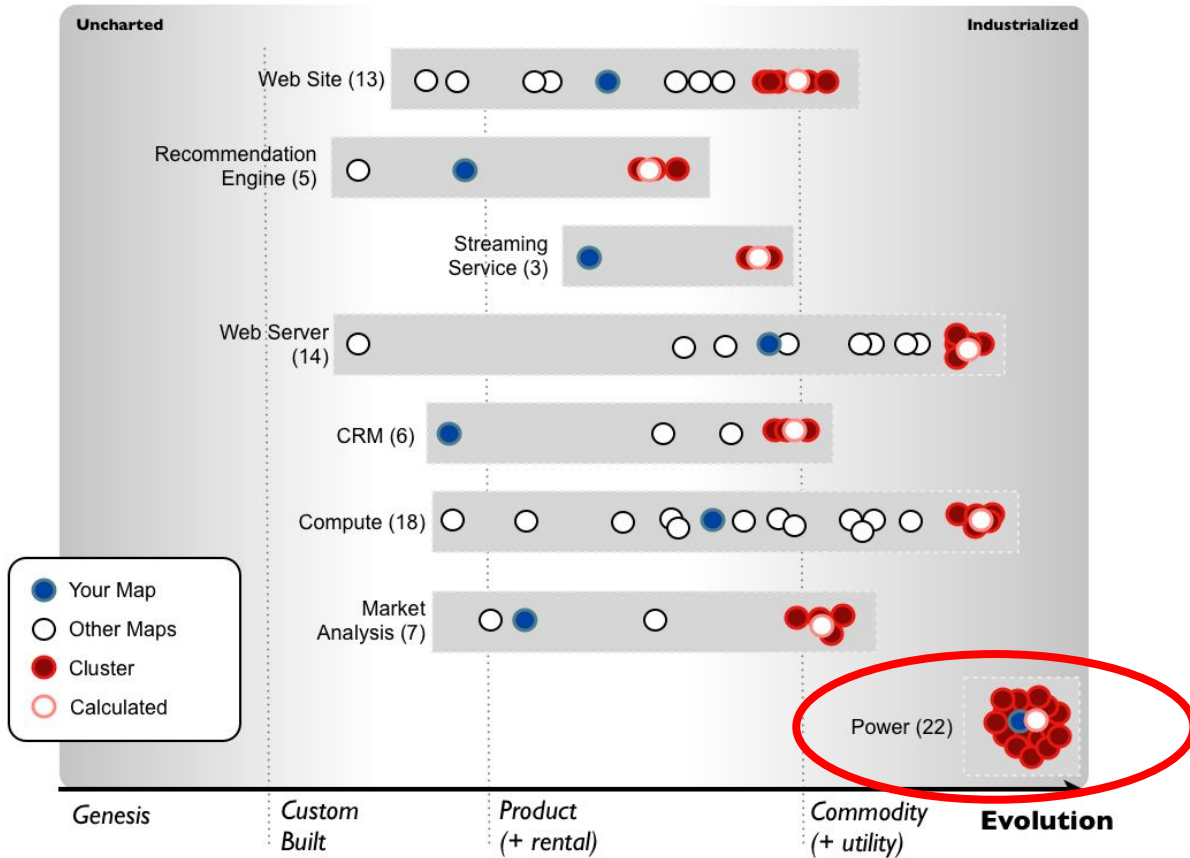


Note: Emissions are highly abstracted in a
mature oil-based economy

“Decoupling”

The term decoupling refers to breaking the link between “environmental bads” and “economic goods.” Decoupling environmental pressures from economic growth is one of the main objectives of the OECD Environmental Strategy for the First Decade of the 21st Century, adopted by OECD Environment Ministers in 2001.

<http://www.oecd.org/environment/indicators-modelling-outlooks/1933638.pdf>



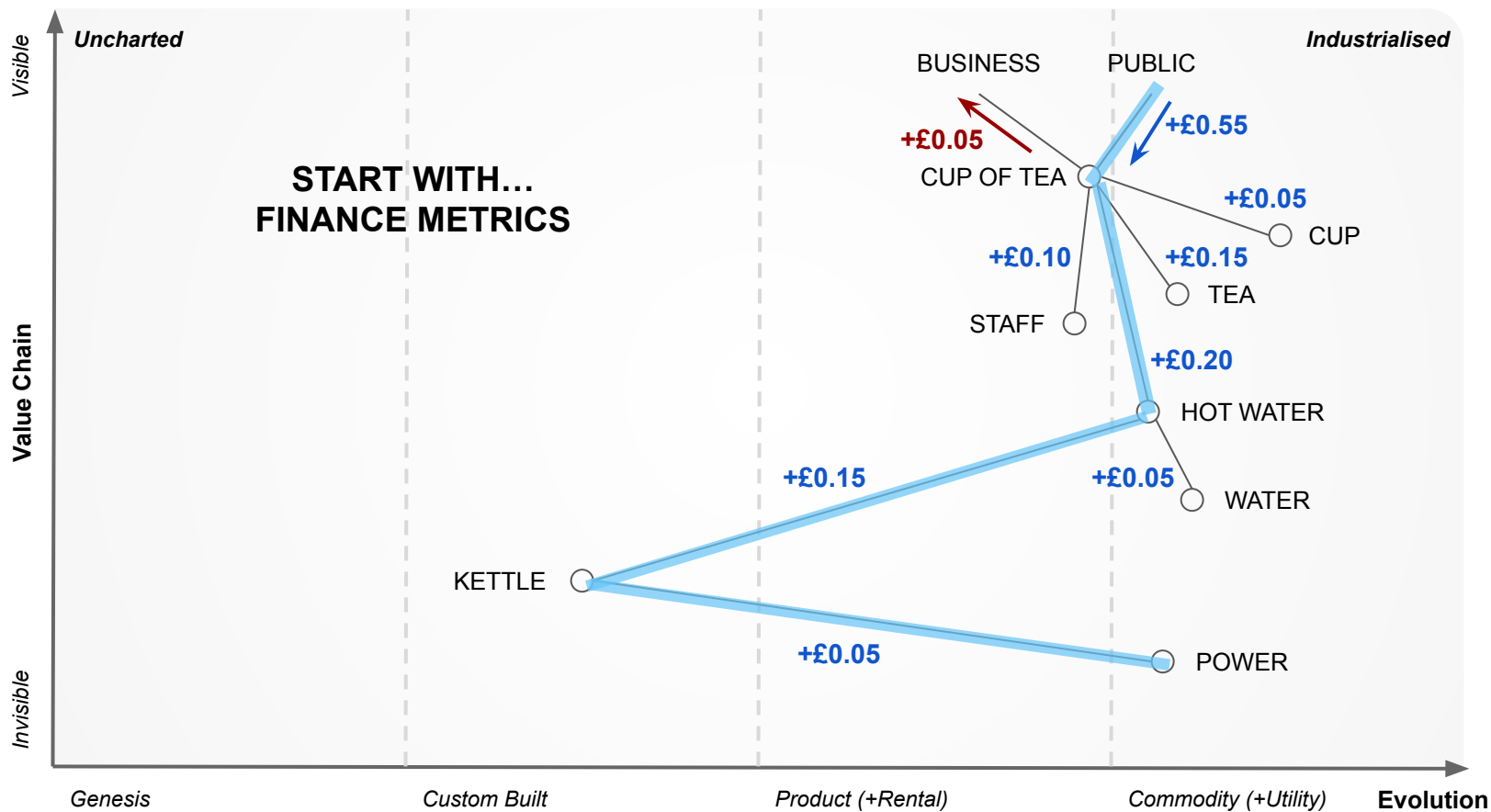
Highly commodified

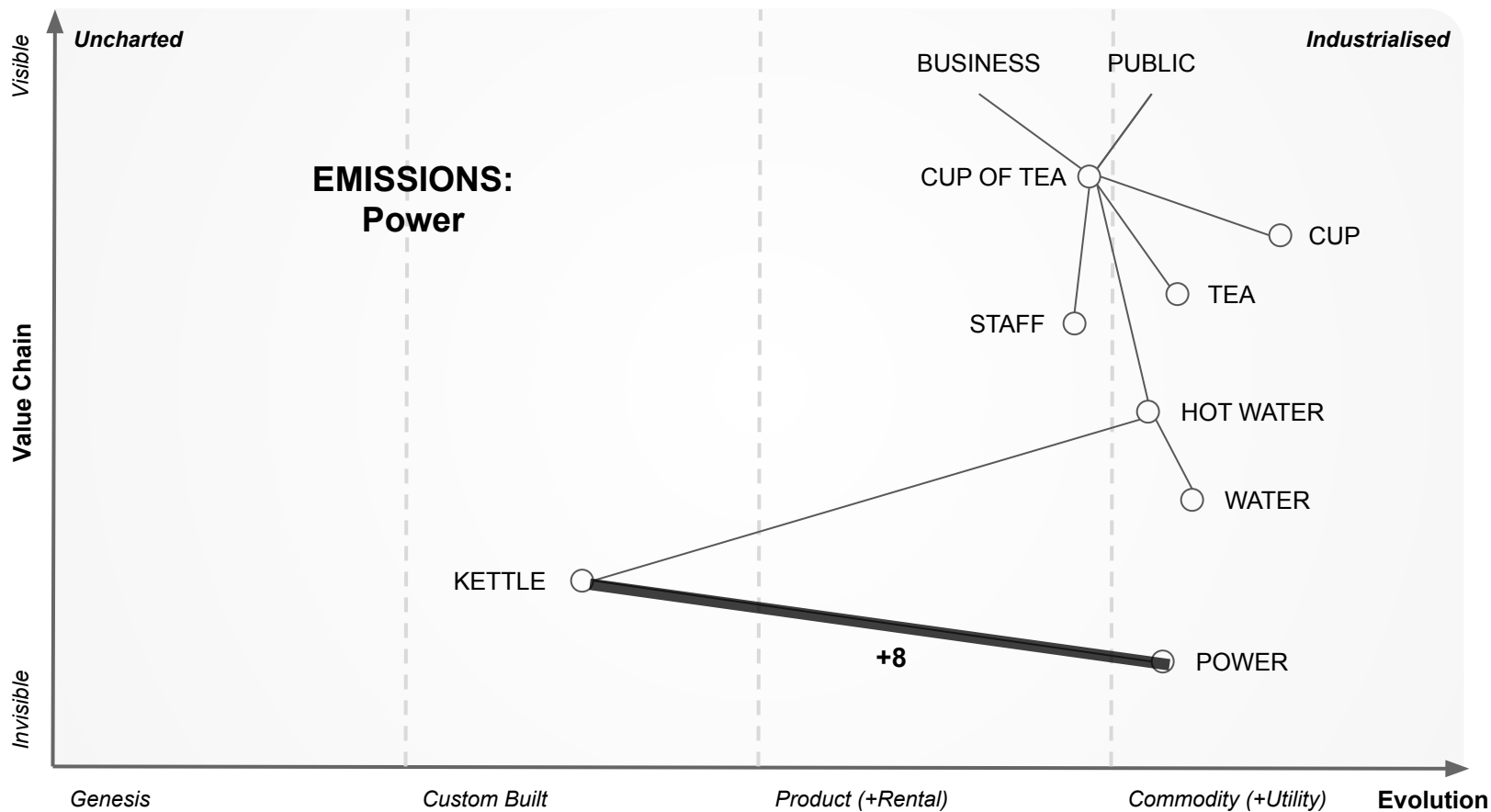
Low perceived value

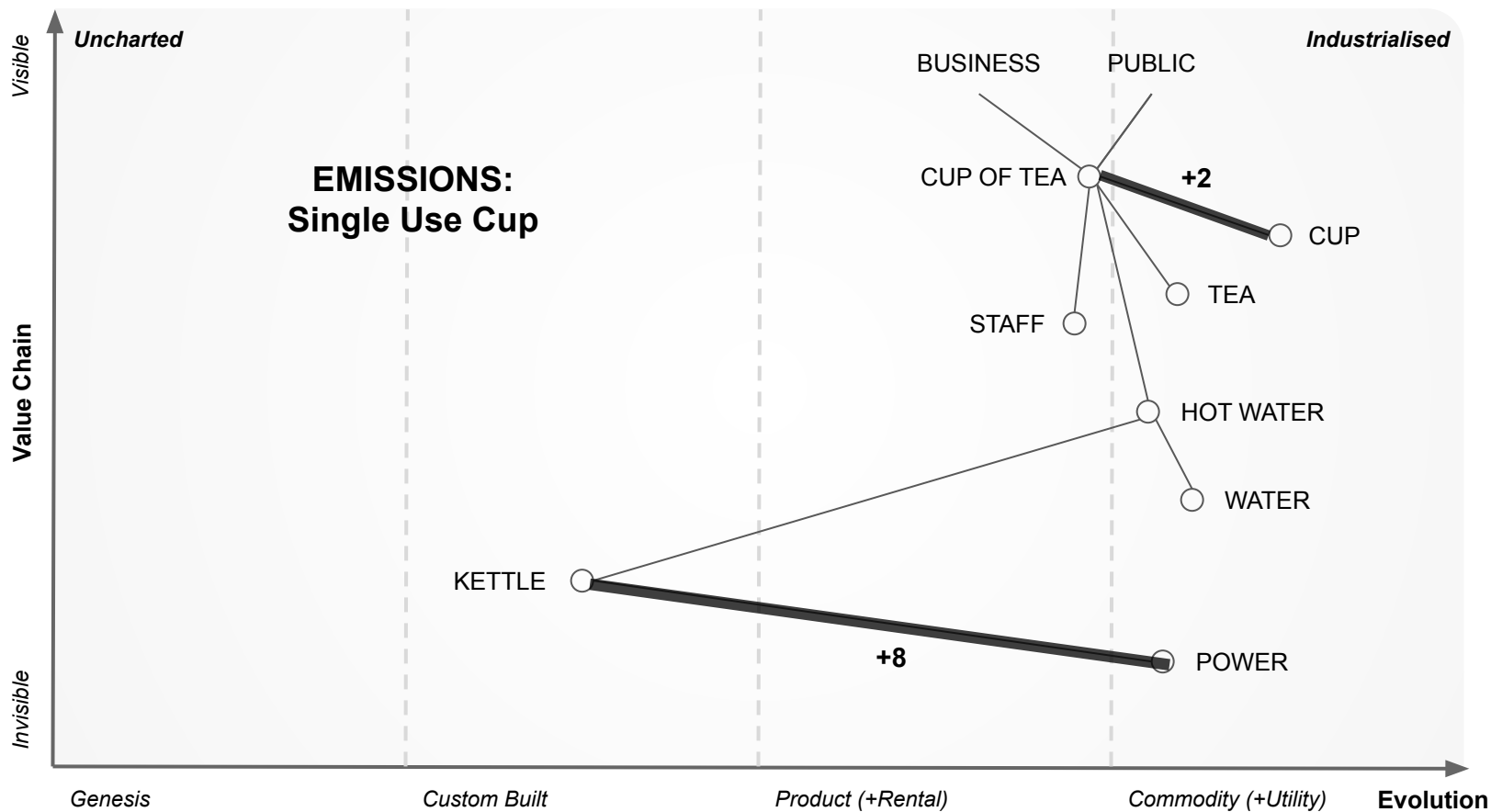
Hard to displace

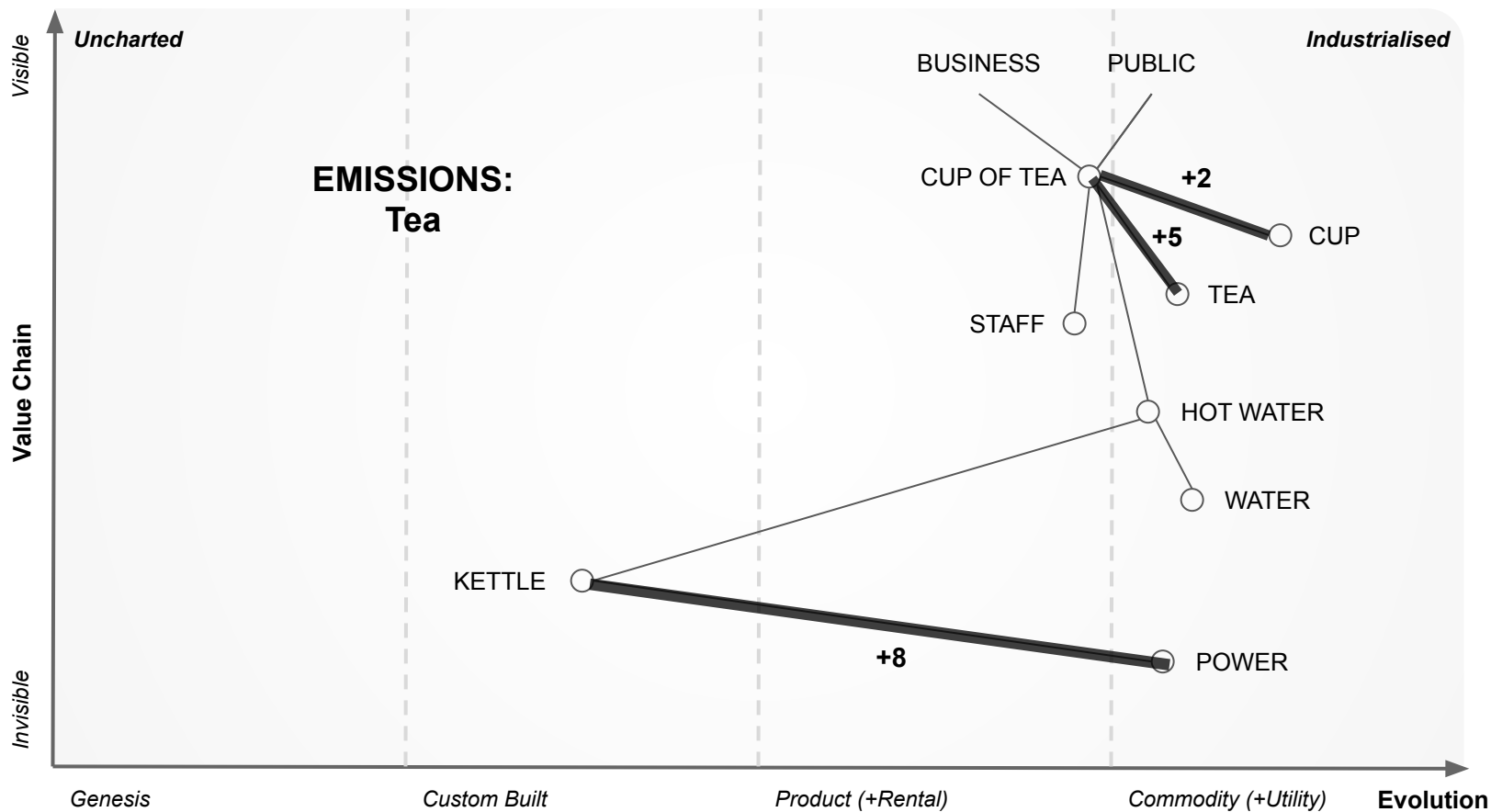


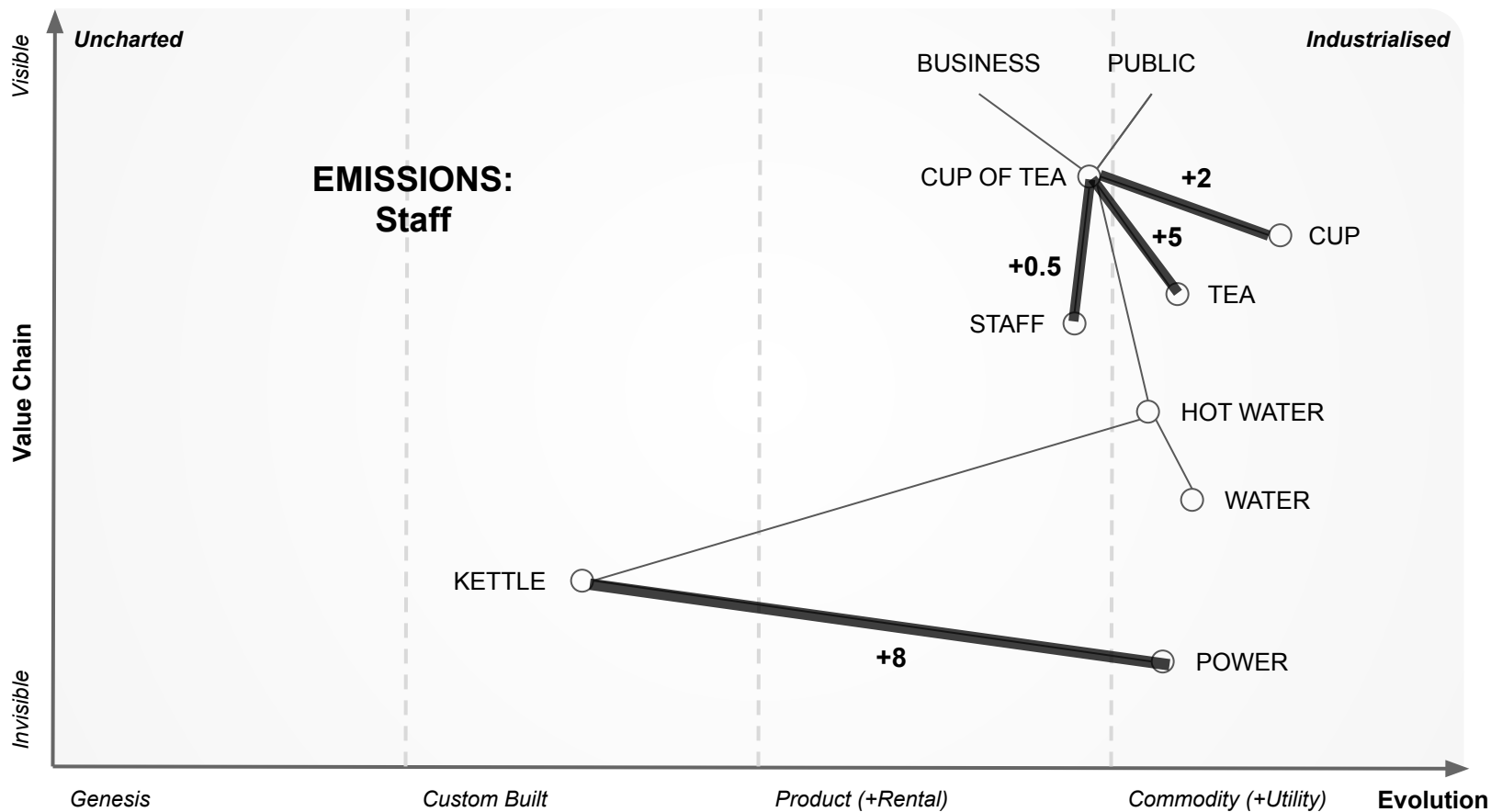
If emissions are “baked in”, can you do anything about it?

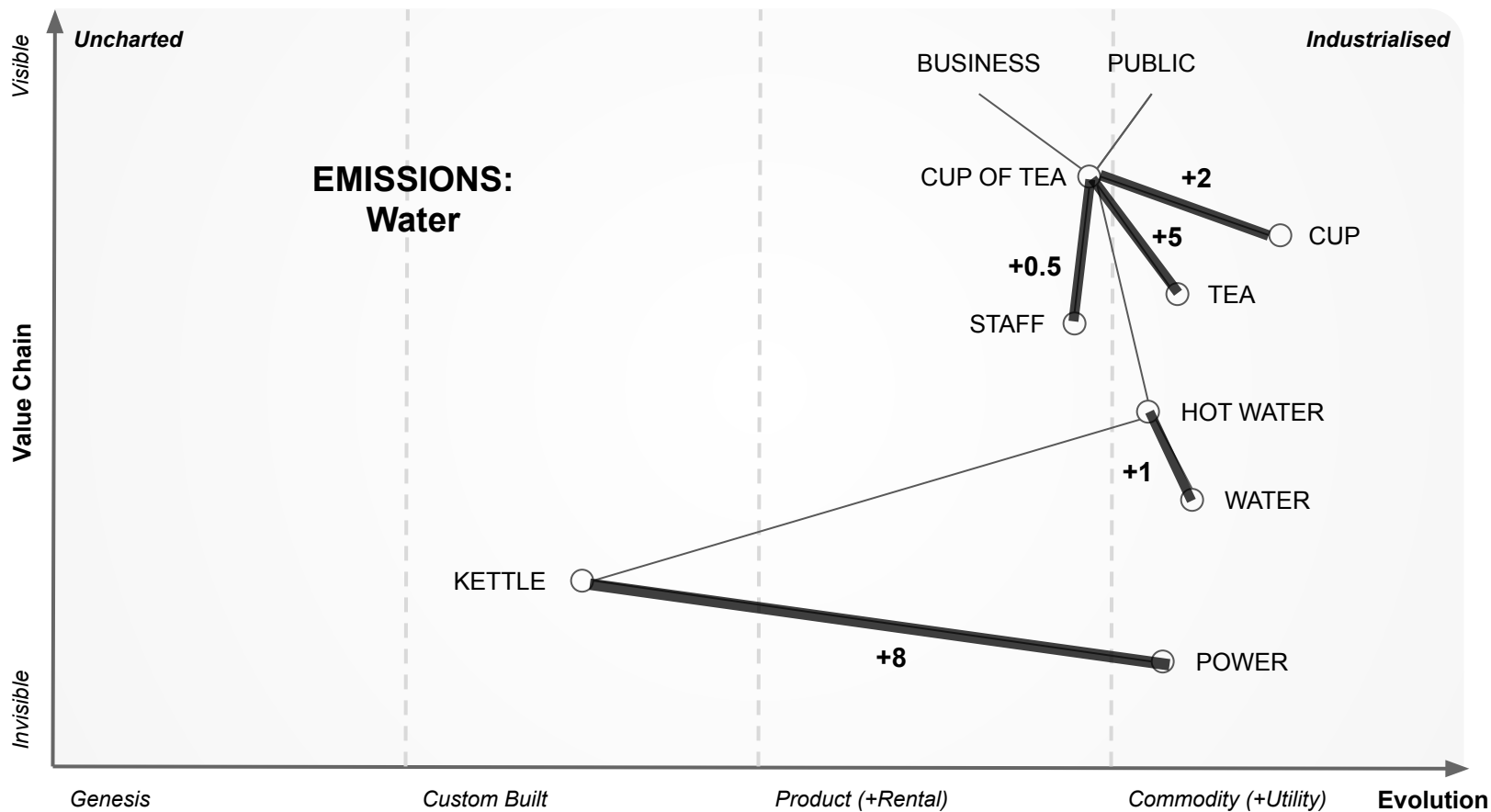


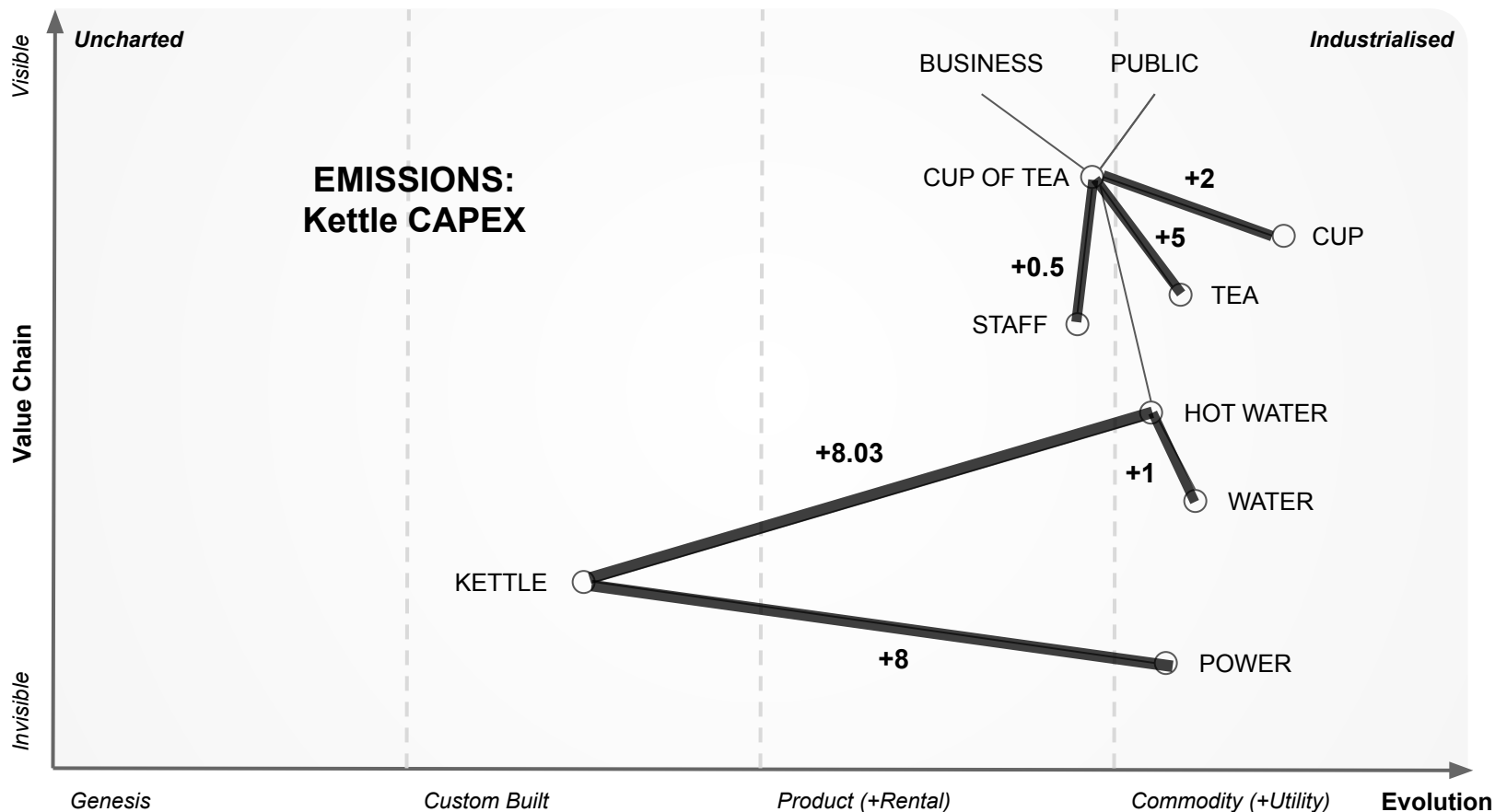


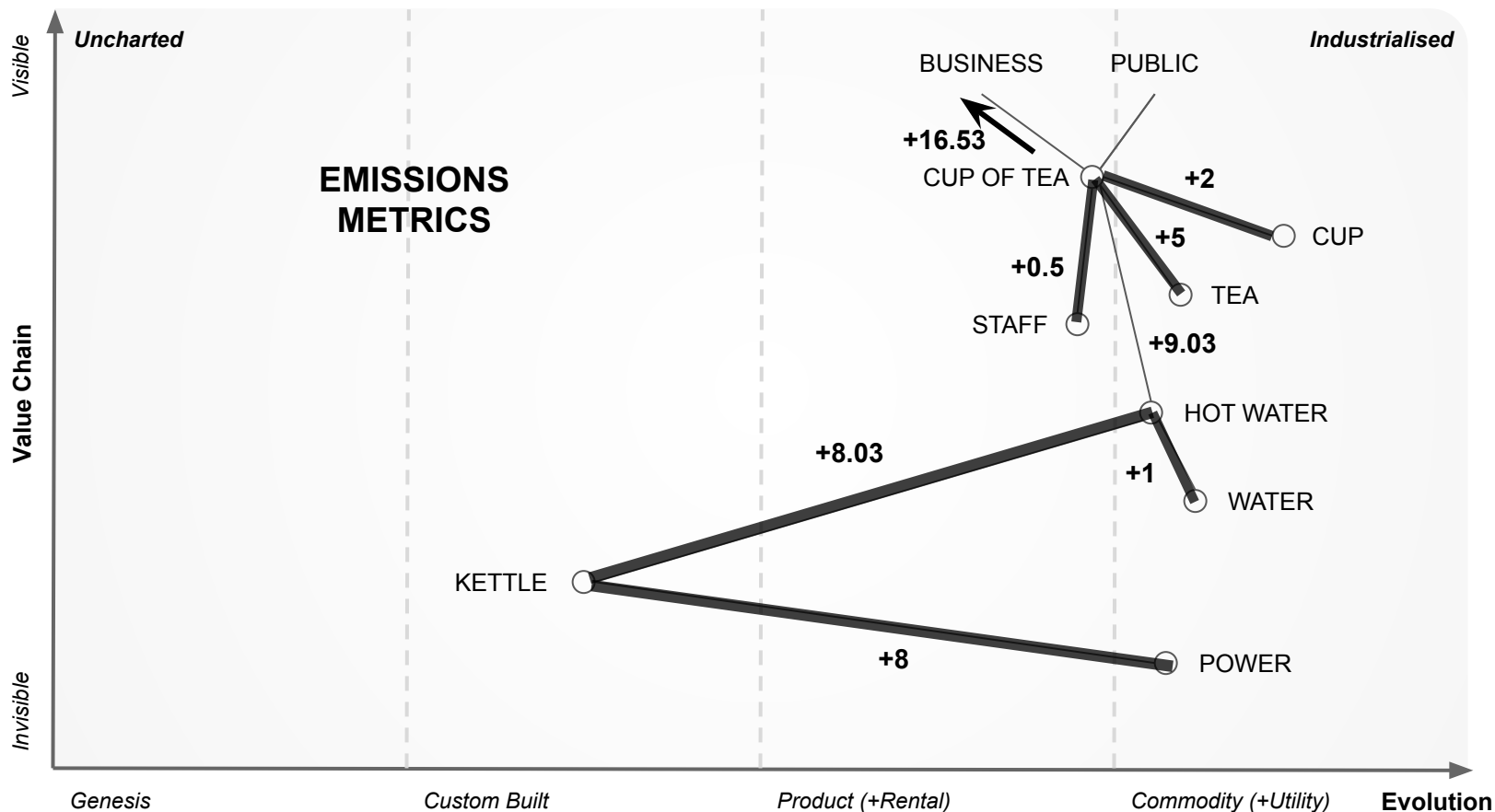


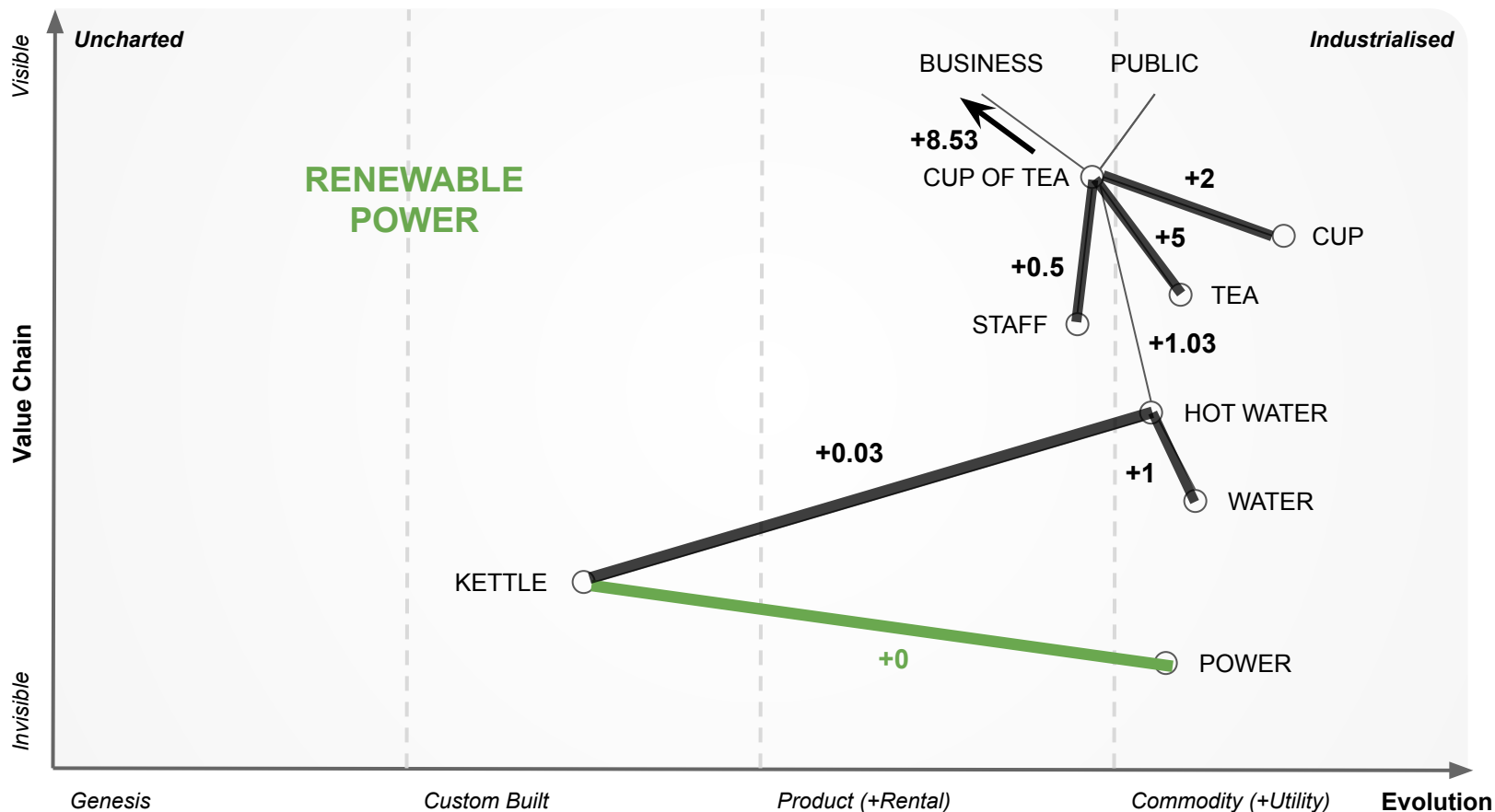


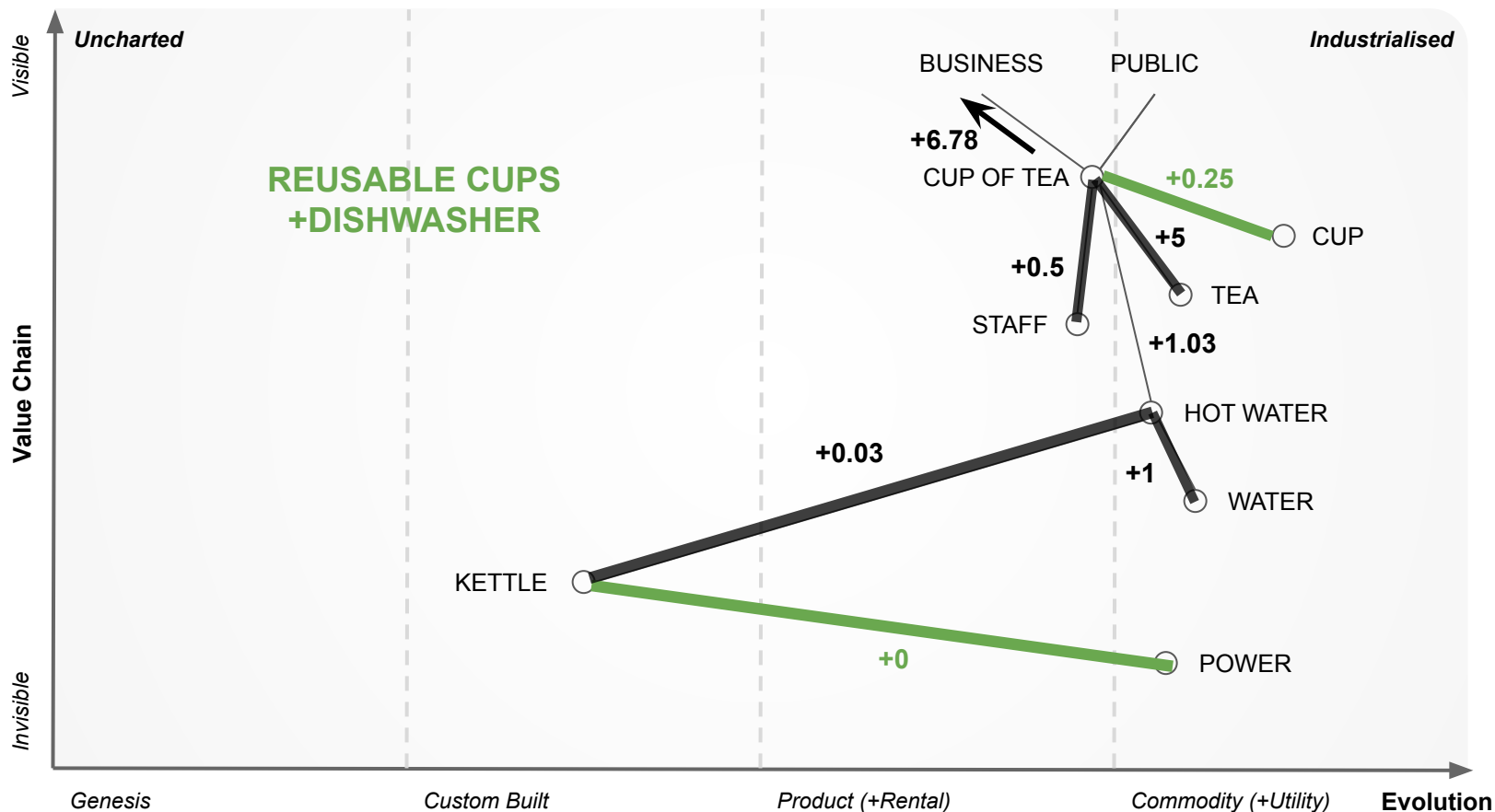


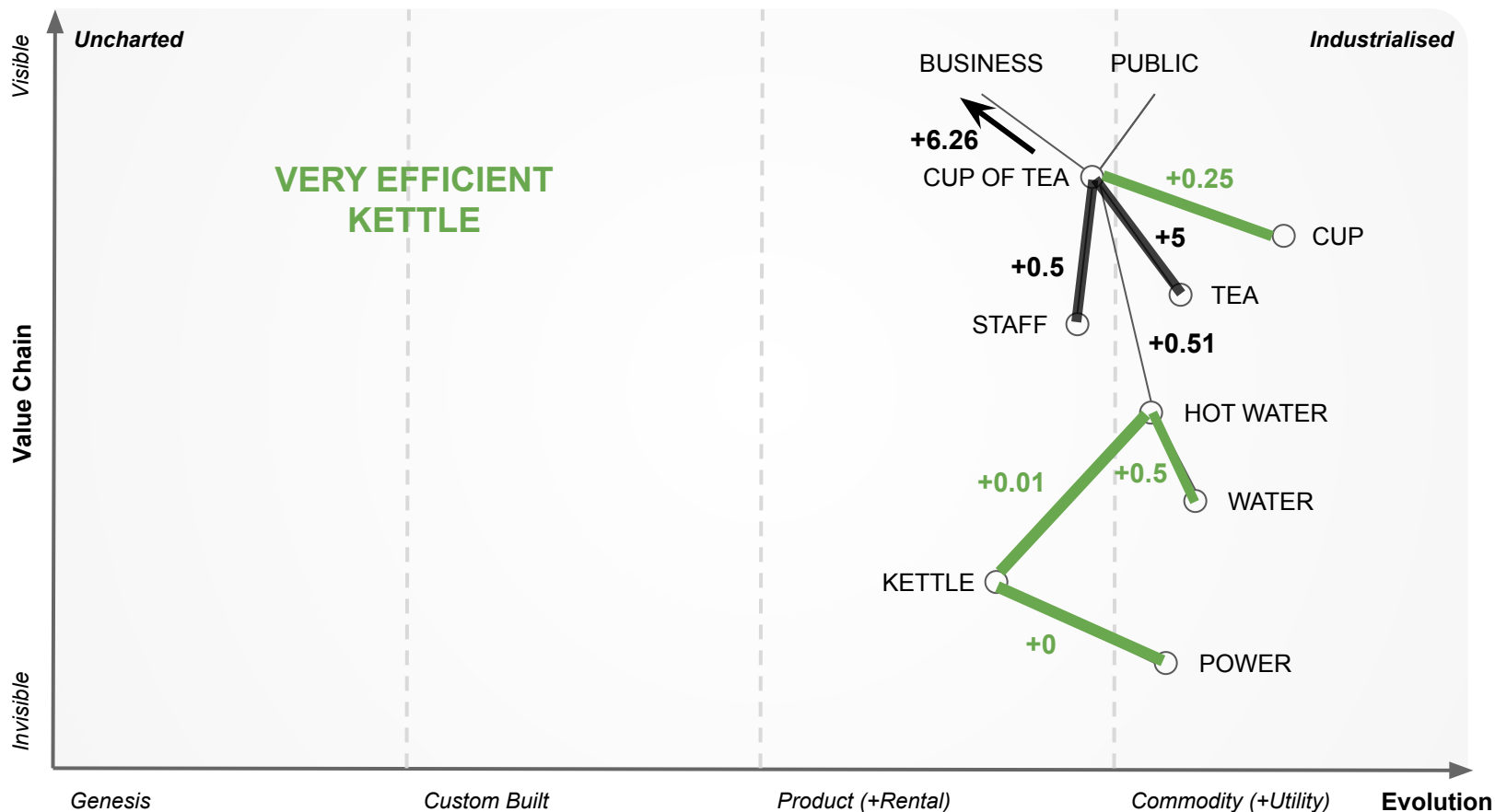


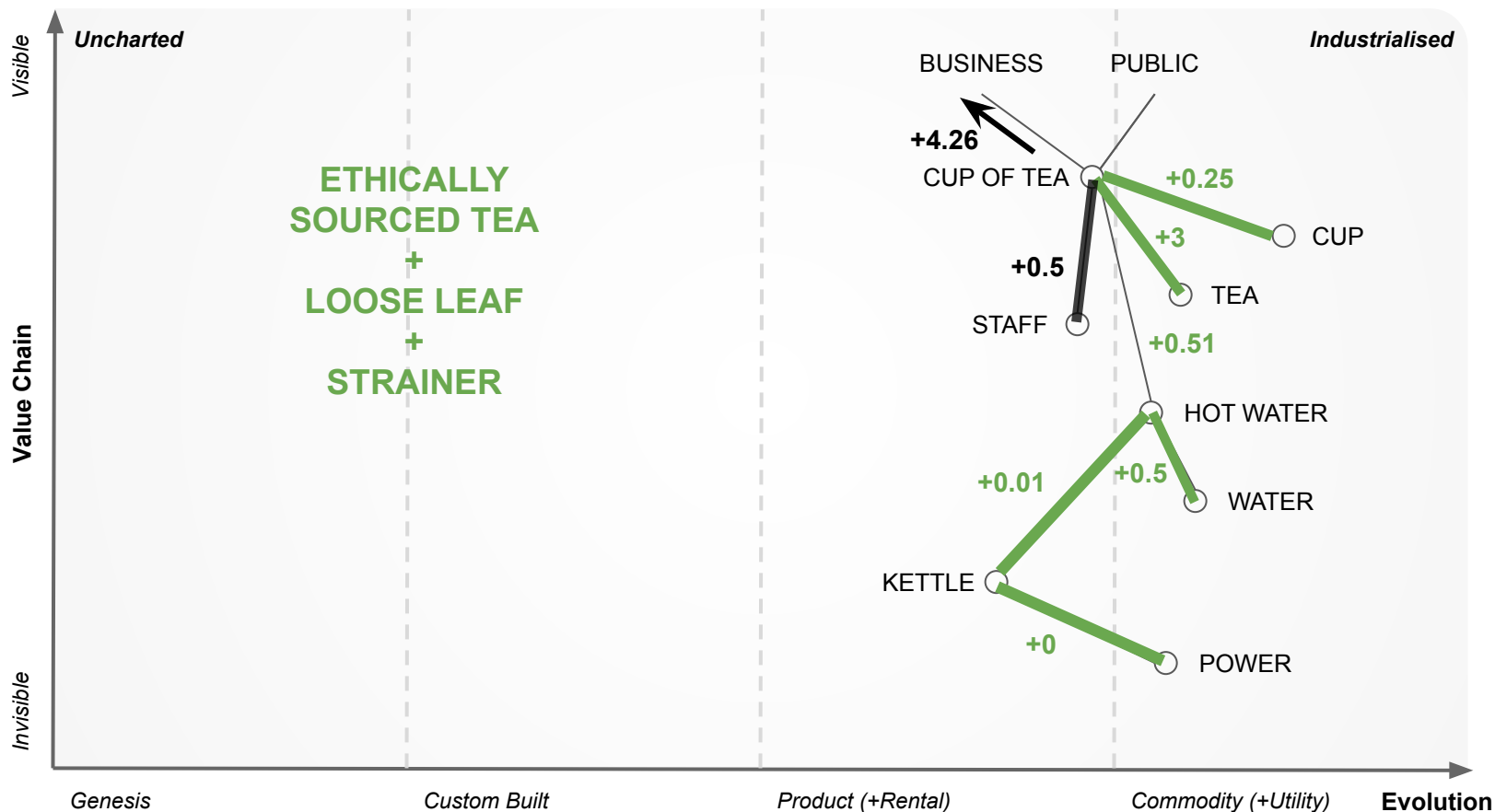


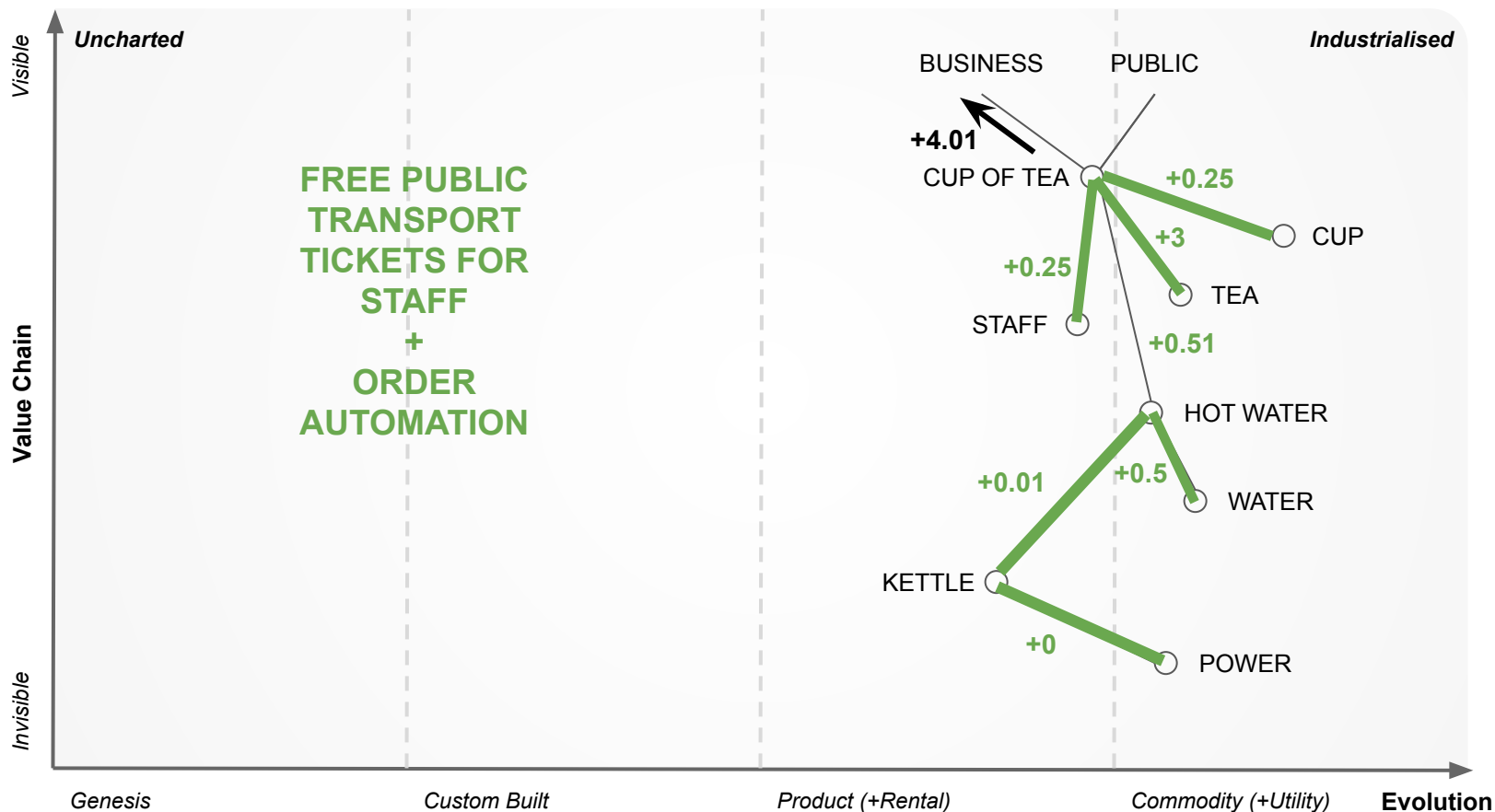


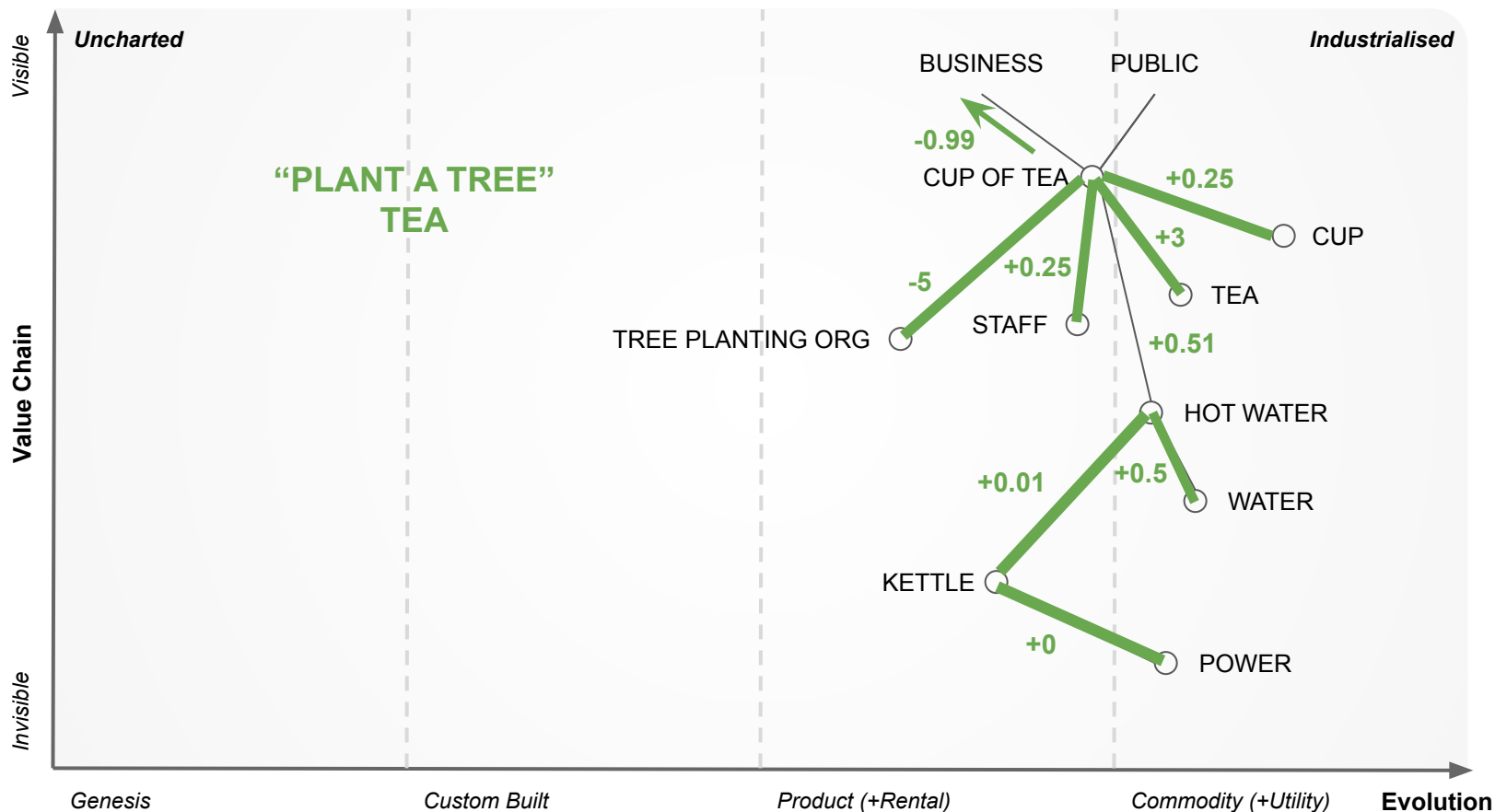


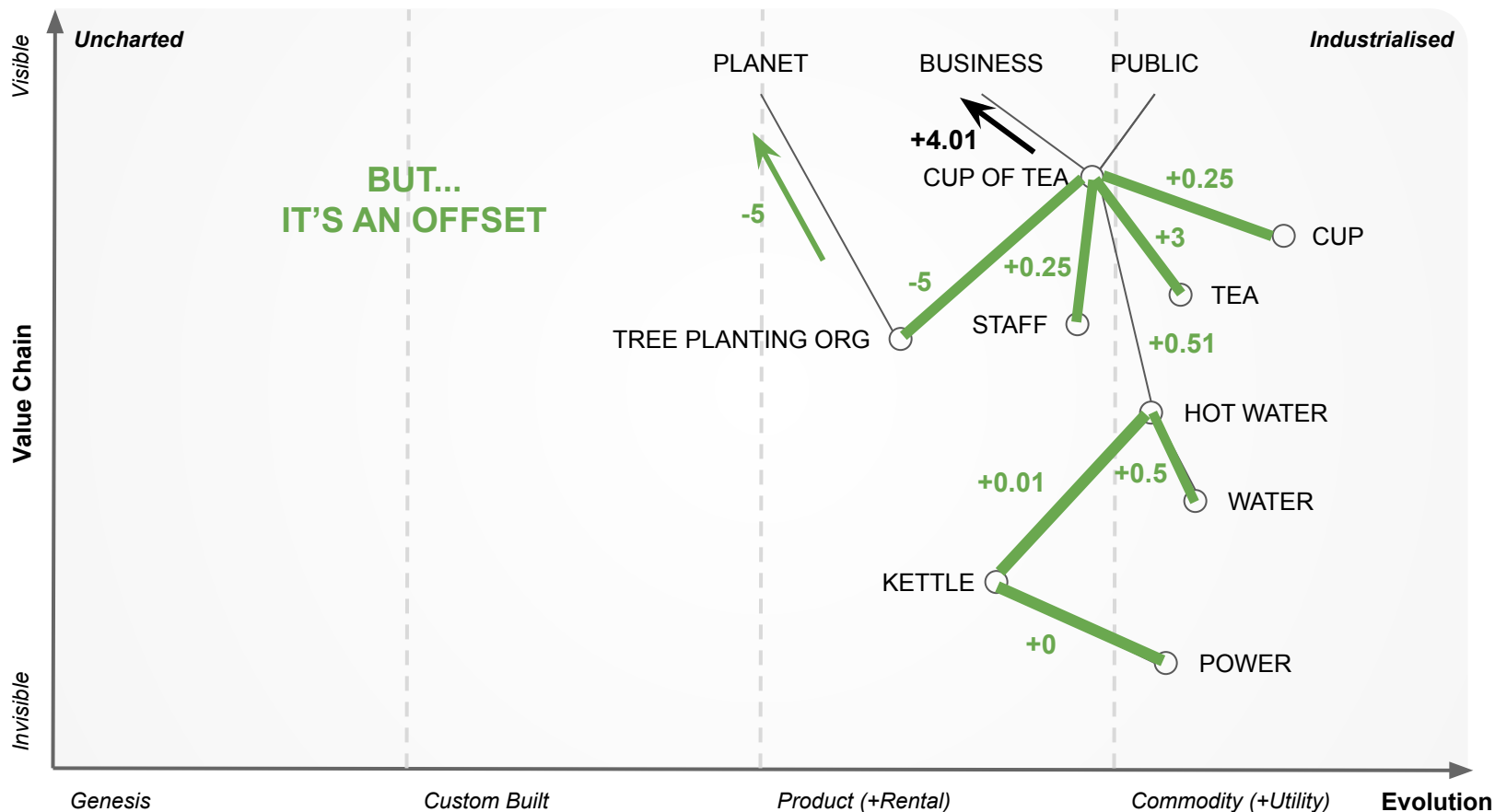


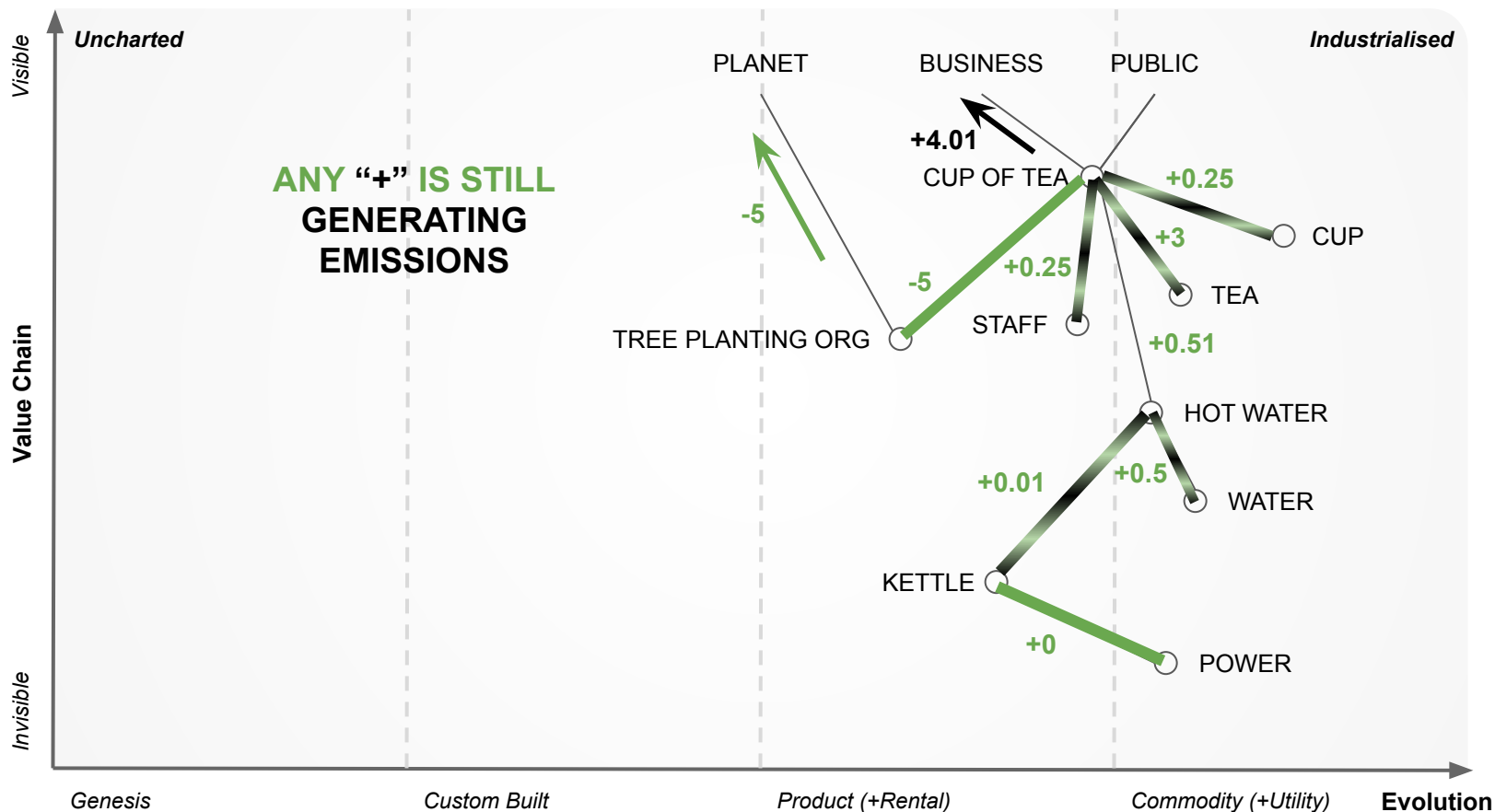


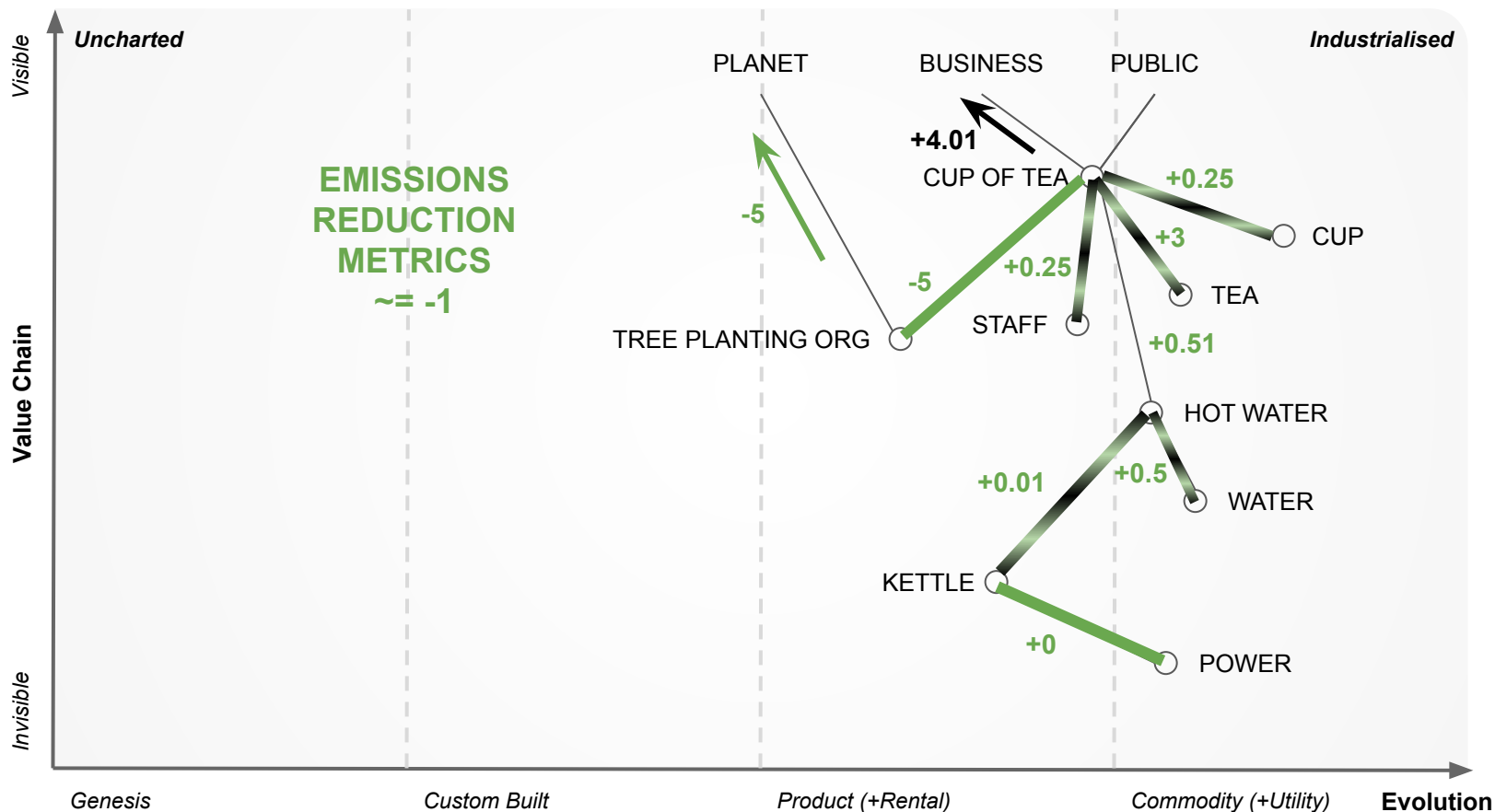


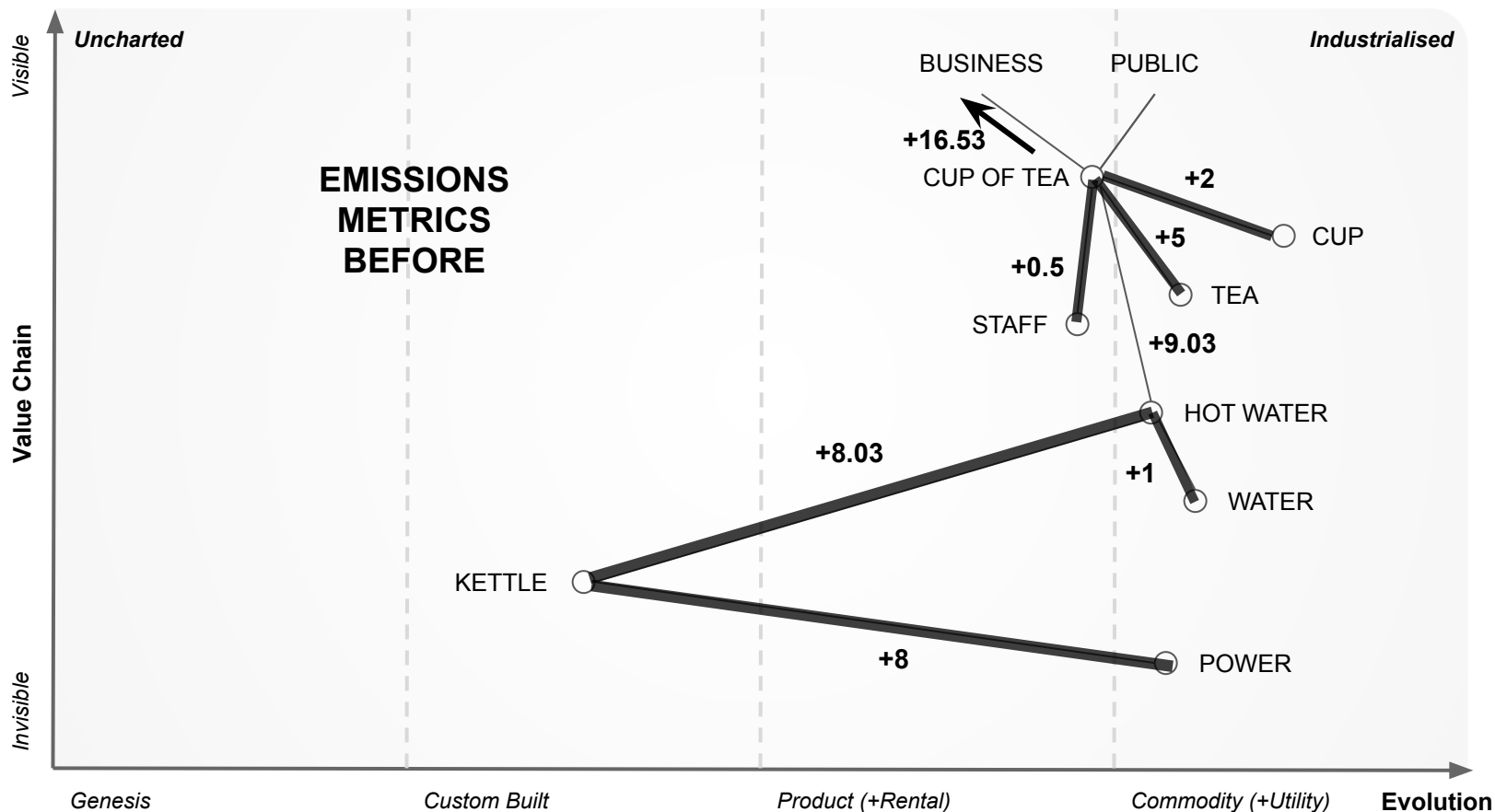


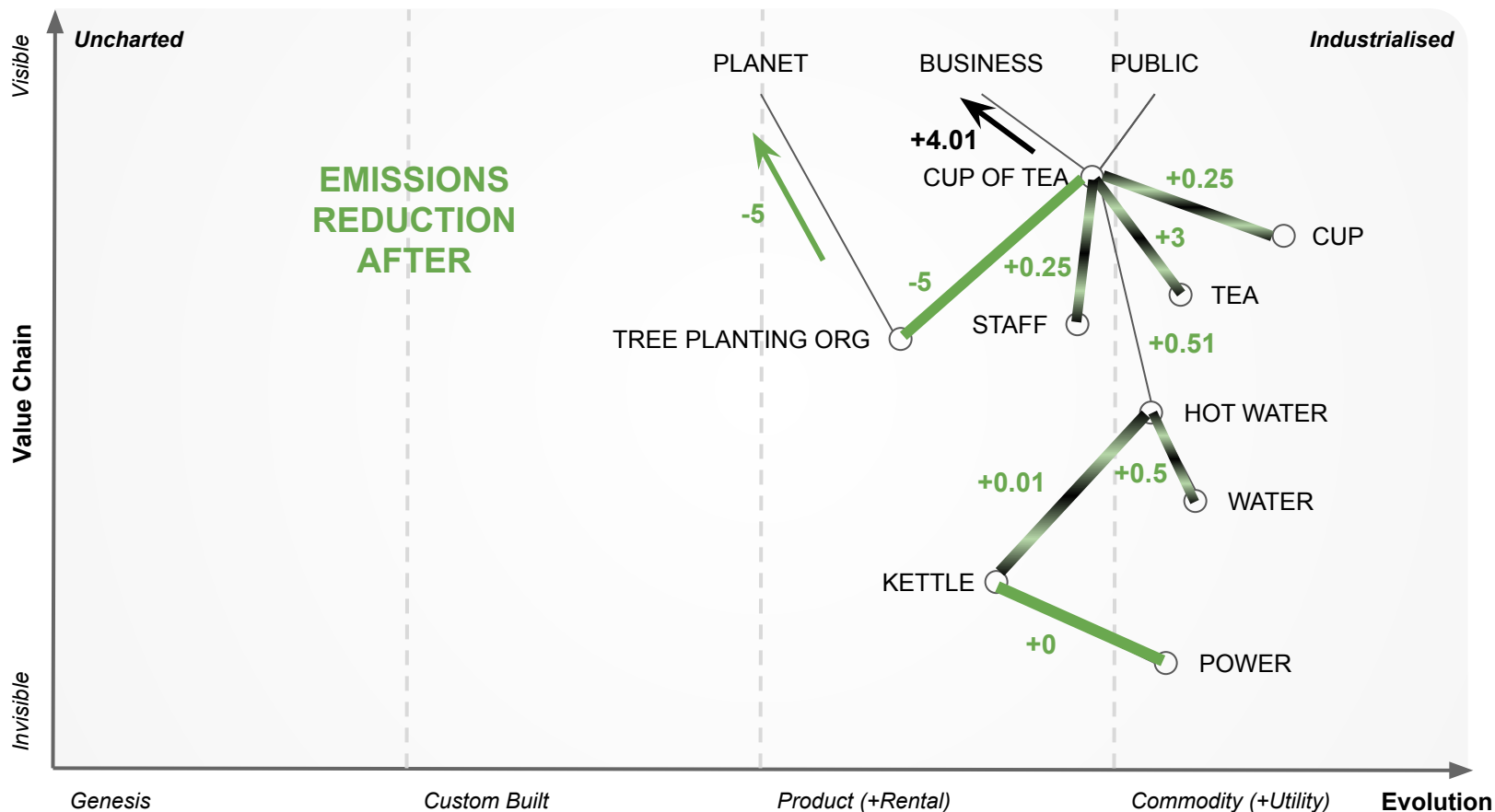










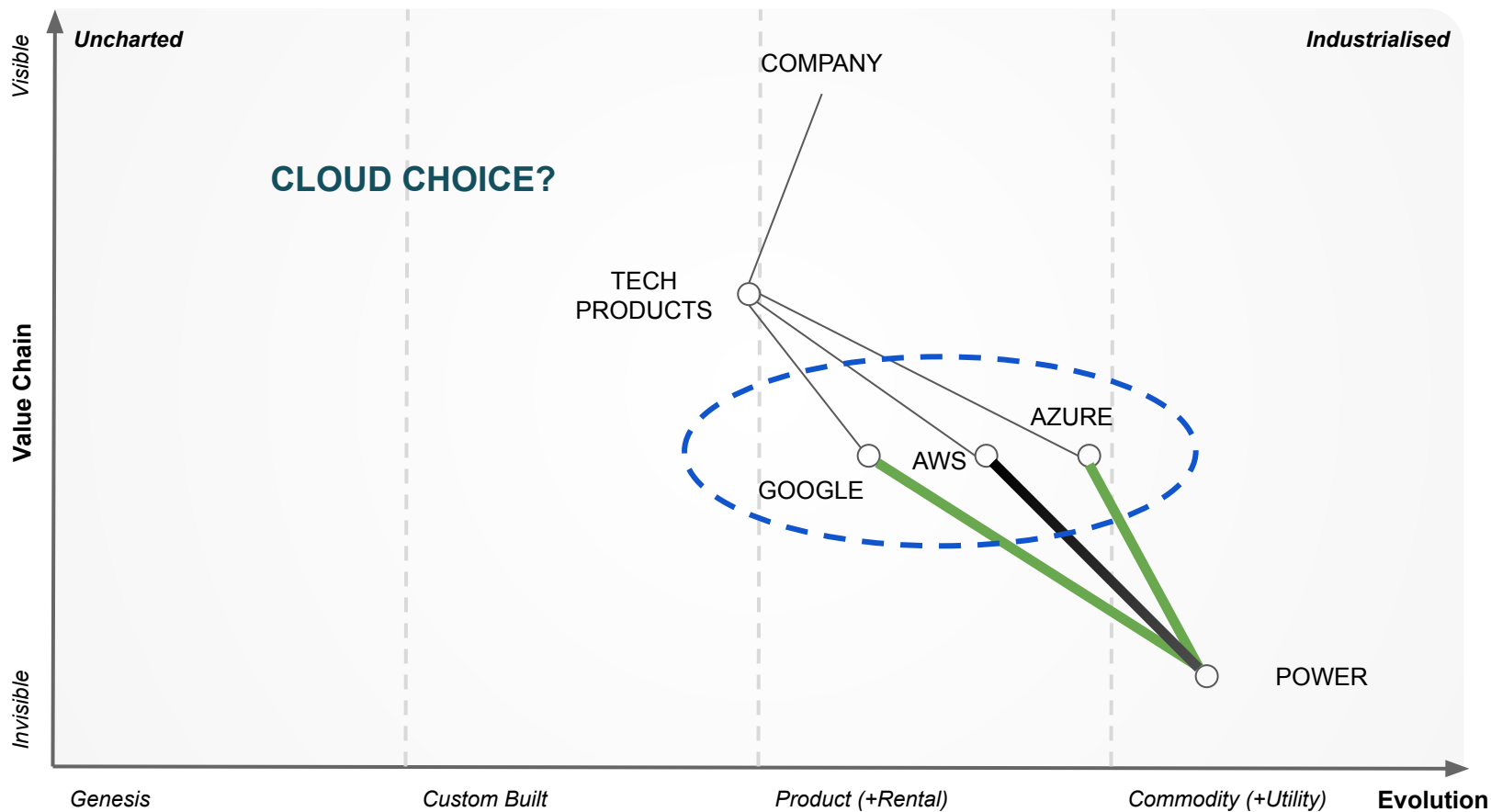


What about the real world?

(It's not all "cups of tea" is it!)

What about choosing a cloud provider?

(if all compute was equal... which it isn't in cloud... see “serverless”)



Maps are useful for identifying and mitigating emissions

Maps are never perfect (enemy of good) but are meant to start conversations

Downside: hard to report on your own
and your supply chain emissions

(the “Cup of tea” numbers are not real!)

AWS does not give you emissions so
you can't even offset

In 2017, Stripe became a carbon-neutral company

Though Stripe doesn't make a physical product—our API powers online commerce for millions of businesses around the world—our operations still contribute to global climate change. So, we decided to take action by measuring our greenhouse gas footprint and purchasing enough carbon offsets to reach net-zero emissions.

We began 2017 at an estimated 18,000 metric tonnes of emissions. The GHG Protocol Corporate Standard assesses greenhouse gas emissions on three dimensions. Stripe estimated all three emission scopes, in tonnes of carbon dioxide equivalent (TCO2E), to determine the magnitude of our impact.

[Stripe's climate reporting page, from 2018](#)

SCOPE 1 DIRECT GHG

Emissions from sources owned or controlled by Stripe, e.g. natural gas burned to heat our buildings.

320
TCO2E

SCOPE 2 INDIRECT GHG

Emissions from purchased energy sources, e.g. the electricity we buy from utility companies.

880
TCO2E

SCOPE 3 OTHER INDIRECT GHG

Emissions from operations that are not directly owned or controlled by Stripe. This includes many sources, but we've chosen to focus on servers, employee commuting, and business travel.

16800
TCO2E

But what about
my code and
systems?



Most climate
friendly tech
solution?
No tech at all

(reduce - reuse - recycle)



Turn off your
unused
instances
and servers

(reduce - reuse - recycle)



Stop building
“climate apps” and
worrying about
“code efficiency”
(unless it’s terrible)

(reduce - reuse - recycle)



Code like it's
1985!

Constraints are
not bad

(reduce - reuse - recycle)



Go serverless

(reduce - reuse - recycle)



Sustainability metrics

Do you know how much
energy your project will use
over its lifecycle?

(reduce - reuse - recycle)



Emissions

Scope 1, 2 and 3

Limited data on emissions

Many sectors still estimating



But what about Business Continuity and Disaster Recovery?



Climate Change is
becoming one of the
most important risk
factors for the C-Level

But not for Disaster
Recovery
professionals



Most Disaster
Recovery is about
planning for
“exceptional” events

Climate Change is
changing
“exceptional”



As the O'Reilly scenario shows, it isn't just about extreme weather

What about impacts on employees and families?



Climate Risks are
much more than
simply future sea
level rise and heating

How resilient is your
organisation?



Wardley Mapping is
a really good tool for
seeing externalities
like Climate Change



The biggest climate risk is capital risk

See BlackRock



Most sustainability
professionals don't
"talk tech"

Go and be their
best friend



Ignoring the Climate Crisis isn't an option...

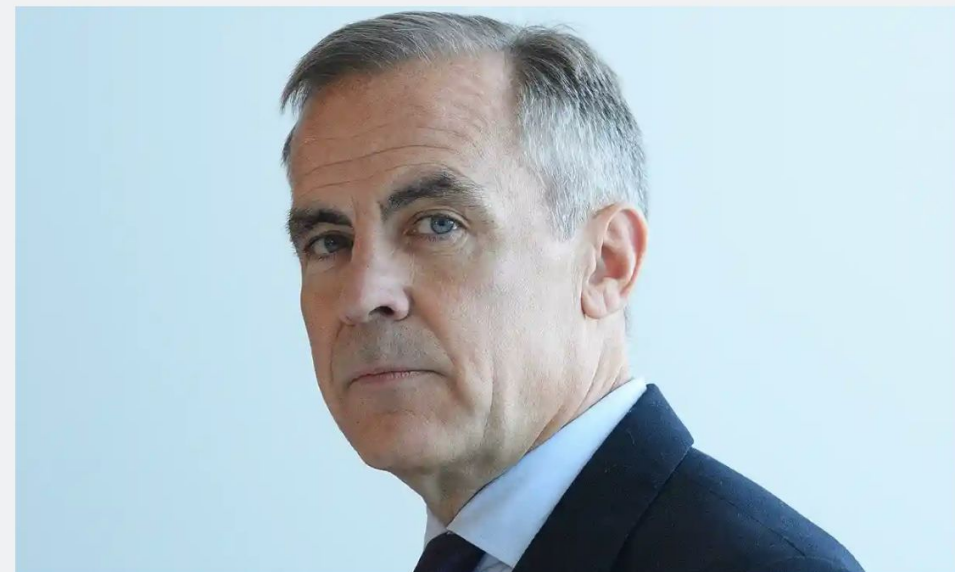
Link:

<https://www.theguardian.com/environment/2019/oct/13/firms-ignoring-climate-crisis-bankrupt-mark-carney-bank-england-governor>
or

Firms ignoring climate crisis will go bankrupt, says Mark Carney

Bank of England governor warns of financial collapse linked to climate emergency

- Top asset managers oversee \$300bn fossil fuel investments
- Why are asset managers investing in fossil fuel companies?



▲ Mark Carney, the Bank of England governor, has led efforts to address the dangers global heating poses to the financial sector. Photograph: Leon Neal/Getty Images

Companies and industries that are not moving towards zero-carbon

Climate Change
is changing our
world:

The new normal



Just because
we work in tech
doesn't make
us automatically
“good”



Get involved

Learn

It's going to take all of
us

<https://climateaction.tech/>





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