But at what cost? Electric Vehicles and Environmental Injustice

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Contents

Dr Robert Bullard

"Environmental justice embraces the principle that all people and communities have a right to equal protection and equal enforcement of environmental laws and regulations"

"Race and class still matter and map closely with pollution, unequal protection, and vulnerability. Today, zip code is still the most potent predictor of an individual's health and well-being"

https://drrobertbullard.com/learn-about-environmental-justice/

Dr Susan L Cutter

Equal access to a clean environment and equal protection from possible environmental harm irrespective of race, income, class, or other differentiating feature of socio-economic status

Example of Environmental Injustice

Kandi (Mossett) White / Eagle Woman

North Dakota (US) produces 6 times more energy than it consumes, so the pollution is felt unequally in the state.

“every single bit of North Dakota’s more than 11,000 miles of rivers, lakes, and streams is contaminated with mercury due to decades of coal extraction”

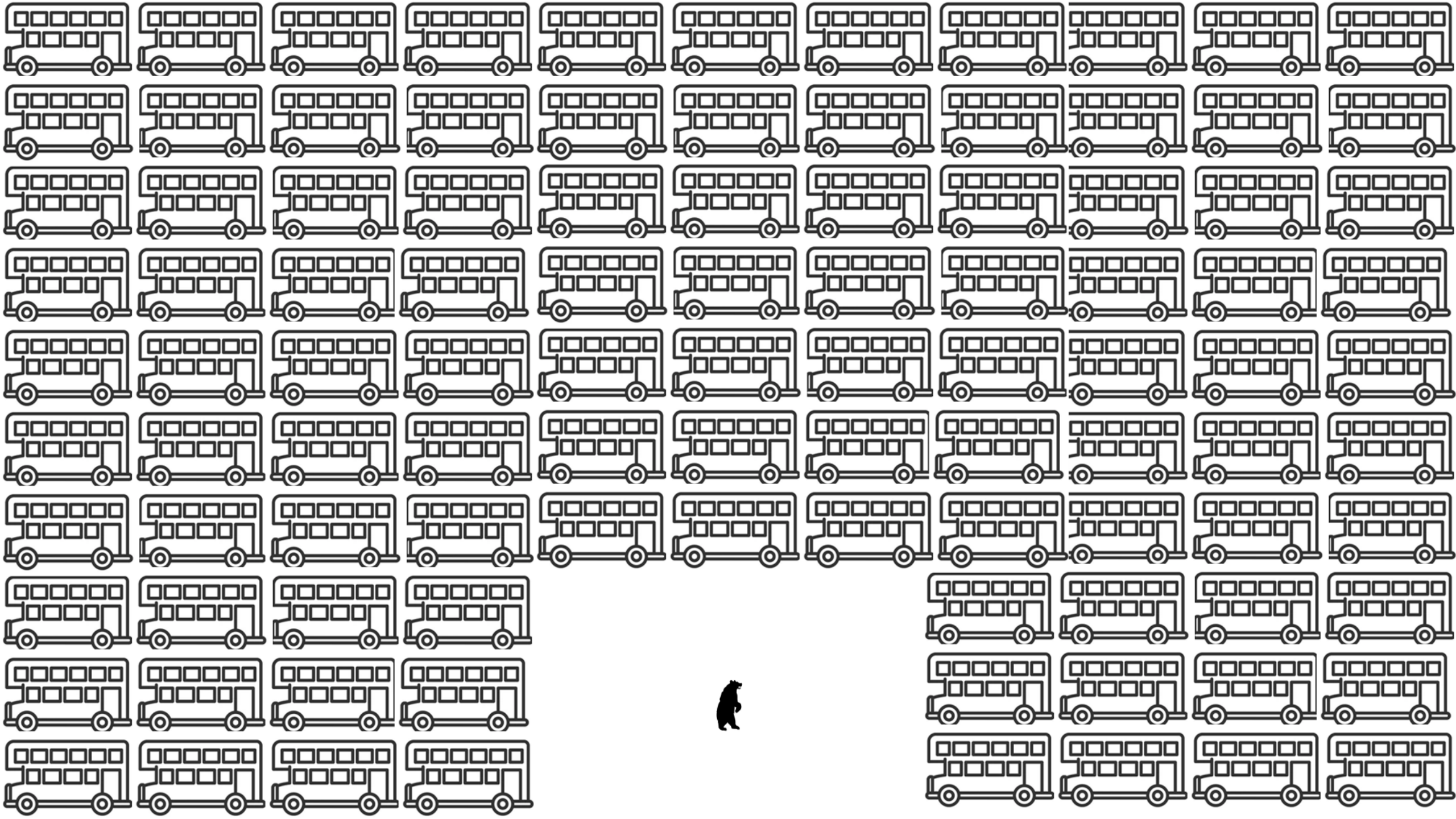
Examples of Environmental Injustice

Colorado River / Rio Colorado

Flows through US, into Mexico. Dams / canals for irrigation etc in US

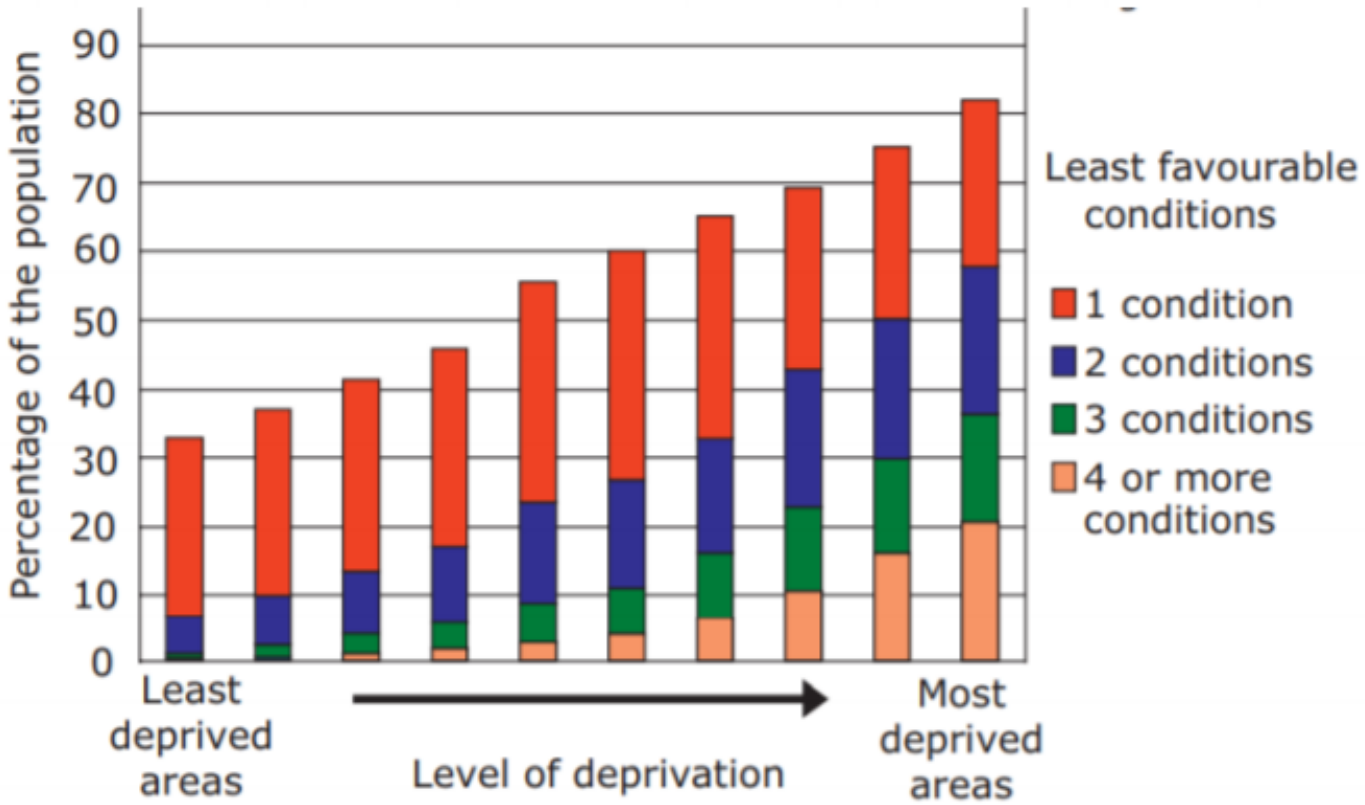
Flow rate at border:

1900	$1200 m^3/s$	Alamo Canal (1901)	Hoover Dam (1936)
1936	$164\ m^3/s$	All American Canal (1942)	
		Morelos Dam (1944)	
		Glen Canyon Dam (1966)	
1966	$8.3 m^3/s$		
2019	$0.3 m^3/s$ – an overall drop of 99.9975%		



Examples of Environmental Injustice

Not just the US – in the UK, the 2019 Natural England meta-study found a clear link between increasing deprivation and higher numbers of “least favourable conditions”



Concept Summary

Humans are unequal instigators of environmental damage and unequal victims of a poor environment

Poorer areas of the city/country/world tend to suffer more because of (eg) rising sea levels, high pollution

Richer areas tend to benefit from the economic activity which causes the problems

Application

States need to recognise environmental (and associated social etc) impact of their activities in (mainly) developing nations.

Companies and local/regional governments need to recognise their impact on poorer areas of the same state.

Much like politicians declaring a Climate Emergency, recognition of Environmental Injustice is just the first (and easiest) step. Doing something about it is harder, but essential.

Best-selling electric car in Europe / Globally

The ELVs are here!

Growth in electric vehicles

All ELVs use batteries

Current market for batteries relies very heavily on Lithium-Ion (Li-Ion) batteries, as they provide “high efficiency and low cost” (Hong et al, 2020).

BloombergNEF (2020a) forecast that 58% of global passenger vehicles sales will be EVs by 2040, and thus demand for batteries will rise commensurately.

Unit price for EV batteries has fallen from over $1000 per kW/h in 2010 to below $100 per kW/h in 2020 (Bloomberg, 2020b).

Growth in electric vehicles

Li-ion batteries require four elements

- Cathode - most commonly lithium cobalt oxide, but may also be lithium manganese oxide (Rajagopalan et al, 2020)
- Anode – most commonly graphite (Rajagopalan et al, 2020)
- Electrolyte
- Separator

The most comment elements used in the cathode therefore are:

- Lithium, Cobalt, Manganese

Today I will focus just on Lithium, the written paper will cover all three, including issues like child labour mining cobalt in DRC and birth defects caused by Manganese mining.

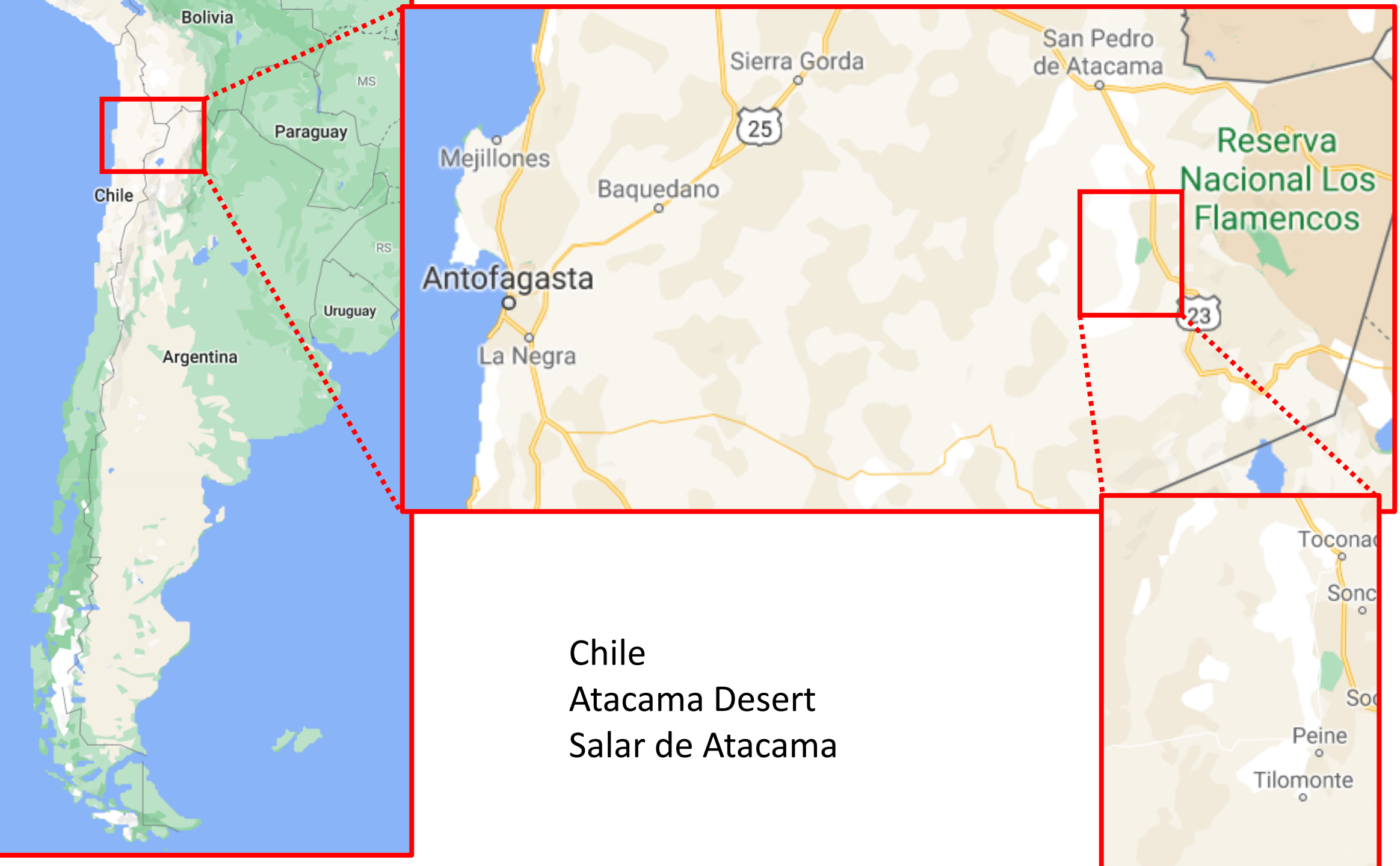
Lithium - Chile

Chilean lithium mining is focused on the *Salar de Atacama*, a massive salt flat in the Atacama Desert, one of the driest places on earth.

The processing of lithium requires a huge amount of water (17,000 litres per second (Gutiérrez et al, 2018)), as the lithium is dissolved in the brine of the *Salar*.

Some estimates put the water use for lithium as two thirds of the region's entire water budget (UNCTAD, p57)

Katwala (2018) says that 500k gallons of water is needed to produce 1 ton of lithium



Chile
Atacama Desert
Salar de Atacama

Salar de Atacama

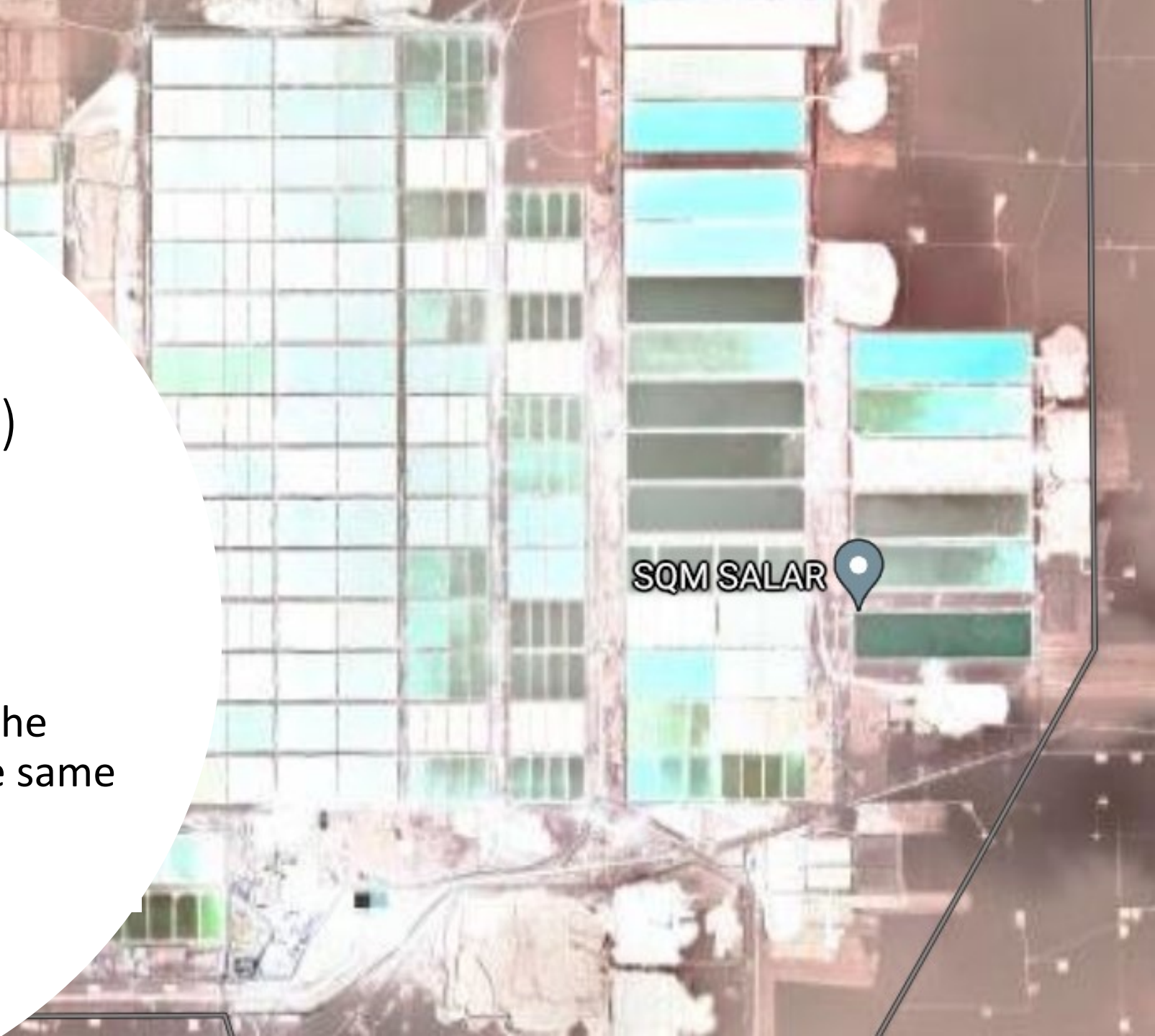
To the East of the Salar is the Los Flamencos Nature Reserve, home to the Andean Flamingo. Gutiérrez et al (2018) argue that the extraction for lithium is threatening the flamingo, and Wanger shows that "cyanobacteria usually eaten by these birds accumulate in the water polluted by lithium extraction, putting human health at risk" (2011)

Human health is also damaged by prolonged exposure to lithium and Agustinata et al (2018) demonstrate that lack of water has led to "forced migration of populations from villages and the abandonment of ancestral settlements"

Sociedad Química y Minera de Chile (SQM)

SQM is the world's second largest producer of lithium.

This is one of SQMs two plants in the Salar de Atacama. It is 75km^2 - the same size as Northampton.



SQM

In 2014, according to the US Department of Justice, SQM paid US$630k to a Chilean politician who “had influence over the Chilean government’s plans for mining in Chile, an issue of central importance to SQM's business” (US v Sociedad Química y Minera de Chile (“SQM”) Case 1:17-cr-00013-TSC)

In 2016, SQM was fined US$22m for environmental damage caused by its lithium extraction plans.

In 2019, the Chilean Environmental Court blocked SQM from expanding its operations, and is considering an additional US$3m file.

In 2019, SQM’s turnover was US$1.9bn

Stopping climate change without injustice

UN Conference on Trade & Development (UNCTAD) suggests:

- Employing scientific and technologically advanced processes that prevent or control undesired environmental impacts
- Recycling of raw materials recovered from spent LIBs (2020, p48)

To that I would add:

- Local community involvement – instead of SQM v local communities, work together – UN Secretary General António Guterres (2020) “Development is not sustainable if it is not fair and inclusive– and rising inequality hinders long-term growth.”
- Reflect full environmental cost in the retail price (of battery tech, but also petrol, diesel etc)

Conclusion

Petrol and diesel engines are directly linked to air pollution, respiratory health, smog and climate change, so ELVs are likely to be the future (one future?) from an end-user perspective.

7% of UK new cars were electric / hybrid in 2020 – 100% will be in 9 years – massive growth in industry and demand for raw materials

Globally, 1.7m sales in 2020, est 26m in 2030 – more than a 1500% rise

Mining of lithium will have to rise a similar level, even if just short term

Conclusion

“IHS Markit says it expects that more than 500,000 tons of batteries will reach end of life in 2020. That figure is expected to rise to 1.2 million tons in 2025 and reach 3.5 million tons in 2030 for a seven-fold increase.”(Toto, 2020)

To recycle just:

- 15 percent (180 kilotons) of lithium
- 7.5 percent (450 kilotons) of nickel and
- 43 percent (930 kilotons) of cobalt

For use in new batteries by 2030, will require the global recycling capacity to treble. (Toto, 2020)

Conclusion

Issues around recharging (how green is your grid?), processing minerals into batteries and so on not discussed, but all are significant issues.

Mineral extraction for ELV batteries hits poorer countries and the improved air quality benefits richer countries – a classic environmental injustice.

The Prime Minister said he wanted to “get serious” on the environment before COP 26 later this year, but if the G7 Communique is anything to go by, it appears that the richer nations will continue to reap the benefits of green technology while the poorer nations suffer the consequences, and environmental injustices continue.

Thank you.
Any Questions?

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