

# Decarbonisation and its discontents: A critical justice perspective on four low-carbon transitions

**Invited Seminar for the Center for Engineering Sustainability and Resilience, Northwestern University, United States, January 21-22, 2021**

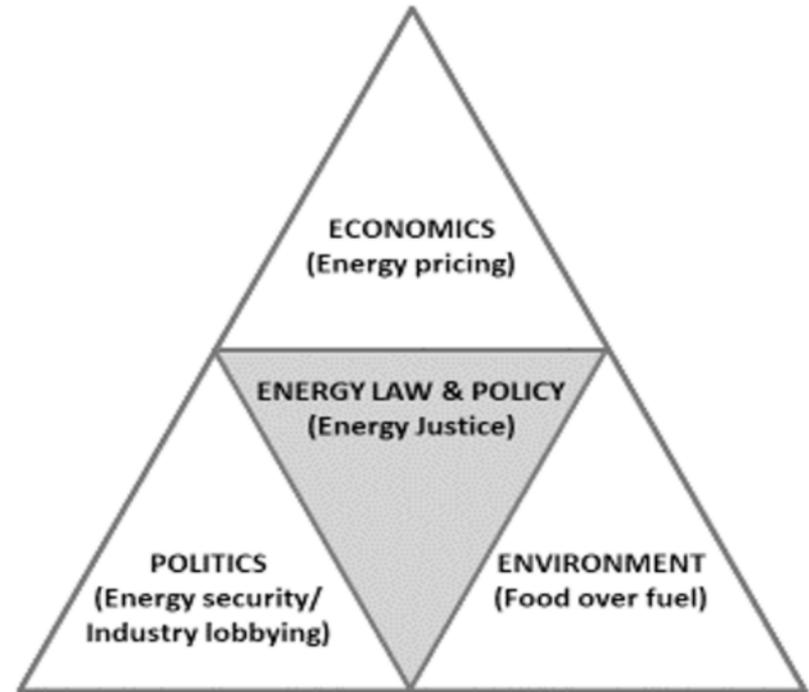
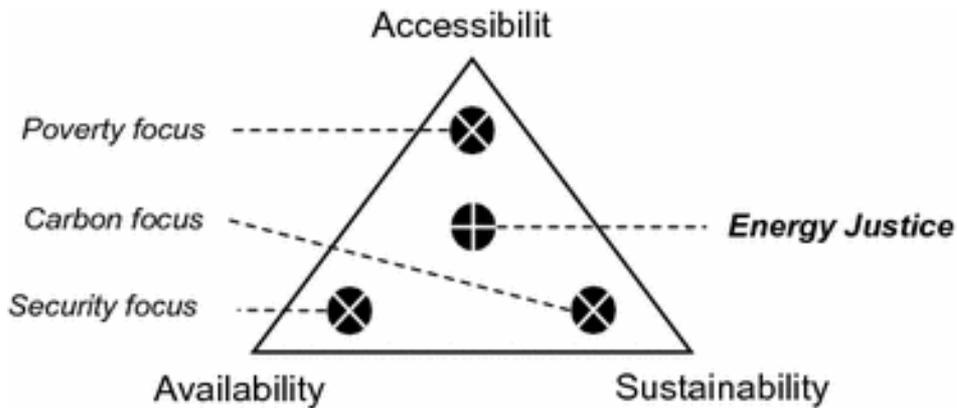
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# “Energy justice” involves:



Source: Darren McCauley, *Global Energy Justice: Tackling Systems of Inequality in Energy Production and Consumption*, Springer, 2017

# “Energy justice” involves:

- *Costs*, or how the hazards and externalities of the energy system are disseminated throughout society;
- *Benefits*, or how the ownership of and access to modern energy systems and services are distributed throughout society;
- *Procedures*, or ensuring that energy decision-making respects due process and representation;
- *Recognition*, or assessing the impact of energy systems on the poor, vulnerable, or marginalized.

[Source: Sovacool, BK, RJ Heffron, D McCauley, and A Goldthau. “Energy decisions reframed as justice and ethical concerns,” \*Nature Energy\* 16024 \(May, 2016\), pp. 1-6.](#)

# Applications within the field:

Dimension	Definition	Application to electric mobility
<b>Distributive justice</b>	Equitable or utilitarian distribution of social and economic benefits and burdens within and across different generations	Benefits and burdens of vehicle use, equity of access
<b>Procedural justice</b>	Adherence to due process and fair treatment of individuals under the law	Planning, due process, and policy issues surrounding incentives and regulations
<b>Cosmopolitan justice</b>	Universal respect for individual human rights regardless of one's identity	Globally produced or distributed externalities including embodied emissions, pollution, and lifestyle impacts
<b>Justice as recognition</b>	Appreciation for the vulnerable, marginalized, poor, or otherwise under-represented or misrepresented populations and demographic groups	Impacts on vulnerable groups, especially women, children, minorities, or indigenous people

Source: Sovacool, BK, Noel, LD, G Zarazua de Rubens, and J Kester. “Energy injustice and Nordic electric mobility: Inequality, elitism, and externalities in the electrification of vehicle-to-grid (V2G) transport,” *Ecological Economics* 157 (March, 2019), pp. 205-217

# Applications within the field:

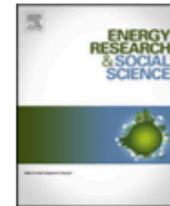
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Review

## Energy justice: A conceptual review

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Tenet	Evaluative	Normative
Distributional	Where are the injustices?	How should we solve them?
Recognition	Who is ignored? Who is responsible?	How should we recognise? How do we achieve responsibility?
Procedural	Is there fair process?	Which new processes?
Cosmopolitanism	Is everyone afforded equal moral rights?	How do we engage in global decision-making?

# Applications within the field (principles):

Principle	Explanation
<b>Availability</b>	People deserve sufficient energy resources of high quality.
<b>Affordability</b>	All people, including the poor, should pay no more than 10 percent of their income for energy services.
<b>Due Process</b>	Countries should respect due process and human rights in their production and use of energy.
<b>Transparency and accountability</b>	All people should have access to high-quality information about energy and the environment and fair, transparent, and accountable forms of energy decision-making.
<b>Sustainability</b>	Energy resources should not be depleted too quickly.
<b>Intragenerational equity</b>	All people have a right to fairly access energy services.
<b>Intergenerational equity</b>	Future generations have a right to enjoy a good life undisturbed by the damage our energy systems inflict on the world today.
<b>Responsibility</b>	All nations have a responsibility to protect the natural environment and minimize energy-related environmental threats.
<b>Resistance</b>	Energy injustices must be actively, deliberately opposed.
<b>Respect</b>	Intersectional differences in knowledge and epistemic upbringing, culture and experience, and race and gender have to be respected in energy decision-making.

Source: Sovacool, BK, M Burke, L Baker, CK Kotikalapudi, and H Wlokas. "New frontiers and conceptual frameworks for energy justice," *Energy Policy* 105 (June, 2017), pp. 677-691.

# Applications within the field (selected principles)

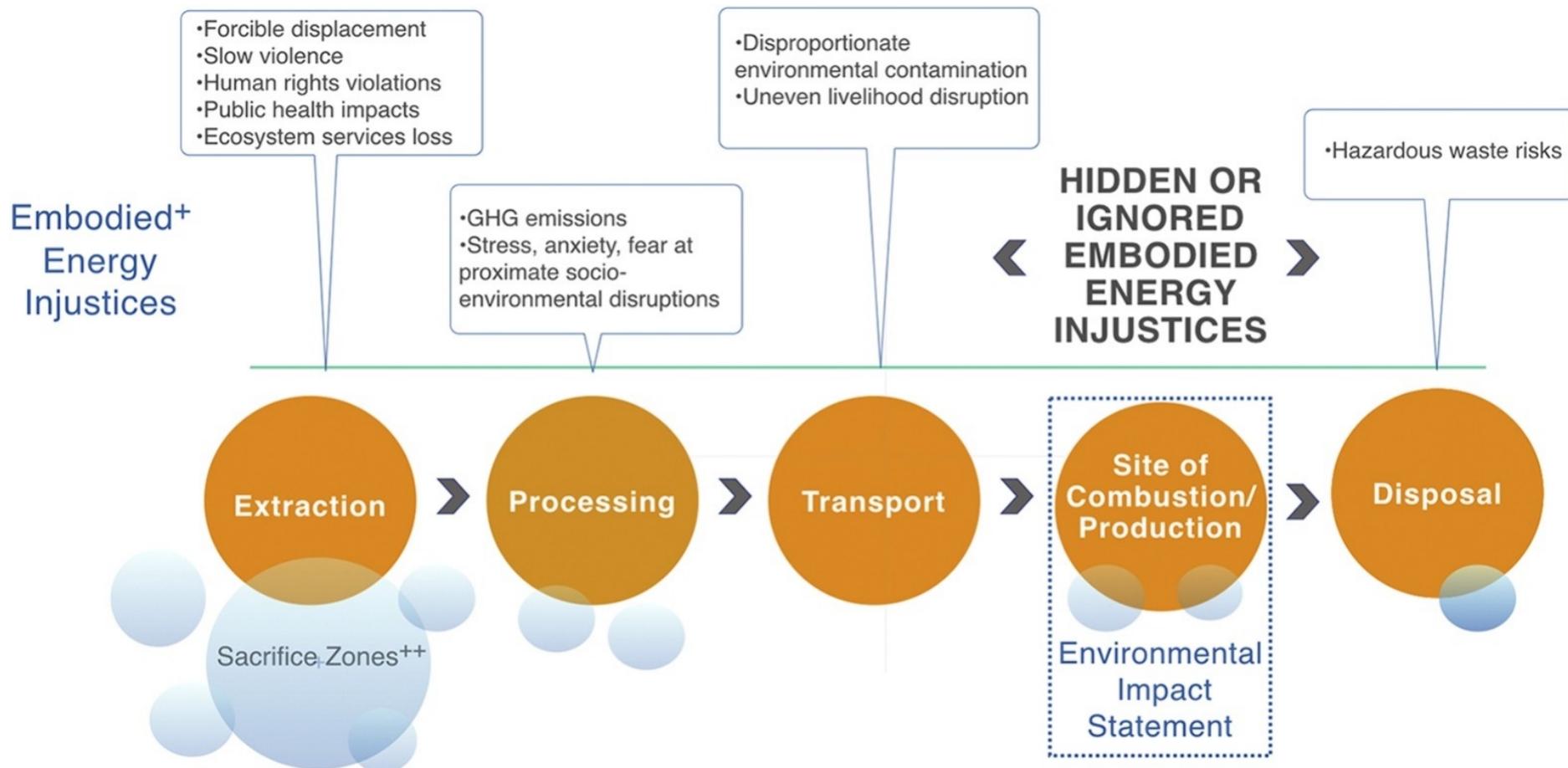


<i>Case study</i>	<b>Technological complexity</b>	<b>Change in user practices</b>	<b>Positive justice dimensions</b>	<b>Negative justice dimensions</b>
<i>Energy services</i>	Incremental	Substantial	Cost savings, more reliable service, more predictable cost, increased productivity of subsidies	Some may be excluded from the market (e.g. because they lack the internet, sensors or a smart phone)
<i>Electric vehicles</i>	Radical	Substantial	Reduced carbon emissions and air pollution, fuel savings	Less accessible to those without off-street parking, and/or those who cannot afford a new car
<i>Solar photovoltaic panels</i>	Radical (especially with storage and time-of-use tariffs)	Modest	Reduced electricity bills, improved resilience and potential revenue from feed in tariffs	Limited to those who own their own roof but subsidized by everyone and too difficult for some to understand
<i>Low carbon heat</i>	Incremental	Modest	Upgrading heating systems and insulating homes can raise property values and improve the quality of indoor environments	Some lack the capital to invest in upgrades or the ability to make the decision because they rent their home

	<b>Energy service contracting</b>	<b>Battery electric vehicles</b>	<b>Solar PV panels</b>	<b>Low carbon heat</b>
<i>Affordability</i>	+++	-	+	+/-
<i>Sustainability</i>	++	+/-	++	+++
<i>Equity</i>	---	---	---	-
<i>Respect</i>	--	-	-	-

Source: Sovacool, BK, M Lipson, and R Chard. "Temporality, vulnerability, and energy justice in household low carbon innovations," *Energy Policy* 128 (May, 2019), pp. 495-504.

# Healy et al. and “sacrifice zones” – but what about pro-climate interventions?



+ The injustices listed can occur anywhere along the supply-chain but typically are most prevalent around sites of extraction.

++ Sacrifice zones are areas poisoned or destroyed for the supposed greater good of economic progress.

Source: Healy, N., Stephens, J. C., & Malin, S. A. (2019). Embodied energy injustices: Unveiling and politicizing the transboundary harms of fossil fuel extractivism and fossil fuel supply chains. *Energy Research & Social Science*, 48(June 2018), 219–234.

# Case study selection: France (1970/80s), Germany (1990s), Norway (2000s), UK (2010s)



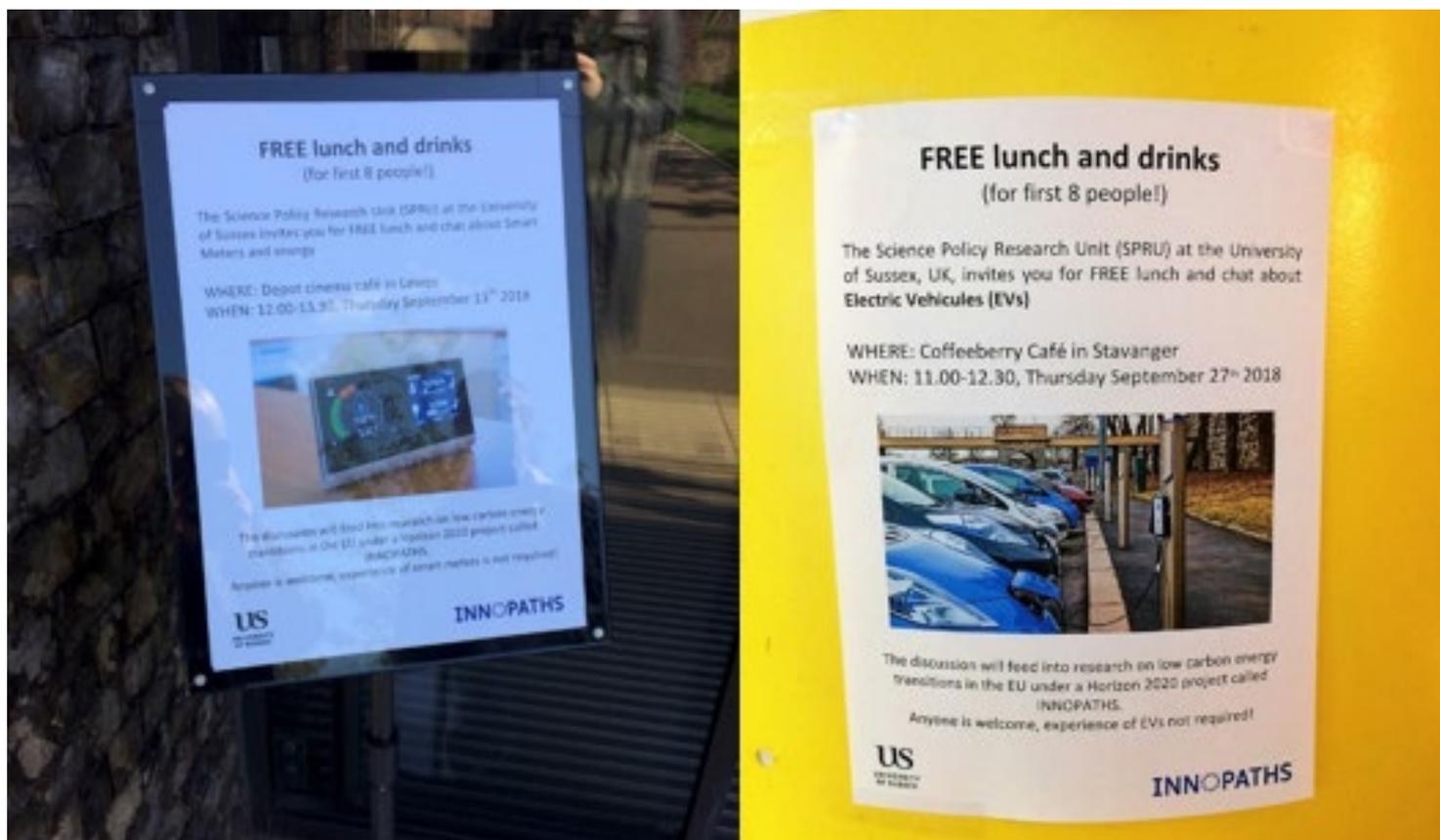
# Research design (mixed methods)

Sixty-four semi-structured expert research interviews

Country	Date	Illustrative Institutions
France	July 2018	CEA (Atomic Energy Commission of France), Electricité de France, ESSEC Business School, Greenpeace, International Energy Agency, Organization of Economic, Cooperation and Development, WISE-PARIS
Germany	July 2018	BMWi (Federal Ministry for Economic Affairs and Energy), Ecologic Institute, Fraunhofer Institute for Solar Energy Systems ISE, German Solar Association (BSW-Solar), the German Energy Agency, the German Solar Energy Society (DGS), Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)
Norway	June - September 2018	Energi Norge, Ministry of Transport and Communications, Norwegian Public Roads Administration, NTNU (Norwegian University of Science and Technology), Statnett, the Norwegian Electric Vehicle Association (NEVA), TOI (The Institute of Transport Economics)
Great Britain	August 2018	Department for Business Energy & Industrial Strategy, Citizens Advice, Energy Saving Trust, Good Energy, Oxford University, Smart Energy GB, University College London

# Research design (mixed methods)

Five focus groups: Lewes (Great Britain), Colmar (France), Freiburg (Germany, two of them), and Stavanger (Norway)



# Research design (mixed methods)

Twelve internet forums (three per country, more than 2m total members) with 58 further responses

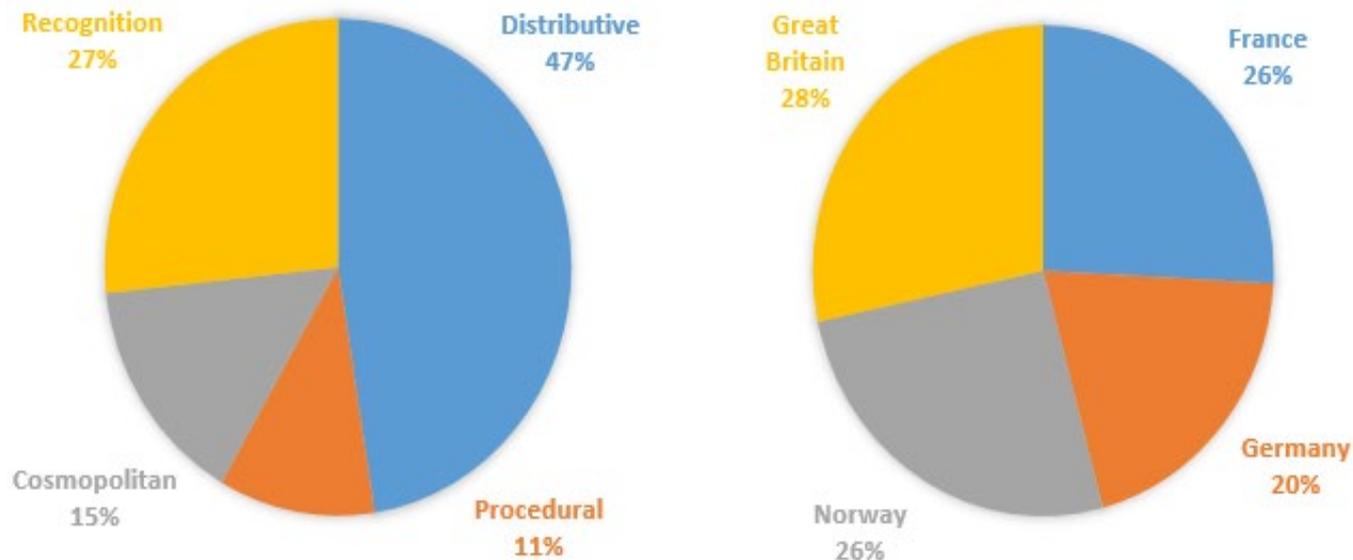
Country	Forum	Description	Members	Responses
Norway	Elbilforum.no	Norwegian EV forum	20,487	7
Norway	Tesla motors club Norway	Online forum for Tesla owners in Norway	N/A	4
Norway	SpeakEV	Online electric car forum for all EV owners and enthusiasts	16,152	0
Germany	Photovoltaik forum.com	A solar forum in German	100,823	2
Germany	Solarstrom-forum.de	Photovoltaic forum in German	2,329	0
Germany	Building Technology Forum - Solar Energy	Online forum for all building technologies including solar	N/A	0
GB	Money Saving Expert	Consumer forum	1,778,314	1
GB	Navitron	Private company forum on a range of energy issues	7139	0
GB	OVO Energy	Private company forum on a range of energy issues		0
GB	The IET	The Institution of Engineering and Technology	N/A	38
France	Que Choisir	Consumer forum	130536	1
France	Forum photovoltaïque	Energy forum	42596	5
France	Droit Finances	Consumer finances forum	N/A	0

# Findings: More detailed results in the study ... how many in total?

	No.	Injustice	Description	Supported by <sup>a</sup>	Frequency <sup>b</sup>
<b>France</b>	1	High long-term costs to tax payers	Future tax payers bearing burden of decommissioning and waste management	RI, FG, IF	11
	2	Risk of accidents	Economic and environmental impacts of a serious incident or accident	RI, FG, IF	10
	3	Crowds out other renewable investment, forestalling energy transitions (in France and beyond)	Future citizens will be locked into nuclear investments and denied benefits of clean energy	RI, FG	8
	4	Nuclear waste burdens	Future generations will face statistically higher risk of pollution due to growing amount of waste	RI, FG, IF	8
	5	Rising electricity costs due to rising nuclear costs	Future energy consumers will have to pay higher costs due to rising costs of nuclear (plus the costs of subsidizing renewables, which lag behind because of nuclear lock-in), complacency around electricity consumption	RI	6

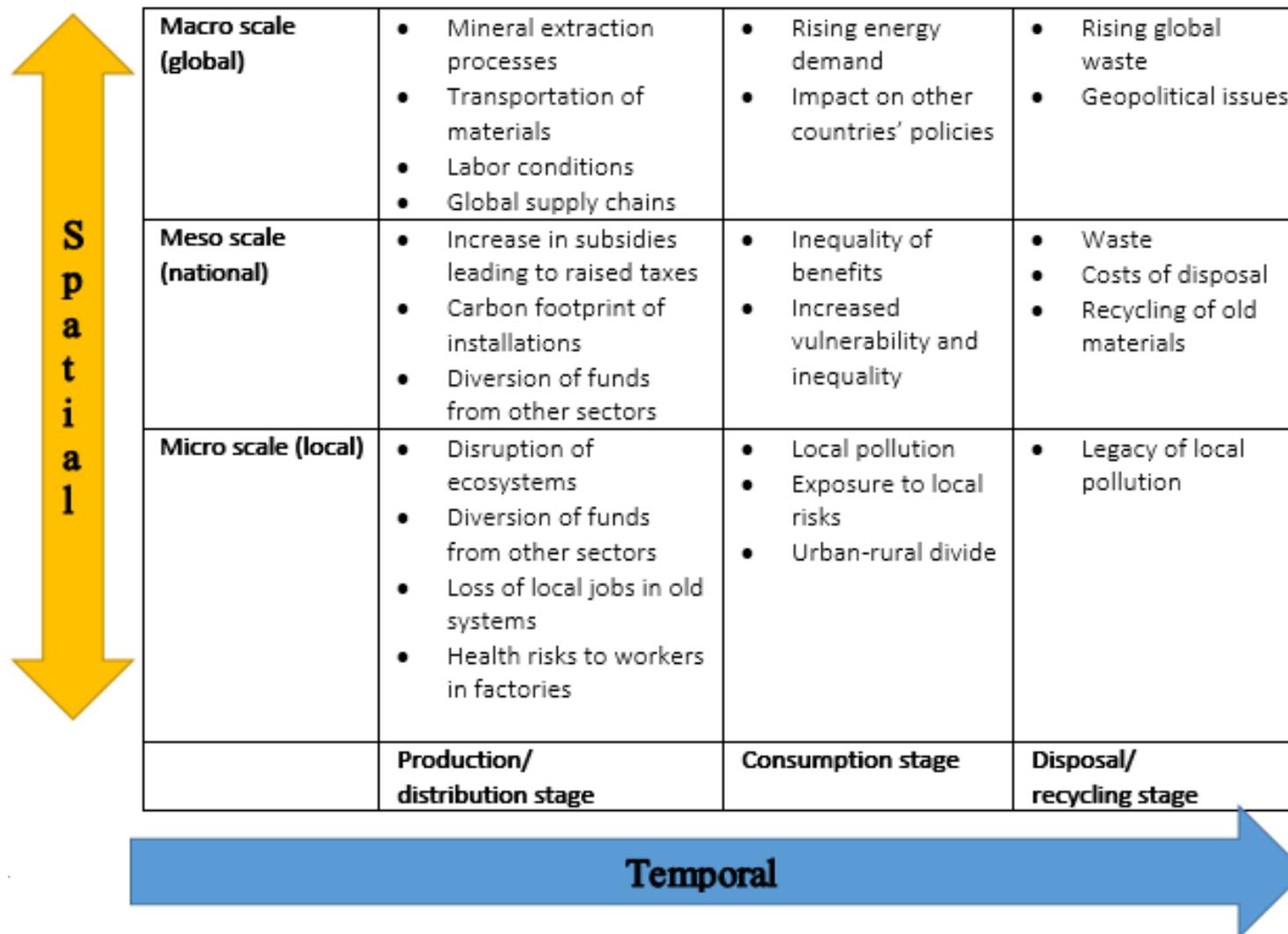
# Findings: summary of injustices (exhaustive “simple” list)

- Our evidence accumulates into 120 (inductively or analytically) distinct energy injustices
- Distributive injustices dominated (57), followed by recognition (32), cosmopolitan (18) and procedural (13)
- Injustices were more evenly distributed with smart meters (34 injustices) entailing the most, followed by nuclear power (31 injustices), electric vehicles (31), and solar PV (24 Injustices).



Sovacool, BK, A Hook, M Martiskainen, and LH Baker, “Decarbonisation and its discontents: A critical energy justice perspective on four low-carbon transitions,” *Climatic Change* 155(4) (August, 2019), pp. 581–619.

# Whole systems energy justice impacts of European low-carbon transitions



<b>Macro scale (global)</b>	<ul style="list-style-type: none"> <li>• Mineral extraction processes</li> <li>• Transportation of materials</li> <li>• Labor conditions</li> <li>• Global supply chains</li> </ul>	<ul style="list-style-type: none"> <li>• Rising energy demand</li> <li>• Impact on other countries' policies</li> </ul>	<ul style="list-style-type: none"> <li>• Rising global waste</li> <li>• Geopolitical issues</li> </ul>
<b>Meso scale (national)</b>	<ul style="list-style-type: none"> <li>• Increase in subsidies leading to raised taxes</li> <li>• Carbon footprint of installations</li> <li>• Diversion of funds from other sectors</li> </ul>	<ul style="list-style-type: none"> <li>• Inequality of benefits</li> <li>• Increased vulnerability and inequality</li> </ul>	<ul style="list-style-type: none"> <li>• Waste</li> <li>• Costs of disposal</li> <li>• Recycling of old materials</li> </ul>
<b>Micro scale (local)</b>	<ul style="list-style-type: none"> <li>• Disruption of ecosystems</li> <li>• Diversion of funds from other sectors</li> <li>• Loss of local jobs in old systems</li> <li>• Health risks to workers in factories</li> </ul>	<ul style="list-style-type: none"> <li>• Local pollution</li> <li>• Exposure to local risks</li> <li>• Urban-rural divide</li> </ul>	<ul style="list-style-type: none"> <li>• Legacy of local pollution</li> </ul>
	<b>Production/ distribution stage</b>	<b>Consumption stage</b>	<b>Disposal/ recycling stage</b>

Source: Sovacool, BK, A Hook, M Martiskainen, and LH Baker. "The whole systems energy injustice of four European low-carbon transitions," *Global Environmental Change* 58 (September, 2019), 101958, pp. 1-15.



### Micro injustices

- Local pollution and waste
- Community health
- Property prices
- Unequal household benefits
- Traffic congestion
- Parking
- Closure of local coal mines



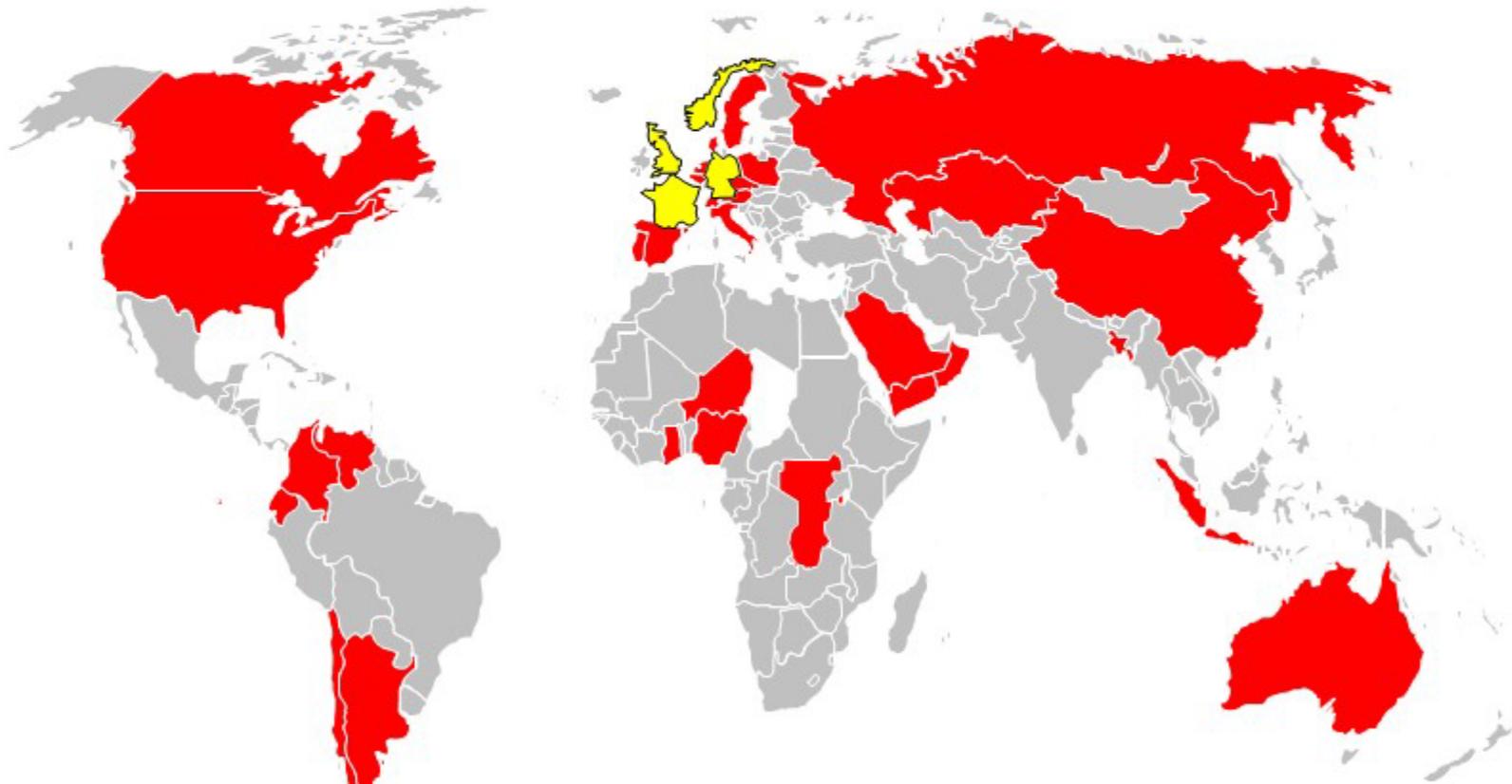
### Meso injustices

- Nuclear accidents
- Disruption of other national transitions
- Higher national energy prices
- Loss of national employment
- Expansion of roads
- Undermining utility business models
- Bankruptcy of national firms



### Macro injustices

- Uranium mining and waste
- Unsafe nuclear exports
- Metal and mineral inputs
- Flows of electronic waste
- Exporting of dirty cars
- Poor overseas labour conditions
- Disruption of fossil fuel industry
- Disruption of other transitions



Source: Sovacool, BK, A Hook, M Martiskainen, and LH Baker. "The whole systems energy injustice of four European low-carbon transitions," *Global Environmental Change* 58 (September, 2019), 101958, pp. 1-15.

# Phase 2 for the “lived experiences” of injustice



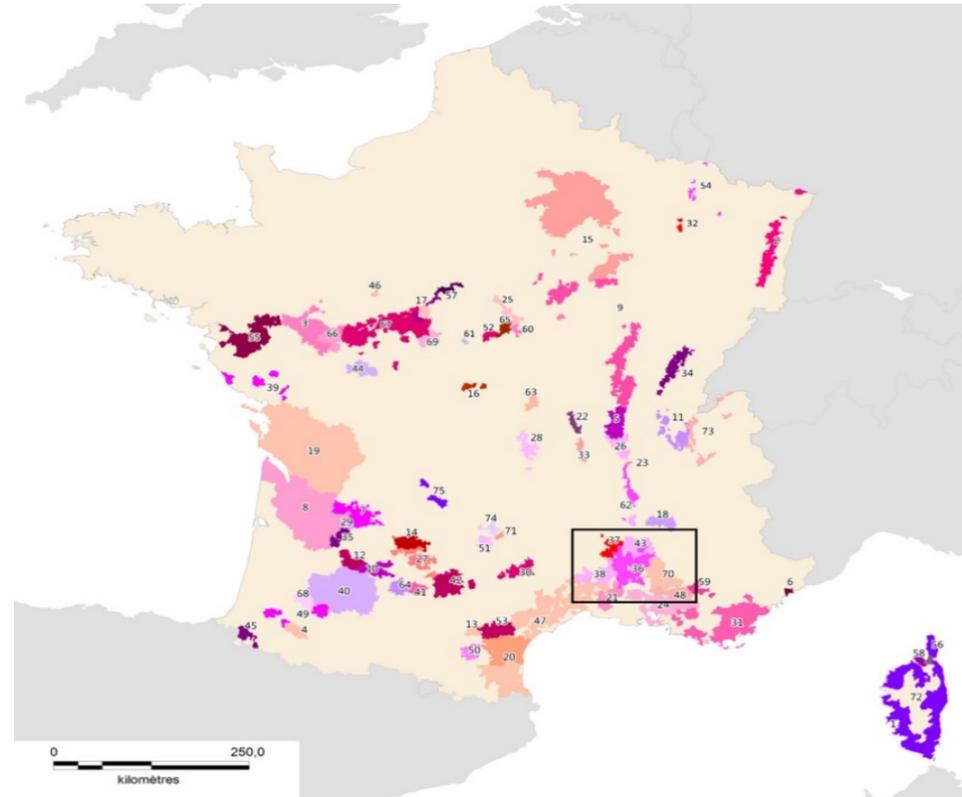
Method	Community	Respondents	Illustrative Institutions or Locations
Expert research interviews	French wine	FER1-7 (mix of wine representatives, wine trade experts, wine-specialized journalists, anti-nuclear associations)	Commercial representatives of wineries, Syndicat général des Côtes du Rhône, Université du Vin, Wine trade experts, Wine journalists, Sortir du Nucléaire, CRIIRAD
	German solar	GERE1-7 (mix of research institutes, private solar firms, mayoral offices, unions)	Fraunhofer ISF, municipalities, mayoral offices, private solar firms
	Ghanaian e-waste	GER1-11 (mix of government, civil society, private sector, and academic respondents)	Environment Protection Agency (EPA), Ministry of Environment, Science, Technology and Innovation (MESTI), World Resources Forum, Greater Accra Scrap Dealers Association (GASDA), Scrap Dealers Association at Agbogbloshie, University of Ghana
	Congolese cobalt mining	CER1-23 (mix of government, civil society, private sector, and academic respondents)	Service d'Assistance et d'Encadrement du Small Scale Mining (SAESSCAM, recently renamed SAEMAPE, the Ministry of Mines, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Gécamines (state-owned mining company), 'entreprise minière Congo Dongfang Mining (CDM mining), Tenke Fungurume Mining (TFM), Glencore, and Ruashi Mining, Université de Kinshasa, Université de Lubumbashi
Community research interviews	French wine	FCR1-6 (winegrowers and residents)	Various local winegrowers, wineries, and bottlers in the Rhone and Grignan-les Adhémar regions
	German solar	GERC1-7 (local community members, ex-solar workers, local journalists)	Ex-solar workers in the Bitterfeld region, other local affected community members
	Ghanaian e-waste	GCR1-21 (e-waste scrapyards workers, their families, labor leaders, politicians, and those supporting e-waste via marketing and vending)	E-waste workers and communities throughout Agbogbloshie and the greater Accra area
	Congolese cobalt mining	CCR1-48 (mix of artisanal cobalt miners as well as artisanal bosses or chiefs, crushers, carriers, drivers, refiners, safety inspectors, sorters, labor unions and members of the mining police)	Various artisanal mining teams, artisanal mining communities and households across Kolwezi, Likasi, Fungurume, and Lubumbashi

# Phase 2: Site visits

Site visits and naturalistic observation	French wine	7 vineyards (within and beyond AOC), wine cellars, winemaking training centers and archives, 3 nuclear sites, and 1 Wine Trade fair in Paris	Within AOCs Grignan-les Adhémar, Côtes du Rhône, Marcoule, Tricastin, Cruas-Meysses
	German solar	8 solar manufacturing sites, affected communities, administrative decision-making centers	Solar Valley, Bitterfeld-Wolfen, Halle, Magdeburg
	Ghanaian e-waste	20 formal and informal scrapyards, affiliated industries	Agbogbloshie scrapyard, Old Fadama Market, Agbogbloshie Health Clinic, Accra Compost & Recycling Plant, Akooshi Recycling Centre, Dawa Steel Mill and Export Zone, various electrical shops
	Congolese cobalt mining	30 artisanal and industrial mines, legal and illegal mines, mines as well as trading depots and processing centers	Ruashi artisanal cobalt mine, Kasulu artisanal mine, Depot 169, Depot 2, Depot 18, Depot 1000, Depot Thomas Boss Billy, Solola and Kabica artisanal mines, Katanga and Fungerume artisanal mines, Kawama artisanal mine

# French winegrowers and vineyards

- “*wine growers ... whose vineyards were in the vicinity of plants were affected. In other areas ... there is radioactive material in the water supply.*”
- One winemaker: “*we made the mistake of believing that this cohabitation with nuclear energy would be profitable.*”
- 40% loss of sales after incidents in AOC Côteaux du Tricastin



Sovacool, BK, B Turnheim, A Hook, A Brock, and M Martiskainen. “Dispossessed by decarbonisation: Reducing vulnerability, injustice, and inequality in the lived experience of low-carbon pathways,” *World Development* 131 (January, 2021), 105116, pp. 1-14.



# Eastern German solar workers

- *“The real vulnerable group from the solar transition is not often talked about, namely 100,000 people who lost their jobs in the German solar sector over the past years. You have trade unions and government going, oh my goodness, we cannot shut down coal because of all the work and these regions. Yet Solar World and other big producers have shut down in the past years and they didn’t make a peep about those workers. Workers in the German renewable energy sector are a vulnerable population.”*
- One local mayor said, *“Berlin got the electricity, we got the ashes”*





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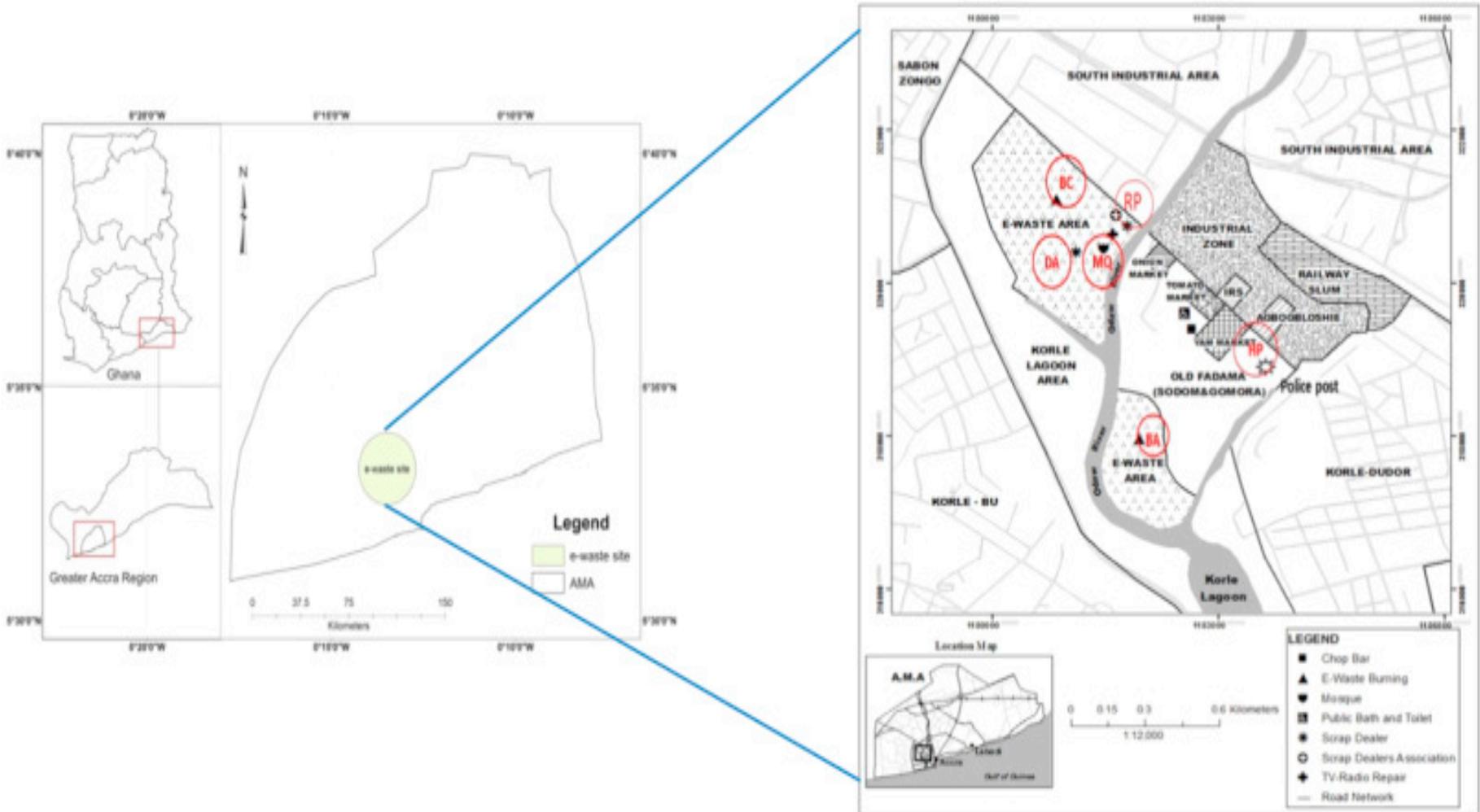
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# E-waste scrapyards workers in Ghana



Source: Sovacool, BK. "Toxic transitions in the lifecycle externalities of a digital society: The complex afterlives of electronic waste in Ghana," *Resources Policy* 64 (December, 2019), 101459, pp-1-21.

# E-waste scrapyards workers in Ghana



*“More than 100,000 people live here in abject poverty, home to the biggest dump for scrap metal and e-waste in the world. Young boys and girls, children as young as six, seven, and eight years old are engaged in this business. They miss school or end up dropping out of school, they go to the slum for a career, or they look for scrap to finance their own education. Even though they go to look for scrap metal, they end up doing it for the rest of their life. I know a story of a young boy, who was not wearing any protective clothing, who got so damaged by the hazardous material he died at the age of 12. Others see their life shortened by decades. They cough, get infected, and fall sick. They dedicate their youth to renting a wooden structure to sleep at night, 5-6 children in a shack, close to the metal business so they can work longer hours”*

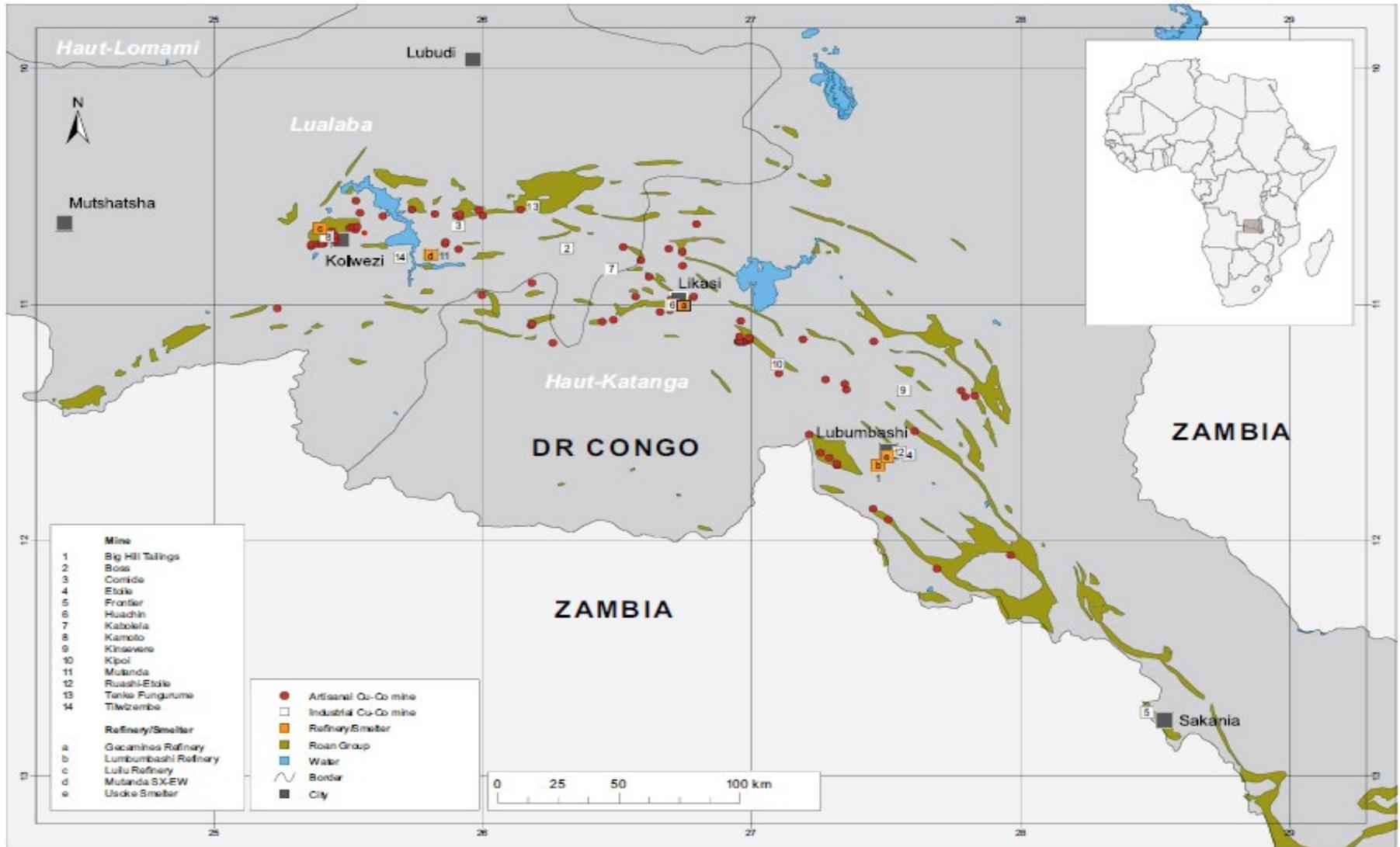
Source: Sovacool, BK. “Toxic transitions in the lifecycle externalities of a digital society: The complex afterlives of electronic waste in Ghana,” *Resources Policy* 64 (December, 2019), 101459, pp-1-21.







# Congolese cobalt miners



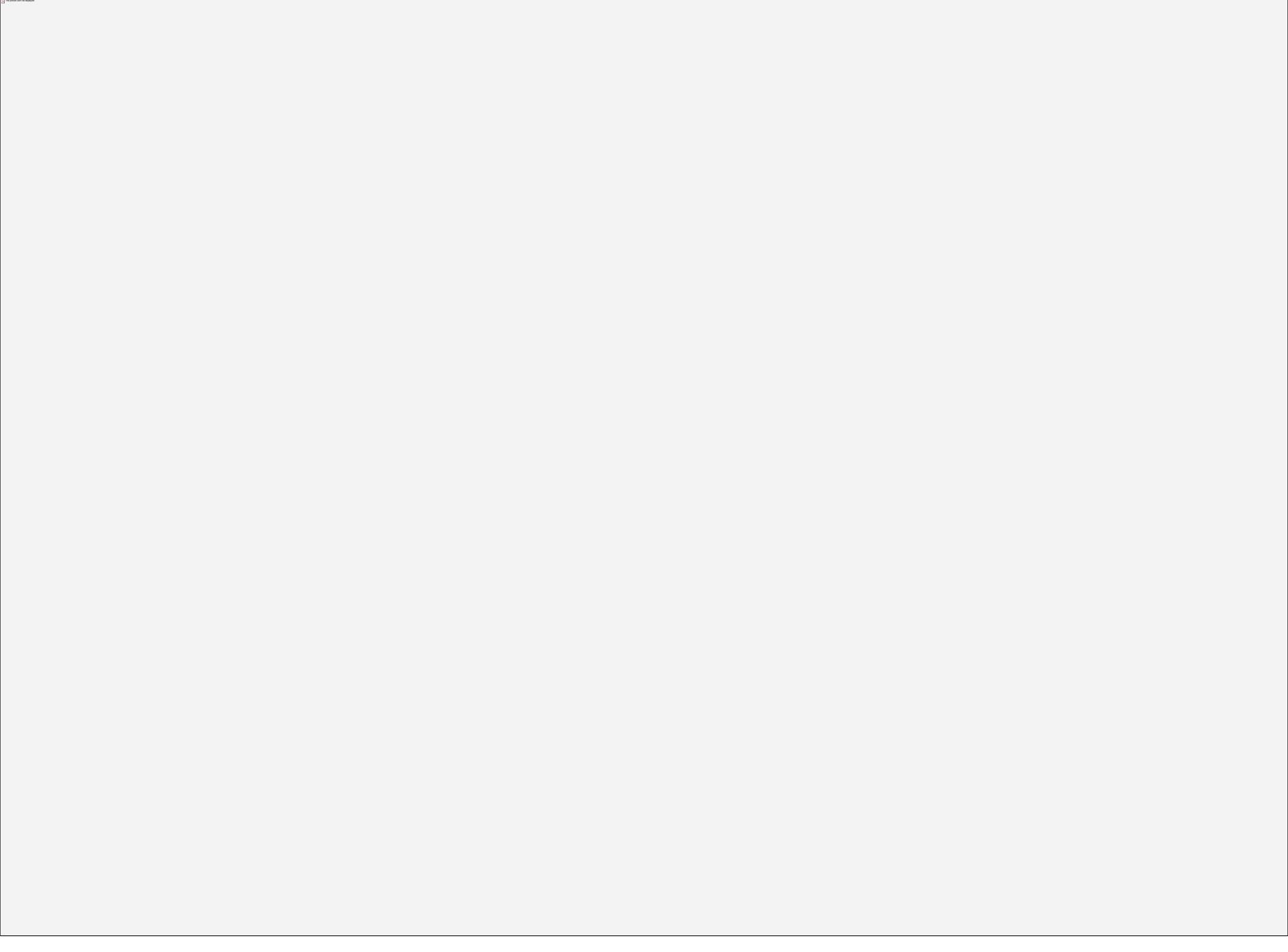
Source: Sovacool, BK. “The precarious political economy of cobalt: Balancing prosperity, poverty, and brutality in artisanal and industrial mining in the Democratic Republic of the Congo,” *Extractive Industries & Society* 6(3) (July, 2019), pp. 915-939.

# Congolese cobalt miners

*“ASM cobalt mining is not living, it’s dying. The moment you step inside the mine, the clock starts ticking. You are exposed to dust which can lead to silicosis, or be poisoned by mercury. You can drown, or become trapped in a mine collapse. You can get crushed by rocks, or even contract diseases by people shitting or urinating into the mine. You can suffer diseases from sitting in water all day, such as cholera or malaria, or get bitten by animals, as many miners will bring them into the mine. This is especially the case when they remain underground in deep shafts for 5 or even 7 days at a time—it’s an underground circus at that point, full of animal and human excrement, I’ve even heard of people contracting the plague in such conditions ... Even if such things cannot kill you, they can still dismember or injure or disable you. I know of people who lose arms or legs in a collapse, they have to painfully break their bones to pull free. Many then bleed to death in the jungle.*”

Source: Sovacool, BK. “The precarious political economy of cobalt: Balancing prosperity, poverty, and brutality in artisanal and industrial mining in the Democratic Republic of the Congo,” *Extractive Industries & Society* 6(3) (July, 2019), pp. 915-939.



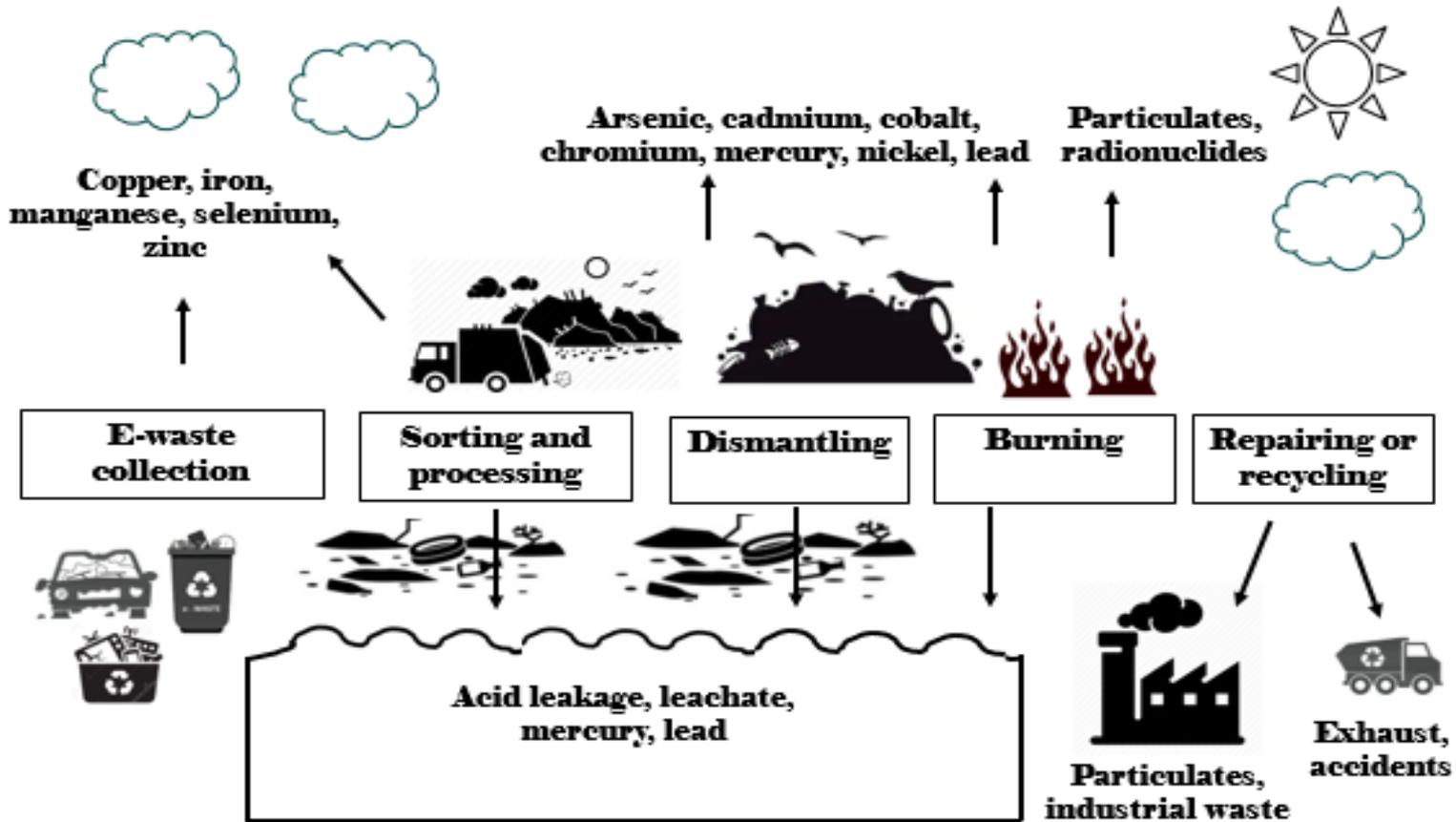








# Concluding thoughts and insights



Source: Sovacool, BK, A Hook, M Martiskainen, A Brock, and B Turnheim, "The decarbonisation divide: Contextualizing landscapes of low-carbon exploitation and toxicity in Africa," *Global Environmental Change* 60 (January, 2020), 102028, pp. 1-19.

# Concluding thoughts and insights



- Injustices were *not* just dominated by centralized supply (nuclear); we also see it with decentralized supply (solar) as well as end-use devices (smart meters, EVs, displays, batteries), some of which will ironically be used to help eradicate fuel poverty (!)
- Procedural injustices remind us that issues of fairness, transparency, and decision-making can stand apart from a technology or program
  - Exclusionary nature of German FiT
  - Supplier led smart meter rollout in GB
  - Secrecy surrounding French nuclear
  - Elitism in Norwegian planning discussions (30,000)

# Concluding thoughts and insights



- Cosmopolitan concerns remind us that justice impacts are *multi-scalar* and do not occur only in Europe
  - Nuclear reactor designs being exported, cheap electricity trade, uranium mining, and nuclear waste
  - Low-wage manufacturing in China, factory waste streams for solar
  - Copper and cobalt (DRC), e-waste (Ghana) for smart meters
  - Extractive industries (cobalt, lithium) for EVs, e-waste, cheaper/dirtier cars flooding other markets
- Clean energy may be a human right, but securing it currently forces tradeoffs with other human rights, leading to *green on green* and *poor on poor conflict*
- Pure energy justice may not be possible, it may pragmatically be *picking your poison*, or choosing winners
- We must avoid conceptual approaches or research designs that obscure or mask this emerging *decarbonisation divide*

# Contact Information



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