A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in partial fulfilment of the requirements for the degree of Master of Science

Cementing the Future

Lessons from Ecological Distribution Conflicts and Environmental Justice Movements for a Just Green Transition of the Cement Industry

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Nóra Horváth

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:
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for the degree of Master of Science and entitled: *Cementing the Future: Lessons from Ecological Distribution Conflicts and Environmental Justice Movements for a Just Green Transition of the Cement Industry*
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The cement industry faces mounting pressure to decarbonise as the sector accounts for ~7% of global CO_2 emissions (IEA 2023). Low-carbon transitions often lead to an exacerbation of inequality and vulnerability (Sovacool et al. 2021), give rise to new ones, while also falling short in addressing preexisting injustices and their structural drivers (Sovacool et al. 2019). This risks exacerbating the very problems it seeks to solve. The thesis aims to contribute to just transition (JT) research by employing a transformative approach that sees conflict as productive and regards ecological distribution conflicts (EDCs) and environmental justice movements (EJMs) as catalysts of sustainable transformations. The thesis examines the drivers of EDCs and EJMs within the scope of cement production, to inform the barriers and opportunities for a just green transition of the cement industry. This is achieved through the analysis (N=56) of conflict cases documented in the Global Atlas of Environmental Justice, directly linked to cement production. Findings show that the examined conflicts are driven by unjust socio-metabolic configurations (unequal allocation of local burdens and benefits, global unequal exchange, and an "urban"- rural divide), and furthered by issues in procedural, recognition and restorative practices. If the JT does not address the underlying drivers of injustices, there is a risk that emerging decarbonisation technologies and policies will replicate existing issues, especially in the case of CCUS. Recommendations are made for a more transformative approach to a just green transition. More research is needed on the just transition of extractive industries and JT benefits.

Keywords: just transition, cement industry, extractive industry, environmental justice movements, ecological distribution conflicts, transformation

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Köszönöm Anya és Apa! A ti támogatásotok nélkül nem készülhetett volna el ez a szakdolgozat!

I am forever grateful to you!

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Chapter 1: Introduction, Background and Aim of the Thesis

1.1 Background and Significance

As the backbone of modern construction, cement production and use have fundamentally shaped modern societies (Belaid 2022). Cement is a fine, powdery binder used as a key ingredient of concrete and mortar for various infrastructural applications. Concrete's properties allow it to be moulded into structural elements, such as beams, columns, and pavements. It is estimated that concrete makes up over 90% by mass of all housing stocks (Deetman et al, 2019). Beyond fulfilling conventional infrastructural needs, new applications of cement are on the rise. It plays a key role in the expansion of green infrastructure, such as green roofs; the construction of wind turbines or hydroelectric dams, and climate change adaptation applications, for example, in the form of sea-level barriers (Siddiqui et al. 2025; Barthelmie et al. 2021). The industry's significance is furthered by the number of people employed along the value chain: from the extraction of raw materials, through production of cement and concrete, to transforming these commodities into assets such as buildings and other infrastructures, all the way to their demolition (Marsh et al. 2024).

The cement industry is an extractive and energy-intensive industry with major greenhouse gas (GHG) emissions (Bashmakov et al. 2022). Beyond its climate footprint, cement production exacerbates broader environmental challenges, such as ecosystem degradation due to limestone mining (Lamare & Singh 2017), industrial water withdrawals (Miller et al. 2018), local air pollution (Miller & Moore 2020); and inequalities of intra- and international scale (Marsh et al. 2024). The Environmental Justice Atlas lists cement as the commodity with one of the highest documented cases of injustices, extending the list of concerns with land dispossession and cultural loss by actors in the cement industry (EJAtlas, 2025).

The cement industry faces mounting pressure to decarbonise as the sector accounts for ~7% of global CO_2 emissions (IEA 2023). Decarbonising cement is not just a technical challenge, but a political and economic battleground, where industry claims about growth, technology, and

jobs shape policy outcomes (Stevis & Felli 2020). Low-carbon transitions are often seen as perpetually positive phenomena with numerous studies highlighting the justice benefits and co-benefits of decarbonisation efforts (Sovacool et al. 2019). However, current low-carbon transitions often lead to an exacerbation of inequality and vulnerability (Sovacool et al. 2021; Curran and Tyfield 2020; Sovacool 2021; Golubchikov and O'Sullivan 2020; Pinker 2020), give rise to new inequalities and vulnerabilities, while also falling short in addressing preexisting injustices and their structural drivers (Sovacool et al. 2019). When the measures proposed to mitigate climate change are unjust or do not address underlying injustices, there is a risk of exacerbating the very problems sought to be solved by failing to achieve meaningful progress towards a sustainable and just future for all. In addition to ethical obligations towards vulnerable groups, a pragmatic concern also arises: adverse effects of climate mitigation efforts can lead to the delegitimization of climate efforts and lowered climate ambitions (Fisher 2019).

1.2 Problem Statement & Research Questions

This thesis is situated within the field of just transition research, with a specific focus on the cement industry, one of the most carbon-intensive and resource-demanding sectors globally. Despite increasing attention to just transition frameworks in energy systems, the decarbonisation of heavy industry remains severely understudied (Upham et al. 2022). As climate imperatives push for the rapid decarbonisation of heavy industries, cement production presents a unique challenge due to its structural role in economic development and its embeddedness in current extractive socio-metabolic configurations. As most transition efforts have centred on the energy sector, there has been limited attention to more complex transitions that involve multiple aspects of the economy (Upham et al. 2022). This shifts when considering the cement industry. Studying the just transition of the cement industry thus represents a crucial and timely next step in just transition research.

Due to necessary limitations, the scope of investigation is ecological distribution conflicts and environmental justice movements connected to cement production. Environmental conflicts

surrounding cement production reveal complex dynamics of power, resistance, and inequality that are often overlooked in just transition approaches (Pinker 2020). Rather than treating decarbonisation as a purely technical challenge, this research centres ecological distribution conflicts (EDCs) and environmental justice movements (EJMs) as key entry points into understanding the systemic barriers and opportunities to a just green transition.

This research asks:

1. *What are the drivers of ecological distribution conflicts and environmental justice movements within the scope of cement production?*
2. *How do these drivers inform the barriers and opportunities of a just green transition of cement production?*

Ultimately, this thesis aims to contribute to just transition research, emphasising a transformative and justice-oriented approach to decarbonising cement production and, more broadly, to industrial decarbonisation.

The term *'just green transition'* is used to describe a way of *decarbonising* that can tackle underlying injustices by treating the just transition not merely as a compensatory mechanism, but as a tool to challenge unjust socio-metabolic configurations (therefore transformative approach), incorporating perspectives from the environmental movement. While the thesis recognises the importance of measures such as demand reduction, technological innovation, energy efficiency measures, circular economy practices to mitigate the impacts of cement production, these components are regarded as necessary yet insufficient elements of a just future. The analysis argues that a just green transition requires a shift in the current socio-metabolic configuration.

1.3 Technical Background of Cement Production and Decarbonisation

Variations of cement have been used since ancient times, but the modern form of cement was developed in 19th-century Europe. This version of cement is produced through the following stages: raw material extraction (limestone and clay), clinker production in preheated and high-

temperature kilns, grinding, blending with other materials, packaging, and transportation (Worrell et al. 2001). The end product is Portland cement, a fine, powdery binder used as a key ingredient of mortar and concrete, the second most consumed material globally after water (Gagg 2014).

Cutting emissions in cement production is particularly challenging due to its reliance on high-temperature processes and carbon-intensive raw materials (IEA, 2020). About 35% of CO_2 emissions come from fossil fuel combustion for heating kilns, while 65% stem from the calcination of limestone, an unavoidable chemical reaction in clinker production (JRC, 2020; IEA, 2023). Decarbonising the sector requires not only improvements in energy and material efficiency but also the adoption of alternative materials and technologies like carbon capture, utilisation, and storage (CCUS) (IEA, 2025).

Despite pledges from the Global Cement and Concrete Association (GCCA), the decarbonisation of the cement industry is not on track (IEA, 2023). The industry continues to favour incremental changes and technological fixes, often resisting deeper transformation (Davis et al., 2018). Strong lobbying efforts have shaped climate policy while alternative solutions remain underfunded (Sandbag 2022). As global demand for cement is projected to rise, particularly in so-called *emerging economies.* According to the International Energy Agency (IEA, 2025) and Ritchie et al. (2023) the main challenge lies in reducing emissions while maintaining supply.

1.4 Structure

This thesis is structured as follows: After outlining the problem statement, research questions and aim of the thesis, the introduction isd of decarbonising cement production. Chapter 2 presents a state-of-the-art literature review on the local impacts of cement production, challenges in decarbonising production, cement production related environmental justice movements, and contested understandings of a just transition. Chapter 3 outlines the theoretical and conceptual framework used. Chapter 4 details the methodology, data collection and

analysis, the limitations and ethical considerations of the study. Chapter 5 showcases the findings, while Chapter 6 interprets the synthetised findings outlined in the pervious chapter. Finally, the Chapter 7 contains the conclusion which explains how this thesis achieved its aims and answered the research questions and provides broader implications of the results and future work.

Chapter 2: Literature review

This literature review synthesises key debates on politicising the just transition and the role of environmental justice movements within, while reviewing the contested impacts of cement production and emerging decarbonisation strategies. By combining these threads of literature, the review lays the groundwork for a power-centred, political approach to the just transition and prioritising environmental justice conflicts in planning a just green transition for cement production.

2.1 The Ecological, Health and Socio-Economic Impacts of Cement Production

Systematic literature reviews on the harmful impacts of cement production emphasise its significant effect on climate change, severe local ecological consequences, and connections to health concerns among both workers and local communities (Mishra et al 2022, Mohamad et al. 2022, Soomro et al. 2023). Patterns emerge across the literature, although environmental, health-related, and socio-economic impacts of cement production can vary significantly depending on the technology used, scale of production, and, importantly, the legal and policy safeguards and their enforcement to mitigate pollution. Socio-economic impacts, however, are less researched, presenting an important area for investigation, particularly in terms of local acceptance of cement production and decarbonisation pathways.

Harmful impacts of cement production occur throughout all manufacturing activities with varying degrees. It is widely acknowledged that cement production contributes significantly to climate change (7% of annual greenhouse gas emissions) and local air pollution (Mohamad et al., 2022). Common emissions include gases such as nitrogen oxides, sulphur oxides, carbon oxides, organic compounds, and hydrogen sulphide released during the combustion process; while particles like dust and carbon are released during extraction, packaging, transport and further manufacturing stages (Ibid.). Cement production is associated with a severe decline in soil quality, elevated levels of heavy metals, and decreased plant productivity, among other issues. It also contributes to habitat destruction and biodiversity loss, as well as detrimental

effects on the chemistry of surface and groundwater (such as high pH levels, nitrates, and total suspended solids), and negative impacts on human health (Mishra et al. 2022). Long-term exposure is associated with a higher risk of respiratory diseases, lung function decline, cancer risk in children and adults, eye irritation, and skin diseases (Ibid.). Compared to measuring environmental pollution, establishing a causal relation between cement production and health concerns is far more complex, creating challenges for impacted communities and regulators seeking to hold the industry accountable. The harmful impacts of cement production are currently most prominent in countries of the global South (or *developing countries*, as often referred to in the literature), where environmental laws are weak. The demand for cement is on the rise, adding poor worker safety and land acquisition to the list of concerns (Suhaib et al. 2023).

Reviews emphasise that a combination of approaches can mitigate harmful effects: deploying technological advancements (energy efficiency advancements, alternative fuels, CCUS), circular economy practices (fuel substitution, industrial waste utilisation), implementing new and enforcing existing legislation (such as stopping the discharge of wastewater) coupled with demand-side management and production technological transfer (Uwasu et al. 2014). Many of these advancements are crucial for the low-carbon transition of the cement industry, indicating that decarbonisation could serve as a catalyst not only for reducing emissions but also for improving local environmental conditions, the health of workers and the broader community.

Corporate tools for measuring impacts remain a contested terrain. While Life Cycle Assessment (LCA) is widely used to evaluate cement's environmental footprint, methodological inconsistencies, such as varying system boundaries (cradle-to-gate vs. full life cycle) and functional units, limit the studies' comparability (Ige et al. 2021; Salas et al. 2016; Chen et al. 2010; Song et al. 2016). The social pillar of sustainability is greatly lacking in the literature (Abbasi, 2017, Ashby et al. 2012, Wu and Pagell, 2011). Research efforts regarding LCAs are focusing on harmonising frameworks. Although LCAs are common in the global

South, incorporating social sustainability indicators (such as worker safety, community conflicts, and employment) is challenging, as they are often underreported.

Studies note that conflicts with local communities are not uncommon in "developing countries" (Sumarno and Wiratomo, 2018). As there is an economic cost associated with conflict resolution, it can be in the economic interest of the cement companies to circumvent conflicts. Economic costs rise with sustainability measures like water treatment and safety improvements, but social benefits (e.g., job creation) often align with economic growth. Social sustainability can be integrated into cement production without major financial burdens, as employment opportunities increase in tandem with production growth (Suhaib et al. 2023). Literature focusing on the methodologies of Environmental Impact Assessments (EIAs) related to cement production is relatively scarce. Research emphasises that Environmental Impact Assessments (EIAs) are one of the most essential environmental protection processes and can utilise the Life Cycle Assessment (LCA) method to determine the ecological impacts of the cement industry (Farahdiba et al. 2021). The reviewed studies on LCAs and EIAs in the cement industry focus on methodological details and provide business rationale for incorporating potential social sustainability factors.

2.2 Decarbonising Cement Production & Sustainability

Academic literature is ubiquitous on technological and policy levers needed to decarbonise cement production (Habert et al. 2020, Cormos 2022, Barbhuiya et al 2024 (a), Barbhuiya et al 2024 (b), Griffiths et al. 2023). Decarbonisation pathways of the cement and concrete sector (CCI) are often discussed together. Deep decarbonisation of the sector is set out to be a complex process, from technological solutions to material efficiency, the use of alternative materials, or targeting demand-side levers. Decarbonisation relies on key technological advances such as the large-scale deployment of carbon capture, utilization, and storage (CCUS) to target hard-to-abate emissions, the utilisation of supplementary cementitious materials (SCMs), electrification of heat, and adoption of alternative fuels (Boa Morte et al. 2023; Kumar et al. 2025). Policy

interventions such as carbon pricing, cap-and-trade systems, research grants, tax incentives, and regulatory standards play a pivotal role in enabling this transition. Demand-side measures, including sustainable construction practices, recycling, and green procurement policies, further drive industry-wide adoption of low-carbon solutions (Kumar et al. 2025). Habert et al. (2020) outline how many of these improvements throughout the cement and concrete value chain could be easily obtained without significant investment, leading to an immediate 50% reduction in greenhouse gas emissions. Miller et al. (2020) also highlight proven mitigation strategies that can be readily implemented and whose implementation would cumulatively cause a 12% reduction in climate and health damages:

1. cleaner-combusting oil as kiln fuel,
2. increased use of limestone filler,
3. use of wind electricity,
4. increased kiln efficiency.

They argue that CC(U)S technologies are the most speculative mitigation methods, such as the two most likely to be implemented technologies: amine scrubbing, calcium looping. The two forms of CCS can reduce GHG emissions by over 50% and 65% (Miller et al. 2020). However, their technological feasibility is not proven in the short and medium term. They found that while CCS technologies have the highest potential to reduce GHG emissions, the health damages associated with cement production (or concrete production, as referred to in the text) will result in a 7% rise. This is due to the energy demand of CCS technologies (Miller at al. 2020).

A decarbonisation measure that is highly endorsed by the industry is co-incineration or co-processing (GCCA 2020, Cemex 2025). Co-incineration is the use of waste (household, industrial or hazardous waste) as fuel in cement kilns, which can replace traditional fossil fuels. The practice has proven highly profitable for the cement industry. Using waste as alternative fuel, generates income on three fronts: fees paid by public authorities for waste disposal, cost

savings from substituting fossil fuels with waste, and possible profits from trading emissions permits as within the EU Emission Trade Scheme (EU ETS) have been assigned at no cost to facilities within the EU (Herrero et al. 2018).

The transition to a post-carbon economy entails unprecedented structural changes across all sectors, with heavy and extractive industries, such as cement production, facing particularly complex decarbonisation challenges. While technological innovations (e.g., carbon capture and storage, alternative fuels) are critical, focusing on technological and policy solutions risks overlooking embedded systemic injustices. For example, decarbonisation strategies, like the deployment of CC(U)S may raise the cost of cement due to the high energy need of the technology, leading to unaffordable housing in the global South, while some decarbonisation startegies are predictably going to exacerbate air pollution levels (Miller and Moore 2020, Habert et al. 2020). Historical concrete consumption disparities complicate equitable climate mitigation, where global North countries could take the burden of extra capital investment for CCS and the burden of higher cement costs (Steinberger et al. 2010).

Marsh et al. (2024) note this pattern in the literature: technical solutions to decarbonising the cement industry dominate industry discourses, while the social and economic inequalities linked to the cement and concrete industry are understudied. In contrast to studies with a purely technical focus on sustainability, Marsh's study (2024) examines the intersection of cement and concrete production with inequalities and their role in sustainable development and decarbonisation. This is a critical study in the context of this thesis, as it demonstrates that inequalities associated with the cement and concrete industry are rooted in structural power imbalances throughout the entire supply chain. Further strength of their research is seeing the CCI industry as a dynamic, socio-technical system with consequences within the supply chain. This allowed them to extend the scope beyond cement production and imagine, for example, the consequences of decarbonisation policies in the cement industry on the affordability of housing. Concerning cement production, the study reveals that it exacerbates inequalities

through uneven enforcement of pollution regulations. Technical factors influence emissions, and regulatory rigour varies globally. For instance, stricter provincial rules in China reduce pollution (Tang et al. 2022), whereas Nigeria's weak enforcement allows widespread non-compliance (Noah et al. 2021). Cement companies evade accountability through direct political influence, opting to pay fines, engage in media manipulation, and commit bribery rather than implementing corrective action, which highlights international disparities in pollution exposure (Noah et al., 2021). These practices reflect Lukes' first dimension (direct coercion) and second dimension (agenda-setting). In contrast, the third dimension (ideological) can be traced back to deep-rooted power dynamics such as neoliberal policies shaping the wealth of nations and perpetuating inequality, leading to the limited capacity of regulatory institutions in the Global South (Harvey, 2006; Hickel, 2017).

Marsh et al (2024) conclude that certain inequalities stem from particular power dynamics within the cement and concrete industries, such as gender inequality within the workforce and partial influence over health impacts from extraction and production. These are the only inequalities that the sectors can directly impact, and to some degree, industry associations are already recognising and backing efforts to mitigate them. Most inequalities, however, stem from underlying structures within the CCI. Here, the role of responsibility is murky due to the value chain and numerous underlying factors.

This thesis, however, argues that the pattern of justice conflicts observed in the cases suggests a greater responsibility of corporate actors in the reproduction and deepening of inequalities. While these injustices may be linked to different dimensions of power, industries not only set agendas but also directly benefit from neoliberal policies that perpetuate global inequalities in resource access and governance. The alliance with the state and state-enforced violence is benefiting them, and it is not in their best interest to change the status quo. This calls for a critical examination of the now-unfolding decarbonisation strategies, such as the use of co-incineration and emerging carbon capture, utilisation and storage (CCS).

2.3 Just Transition: A Principle, a Process, and a Practice

The concept of a just transition (JT) has a long-standing history, dating back to the alliance between trade unions and environmental justice movements in 1970s North America (Wilgosh, Sorman, and Barcena 2022). Initially centred on protecting jobs and communities impacted by industrial decline (Pai et al. 2020), the concept of a just transition has since become an increasingly important aspect of climate change discourses. It has been incorporated into key policy efforts on various levels of governance to support just decarbonisation efforts (Pinker 2020). At the same time, academic discussions have generated a substantial body of just transition research introducing diverse interpretations and scopes of what constitutes a *just transition* (Wang and Lo 2021; Pai et al. 2020).

According to the Just Transition Research Collective (JTRC), at the very base, the concept of a 'just transition' is to show that job security and protecting the environment are compatible goals, and to broaden the scope of low-carbon transitions beyond questions of technology towards socio-economic and social justice implications (JTRC 2018). Drawing on existing literature, the Scottish Just Transition Commission differentiates the following approaches in which the *just transition* might be carried out:

1. Status quo: approaches that seek to craft transition processes without modifying the current socio-economic system;
2. Managerial: approaches that alter certain rules and arrangements within the existing system;
3. Structural: approaches that use procedural and distributive justice mechanisms to modify aspects of the system;
4. Transformative: approaches that seek to radically overhaul the current system.

Evaluations of just transition processes are scarce, and existing case studies suggest that transition processes are conducted with a managerial approach, with only a few elements of structural change in some instances (Pinker 2020). This is important as mainstream transition policies often adopt a managerial, techno-economic logic—emphasizing efficiency,

innovation, and green growth—while sidelining justice concerns as "side effects" (Fletcher et al 2019 in Abram et al 2022). This means that status quo and managerial approaches depoliticise climate action, obscuring how decarbonisation intersects with historical responsibility, extractivism, and global inequities (Abram et al. 2022).

In practice, most advanced national just transition planning has occurred within the energy sector, particularly concerning the coal phase-out (Pinker 2020). Due to this sectoral focus, energy justice literature has enriched JT discourses, pointing out that conventional energy justice frameworks and transition studies are normative, failing to expose the structural roots of injustices. A case study of the first EU regions to receive Just Transition Mechanism (JTM) funding for coal phase-out concludes that the JTM's implementation reproduces injustices by not confronting political-economic structures that caused them (LaBelle et al. 2023).

This led to a call for an explicitly political approach in recent JT literature. Politicised approaches are often rooted in political ecology, centring relations of power to target the structural roots of existing injustices and potential injustices perpetuated by low-carbon transitions (McCauley et al. 2019). Politicising JT is a call for transformative approaches, which are often referred to as *just transformation*.

Beyond categorising JT approaches based on their transformative potential, conceptualisations in research correspond to the following themes: just transition as a labour-oriented concept, just transition as an integrated framework for justice, just transition as a theory of socio-technical transition, just transition as a governance strategy (Wang and Lo 2021). The concept of an integrated framework of justice emerged in a scholarly attempt to transcend historical, labour-oriented approaches, through recognising the linkage between the JT concept and more established concepts in justice-focused literature. These linkages are versions of environmental justice, energy justice, and climate justice struggles that incorporate distributional, procedural, recognitional, and restorative justice elements (Wang and Lo 2021). In their conceptual review of the JT, Sovacool et al conclude that scholars adopting a more transformative notion of justice

target the root cause of injustice and identify the groups most affected by low-carbon transitions as low-income households, people with health concerns, and residents of rural areas (Sovacool et al. 2019). A just transition, as an integrated framework of justice, thus goes hand in hand with transformative approaches.

There is another problem, however: the accelerating climate crisis demands rapid, large-scale transitions; and transitions, especially just ones, are likely to take a long time (Pinker 2020). Furthermore, an increasingly broad conceptualisation of JT runs the risk of rendering the term meaningless (Bainton et al. 2021; Wang and Lo 2021; Jenkins 2020). While the question of just transition for whom is still under debate, action is needed quicker than ever (Wang and Lo 2021). Rapid and just transitions are not just technical challenges but political processes. Historical lessons caution against top-down, elite-controlled approaches, while insights from political economy underscore the need for contested, democratic pathways (Newell et al. 2022). Without matching the speed of transition by a commitment to equity, accelerated decarbonisation risks reinforcing the very inequalities that the climate crisis exacerbates (newell). This makes JT both a process and an end goal (Williams & Doyon, 2019).

A just transition, therefore, requires not only technological and infrastructural shifts but also inclusive, democratic decision-making that redistributes power and benefits (Leach et al. 2015). A transformational JT agenda must disrupt entrenched power structures. Therefore, there is a need for place-based, participatory governance to avoid top-down impositions that trigger backlash, as also stressed by (Abram et al. 2022). Past energy transitions were not purely technological but emerged from political struggles—such as labour movements in carbon democracies (Mitchell 2013). Today, climate justice movements, trade unions, and grassroots organisations are pushing for systemic change, challenging both fossil fuel hegemony and the technocratic management of decarbonization (Swyngedouw 2010). Wang and Lo (2021) further highlight the literature gap in centring power dynamics within just transitions and the need to expand the scope beyond transitions of the global North.

Despite growing attention to just transition frameworks in energy systems, industrial decarbonisation remains severely understudied (Upham et al. 2022). This gap primarily concerns heavy industries, industrial clusters, and extractive industries, with the notable exception of rare earth materials required for the decarbonisation of the energy sector. Due to the focus on decarbonising the energy sector, transition processes have had a relatively limited sectoral focus, making it less necessary to engage in more complex transition processes that address multiple domains across the socio-economic system simultaneously. This changes with the cement industry. Studying the just transition of cement production and the just green decarbonisation of the cement industry is therefore a crucial next step. Furthermore, there is a need for studies rooted in practice and more knowledge about how transformational approaches to a just transition can be effectively translated into on-the-ground actions (Wang and Lo 2021, JTRC 2018).

This thesis employs the term *'just green transition'* to refer to a decarbonisation that has the potential to address underlying issues of injustice, referring to a transformational approach and JT as an integrated framework of justice. This prepares for the potential outcomes of low-carbon transitions.

2.4 Environmental Justice Movements (EJMs)

Environmental Justice (EJ) is a framework that encompasses both theory and action (Schlossberg 2004). It seeks justice for communities affected by environmental degradation through: promoting equity in the distribution of environmental risks, recognising the diverse identities and experiences within affected communities, and fostering community participation in the political processes that shape ecological policies (Schlosberg 2007, 4-5). As previously established, when the *just transition* is conceptualised as an integrated framework of justices, environmental justice plays a significant part in just decarbonisation, acting as both a guiding principle and a way of action (Schlossberg 2004).

Current research on justice conflicts and environmental movements related to cement production primarily focuses on case studies, providing opportunities for more comprehensive assessments. These cases highlight environmental racism, legal challenges and the power of community organising (Fleming and Suarez 2024). One example of a significant case study is the literature on indigenous struggles of the Sedulur Sikep community in Indonesia, leading to an anti-cement movement led by women (Nawiyanto et al. 2019, Setiadi et al. 2017, Putri 2017).

There is a growing focus on quantifying EJ Movements and using statistical approaches to characterise environmental justice or ecological distributional conflicts and movements. One of these is the paper by Martinez-Alier et al. (2016) which argues for the presence of a global environmental justice movement. The authors utilise the EJ Atlas to illustrate their point by demonstrating that EJ movements are spreading geographically and becoming increasingly networked within themselves, interlinking the claims and vocabulary of local resistance, intermediary organisations, and international actors fighting for environmental justice. The study establishes that while most conflicts are local events targeting specific local grievances, there is a *global* movement for environmental justice as these local events thematise issues that regularly appear elsewhere in the world, they raise the conflict issues through various levels due to the movement's connection to regional and international actors, or because the conflicts create and operate at a global scale (Sikor and Newell 2014). This approach is important as it allows for a more systemic analysis within the bounds of the atlas and establishes connections to what leads to successful campaigns, the values they define, and their place-based interests (Anguelovski and Martinez-Alier 2014; Escobar 2008). These are now possible with the use of the EJ Atlas, onto which this thesis builds both theoretically and methodologically.

One recent study, based on the EJ Atlas, examines the emerging environmental justice movement against waste co-incineration in cement kilns in Spain. While the industry is shifting away from the use of fossil fuels, waste-based fuels sparked conflict within the local population

due to health risks. This paper is important for the findings of this research as it also shows the emerging concerns of a technological solution implemented as a decarbonisation measure, while creating a new set of environmental problems, affecting the local community.

Chapter 3: Theoretical and Conceptual Framework

The theoretical and conceptual framework of this thesis is based on the work of Scheidel et al. (2018), prominent scholars working on the Global Atlas of Environmental Justice (see Chapter x), and has been applied in such context. Figure 1 serves as an illustration of their initial framework. This thesis employs a cyclical approach to investigate the drivers of ecological distribution conflicts and emerging environmental justice movements within the scope of cement production.

By modifying the framework, it proposes the just green transition as a mechanism to further sustainability transitions, thereby changing the socio-metabolic configurations that drive ecological distribution conflicts (see Figure 1). The framework is based on the idea that addressing underlying injustices requires a transformation of unsustainable systems. The framework integrates perspectives from political ecology, social movement theory, sustainability transitions, and just transition theory, based on multiple justice literatures (Scheidel et al. 2018) as outlined in Chapter 2. These lenses collectively underscore the pivotal role of EJ conflicts and reframe conflicts from obstacles to catalysts of change (Temper et al. 2018).

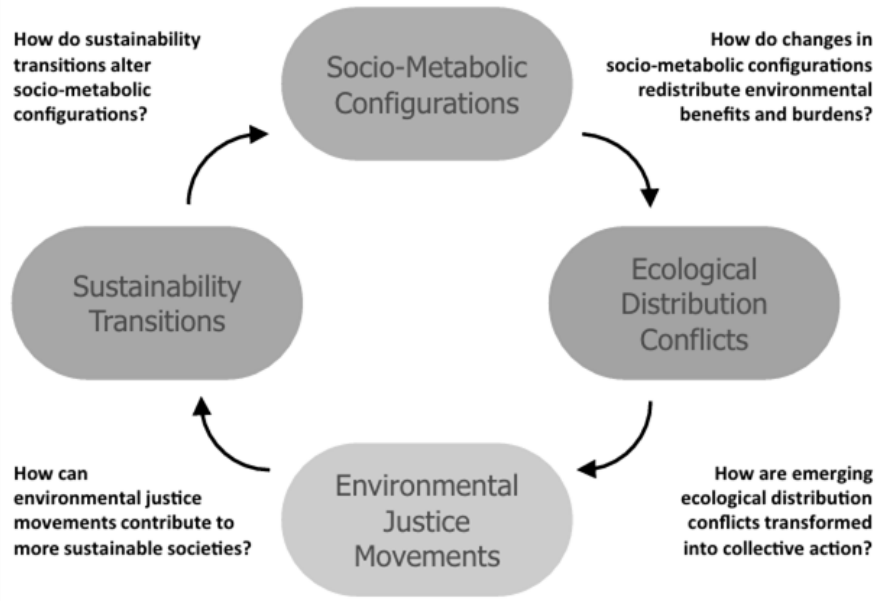

Figure 1: Schematic Overview by Scheidel et al. (2018, p.589)

3.1 Social Metabolism and Socio-Metabolic Configurations

Sustainability is largely defined by the material and energy exchange processes between socio-economic systems and the environment, including biogeochemical cycles (Scheidel et al. 2018). The concept of social metabolism draws on the idea that, similarly to any biological organism or ecosystem, societies also require a continuous energy and material flow to self-organise, develop and maintain internal functions and structures (Giampietro et al 2014). Applications of the interdisciplinary concept of social metabolism allow the quantification and characterisation of specific socio-economic processes and different types of societies. Societies, from hunter-gatherers to industrialised economies have distinct metabolic profiles which sometimes coexist. Beyond the biophysical dimensions of social metabolism, society's metabolism is also shaped by political, economic and social dimensions. The term socio-metabolic configurations captures this connection, integrating material flows with the power relations that govern them (Scheidel et al. 2014). These configurations redefine the distribution of environmental benefits and burdens, linking patterns of resource use to broader sustainability challenges (Scheidel et al. 2014). Understanding socio-metabolic configurations is crucial for analysing ecological distribution conflicts (EDCs), as changes in resource flows redistribute environmental benefits and burdens, creating tensions.

Concepts employed by scholars from a neo-Marxist tradition, such as David Harvey, can be beneficial in understanding the key characteristics of dominant socio-metabolic configurations. For example, modern capitalism drives global metabolic expansion through capital accumulation, in the form of expanded production, as well as dispossession (i.e. the separation of the labourers from their means of production) and contamination (i.e. the socialisation of costs, or cost-shifting), where environmental burdens are externalised onto marginalised communities (Harvey 2004, Demaria and D'Alisa 2013).

These neo-Marxist approaches emphasise global-local linkages, revealing how transnational companies exploit resources across scales, often creating metabolic rifts (e.g., ecological

disruptions from unequal exchange) (Khan 2013). The concepts of accumulation by dispossession and the metabolic rift are essential for understanding the global mechanisms that lead to the justice issues, including conflicts and EJ movements connected to cement production(Harvey 2004, Khan 2013). Neo-Marxist approaches are, however, criticised for overlooking non-material forms of exploitation such as gender, ethnicity or local politics (Khan 2013). While conflicts arising from dominant socio-metabolic configurations may be primarily driven by material exploitation, it is essential not to neglect conflict drivers of a different nature and to integrate a wide range of perspectives, such as feminist and decolonial perspectives, into the analysis to understand a broader range of drivers (Khan 2013).

3.2 Ecological Distribution Conflicts (EDCs)

The concept of ecological distribution conflicts (EDCs), introduced by Martínez-Alier and O'Connor (1996), examines the social tensions that arise from unequal access to environmental benefits (e.g. resources, land, ecosystem services) and disproportionate exposure to burdens (e.g. pollution or waste). These conflicts represent more than material disputes, as they reflect clashing value systems about the worth of nature, whether measured in market terms, livelihood needs, Indigenous rights, or ecological sacredness (Temper & Martínez-Alier 2013). Unlike economic conflicts, which can be resolved through monetary compensation, EDCs often involve incommensurable values that resist market-based solutions (Temper & Martinez-Alier 2013). This does not mean that conflicts over, for example, procedural issues or recognition of different values and worldviews (Schlosberg 2004) are excluded. The framework sustains that conflicts inevitably involve a distributional perspective; that is, the lack of participation and recognition contributes to unjust distributional outcomes(Scheidel et al. 2018).

Conventional conflict management, which focuses on consensus and win-win solutions, often fails to address the root causes of conflict, including entrenched power asymmetries, historical injustices, and institutional failures. In contrast, conflict transformation (Lederach 1995; Dukes 1996) views conflicts as opportunities to expose structural inequities and forge new

relationships founded on justice. This aligns with EJ's imperative to rectify historical wrongs and create equitable futures, rejecting superficial resolutions that perpetuate cyclical violence. Ecological distribution conflicts mark the first step in sustainability transitions by exposing systemic violence and inspiring collective action (Scheidel et al. 2013).

3.3 Environmental Justice Movements (EJMs)

Rooted in 1980s America's civil rights struggles, the EJ movement emerged as a response to the systemic placement of polluting industries in communities of colour (Bullard 1990). This grassroots resistance to environmental racism quickly evolved into a global force. EDCs often catalyse the rise of environmental justice movements (EJMs), which mobilise against unsustainable practices and advocate for equitable alternatives (Scheidel et al. 2013). Born from grassroots struggles, EJMs bridge local grievances with transnational networks, amplifying their impact (Martinez-Alier et al. 2016). This framework reframes environmental conflicts from obstacles to catalysts of sustainability (Temper et al. 2018).

This approach links ecological and social justice by challenging power structures that force marginalised populations to bear the environmental costs of others' economic gains. Environmental justice movements pursue change through two distinct conflict types:

1. Intramodal conflicts focus on redistributing environmental goods and burdens within existing systems: such as disputes over water access or pollution mitigation. While important for local equity, they rarely challenge the underlying unsustainable structures (Scheidel et al. 2013).
2. Intermodal conflicts, defend traditional resource systems against industrial encroachment. These conflicts often adopt anti-capitalist stances by rejecting monetary valuation of nature in favour of indigenous rights, ecological integrity, or sacred values, making them powerful drivers of systemic sustainability transformations (Scheidel et al. 2013).

The outlined framework acknowledges that marginalised communities have the power to move from suffering to critical consciousness and to reach transformative action. EDCs and EJ movements not only resist different types of exploitation, but also generate alternative visions such as localised governance, democratic resource management, and anti-extractivist economies (Temper et al. 2013). This reveals conflicts and movements as productive spaces for systemic reimagination.

3.4 Sustainability Transitions

The growing field of sustainability transitions research argues that humanity's complex environmental crises necessitate systemic restructuring, rather than just technological tweaks or one-off solutions (Grin et al. 2010). Unlike temporary "sustainability fixes" like shutting down a single polluter, true transformations require fundamental shifts in production regimes, consumption patterns, and governance frameworks. By combining the politics of transformation with research on transitions, political ecology, environmental justice movements, and grassroots alternatives, it reveals how conflicts over the distribution of ecological resources can drive these changes (Scheidel et al. 2018).

All visions of sustainability transformations require fundamental shifts in socio-metabolic relations. At present, the main focus in socio-metabolic terms is the shift towards a low-carbon, resource-efficient economy. While current efforts emphasise technological efficiency in the energy and industrial sector, such incremental changes risk triggering rebound effects unless paired with absolute reductions in material and energy throughput (Scheidel et al. 2018). Degrowth scholars argue that *true* sustainability demands not just cleaner production but also equitable downscaling of resource use. This requires a radical departure from historical transitions that increased metabolic rates. The shape of these transitions depends on how resource regimes are governed, while the very materiality of the examined resource also shapes the outcomes (Scheidel et al. 2018).

3.5 Linking Cement Production to the Framework

The interplay between socio-metabolic configurations, ecological distribution conflicts, environmental justice movements and sustainable transitions forms a dynamic feedback loop. Figure 2 depicts the use of the outlined framework within this thesis.

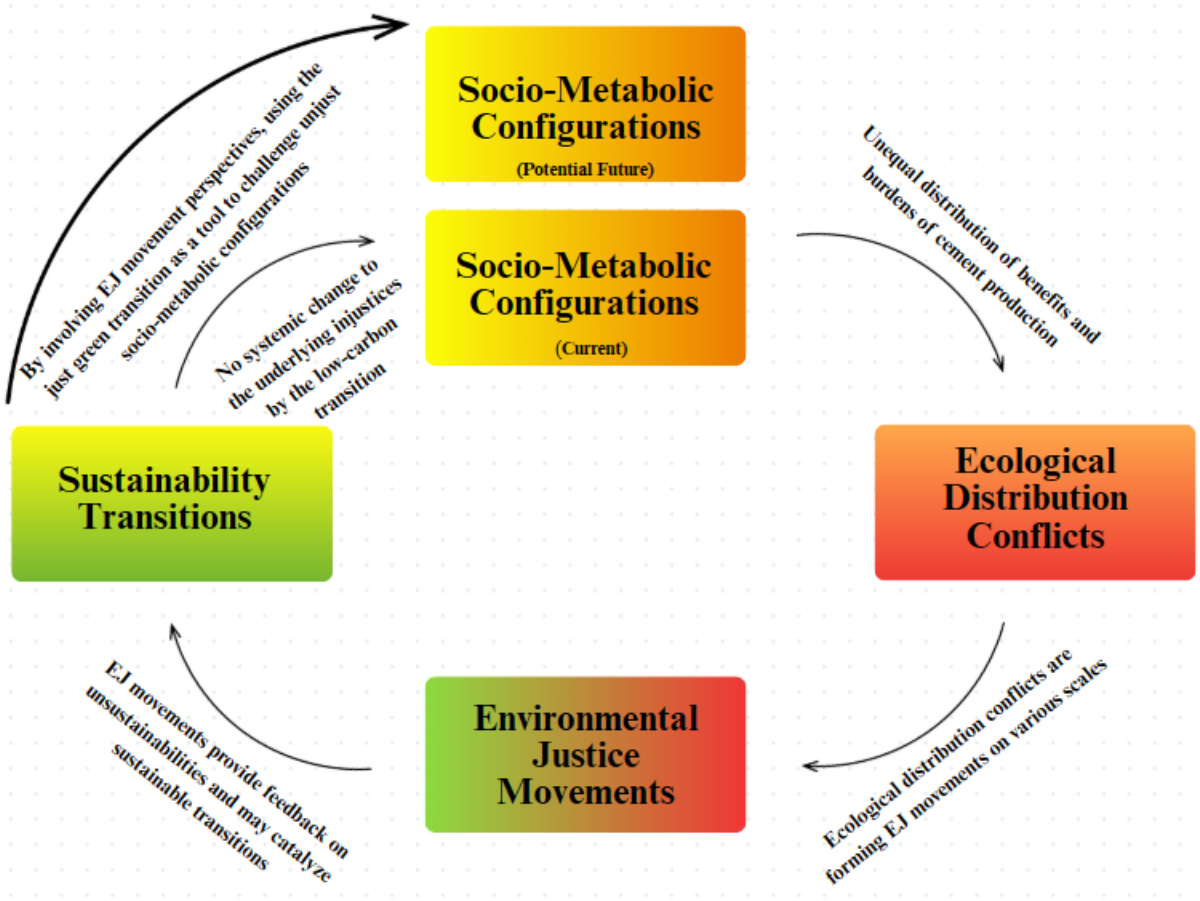

Figure 2: Cyclical framework as used in the thesis. Figure modified from Scheidel et al. (2018)

Cement production fits this conceptualisation as a resource-intensive, heavy industry which relies on large-scale limestone extraction, high energy consumption, waste generation, often at the expense of local ecosystems and populations. The global cement industry contributes to ecological distribution conflicts, as driven by the current socio-metabolic configuration. These conflicts reveal the limits of technological solutions and market-fixes, as monetary compensations are not a solution, since incommensurable values are at risk. Ecological distribution conflicts are fuelling EJ movements to confront the industry with the perpetuated injustices. By centring those most harmed, EJ movements show that low-carbon transitions and

a circular economy are not leading to transformative change if they do not address a change of power dynamics.

Cement's future tests a core hypothesis: sustainability transitions fail when they do not challenge unjust socio-metabolic configuration, and succeed only when they redistribute power. The just green transition can act as a key policy tool for incorporating the visions of environmental justice movements and weaving them together with decarbonisation efforts to achieve a transformational outcome ("Potential future" in Fig. 2). The stakes transcend cement, offering a blueprint for all extractive industries.

Chapter 4: Research Design, Materials and Methods

4.1 Research Design

This study utilises a mixed-methods research design. This approach is particularly suitable for examining the complex issues central to this research, as it accommodates both overarching trends through statistical patterns and contextualised experiences of injustices connected to cement production (Cresswell 2018). To answer RQ1 and RQ2, a convergent mixed design was employed using data from the Global Atlas of Environmental Justice (EJ Atlas) as described in 4.2. A convergent design usually involves simultaneously collecting and analysing both quantitative and qualitative data, then merging the findings to create a comprehensive understanding of the research problem (Cresswell 2018, Chapter 10). It requires intentional integration during interpretation and explicit attention to resolving contradictory findings through further investigation. It is advantageous to capture both statistical patterns and conceptual depth, addressing complex problems that require multiple perspectives. As both the quantitative and qualitative data were sourced from the EJ Atlas, this also demonstrates the internal validity of the EJ Atlas data rather than the use of multiple sources of data.

4.2 The Global Atlas of Environmental Justice (EJ Atlas)

This research utilises the Global Atlas of Environmental Justice (EJ Atlas) to provide insights on both of its research questions (*What are the drivers of ecological distribution conflicts and environmental justice movements within the scope of cement production? How do these drivers inform the barriers and opportunities of a just green transition of cement production?).*

The EJ Atlas is the world's largest database of socio-environmental conflicts. Developed in 2011 by justice researchers, this online, interactive platform documents and categorises over 4,300 conflict cases globally (as of June 2025), offering a searchable, collaboratively produced knowledge base. Unlike traditional case-study approaches (e.g., Urkidi 2010; Veuthey &

Gerber 2012), the EJ Atlas enables systemic analysis by compiling reviewed grassroots-reported conflicts that meet strict criteria:

1. Economic activities or policies with harmful socio-environmental impacts;
2. Documented claims by affected groups or activists;
3. Media coverage of the conflict.

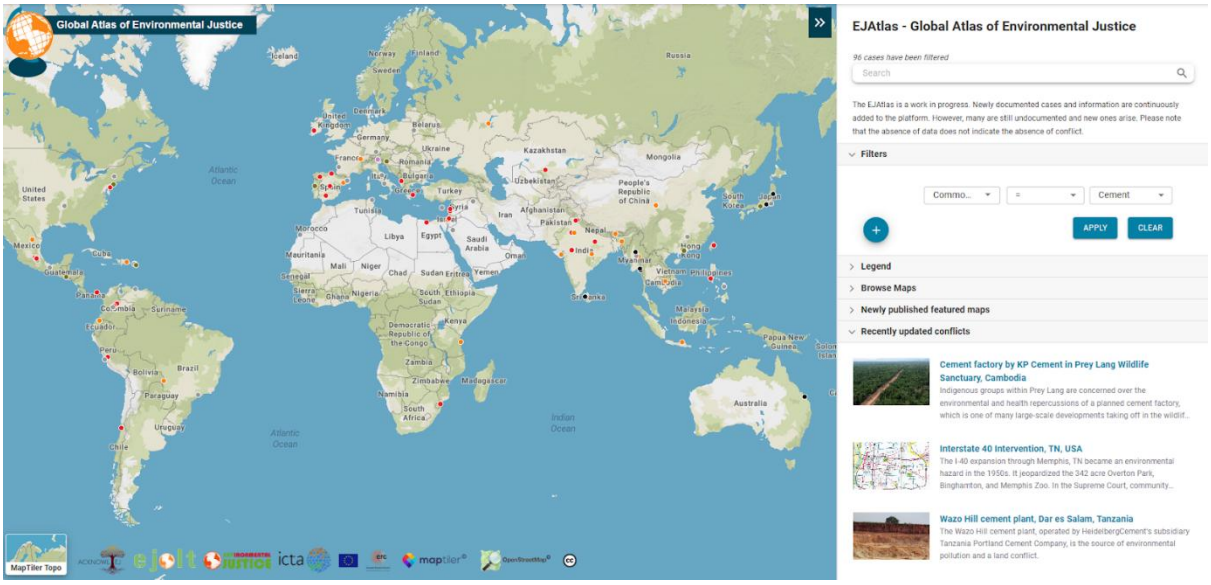

Figure 3: The EJ Atlas page filtered by cases where the commodity "cement" was present. The points on the map indicate the locations of the 96 documented cases related to cement as a commodity.

The database is continuously updated and expanded by NGOs, researchers, and communities. It gave fuel to academic publications such as Avila 2018; Scheidel et al. 2020; Temper et al. 2018, advocacy campaigns, and policy debates. The EJ Atlas is based on the co-production of knowledge and highlights injustices across sectors while amplifying marginalized voices. At its core, the Atlas underscores a fundamental truth: environmental costs and benefits are disproportionately distributed, not just across species and generations but also among present-day communities. While many injustices spark visible resistance, others persist unchallenged due to power imbalances or structural constraints. The EJ Atlas thus serves as both a map of visible conflicts and a mirror reflecting the uneven terrain of environmental inequity worldwide.

While in-depth case studies provide critical narratives (Martínez-Alier et al. 2016), answering the research questions of this thesis requires a global, systematic lens, focusing on the overarching drivers of environmental justice conflicts and EJ movements connected to cement

production. The EJ Atlas bridges gaps between localised struggles and broader sustainability transitions, making it an empirically robust and unique tool for analysing structural injustices and highlighting the success and wisdom of local resistance that can be incorporated into a just green transition.

4.3 Ethical considerations

All data from the EJ Atlas used in this research were obtained from publicly available case sheets on their platform. The EJ Atlas makes its content available under a Creative Commons Attribution-NonCommercial- ShareAlike 3.0 Unported license, which this thesis complies with through:

1. Exclusive non-commercial use
2. Proper attribution to EJAtlas
3. Maintaining equivalent or similar licensing terms.

While the complete dataset requires formal approval for access (csv/ods format), this study utilised only publicly available information from the case sheets to reconstruct the data in cvs format. This was done due to time constraints that may not have allowed for the formal request process. It is noted in the data use policy of the EJ Atlas that formal data use requests are granted for cases which:

1. Advance environmental justice objectives;
2. Meet established ethical standards;
3. Acknowledge the collective nature of the data;
4. Demonstrate responsible analysis of data limitations.

This research aligns with these principles, using the data to support environmental justice scholarship while respecting the platform's terms of use and the communities represented in the cases, and acknowledging the limitations of the data. Upon approval of this thesis, the EJ Atlas is notified about the use of data and the research outcomes are shared with their community.

This independent study was conducted without receiving external funding.

4.4 Methods Used to Collect Data

The EJ Atlas case sheets were systematically screened to ensure relevance to cement production, and the database was manually constructed in Microsoft Excel. Beginning with the 96 cases identified under the "cement" commodity filter, I conducted further manual review to exclude cases beyond the study's scope, such as concrete use in contested, large infrastructure projects. Most case descriptions are available in English. Where English was not available, the Google Translate plug-in was used to translate the page. The data from the case sheets were then collected using the attributes and variables employed by the EJ Atlas. To efficiently construct the database, some variables were collected as codes. For the definitions used by the study and the EJ Atlas see Appendix C, for the codes used, see Appendix B. *Appendix A* contains the cases analysed.

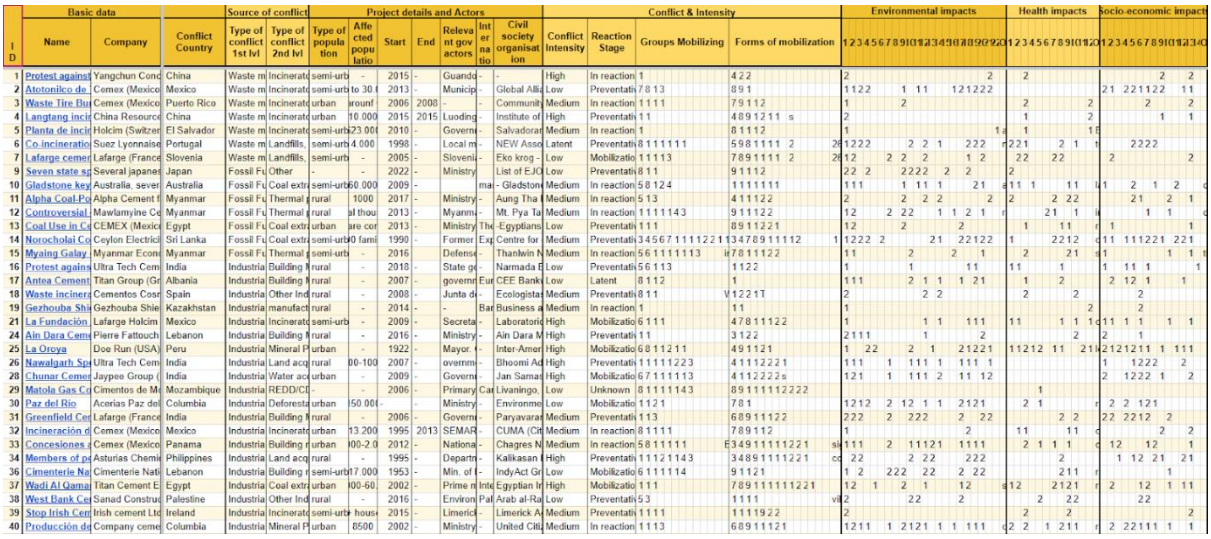

Figure 4: : Screenshot of the partial database.

The final Excel database of this thesis consists of 70 conflict cases connected to cement production. The final database can be shared upon request of the examinees. The database contains:

- *data on the name of the conflict case as used in the EJ Atlas;*
- *a link to the case sheet;*
- *the company connected to the conflict case;*
- *the conflict country;*
- *the type of the conflict;*
- *further project details;*
- *actors;*
    - *kind of population affected and the number of people when available;*
    - *relevant governmental, civil society and international organisations;*
- *the beginning and end date;*

- *information on the conflict;*
    - *conflict intensity;*
    - *reaction stage;*
    - *mobilising groups;*
    - *forms of mobilisation;*
- *the impacts;*
    - *environmental, health and socio-economic impact types;*
- *the conflict outcome;*
    - *project status;*
    - *conflict outcome by type;*
    - *alternative proposals;*
    - *the overall judgement whether the case was a success for environmental justice.*
    - *manual summary of the case.*

The cases are spatially varied and contain conflicts that are relevant to this day and mainly emerged since 2000. Out of the 70 cases, in 56 cases, cement production is the main source of conflict. This group makes up the bulk of the database and was chosen to be presented in the findings, as the connection between cement production and local harm is directly established. Within the remaining 14 cases, while cement production is part of the conflict, the impacts are from various industries, such as in the cases of industrial clusters and their remediation efforts. In these cases, the impacts and movements cannot be directly tied to cement production. Due to limitations, findings from these 14 cases are not presented.

4.5 Methods Used to Analyse Data

4.5.1 Quantitative Analysis

The compiled database primarily contains nominal (e.g. conflict country) and ordinal level (e.g. conflict intensity) variables, which necessarily limits the range of applicable statistical methods. Within these parameters, the analysis employed:

1. Frequency distributions to identify prevalent patterns;
2. Spatial pattern of conflict cases and the associated company or companies;
3. Cross-case comparisons to establish connections between different types of impacts;
4. Targeted examination of success cases and cases connected to low-carbon technologies.

Where feasible, correlations between ordinal variables were explored to identify potential relationships. The quantitative findings serve a dual purpose. They have the potential to reveal systematic, global patterns in conflicts and EJ movements related to cement production, and

they provide structural guidance for qualitative analysis, receiving contextual enrichment in return from qualitative insights.

4.5.2 Qualitative Analysis & Integration of Findings

The qualitative analysis is based on the description of the cases provided in the case sheets. These descriptions provide context to the conflict, detail the timeline of events, the motives and narratives of the resisting groups, and include quotes, as well as potential narratives of the companies and other actors involved. Some case descriptions also put the conflict case in a broader context by drawing connections to harmful practices by that specific company or recurring struggles of a specific kind within the same country. As mentioned before, each case description is around the length of 1-2 pages. A thematic analysis was conducted based on the 70 descriptions and their individual summaries in the database to identify patterns. These identified themes refer to problem clusters and can be linked to tendencies revealed in the quantitative analysis.

The findings are therefore the results of an integration of qualitative and quantitative methods. The quantitative data and qualitative analysis complement each other, and both point to tendencies in one another. This bidirectional approach ensures that statistical patterns inform qualitative interpretation, narrative evidence grounds quantitative findings in real-world contexts, and methodological limitations are mitigated through triangulation.

4.6 Limitations

While the EJ Atlas represents the most comprehensive global database of environmental justice conflicts, it is not exhaustive. The absence of documented cases in certain regions or sectors does not imply the absence of injustice or a movement to counter it. The Atlas is a collaborative database, where its richness and updates depend on the capacities of activists, grassroots movements and researchers often lacking funding and other resources. Additionally, underreporting may reflect limitations in local advocacy capacity or visibility (e.g. in the form of independent media) rather than actual conditions. Not all environmental injustices lead to

open resistance, despite many being challenged by affected communities (Sikor and Newell 2014). These gaps are themselves analytically significant, revealing patterns in mobilisation barriers or suppressed dissent.

The EJ Atlas relies on reviewed, but not continuously updated case data, meaning some entries may not capture recent developments. The majority of analysed cases do not have an end date of the conflicts (as conflicts are so often unresolved), but they follow through the conflicts until 2020 and later. As such, findings cannot be generalised beyond the timeline of reported conflicts, yet discernible trends emerge across cases that are up to date. Another aspect is that the EJ Atlas data provide a scientifically trustworthy source of raw data that can shed light on conflicts earlier than they would appear in peer-reviewed publications.

4.7 Positionality

As with all research, this work is shaped by my ontological and epistemological positioning. Creswell (2018, p.44) use the concept of worldviews to describe the basic set of values that guide action, often referred to as paradigms, epistemologies and ontologies by others. The researcher's worldview is shaped by the nature of the inquiry, their disciplinary training, academic communities, personal research experiences, and many other factors. The worldview I position myself in is the *transformative worldview.* This worldview holds that research inquiry needs to be intertwined with politics and a political change agenda to confront oppression (Cresswell 2018, pp.46-47). Its core is an action-oriented epistemology that focuses on studying asymmetric power dynamics and the lived experiences and voices of historically marginalised groups to provoke change.

I have to acknowledge the hegemony of Western knowledge systems in framing just transition discourse, and that as someone from the global North socialised in a Western knowledge system, I further this pattern. My interpretations of the conflicts and solutions are viewed through my own lenses. The use of the EJ Atlas represents both an attempt to centre pluralistic knowledge and an inevitable refraction through my interpretive lens.

My engagement with this topic was further influenced by my time spent volunteering in an ecovillage on Gotland, Sweden, where the country's largest cement manufacturing plant is located. The people I met there were living on and off their land and felt the detrimental effects of environmental and political impacts of local cement manufacturing, including political tensions, water scarcity, biodiversity loss, and questions around decarbonisation. I had various discussions over their concerns and became connected to the issue from their side.

It was on Gotland where I saw the most beautiful sunsets of my life. From the direction of the ecovillage, the sun is setting over the quarries and the manufacturing plant. I wonder whether those breathtaking sunsets were caused by air pollution from industrial activities. This gives a strange metaphor for the entanglements of industrial harm and human perception.

Chapter 5: Findings

This chapter presents the interwoven findings of the analysis of environmental justice conflicts, along with supporting analysis of industry documents. To answer the research questions, findings detail the drivers of environmental justice conflicts within the scope of cement production and outline the barriers and opportunities for a just green transition of cement production as informed by the identified conflict drivers.

5.1 Distributive Drivers of Environmental Justice Conflicts in Connection with Cement Production

The findings from the analysis of 56 environmental justice conflict cases directly linked to cement production reveal various drivers of injustices, mainly highlighting distributional concerns such as the uneven distribution of burdens and benefits between countries as well as within the conflict country. Beyond drivers connected to distributive justice issues, recognitional justice, procedural justice as well as restorative justice drivers are heavily present. While recognitional, procedural issues interact with and inform these distributive dynamics, they remain secondary drivers that may be improved independently. The distributive dimension, by contrast, suggests systemic transformation of socio-metabolic configurations to achieve meaningful change.

Given the theoretical framework's emphasis on distributive justice, I present the findings through a distributive justice lens first. Distributive justice here is understood as the full range of distributional consequences of cement production including current production and decarbonization processes: from concerns over quality and equality of employment in the sector to unequal access to affordable services and other benefits of transition (Abram et al. 2022). Supporting the use of the framework, distributive justice issues contribute primarily to the examined environmental justice conflicts. The investigation reveals three key drivers of conflict connected to the unequal distribution of burdens and benefits:

1. The visible and potential broad range of environmental, health, and socio-economic impacts outweigh the benefits of cement production for the local community.
2. Unequal distribution of burdens and benefits across countries, where the conflict countries are dominantly in the global South, with companies benefiting come from economically stronger regions.
3. Urban-rural tensions arise from the distribution of burdens and benefits, as rurally produced cement is used in urban areas. At the same time, the environment and sustenance options of rural locals are jeopardised.

5.1.1 Environmental, Health and Socio-Economic Impacts of Cement Production

Many factors influence the interpretation of environmental, health and socio-economic impacts. Firstly, the reported impacts encompass both visible and potential impacts: 364 visible and 754 potential reported impacts across the 54 cases. Potential impacts are perceived by the resisting actors, and they may or may not actually be present or pose future threats. They can, however, signal problems that are not yet established as impacts of cement production or the visibility of the impact cannot be determined due to inadequate data monitoring and dissemination. Secondly, 22% of the conflict cases are preventative resistance, meaning the consequences have yet to materialise and it might never be known if the movement is successful for EJ.

The described impacts emerge all across the cement production chain (as labelled by the EJ Atlas as first type of conflict): the extraction of raw materials (18 cases), use of fossil fuels in the production process and to power the cement plant (5 cases), waste management conflicts (7 cases) dominantly connected to co-incineration, industrial and utilities conflicts (24 cases) and infrastructure and built environment conflicts (2 cases).

Figure X illustrates the cumulative environmental, health and socio-economic impacts (visible and potential) across cases. The Figure shows that environmental impacts (189 visible and 400 potential impacts) are the most commonly mentioned within conflict cases, followed by socio-economic impacts (118 visible and 216 potential impacts), and lastly health impacts (57 visible and 138 potential impacts). This does not mean that health impacts are less critical in the eyes

of mobilising actors; it simply means that socio-economic impacts are a frequent and key part of conflicts. The most common environmental impacts include air pollution, biodiversity loss, water pollution (surface water, decreased water quality), soil contamination, and landscape/aesthetic degradation. Global warming potential is also present in 5 cases for visible impact and 22 instances of potential impact. Interestingly, these cases are often linked to the current proposed expansion of coal-based power plants to provide electricity for the cement factory, directly contradicting climate goals and decarbonisation efforts. These cases will be analysed later in section X. The list of environmental impacts further includes, among others, noise pollution, food insecurity, desertification and large-scale disturbance of hydrological and geological systems. The myriad of problems underlines the wide-ranging environmental impacts connected to cement production, even in categories such as food insecurity, which are less often documented.

Looking at health impacts, the most reported category (beyond other health impacts) is exposure to unknown or uncertain complex risks, occupational disease, other environmental-related diseases and accidents. The list further includes mental problems, deaths, infectious diseases and malnutrition as the lowest occurring environmental impact.

Beyond health impacts, cement production also affects incommensurable values of a socio-economic nature. The most frequently reported impacts include loss of livelihood, loss of landscape/sense of place, land dispossession, violation of human rights and displacement. The loss of traditional knowledge/practices/culture has been reported in 5 cases as a visible impact, and in 20 cases as a potential impact, suggesting that the importance of preserving traditional knowledge acts as an essential driver of conflict. Socio-economic impacts include areas in which the state and local government actors are complicit: an increase in corruption, militarisation and increased police presence. The interconnectedness of various issues is apparent, as their impacts contribute to soil erosion, which in turn leads to food insecurity and

loss of livelihoods from farming. This situation also disproportionately affects women who work in the fields, as well as women in domestic roles.

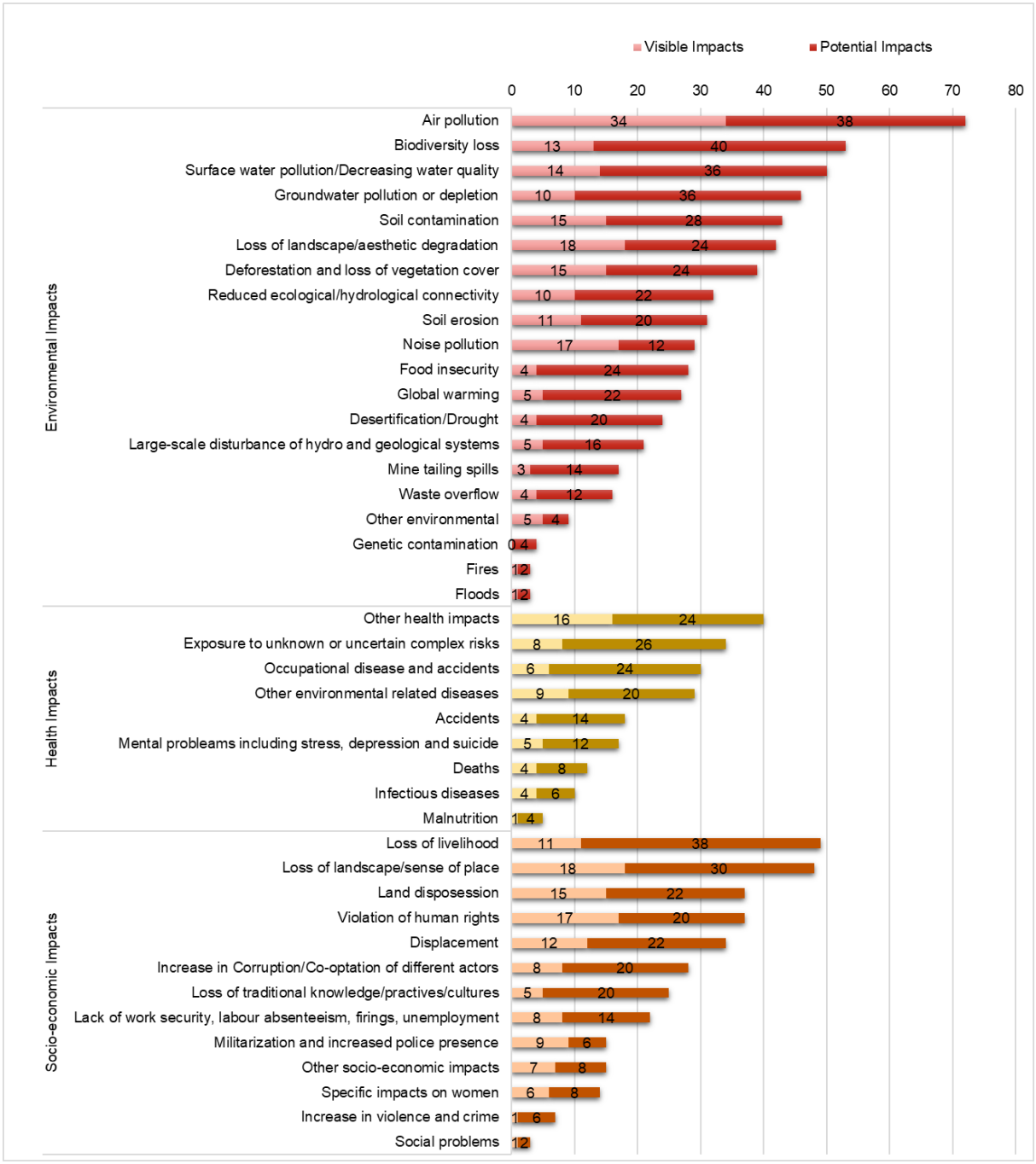

Figure 5: : Cumulative environmental, health and socio-economic impacts of cement production in the analysed conflict cases. A darker colour marks potential impacts, while visible impacts are lighter.

A case from the EJ Atlas that illustrates the interconnectedness of issues well is the grassroots movement in Central Java. The Kendeng Karst region of Central Java, Indonesia, is a critical ecological zone that provides freshwater to local farming communities and sustains the traditional livelihoods of the Indigenous Sedulur Sikep (Samin) people. These communities

oppose state-imposed modernity and extractive industries, particularly the cement industry, which poses a threat to their water sources, rice cultivation, and cultural autonomy. Conflict began in 2014 when Semen Indonesia initiated the construction of a large cement plant without conducting adequate environmental assessments or consulting with the community. Women played a leading role in the resistance, most notably casting their legs in concrete in front of the presidential palace, while police repression and legal setbacks followed. Although the Indonesian Supreme Court later revoked the factory's permits due to environmental concerns, Heidelberg Materials has since entered the region through its subsidiary, Indocement, thereby renewing tensions. The conflict highlights the interconnectedness of environmental degradation, health impacts, and socio-economic displacement. Cement mining in karst landscapes threatens groundwater systems, accelerates biodiversity loss, and undermines rural livelihoods through pollution and land dispossession. Despite persistent local opposition and legal victories, global cement corporations continue to expand through subsidiaries, leveraging legal and political loopholes. Framed as a transnational environmental justice movement, the Kendeng struggle reflects broader critiques of extractivist development and calls for Indigenous rights, ecological protection, and community-led governance (EJ Atlas, 2024a).

In the eyes of resisting actors, socio-economic impacts are more frequently present than health impacts. Issues related to the mining and transport of raw materials and cement are often overlooked; however, the cases demonstrate that machinery compacts land, worsens air quality, that parked machinery pollutes rivers, and detonations from mining can make nearby houses uninhabitable by cracking their walls (EJ Atlas 2021; EJ Atlas 2021a; EJ Atlas 2021b).

5.1.2 Global Unequal Exchange: Inter-Country Burdens and Drivers

In a significant portion of cases, the headquarters of the responsible company or companies are located within the conflict country (section 5.1.2.3 addresses most of these cases in detail); however, in 38 instances companies headquartered in different countries are the main perpetuators of the conflict or are involved in perpetuating the conflict alongside local

companies. This section examines the cases of global unequal exchange as the inter-country burdens and drivers. The following list of companies repeatedly perpetuated the described dynamics: Heidelberg Materials (Germany), CEMEX (Mexico), Anhui Conch Cement (China), Titan Group (Greece), Grupo Votorantim (Brazil), Lafarge (France), and Holcim (Switzerland), which merged into LafargeHolcim in 2015.

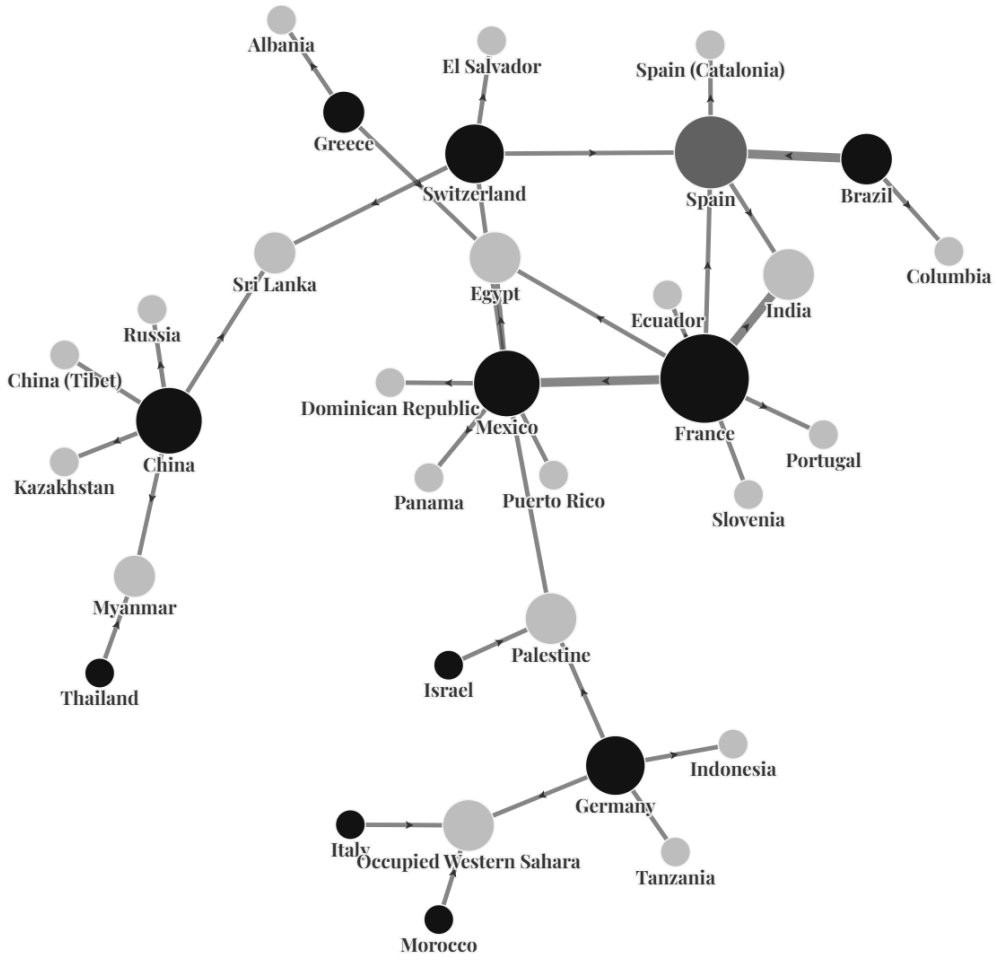

Figure 6: Global Relations of Headquarters and Conflict Countries

Fig.6 illustrates these connections of global unequal exchange, where the darkest colour represents the headquarters' country of companies perpetuating conflict (e.g. France, Mexico, Germany), the lightest colour depicts the conflict countries (e.g. India, Palestine, Colombia), and the intermediate grey tone signifies Spain, a country that both hosts a complicit company and experiences conflict. The size of the spheres indicates the prevalence of the pattern.

Likewise, the thicker the line between countries, the more prevalent the pattern, while the arrow points towards the countries experiencing conflict, highlighting the drivers of ecological distributional conflicts.

The use of subsidiaries allows parent companies to maintain operational distance while extracting value from politically unstable or contested regions. This is a used pattern by Heidelberg Materials' (Germany) operations in Palestine, Occupied Western Sahara, Indonesia and Tanzania (EJ Atlas 2025b; EJ Atlas 2025c).

Chinese cement giants, such as Anhui Conch Cement, and Gezhouba Shieli Cement Company, have rapidly expanded their global footprint by furthering cement production across Kazakhstan, Myanmar, Russia and Sri Lanka. In Sri Lanka, the Export-Import Bank of China financed coal power plants and related infrastructure, despite the country's lack of coal reserves. This led to a procurement controversy where the coal supplier could not deliver enough coal, prompting an emergency state-level procurement mission to China to purchase a vessel with the capacity to transport coal immediately (EJ Atlas 2025a).

Out of the five conflicts defined primarily as a *fossil fuel and climate justice/energy* conflict, China is most involved in financing the construction of coal-based power plants to supply the cement plant with electricity. Another case also includes CEMEX (Mexico) financing coal power in Egypt (EJ Atlas 2022). Four out of these five conflicts emerged after 2003, and all five conflicts remain unresolved based on the EJ Atlas. The expansion of coal use in connection with cement production stands in direct opposition to decarbonisation efforts. Similarly, in Myanmar, the Chinese-financed Alpha Cement factory (a joint venture involving Anhui Conch) intensified local conflict, particularly after 2017 (EJ Atlas 2022a). In Kazakhstan, two Chinese firms launched a cement plant in 2014 as part of a broader BRI-aligned development program (EJ Atlas 2024). These investments are often accompanied by long-term, low-interest loans and infrastructure promises, yet they carry the burden of debt, environmental degradation, and local unrest.

In Palestine, Hanson & Readymix Industries' (Israeli), Heidelberg Material's (Germany) and CEMEX' (Mexico) companies and infrastructure expansion underpin settlement growth and occupation, while in Occupied Western Sahara, Heidelberg Materials (Germany), Ciments de Maroc (Morocco) and Italcementi Group (Italy) lead to similar patterns (EJ Atlas 2025b; EJ Atlas 2025c) .

Heidelberg Materials and Cemex have expanded their operations into occupied territories, profiting from resource extraction that supports ongoing occupations while ignoring international law and local opposition. Heidelberg Materials is continuing to produce cement in Western Sahara, a territory occupied by Morocco. Through its Moroccan subsidiary, Ciments du Maroc, the company operates two grinding plants, with 45% of production sent to Morocco to support infrastructure projects, including military and settlement developments. These activities contribute to the economic normalisation of the occupation. Despite corporate claims of local benefit, Saharawi communities report a lack of consent and economic benefits, while the plants are falsely registered as being in Morocco (EJ Atlas 2025c).

In occupied Palestine, both Heidelberg and Cemex supply construction materials to illegal Israeli settlements, aiding the expansion of the Annexation Wall, checkpoints, and settler roads. Cemex operates three concrete factories in settlements, while Heidelberg extracts 4,000 tons of dolomite daily, worsening environmental and health conditions for Palestinian communities. Although Palestinian quarries have been shut down or denied permits, settler quarries continue with legal backing under the guise of "economic development." These double standards uphold a system of corporate impunity and environmental injustice. International criticism has led to divestment by pension funds in several European countries, citing violations of human rights and international law (EJ Atlas 2025b).

5.1.3 Urbanisation vs Rural Livelihoods: Intracountry Burdens and Drivers

Approximately 39% of the conflict cases are located in rural areas, followed by semi-urban (36%) and urban (23%) locations, with 2% categorised as unknown. Conflicts in rural areas underscore the burden of sustaining urbanisation, with cement produced in rural territories serving as the literal foundation of expanding cities, with the highest drive in the global South. Rural communities surrounding the extraction zones bear the environmental, social and socio-environmental costs without reaping the promised benefits of employment or the use of cement in their infrastructure.

Contrary to narratives of industrial development "delivering services" to deprived regions, cement projects often result in the mass destruction of rural livelihoods, soil and water contamination, land dispossession, and the deterioration of local ecological and social systems. While cement is critical for urban infrastructure, the industry in conflict cases undermines the agrarian economies and community structures it exploits.

Across rural India, communities are bearing the burdens of cement production, particularly at the hands of UltraTech. In Madhya Pradesh's Manawar region, the Adivasi Bhil population was displaced from 27 villages for a cement plant and limestone mines, despite constitutional protections for tribal land. Promises of jobs and compensation went largely unmet, with only a handful hired and workplace accidents sparked youth-led protests, met with criminalisation instead of accountability (EJ Atlas 2025d). In Rajasthan's Nawalgarh, fertile farmland was falsely labelled "barren" to enable the handover of nearly 6,000 hectares for cement-linked Special Economic Zones. Local farmers, whose livelihoods depend on the land, have fought back through legal and grassroots resistance (EJ Atlas 2022b). In Chhattisgarh and Gujarat, cement operations pose a threat to vital water and agricultural systems (EJ Atlas 2025e; EJ Atlas 2025f). Near the Pendravan Reservoir, UltraTech's mining project threatens to endanger water access for over 3,000 farmers, with scientists warning of irreversible ecological damage (EJ Atlas 2025g). In Bhavnagar, over 70,000 people have suffered from groundwater salinisation, air pollution, and collapsing agriculture due to limestone mining. Widespread

protests have been violently suppressed, with reports of police brutality and judicial bias (EJ Atlas 2025f). Across these sites, rural populations face dispossession, polluted environments, and systemic neglect under the guise of industrial development.

5.2 Characterising Environmental Justice Movements: Mobilisation, Outcomes, Procedural and Recognitional Issues

Characterising the EJ movements helps identify further conflict drivers that may be connected to procedural and recognitional issues, which can exacerbate distributional injustices.

Out of the 65 cases, 39% emerged as preventative resistance, 41% as a reaction to the implementation, 16% as mobilisation for reparations, and around 4% of cases were latent or unknown in terms of reaction stage. 52% of analysed cases were categorised as *medium* conflict intensity, followed by *high* (23%) and *low* (20%). No correlation was found between the reaction stage and conflict intensity, or the type of affected population and conflict intensity. Most commonly, the movements did not result in success for EJ (51%), in 33% of cases the outcome is either mixed or ongoing (*not sure*), and finally, in 14% of cases the movements led to environmental justice.

The following cases illustrate the procedural and recognitional issues, showing that even national parks and protected areas are not exempt from the expansion of cement production. Cement production near protected areas in the Dominican Republic and Mexico has raised serious procedural and environmental concerns, particularly around weak enforcement and public exclusion, as Cemex, the multinational company from Mexico, expanded operations (EJ Atlas 2022e; EJ Atlas 2022f). In both countries, regulatory failures and disregard for rulings allow cement projects to threaten ecosystems, water sources, and public health. In the Dominican Republic, Cemex Dominicana sought to build a cement plant in the buffer zone of Los Haitises National Park, which is home to vital underground water reserves that supply Santo Domingo and nearby regions (EJ Atlas 2022e). The proposal sparked broad opposition from youth groups, scientists, unions, and environmentalists. A court suspended the project,

deeming it environmentally unviable. Despite this, there are concerns that the ruling may be disregarded. Cemex's environmental record, adds to public distrust. A 2013 restoration plan for Los Haitises remains stalled.

In Mexico, Cemex operates extensively in Nuevo León near Monterrey, where 45 to 65 quarries extract limestone despite a 1982 order to relocate them. These operations supply cement plants and exports, but have caused severe environmental damage to mountain ranges and led to serious health issues due to dust pollution. Despite over 185 ignored complaints, civic resistance successfully blocked a quarry in the Sierra de Picachos, and communities now call for an expansion of the protected area.

5.2.1 Mobilising Groups

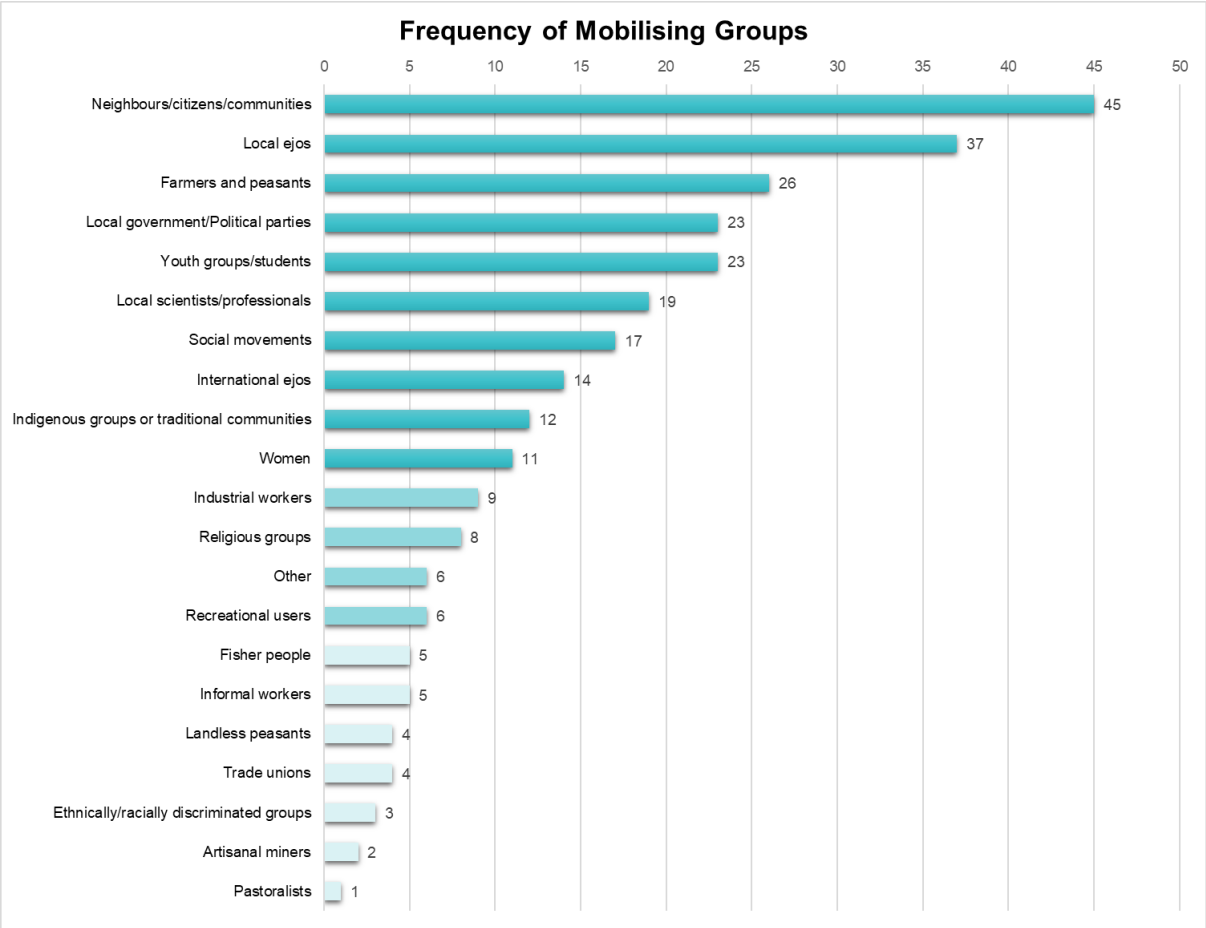

Figure 7: Mobilising groups across cases

Fig.7 shows that the most active groups in the EJ movements were locals: neighbours/citizens/communities in 45 instances and local environmental justice organisations in 37 cases, followed by farmers and peasants in 26 cases, and local scientists and professionals

in 19 cases. Local governments and political parties were represented in 23 cases, while a younger generation of organisers also emerged in the form of youth groups and students (23 cases). While present within the mobilising groups, workers connected to cement production did not participate in the movement in the highest instances: industrial workers (9 cases), trade unions (4 cases). Indigenous groups (12) were active in cases whenever cement production was threatening indigenous lands and the loss of tradition, often citing values such as the inherent value in mother nature, citing values connected to climate justice (EJ Atlas 2024a).

5.2.2 Forms of Mobilisation

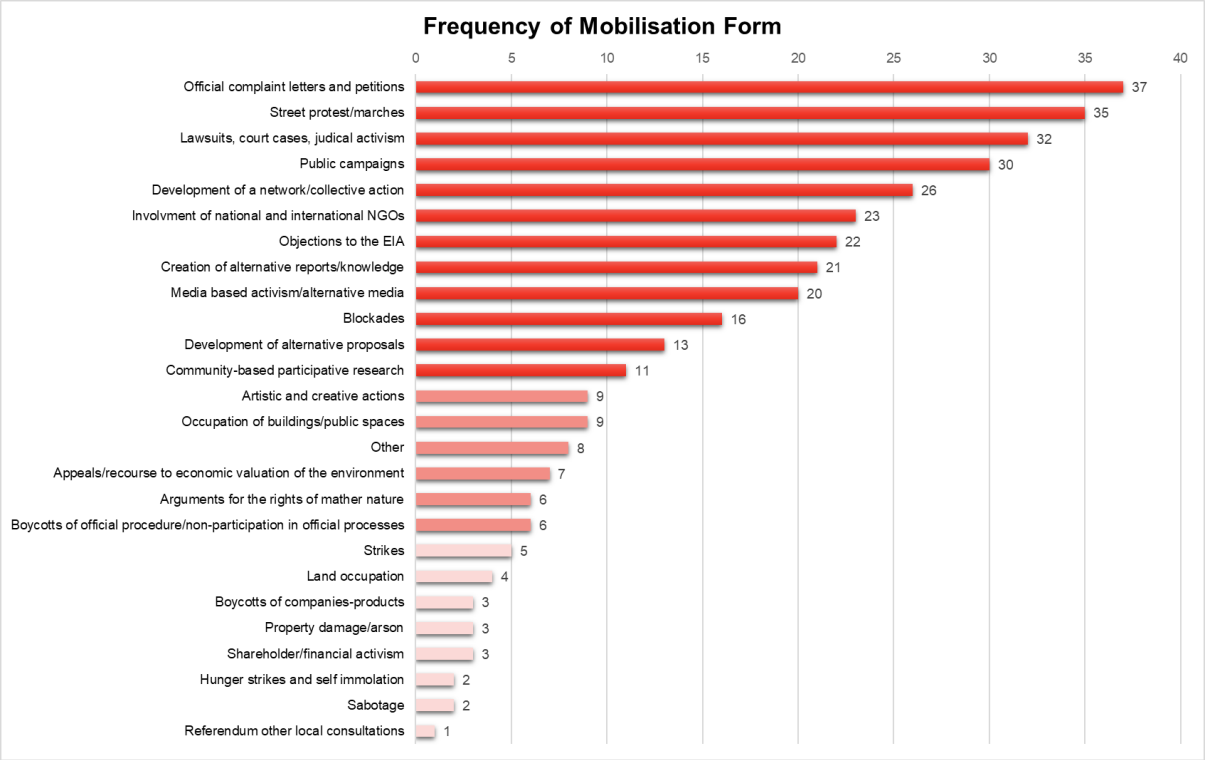

Figure 8: Mobilisation forms across cases

Fig.8 shows the mobilisation forms used by the movements across cases. Commonly used tactics included peaceful mobilisation forms challenging procedural processes, such as official complaint letters and petitions (37 cases), lawsuits, court cases and judicial activism (31 cases), objections to the EIA (22 cases), boycotts of official procedure or non-participation in official processes (6 cases). Mobilising groups also engaged in the production of alternative knowledge

through cooperation with international institutions and the dissemination of such knowledge: public campaigns (30 cases), development of a network or collective action (26 cases), involvement of national and international NGOs (23 cases), creation of alternative reports and knowledge (21 cases), media based activism and creation of alternative media (20 cases), the development of alternative proposals (13 cases) or community-based participative research (11 cases). In 35 cases mobilising groups led street protests and marches, created blockades (16 cases), occupied buildings or public spaces (9 cases), striked (5 cases) occupied lands (4 cases), damaged property (3 cases) and in two rare cases the movement led to hunger strikes or self-immolation.

5.2.3 Conflict Outcomes

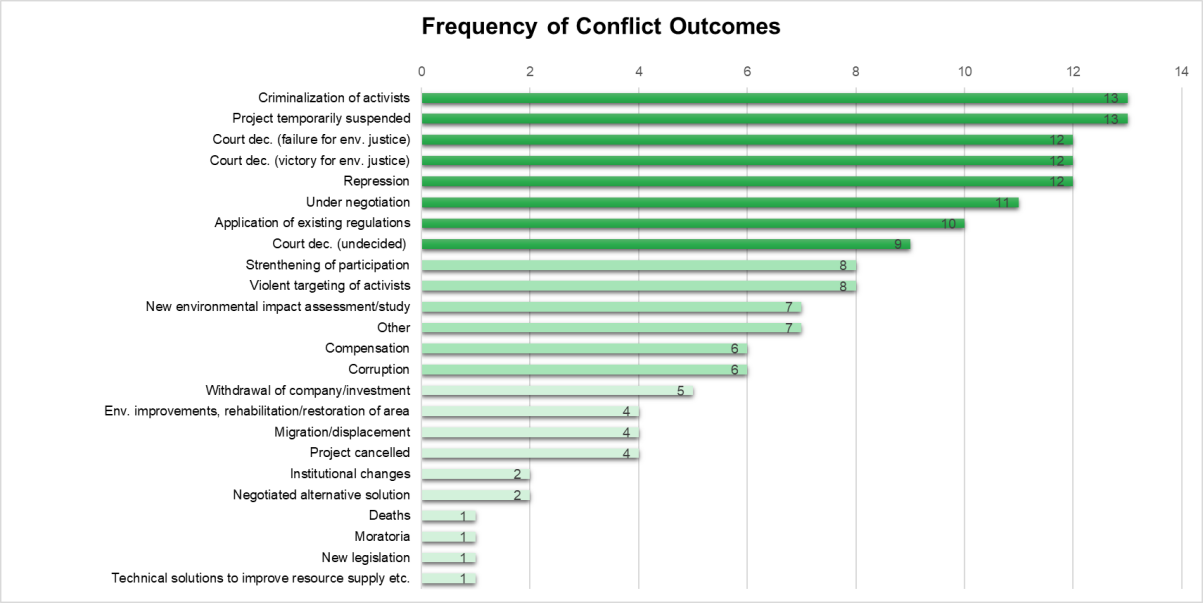

Figure 9: Conflict Outcomes across cases

The detailed mobilisation forms and mobilising groups resulted in a vast array of concrete conflict outcomes. Most commonly, activists were criminalised (13 cases), and the mobilisation led to the temporary suspension of the project (13 cases). Judicial activism yielded mixed results, as even within a single case, court decisions could produce varying outcomes for the mobilising actors: in 12 instances, the court's decision is deemed a success for environmental justice, while in another 12 cases, it is viewed as a failure. Additionally, in 9 more cases, the

court's decision was recorded as undecided by the EJ Atlas, and in an additional 11 cases, the outcome was still under negotiation between actors. Repression as a conflict outcome appeared 11 times; activists were violently targeted in 8 instances, 6 cases resulted in increased corruption, and in 4 cases the outcome was the migration or displacement of locals.

The data shows some hope too for environmental justice movements: 10 cases led to the application of existing regulations, the mobilisations strengthened participation (8 cases), new EIAs were carried out (7 cases), the company withdrew from the project or the investment (5 cases), and in 2 cases the mobilising actors achieved institutional changes and in 2 other negotiated alternative solutions. Mobilising actors also received compensation in five cases; however, these compensations are often criticised as unfair or disproportionate compared to the harm caused, or that the compensations did not cover all admitted harms (EJ Atlas 2025d; EJ Atlas 2025i; EJ 2021b). Compensations as executed remain controversial; however, local communities viewed it as essential in some cases to compensate for lost livelihood, displacement and land dispossession (EJ Atlas 2022; EJ Atlas 2022a; EJ Atlas 2021j).

5.3 Conflicts Surrounding Decarbonisation Efforts

Based on the GCCA, the decarbonisation of the cement sector is heavily reliant on technology levers and policy enablers in the following areas (GCCA 2020):

- savings in clinker production;
- savings in cement and binders;
- carbon capture, utilisation and storage (CCUS);
- decarbonisation of electricity.

And areas outside the scope of this thesis:

- efficiency in concrete production;
- recarbonisation;
- efficiency in design and construction (roadmap).

Based on the case data, this thesis focuses on co-incineration (or co-processing, as industry actors more commonly use it) to investigate an already in-place measure and a cornerstone of future decarbonisation of cement production. This helps to inform the barriers and opportunities

of a just green transition, not only through the generalised drivers of ecological distribution conflicts and EJ movements, but also connected to a specific technology.

The other focal point of decarbonisation measures is CCUS, an emerging yet vital technology in current decarbonisation plans, both in industry reports and academic assessments. The industry-wide deployment of CCUS is the most significant measure of CO2 reduction, as process emissions cannot be mitigated in any other way. This sparks unprecedented investment and technological development, and deployment. The examined justice conflict cases from the EJ Atlas detail one conflict related to CCUS connected to cement production; however, the previously identified drivers of conflict suggest that the rapid emergence of CCUS conflicts will occur once cement manufacturers plan to implement the technology, unless the socio-metabolic conditions of production are fundamentally altered. The implications to CCUS are detailed in the discussion chapter of the thesis.

5.3.1 The Case of Co-incineration

Co-incineration or co-processing waste in cement production is increasingly promoted by the GCCA, and a method used by companies like CEMEX, LafargeHolcim, and Anhui Conch. Co-incineration of waste means the burning of municipal, industrial or in some cases hazardous waste as alternative fuels in cement kilns, and thereby reducing fossil fuel consumption. It is presented by companies as a climate-friendly practice aligned with circular economy principles, addressing the issues of landfills while also leading to cost-saving measures. The practice has triggered widespread EJ conflicts. Co-incineration in practice often displaces pollution onto rural, low-income, or otherwise vulnerable communities already burdened by environmental harm. Waste burning in cement kilns emits toxic pollutants such as dioxins, furans, and heavy metals without solving structural waste management issues. Across nearly all documented conflict cases related to co-incineration, the root cause of unrest was a lack of transparency, insufficient or absent EIAs, health concerns from local residents, and disregard for community consultation.

Remarkably, the highest number of successful EJ outcomes was tied to resistance against co-incineration. Successful resistance against co-incineration represents 75% of the cases evaluated as EJ success. These victories were observed in Puerto Rico, El Salvador, Slovenia, China and Sri Lanka (EJ Atlas 2021c; EJ Atlas 2021d; EJ Atlas 2021e; EJ Atlas 2021f; EJ Atlas 2021g) . They were driven by coordinated action between local grassroots groups and international environmental justice networks, such as GAIA (Global Alliance for Incinerator Alternatives), along with legal and scientific allies.

In Puerto Rico, CEMEX's plan to burn 4.7 million tires annually in Ponce was halted after Acción Comunitaria Ponceña por un Ambiente Sano (APCAS) secured a legal revocation of the permit in 2008—though corporate lobbying later briefly reinstated it during a public health crisis (EJ Atlas 2021c). In El Salvador, Holcim's attempt to incinerate 19 tons of toxic pesticides was stopped by CESTA (Friends of the Earth El Salvador) through policy advocacy and public pressure (EJ Atlas 2021d). Similarly, in Slovenia, Lafarge's waste-burning operations were shut down after NGO Eko Krog and Uroš Macerl, a local, won a lawsuit against the national environmental agency (EJ Atlas 2021e). In China, mass protests involving over 10,000 residents forced the cancellation of a China Resources Cement incinerator after violent police repression backfired, drawing national outrage. These successes hinged on early mobilisation, cross-sector alliances, media exposure, and strategic legal action (EJ Atlas 2021f). In Córdoba, Spain, Votorantim Cementos (Brazil) sought to burn 137,000 tons/year of toxic waste (plastics, tires, sewage sludge, and domestic garbage) near residential areas. Local groups exposed the company's attempts to fraudulently extend its permit by falsifying construction records. After years of pressure, the Andalusian government revoked the company's license in 2013, citing its failure to comply. However, corporate lobbying kept the threat alive, with renewed attempts to legalise incineration in 2015 (EJ Atlas 2021h).

By contrast, unsuccessful or stalled resistance movements, such as in China, Mexico, and Portugal, show how corporate impunity, state repression, and regulatory loopholes continue to

enable hazardous co-incineration practices. In Chunwan (China), protests erupted in 2015 after the community discovered plans for a regional waste incinerator only during trial operations; despite widespread opposition, tear gas and arrests quashed dissent. The lack of pre-project consultation and the state's violent response undermined local organising efforts (EJ Atlas 2025h). In Mexico's Hidalgo region, CEMEX circumvented legal bans on waste incineration by quietly shifting operations from Huichapan (where community resistance and lawsuits had led to a shutdown) to Atotonilco de Tula (EJ Atlas 2022c). There, residents detected waste incineration only due to foul smells and late-night garbage deliveries. Organising locals protested against secretive operations and environmental health risks, but legal enforcement remained weak, and the company continued to burn waste (EJ Atlas 2022d). In Portugal, a massive anti-incineration movement in the late 1990s led to the cancellation of a national co-incineration strategy. Still, years later, the same cement plants resumed burning hazardous waste under new licenses. Despite a successful legal battle in 2016 that revoked permits due to the lack of EIAs, cement companies continue to burn waste with limited community oversight (EJ Atlas 2021i).

These cases illustrate how the push for decarbonisation through waste-derived fuels, when driven by corporate cost-cutting and weak regulatory systems, risks reproducing and intensifying existing injustices. Instead of reducing harm, co-incineration often displaces environmental and health burdens onto already marginalised communities, reshaping rather than resolving prior inequalities. Furthermore, the selective success of resistance movements underscores the critical role of procedural justice: where communities were informed, mobilised, and supported by expert networks, they could influence decisions and achieve victories. In contrast, where secrecy, repression, or regulatory capture dominated, corporate operations continued largely unchecked.

Chapter 6: Discussion

6. 1 Drivers of Ecological Distribution Conflicts and Environmental Justice Movements in Cement Production

6.1.1 Environmental, Health and Socio-Economic Burdens

Cement production is responsible for a wide range of local environmental, health, and socio-economic impacts that are either visible or perceived by the mobilising groups, primarily composed of locals. This imbalance between environmental, health, and socio-economic burdens, whether visible or perceived, is one of the key drivers of ecological distribution conflicts and environmental justice movements. The analysis of conflict cases related to cement production revealed that locals had little say in their future and the protection of their values. On the contrary, the expansion of local cement production resulted in the loss of livelihoods, landscape degradation, and land dispossession, and its mobilisation was met with the criminalisation of activists, mixed legal outcomes, and repression. Local groups often received little to no compensation for these adverse impacts. When they have, it has been perceived as unjust, fuelling further conflict. Monetary compensation rarely captures the non-material losses associated with these developments, such as loss of traditional knowledge, practices, and cultures.

These non-material burdens of cement production are often socio-economic in nature. The investigation of conflict cases suggests that, beyond environmental and health impacts, socio-economic impacts are a key driver of conflict. The literature review established that while environmental and health impacts are more established in academic research, the understanding of socio-economic factors is lacking in academic literature, and is even less adopted by industry actors or in the methodology of LCAs and EIAs. The oversight and scientific scrutiny of EIAs are in themselves a source of the problem, echoing company interests.

A deep distrust toward companies also persists, as power imbalances heighten local corruption and judicial influence. Promises of job creation are often used to justify projects. However, the

expansion of cement production in the global South often occurs in farming regions, where the arrival of heavy industry leads to the degradation of arable land, the loss of traditional livelihoods, and an increased dependence on external markets. Case studies have shown that the short-term economic benefits of corporations rarely offset the long-term social and environmental costs borne by local communities.

6.1.2 Global Unequal Exchange

The analysis reveals entrenched patterns of unequal ecological exchange, where communities in the global South bear the burdens of corporations headquartered in the Global North, or economically stronger regions of the global South. In these cases, companies extract resources and externalise environmental burdens onto conflict zones, often in former colonies or geopolitically contested regions. The dynamics illustrate how cement production is intertwined with neocolonial resource hierarchies and military-industrial control, particularly through subsidiary networks that obscure corporate accountability. European companies headquartered in countries with a colonial past, such as Lafarge (France, now LafargeHolcim) and Heidelberg Materials (Germany), operate with disproportionate influence over former colonised countries. In various regions, including Palestine and the Occupied Western Sahara, cement production becomes a literal and symbolic weapon in geopolitical conflicts. Its production supports infrastructure projects that entrench military occupation, territorial expansion, or extractive development.

While Europe's corporate actors continue to operate under neocolonial logics, China's Belt and Road Initiative (BRI) represents a new modality of state-led, infrastructure-based geopolitical expansion. As Reuters reported in 2019, Chinese cement firms are building not only for themselves but also on behalf of Western companies such as LafargeHolcim and HeidelbergCement (Goh et al. 2019). This signals a shift from Chinese isolation to potential global cement imperialism. While some of these developments are framed as South-South cooperation, they often replicate extractivist logics, particularly when local governance

structures are weak or authoritarian. China's strategic use of cement infrastructure in the Tibet Autonomous Region (TAR) is another example of how material development is deployed for political control. China's strategic use of cement infrastructure in the Tibet Autonomous Region (TAR) is another example of how material development is deployed for political control. Cement and construction are thus central to Beijing's project of cultural assimilation and territorial securitisation (Times of India 2023).

Occupied Western Sahara remains Africa's last colony, under illegal occupation by Morocco. Here, European corporations are complicit in sustaining the occupation through infrastructural investments, particularly in renewable energy. In this context, "green" energy is weaponised as a tool of occupation, raising serious questions about the justness of the ongoing energy transition (Allan et al. 2021; WSRW 2021).

Southern multinationals are replicating the exploitative models. Whether through foreign direct investment or infrastructure-for-resource agreements, these actors increasingly participate in the same patterns of resource hierarchy that have long defined the global North's relationship with the global South. This pattern typically involves a company from a stronger economy, such as Cemex from Mexico, operating in less economically strong countries like Panama, Puerto Rico, or the Dominican Republic.

The outlined connections show the pressing need to interrogate and reconfigure colonial resource hierarchies within the framework of a just green transition. Without acknowledging and addressing historical and contemporary colonial patterns, any climate or energy transition risks entrenching existing inequalities under a new, greener guise.

6.1.3 "*Urbanisation*" on the Expense of Rural Livelihoods

As seen in the EJ Atlas cases, rural communities are not passive bearers of the burdens of urbanisation. In the examined cases, cement production is often fuelled at the expense of rural livelihoods, citing urbanisation as a driver in the Global South. Ownership structures and control remain firmly with corporations, and employment generation, often cited as a key

developmental justification, fails to materialise meaningfully, particularly in skilled roles. This necessitates a critical examination of the uses of the produced cement and concrete. The urbanisation versus rural livelihood argument may represent a false dichotomy. A study cites the major challenges to ensuring adequate, secure, and affordable housing in the global South include the proliferation of informal or substandard settlements, an overreliance on homeownership models, and policy or legal frameworks that marginalise the urban poor and displace them from city centres (King et al. 2017). Furthermore, the potential for incremental housing largely hinges on the availability and affordability of industrial building materials, which are influenced by the marketisation and globalisation of the construction sector (Van Noorloos et al. 2020). Overall, this suggests that the growing cement and concrete demand is fuelled by reasons other than providing adequate housing in cities.

6.2 Addressing Procedural, Recognitional and Restorative Issues on Top of Distributive Drivers

For a just green transition, more than technological solutions or financial incentives are needed. Although the framework used here concentrates on distributional drivers, it is clear that procedural and recognition issues also contribute to unjust outcomes. There is a key need to address a broader range of impacts of cement production and just green transition efforts, as well as to include impacted communities in the knowledge production process related to these efforts.

One of the key procedural issues lies in the lack of transparency and accountability in Environmental Impact Assessments. In many cases, legal proceedings around EIAs are marred by corruption and opacity, undermining public trust. Strengthening the methodology of EIAs and LCAs to incorporate socio-economic impacts and to strengthen the integrity of EIAs through open, participatory, and legally enforceable processes is a crucial step.

At the same time, there is a growing need for a restorative leg within green transition policies, especially in the global South. The existence of examined cases of ecological distribution

conflicts and environmental justice conflicts, along with the extensive reported impacts and outcomes, supports the need to give power back to local communities and restore what has been lost due to cement production. In the case of industrial clusters, this challenge will be even more burning. This means resisting the manufacturing of consent through state repression, corporate influence, or superficial compensation schemes. Instead, independent platforms must be created to critically examine and challenge just transition plans, including in-depth evaluations of how justice principles are actually implemented on the ground. Restorative goals also necessitate a commitment to epistemic justice, ensuring that voices from the Global South and marginalised communities are not only heard but valued in shaping transition pathways. It is crucial to include a plurality of perspectives to counter dominant narratives that frequently overlook local knowledge and personal experiences. Finally, justice-oriented transition policies must set clear boundaries and safeguards. This includes the outright banning of high-impact facilities in environmentally protected areas, the withdrawal of public funding for such projects, and the implementation of strict requirements that prohibit the expansion of fossil fuels, environmental degradation, and social oppression. These conditions must be hardwired into just transition frameworks to prevent the replication of existing inequalities under the guise of climate action.

6.3 Lessons From Successful Resistance Against Co-incineration

The conflict cases surrounding co-incineration offer vital insights and hope for shaping a just green transition. The already researched movement against co-incineration in cement kilns in Spain illustrates how grassroots resistance can advance justice within climate policy debates. In this context, local communities opposed the burning of waste in cement plants in various Spanish locations. Activists employed two main tactics: legally contesting environmental permits with the support of lawyers and ecological experts, and raising public awareness through education campaigns backed by health and waste management professionals. While rarely using the term “environmental justice” explicitly, these movements articulated clear

justice-based demands, grounded in four main domains: the right to health and a clean environment, the right to be recognised, the right to participate, and the need to pursue zero waste goals. Despite the movement's limited institutional influence, it succeeded (Herrero et al. 2018).

The EJ movements in Spain and further movements targeting co-incineration came with strong international collaboration; however, successful cases cannot be qualified as intermodal conflicts, as outlined by Scheidel et al. (2018), which highlight the tension between long-standing community practices and extractive development models. They are rather intramodal conflicts that do not address the distributional inequalities within the mobilising community or the very base of the socio-metabolic configurations. Despite this, a high proportion of cases targeting harmful co-incineration succeeded. This could be due to the mobilisation of more privileged groups, the international and local alliances, but also because the opposed co-incineration measure is a targeted decarbonisation measure of the cement industry.

As industries and countries scale up decarbonisation investments, past conflicts remind us that without justice, transition plans risk deepening the inequalities they aim to resolve. Conflicts might arise around CCUS (Carbon Capture, Utilisation and Storage) technologies as they are increasingly promoted as a key solution to industrial emissions (both in academia and by industry actors), particularly in hard-to-abate sectors like cement. These technologies often require vast infrastructural developments, majorly expanding the electricity demand of cement production, land acquisition, and long-term storage sites. It remains uncertain how and where CO2 will be stored; however, in line with decarbonisation goals, it must not be utilised for the extraction of fossil fuels (Global CCS Institute 2024). Deploying CCUS also expands the value chain and infrastructural sites of cement production, adding new frontiers to possible environmental, health and socio-economic destruction. Without careful planning, transparent consultation, meaningful participation, and recognition of local and traditional knowledge systems, CCUS projects may reproduce patterns seen in the investigated conflict cases.

Furthermore, if CCUS is deployed to justify the ongoing expansion of cement production or to delay more transformative approaches (such as, at the risk of undervaluing circular economy practices), it risks concealing inaction whilst imposing additional burdens on affected communities.

Chapter 7: Conclusion

This thesis set out to answer the following research questions:

1. *What are the drivers of ecological distribution conflicts and environmental justice movements within the scope of cement production?*
2. *How do these drivers inform the barriers and opportunities of a just green transition of cement production?*

By analysing 56 ecological distribution conflicts and environmental justice movements based on the EJ Atlas, the thesis worked on achieving its aim and concludes the following:

The current socio-metabolic configuration in which cement production is embedded, as well as profits from, is a major source of ecological distribution conflicts that trigger environmental justice movements to oppose cement production. Cement production's impacts go beyond environmental and health issues, particularly in the Global South. Socio-economic and non-material impacts are key drivers of conflicts but are underexplored both in academic literature and by industry actors. Where environmental justice movements arise, cement production is often embedded in global patterns of unequal ecological exchange. These include potential neocolonial and imperialist dynamics where international corporations externalise harms onto weaker, often postcolonial or occupied territories.

In conflict cases, urbanisation narratives often mask the sacrifice of rural livelihoods, especially in the global South. The push for urban infrastructure development might be used to justify harmful practices on rural communities, such as land dispossession, without delivering promised benefits of employment or just compensation measures.

Beyond addressing the underlying inequalities stemming from the socio-metabolic configuration, targeting restorative, procedural, and recognitional issues is also key to a just green transition of the cement industry. Integrating these aspects into a just green transition helps address historical harms, community disempowerment, and upholds epistemic diversity.

Successful grassroots resistance, such as against the adverse effects of co-incineration in cement kilns, demonstrates the power of justice-based mobilisation. These movements show that informed, locally rooted, and legally supported activism can achieve meaningful outcomes. The success behind co-incineration movements might also be due to the fact that co-incineration is a decarbonisation measure. Emerging decarbonisation technologies, particularly CCUS, may reproduce the underlying injustices and create new ones. If not carefully governed, these technologies risk extending the destructive socio-metabolic configurations of cement production and delaying systemic change. Therefore, a just green transition as understood in this thesis, supports systematic change and has the potential to address newly emerging injustices. It is important to additionally acknowledge the limitations of this study as it is based on the cases reported by the EJ Atlas.

Future research would benefit from further exploration of the socio-economic impacts of cement production, as well as the analysis of ecological distribution conflicts and environmental justice movements, particularly in the context of industrial clusters and current remediation efforts. This analysis would help better understand the challenges of future just transitions. Furthermore, the justice implications of planned decarbonisation technologies, particularly of CCUS need to be outlined and prepared for by academics. An emphasis on success cases and the benefits of decarbonisation regarding cement production is another future area of interest.

The following policy recommendations are made for a just green transition of cement production:

- Enforcing corporate accountability for transboundary harms by companies providing reparations, not just compensation. Mandating supply chain transparency of subsidiaries and imposing legal obligations on multinational companies to combat human rights abuses.

- Prohibiting environmentally harmful industry projects in ecologically or socially sensitive areas. This means the withdrawal of public funding from areas with proven environmental justice movements, and banning cement manufacturing in indigenous territories if the project is not approved by the informed consent of the community.
- Strengthening and democratising EIA and LCA processes, and recognising non-material and socio-economic impacts.
- Establishing independent platforms for critical review and the auditing of just transition plans, which includes the affected communities, especially indigenous groups.
- Critical review of cement demand and a focus on demand reduction practices. Enhancing community-led initiatives and promoting local alternatives to cement use.

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Appendix A: List of Analysed EJ Atlas Cases

This list contains all 70 cases and the following list shows the excluded cases from the findings.

	Basic data		Source of conflict
ID	Name	Conflict Country	Type of conflict 1st lvl
1	Protest against Anhui Conch Cement's waste incinerator	China	
2	Atotonilco de Tula y la planta de Cemex	Mexico	
3	Waste Tire Burning for Energy Production in Cemex Plant	Puerto Rico	
4	Langtang incinerator in Luoding	China	
5	Planta de incineración y desechos sólidos de Holcim	El Salvador	
6	Co-incineration in Cimpor and Secil cement kilns	Portugal	
7	Lafarge cement Trbovlje	Slovenia	
8	Gowanus Canal Cleanup	USA	Waste management
9	Seven state sponsored CCS projects under development in Japan	Japan	
10	Gladstone key node for coal, gas and aluminium	Australia	
11	Alpha Coal-Powered Cement Factory	Myanmar	
12	Controversial coal-fired power plant built in MCL Cement factory	Myanmar	
13	Coal Use in Cement Factories	Egypt	
14	Norocholai Coal Power Station	Sri Lanka	Fossil Fuel and Climate
15	Myaing Galay cement plant in Hpa-an	Myanmar	Justice/
16	Protest against UltraTech Cement by Bhil community in Dhar	India	Industrial and Utilities Conflicts

17	Antea Cement Plant	Albania
18	Waste incineration fuelled cement plant in Toral de los Vados Léon	Spain
19	Gezhouba Shieli Cement in Kazakhstan	Kazakhstan
20	Elefsina Bay industrial activities	Greece
21	La Fundación Apaxtle y Prosalud Apaxo-Atotonilco contra planta Ecoltec de Holcim	Mexico
22	Ventanas Industrial Complex	Chile
23	Waterfront South as Environmental Sacrifice Zone in Camden	USA
24	Ain Dara Cement Factory	Lebanon
25	La Oroya	Peru
26	Nawalgarh Special Economic Zone	India
27	"Movilizaciones del gas" protest against industrial pollution	Spain
28	Chunar Cement Factory in Mirzapur	India
29	Matola Gas Company CDM project	Mozambique
30	Paz del Río	Columbia
31	Greenfield Cement Plant	India
32	Incineración de residuos en una fábrica de Cemex en Huichapan	Mexico
33	Concesiones a Cemex amenazan Parque Nacional Chagres	Panama
34	Members of peasant organizations murdered in 2017	Philippines
35	Taiwan Cement Corporation in Hualien city	Taiwan
36	Cimenterie Nationale Factory in Chekaa	Lebanon

37	Wadi Al Qamar residents and Alexandria portland cement	Egypt	
38	West Bank Cement Factory	Palestine	
39	Stop Irish Cement Ltd. from burning tyres and other waste	Ireland	
40	Producción de Cemento en Suesca	Columbia	
41	Jaypee Cement Plant in HP	India	
42	Holcim cement plant in Puttalam	Sri Lanka	
43	Waste incineration fuelled cement plant in Córdoba	Spain	
44	Waste incineration fuelled cement plant in Montcada i Reixac	Spain	
45	Waste incineration fuelled cement plant in Morata de Tajuña	Spain	
46	Heidelberg cement's grinding plants in occupied Western Sahara	Occupied Western Sahara	
47	Ezra Prentice Public Housing Residents and EJ Orgs Fight for Clean Air	USA	
48	Asbestos Pollution in Vele of Scampia	Italy	
49	Shwe Taung cement Factory	Myanmar	Infrastructure and Built Environment
50	Delhi-Mumbai Industrial Corridor	India	
51	Cement Factory by KP Cement in Prey Lang Wildlife Sanctuary	Cambodia	
52	Wazo Hill cement plant	Tanzania	
53	Limestone mining by Ultratech Cement Company in Pendravan reservoir	India	
54	Cementos Fortaleza y Movimiento Indigena Santiago de Anayo	Mexico	Mineral Ores and Building Materials Extraction
55	Israeli stone quarrying in Occupied Palestinian Territory	Palestine	

56	Large-scale protests against Ultra Tech Cement	India
57	Protests against UltraTech cement in Jodhpura	India
58	Anhui Conch's cement plant in Ulyanovsk	Russia
59	Complaints against Lafarge-Holcim quarries and cement factories in France and Switzerland	France, Switzerland
60	Mining-metallurgical complex in Corumbá	Brazil
61	Pinpet iron mine and steel factory	Myanmar
62	Mahuva Movement against proposed Nirma Cement Plant	India
63	Quarries and Land Overexploitation in the Baix Camp region	Spain (Catalonia)
64	Cement factory around Madang Township	China (Tibet)
65	Gidawom quarrying case	Bhutan
66	Contaminación por empresa de cementos en Selva Alegre	Ecuador
67	Lafarge's limestone mining at Bangladesh border	India
68	Cementera en Los Haitises	Dominican Republic
69	Cement factory in Kendeng Karst Mountains	Indonesia
70	Devastación ambiental por pedreras en la región de Monterrey, México	Mexico

The 14 Excluded Cases from The Findings:

	Basic data		Source of conflict
ID	Name	Conflict Country	Type of conflict 1st lvl
8	Gowanus Canal Cleanup	USA	Waste management
9	Seven state sponsored CCS projects under development in Japan	Japan	Fossil Fuel and Climate Justice/
10	Gladstone key node for coal, gas and aluminium	Australia	Fossil Fuel and Climate Justice/
20	Elefsina Bay industrial activities	Greece	Industrial and Utilities Conflicts
22	Ventanas Industrial Complex	Chile	
23	Waterfront South as Environmental Sacrifice Zone in Camden	USA	
25	La Oroya	Peru	
27	"Movilizaciones del gas" protest against industrial pollution	Spain	
35	Taiwan Cement Corporation in Hualien city	Taiwan	
47	Ezra Prentice Public Housing Residents and EJ Orgs Fight for Clean Air	USA	Infrastructure and Built Environment
48	Asbestos Pollution in Vele of Scampia	Italy	
50	Delhi-Mumbai Industrial Corridor	India	
60	Mining-metallurgical complex in Corumbá	Brazil	Mineral Ores and Building Materials Extraction
61	Pinpet iron mine and steel factory	Myanmar	

Appendix B: Codes Used in the Database

MG code	Mobilizing Group
1	Artisanal miners
2	Ethnically/racially discriminated groups
3	Farmers and peasants
4	Fisher people
5	Indigenous groups or traditional communitie
6	Industrial workers
7	Informal workers
8	International ejos
9	Journalists organisations
10	Landless peasants
11	Local ejos
12	Local government/Political parties
13	Local scientists/professionals
14	Neighbours/citizens/communities
15	Other
16	Pastoralists
17	Recreational users
18	Religious groups
19	Social movements
20	Trade unions
21	Wastepickers, recyclers
22	Women
23	Youth groups/students

MF code	Mobilizing Form
1	Appeals/recourse to economic valuation of the environment
2	Arguments for the rights of mather nature
3	Artistic and creative actions
4	Blockades
5	Boycotts of companies-products
6	Boycotts of official procedure/non-participation in official process
7	Community-based participative research
8	Creation of alternative reports/knowledge
9	Development of a network/collective action
10	Development of alternative proposals
11	Hunger strikes and self immolation
12	Involvment of national and international NGOs
13	Land occupation
14	Lawsuits, court cases, judical activism
15	Media based activism/alternative media
16	Objections to the EIA
17	Occupation of buildings/public spaces
18	Official complaint letters and petitions
19	Other
20	Property damage/arson
21	Public campaigns
22	Referendum other local consultations
23	Refusal of compensation
24	Sabotage
25	Shareholder/financial activism
26	Street protest/marches
27	Strikes
28	Threats to use arms

Env code	Environmental Impacts
1	Air pollution
2	Biodiversity loss
3	Deforestation and loss of vegetation cover
4	Desertification/Drought
5	Fires
6	Floods (river, coastal, mudflow)
7	Food insecurity (crop damage)
8	Genetic contamination
9	Global warming
10	Groundwater pollution or depletion
11	Large-scale disturbance of hydro and geological systems
12	Loss of landscape/aesthetic degradation
13	Mine tailing spills
14	Noise pollution
15	Oil spills
16	Other env impacts
17	Reduced ecological/hydrological connectivity
18	Soil contamination
19	Soil erosion
20	Surface water pollution/Decreasing water quality
21	Waste overflow
22	Other

H code	Health impacts
1	Accidents
2	Deaths
3	Exposure to unknown or unc
4	Health problems related to a
5	Infectious diseases
6	Malnutrition
7	Mental problems including st
8	Occupational disease and ac
9	Other health impacts
10	Other environmental related
11	Violence related health impa
12	Other

SE Code	Social-economic Impacts	CO code	Conflict Outcome			
1	Displacement	1	Application of existing regulations		VISIBLE IMPACT	1
2	Increase in Corruption/Co	2	Compensation		POTENTIAL IMPACT	2
3	Increase in violence and c	3	Corruption		NO IMPACT	0
4	Lack of work security, labo	4	Court dec. (failure for env. justice)			
5	Land disposession	5	Court dec. (undecided)			
6	Loss of landscape/sense o	6	Court dec. (victory for env. justice)			
7	Loss of livelihood	7	Criminalization of activists			
8	Loss of traditional knowlec	8	Deaths			
9	Militarization and increase	9	Env. improvements, rehabilitation/restoration of area			
10	Other socio-economic imp	10	Fostering a culture of peace			
11	Social problems (alcoholis	11	Institutional changes			
12	Specific impacts on wome	12	Land demarcation			
13	Violation of human rights	13	Migration/displacement			
14	Other	14	Moratoria			
		15	Negotiated alternative solution			
		16	New environmental impact assessment/study			
		17	New legislation			
		18	Other			
		19	Project cancelled			
		20	Project temporarily suspended			
		21	Repression			
		22	Strenthening of participation			
		23	Technical solutions to improve resource supply/quality/distribution			
		24	Under negotiation			
		25	Violent targeting of activists			
		26	Withdrawal of company/investment			

Appendix C: EJ Atlas Definitions

Variable group	Full name in the EJAtlas	Definition and description of the variable/term/category
Main conflict category (1st level classification)	Biodiversity conservation conflicts	Conflicts involving terrestrial and aquatic nature conservation initiatives. Examples: protected areas and other conservation zones, REDD+, wildlife corridors, etc.
	Biomass and land conflicts (Forests, agriculture, fisheries and livestock management)	Conflicts involving land uses for agriculture, forestry, livestock or fisheries. Examples: land acquisition for agribusiness, tree plantations, livestock farms, aquaculture, timber logging, extraction of non-timber products, etc.
	Fossil fuels and climate justice/energy	Conflicts involving energy production or conflicts caused by climate change. Examples: oil and gas exploration, extraction or refining, oil spills, coal extraction or processing, gas flaring, fracking, solar or wind energy mega-projects, geothermal energy installations, climate-change-related conflicts such as the disappearance of glaciers or islands, etc.
	Industrial and utilities conflicts	Conflicts involving industrial activities and related pollution. Examples: chemical industries, metal refineries, manufacturing activities, cement or aluminium factories, industrial zones, etc. It also includes military installations and related pollution.
	Infrastructure and built environment	Conflicts involving the construction of infrastructures, such as urban development projects, and transportation infrastructures, as well as the pollution resulting from them. Examples: ports, airports, highways, roads, railways, pipelines, canals, housing plots, etc.
	Mineral ores and building materials extraction	Conflicts involving mining, including extraction, transportation, waste material disposal, and raw processing. Examples: conflicts linked to mineral ore exploration and processing, tailings from mines, extraction of building materials such as sand, gravel, quarries, etc.
	Nuclear	Conflicts involving nuclear energy production and waste disposal, including uranium extraction, transportation, nuclear power plants, nuclear waste storage, etc.
	Tourism recreation	Conflicts involving the construction of tourism facilities or the establishment of exclusive recreational areas that are mainly used as tourist attractions. Examples: hotels or marinas, fun parks, ski resorts, enclosure of coastal areas for mass tourism, urban speculation, cruises or exclusive touristic airports, etc.
	Waste management	Conflicts involving waste management either creating unequal environmental burdens and/or health problems in specific areas or over privatisation of waste. Examples include incinerators, co-incineration facilities, toxic and e-waste disposal, polluting landfills, uncontrolled or unwanted dumping sites, ship-breaking yards, waste privatisation, excluding waste pickers from their recycling practices etc.

	Water management	Conflicts linked to the access to and control over (mainly fresh-) water resources. Examples include dams, transboundary water conflicts, inter-basin water transfers, desalination plants, water access rights and entitlements, water privatisation, water treatment and access to sewage facilities, etc.
Mobilising groups (actors)	Waste pickers, informal recyclers	People that collect and segregate recyclable waste, in order to sell the materials to make a livelihood.
	Artisanal miners	Informal workers extracting minerals as a source of subsistence.
	Pastoralists	Farmers dedicated to animal husbandry, normally moving herds in search of fresh pastures and water.
	Industrial workers	Workers in different types of industries, including oil, mineral, chemical and waste facilities, as well as in infrastructure buildings such as airports, highways and industrial corridors, etc.
	Informal workers	People performing different types of informal labour, often not registered or regulated. Examples include construction workers, plantation seasonal workers, etc.
	Recreational users	Groups mobilising for recreational activities and spaces of cultural, ecological and aesthetic importance, which are at risk due to a contentious project. Examples include promoters of water sports on rivers vs. dam industries, supporters of ecological tourism vs forest industry, etc.
	Landless peasants	People who do not have any land for farming or are prevented from owning the land they farm.
	Trade unions	Formal or institutionalised organisation of workers who coordinate to achieve common interests regarding their working conditions (safety standards, wages, social security, etc.).
	Religious groups	Spiritual or religious institutions, religious movements (e.g. liberation theology groups, Buddhist monks, etc.) and individuals mobilising through their spiritual beliefs against projects affecting their sacred grounds, activities, values, etc.
	Ethnically/racially discriminated communities	Groups defined by their ethnic or racial status discriminated in their region, due to misrecognition by the government, by old and new forms of colonialism, or due to general social discrimination. Examples include Roma communities, Latino, afro or migrant collectives in big cities, etc.
	Women	Women collectives or women organisations play a key role in the mobilisation against the contentious activity, either because they are affected by specific impacts (health, labour, household conditions, sexual exploitation, discrimination or murder), or because they lead the main narratives of resistance and transformation.
	Fisher people	Fisher communities, who obtain their main source of nutrition and/or income from fishing (both from marine and

		freshwater areas), and small-scale commercial fishers usually organised through cooperatives or associations.
	International EJOs	Transnational civil society organisations supporting the resistance and counter-knowledge production in conflicts over resource extraction or waste disposal. They have an international profile (scope and influence beyond national borders) and include NGOs, coalitions, formal and informal activist networks, etc.
	Government, political parties	Actors within different levels of government (executive, legislative and judicial powers at national or local level, political parties and government bodies) involved in a specific environmental conflict, by supporting claims of affected populations.
	Social movements	Networks of a plurality of individuals, groups and/or organisations that recognize themselves as part of one movement, operating on the basis of shared collective identities or scopes. They may have existed before the conflict event or formed as a response to it.
	Local scientists/professionals	Individuals or collectives providing professional, scientific, and technical knowledge to support claims for environmental justice. Some examples include toxicological evidence of health risks or independent assessments regarding social and environmental impacts.
	Indigenous groups or traditional communities	Communities and ethnic groups that recognize themselves as indigenous, tribal or traditional. Indigenous and tribal peoples are often known by national terms such as native peoples, aboriginal peoples, first nations, Adivasi, etc. Traditional communities include afro-descendent communities, such as quilombos, Garifuna, etc.
	Farmers	People performing agriculture, raising field crops for food or raw materials, as well as livestock. This category refers to farmers who own and work on their own land. It includes both small-scale subsistence farmers, as well as larger landowners.
	Neighbours, citizens, communities	Urban and rural community members are defined by proximity or common interest for an EJ cause and mobilising together against a specific project that affects their immediate environment or interest. They include people not necessarily organised into formal collectives or associations.
	Local EJOs	Civil society organisations or informal collectives involved in the conflicts at a local scale. They frequently have a local profile when their scope and influence focus on a specific territory, or can act on the country level. They include NGOs, associations and other grassroots organisations.
	Other actors	This category includes all other actors not included above. If checked, please explain.
Mobilisation forms (actions)	Appeals/recourse to economic valuation of the environment	Arguments and methods valuing nature in economic terms as a means to defend against its destruction. This may include 'natural capital accounting', 'ecosystem services' and 'biodiversity offsets'.

	Street protests	A protest march is a type of protest or demonstration that generally involves a group of people walking from an assembly point to a predetermined destination, usually culminating in a political rally.
	Development of a collective action/network	Creation of a collective subject and first organised actions that did not exist before the specific conflict, often in terms of a committee, an association or even a network. These can be at local, national or transnational levels.
	Blockades	Actions or means of sealing off a place to prevent goods or people from entering or leaving, often preventing access to a disputed area.
	Involvement of (inter)national NGOs	The involvement of national and international NGOs to strengthen, support, increase outreach, or integrate the resistance into a broader overarching theme and agenda.
	Media-based activism	Massive use of different forms of media- be it print or online-, as well as social media as one of the main strategies of the mobilisation. A few examples could be video clips, alternative media channels, viral songs and videos in support of the community's protests etc.
	Arguments for the right of nature	Mobilisation arguing that nature is not merely a property to be owned, but rather an entity which has an independent right to exist and flourish.
	Occupation of buildings/public spaces	Occupation of public spaces or buildings, which could include public offices, such as district headquarters, or offices of the involved companies. In these cases, people protest by physically placing themselves, or other materials, in strategic spots to make their demands heard.
	Land occupation	Protestors physically occupy an area of land for an extended period, frequently sleeping and living there. Such occupations usually take place on the site of a conflictive project or contested land, to physically prevent the project from taking off and/or continuing while engaging in forms of alternative living and collectivity building.
	Artistic and creative actions	Use of creative ways, art and humour to draw attention to environmental conflicts. It can range from guerilla theatre, street plays, fairs and parties, music, and puppet shows to murals, graffiti, banners, etc.
	Hunger strikes and self-immolation	Bodily harming oneself, by hunger strike or other forms of self-immolation. It brings across the message that if a particular project is carried forward, then the only option left for a person or community would be to perish.
	Boycotts of companies/products	Collective action against or ban of a company, by not purchasing or using its products. It aims to diminish the economic performance of conflictive companies, or/and generate awareness about a company's policies, plans or industries which are causing environmental injustices
	Official complaint letters and petitions	Official or public complaint letters which are often directed at government bodies, financial actors and banks, or companies, as well as online and offline petitions to collect signatures against a specific project.

	Lawsuits, court cases, judicial activism	Legal actions using the existing environmental laws and regulations, which can happen at the local or national fora level, or international courts. It includes collective or individual legal initiatives.
	Objections to EIAs	Formal objections to the Environmental Impact Assessment (EIA) through official, legal, procedural or administrative channels.
	Strikes	Refusal to work or carry out a certain activity, performed in an organised fashion, typically used in an attempt to gain concessions from their employer or from the government.
	Referendum and other local consultations	This refers to both regulatory or consultation processes in which the public is asked to provide input in matters which directly affect them through official and publicly recognized procedures (sometimes even binding) as well as community-organised consultations. This category includes both officially recognized and self-organised consultations, both at the local and national levels.
	Boycotts of official procedures	Intentional non-cooperation and non-participation in official procedures, such as public hearings or official consultations.
	Refusal of compensation	Rejection of the form or criteria for assessing reparations, or directly rejecting money offered as compensation.
	Shareholder/financial activism	Actions by shareholders to support claims of affected groups. For example, buying shares in a publicly traded company that is causing environmental injustices so as to be able to attend the stakeholders' meetings and influence decision-making.
	Creation of alternative reports, knowledge	Production of new and alternative knowledge by activists, communities, or scientists, to challenge information produced by the state or companies. It includes performing alternative studies and preparing reports based on local knowledge and wisdom.
	Development of alternative proposals	Proposals for alternatives to the contentious project. It includes alternative proposals from communities' traditional knowledge and/or participative research with other collectives. It can be issued in the form of a formal report or through narrative claims-making.
	Community-based participatory research	Collection and analysis of data, performed by the communities themselves, or in collaboration with supportive organisations or committed researchers. Examples include popular epidemiology instances on local health and the local environment, forming coalitions with scientists and building citizen–scientist collaborations to advance their claims and seek legitimacy for their views.
	Property damage	Physically targeting objects, infrastructures or buildings, as a symbol of the causes of environmental injustices. It includes setting property or objects on fire, breaking or vandalising houses and offices, puncturing tires of vehicles, burning effigies etc.

	Sabotage	Destruction or vandalism of property, often in order to prevent any project from beginning or continue operating. An example of sabotage could be the destruction of fences or walls created for enclosing common land.
	Threats to use arms	Non-peaceful and potentially violent forms of mobilisation. It refers to the use of arms and ammunition, be it guns and grenades, or even locally used arms such as bows and arrows, axes, etc.
	Public campaigns	Actions aiming at generating awareness about the harmful impacts of certain projects or the destructive policies of certain companies involved in environmental conflicts. They can be of local, national or transnational nature, formally led by a set of organisations and promoters or animated by general slogans that are later picked up locally in multiple forms and narratives.
	Other mobilisation forms	This category includes all other forms of mobilisation not included above. If checked, please explain.
Outcomes	Deaths, Assassinations, Murders	Death of one or more protests, intentionally caused by a third party. Death can occur on the spot, for example when shooting to death environmental defenders, or be caused by wounds, rapes, tortures, etc.
	Criminalization of activists	It includes criminal prosecutions of individuals and abuses of civil and human rights, the opening of criminal investigations unlikely to reach the trial stage used to disarticulate, demoralise and discourage social protest, and the use of disproportionate sentences for offences to punish practices often deployed in social protests.
	Repression	Threat to subdue or act of subduing protests by institutional or physical force. Includes a variety of tactics (frequently including violent and coercive actions, violating rights) taken by the government, security staff, militias or corporate actors, to quell dissent and protests.
	Violent targeting of activists	Physical harassment, injuring or assassinations of specifically targeted persons, usually key activists, or to implant fear in order to defer environmental defenders' actions. Examples include violent threats to activists and their relatives, death threats, sexual threats, accident attempts, etc.
	Strengthening of participation	Increased civic engagement and public participation in consultation, planning and politics as an outcome of mobilisation and collective organising in the conflict.
	Project cancelled	The contested project, or activity, is stopped. The decision can be made by the government or the company itself, both in the initial or later stages. The decision is usually confirmed in official documents or announcements. However, it does not necessarily mean that the conflict is over, nor that the impacts are not there anymore.
	Environmental improvements, rehabilitation/restoration of area	Reparations, interventions or restoration of the environment so as to improve the ecological conditions of the area.

	Court decision (victory for environmental justice)	Cases where legal action is taken, and the courts rule in favour of the environmental defenders. Such legal victories can include for example cancellation of projects, orders for creating better regulations, a total ban on the contentious activity or for a stipulated period of time, orders for re-evaluation of impact assessments, compensation demands, etc.
	Court decision (undecided)	Cases where legal action has been taken but no clear decision has yet been issued or the case is ongoing.
	Court decision (failure for environmental justice)	Cases where legal action has been taken but the ruling is in favour of the industries or the projects which triggered the conflict, or cases that dismissed the claims of affected people.
	Negotiated alternative solution	Cases where some project parameters are modified, or where some affected groups gain benefits, through processes of negotiation with involved actors such as companies, governments and project authorities. Such negotiated solutions do not necessarily meet the demands and claims raised by all.
	Application of existing regulations	Cases in which regulations that already existed before the conflict but were not being applied, are applied following a court order, government action or as a result of public pressure.
	Compensation	Compensation by the state or company to address loss and impacts related to the project, either through financial transfers or through in-kind compensations (goods and services aiming to amend the impacts suffered).
	Corruption	Abuse of entrusted power for private financial or political gain. Here, this category captures those cases where corruption has been proven and/or condemned by a court judgement or evidenced and documented by mobilising groups.
	Fostering a culture of peace	Despite the conflict, communities and mobilising groups have worked for peaceful resistance and for fostering a culture of peace.
	Institutional changes	Cases where the conflictive situation has brought to changes in the institutional systems, for example by setting up government bodies for monitoring impacts, or new local authority systems.
	Land demarcation	Demarcation of lands is the formal process of identifying the actual locations and boundaries of Indigenous lands or territories or more broadly of clarifying territorial boundaries.
	Migration/displacement	Forced or otherwise induced movement of peoples due to the conflictive project or activity. It includes displacement according to resettlement programs or without any such scheme. It can be a direct impact of the conflictive project or an indirect, gradual consequence of it across time.

	Moratoria	Temporary or indefinite suspension of the conflictive activity beyond a specific project, through legal tools. Moratoria delay the contentious activity but do not necessarily ban it over longer periods. It includes moratoria to future projects, or to specific aspects and practices of current activities. Examples are provincial or countrywide bans on timber logging, large-scale agricultural concessions, fossil fuel extraction, open-cast mining, GMOs, approval of new nuclear power plants, etc.
	New Environmental Impact Assessment/Study	Cases in which, as a result of the mobilizations, public authorities decide to conduct a new environmental impact assessment (EIA) of the proposed investment project. It includes both cases where there were no initial EIAs at all and those where an environmental impact study was previously submitted but was deemed incomplete or flawed.
	New legislation	Cases in which, as a result of mobilizations and political debates around them, public authorities issue new legislation. It includes new legislation either in favour or against the mobilised groups.
	Project temporarily suspended	Suspension of the contentious project due to protests and claims, or for financial and political reasons. The suspension can last days, months or even years. During the suspension, the project can be re-negotiated, and/or another EIA can be carried out, or the project can be finally scrapped.
	Technical solutions to improve resource supply/quality/distribution	It refers to technical solutions to minimise impacts or the number of affected people and land. For example, new filters in incinerations to reduce emissions.
	Under negotiation	Cases where a process of dialogue or negotiation is in place among some of the actors involved in the conflict. This negotiation can take place while the contentious project is planned, operating, in construction, or suspended.
	Withdrawal of company/investment	Cases where companies involved in the conflict withdraw or stop their investment. Reasons for their withdrawal could include economic viability, internal business decisions, pressure from the environmental movement, etc. However, it does not necessarily imply the suspension of the contentious project, as other companies or investors can get involved.
	Other outcomes	This category includes all other types of outcomes not included above. If checked, please explain.
Mobilisation start	LATENT (no visible resistance)	This category refers to conflicts without visible resistance and mobilizations, but where there are reasonable signals that it might appear anytime.
	PREVENTIVE resistance (precautionary phase)	This category refers to those conflicts, in which mobilisation begins before the project begins to be operated or constructed. Examples include those cases when mobilizations begin during public consultation processes.
	In REACTION to the implementation (during construction or operation)	This category refers to those mobilizations starting after the construction or operation of a contentious project.

	Mobilisation for reparations once impacts have been felt	This category refers to those cases, in which the project already produced harm and caused adverse impacts to the environment and/or to local groups, and where mobilisation begins once the impacts have been felt.
	UNKNOWN mobilisation start	This category refers to those cases, in which the inception of the mobilisation is not certain.
Environmental Impacts	Air pollution	Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings or cause damage to the climate or to materials. Air pollutants include gases (such as ammonia, carbon monoxide, sulphur dioxide, nitrous oxides, methane and chlorofluorocarbons), particulates (both organic and inorganic), and biological molecules.
	Fires	Fire in its most common form can result in conflagration, which has the potential to cause physical damage through burning. A conflagration can begin accidentally (e.g. fires at oil refineries), be naturally caused (wildfire), or intentionally created (arson). The negative effects of fires include hazards to life (human and non-human) and property, atmospheric pollution, and water contamination.
	Genetic contamination	Uncontrolled spread of genetic information (frequently referring to transgenes) into the genomes of organisms in which such genes are not present in nature. Though controversial, the term also refers to the effects of introducing invasive species that may hybridise with native species, causing genetic pollution.
	Noise pollution	Also known as environmental noise or sound pollution, it refers to unwanted noise or vibration, or excessive sound that can have negative impacts on human and wildlife health, environmental quality, and orientation behaviours (such as echolocation for bats). The source of outdoor noise is mainly caused by machines, transport, and propagation systems, explosions, etc.
	Waste overflow	The overflowing of waste of various types when the disposal and accumulation speed is faster than waste treatment, causing not only air pollution like bad odours but also negative health and environmental impacts, such as intoxication and soil contamination.
	Surface water pollution / Decreasing water (Physico-chemical, biological) quality	Surface water pollution refers to the pollution of lakes, oceans, streams, rivers, ponds, reservoirs, wetlands, and other surface water bodies, caused by anthropogenic contaminants and/or anthropogenic activities. Examples include surface water pollution resulting from activities related to agriculture, mining, industries, infrastructure development, landfills, and human/animal waste, among other sources.
	Reduced ecological / hydrological connectivity	Ecological/ Hydrologic connectivity refers to species/water-mediated transfer of matter, energy and/or organisms within or between elements of the ecologic/hydrologic cycle. The reduced ecological/hydrological connectivity can be caused by projects like dams when these prevent or impede movement of water, migratory animals, plants, etc.

	Biodiversity loss (wildlife, agro-diversity)	Biodiversity loss refers to the loss of forms of life, including the decline and extinction of species, habitats, and ecosystems. Examples are loss of wildlife, loss of agro-diversity caused by diverse human activities, decrease in fish population in rivers due to dams, etc.
	Floods (river, coastal, mudflow)	Floods refer to the overflowing of a large amount of water from its natural or artificial water bodies. Floods can occur unexpectedly or due to poor prevention in the management of infrastructures, for instance, when an overflow of water or mud submerges surrounding areas. Consequences of floods might be exacerbated by heavy rainfall, rapid snowmelt or a storm. Besides natural factors, human activities often increase the intensity and frequency of flooding. These include deforestation, removal of wetlands, diverting river courses, and excessive groundwater pumping, among others.
	Global warming	Global warming, as used in the EJAtlas database, refers to the direct contributions of a contentious project to climate change due to the emission of substantial amounts of greenhouse gases.
	Soil contamination	Soil contamination refers to land degradation caused by a range of pollutants that disturb the previously established or prevailing soil environment. Examples include soil contamination through pollutants such as chemicals, heavy metals, organic residues, radioactive substances, plastic, and other non-degradable substances, waste-related substances, and other pollutants released by anthropogenic activities.
	Oil spills	Oil spills refer to incidents in which liquid petroleum hydrocarbons are discharged, accidentally or intentionally, into the environment, such as soils or water bodies. Oil spills can occur as a consequence of an unexpected event (i.e. malfunctioning or breaking down of a pipeline, ship sinking, etc) or poor infrastructure maintenance.
	Groundwater pollution or depletion	Groundwater pollution refers to the transmission of a range of pollutants into groundwater bodies. Examples include groundwater pollution caused by industrial and household chemicals, garbage landfills, industrial waste lagoons, tailings and processed wastewater from mines, oil field brine pits, leaking underground oil storage tanks and pipelines, sewage sludge, and septic systems. Groundwater depletion refers to a long-term decline in water levels, caused for example by sustained groundwater pumping.
	Mine tailing spills	Mine tailing spills are leakages or overflows of tailings, a mixture of fine mineral particles, chemicals, and water. The spills can happen from tailing dams failures or other inappropriate mine safety measures. Tailing spills are highly contaminant as they release toxic substances, radioactive content, or sulfites into the environment.
	Desertification / Drought	Desertification refers to the process by which the biological productivity of lands is reduced, typically as a result of human-led drought, deforestation, inappropriate agriculture or global warming. Drought is the lack or insufficiency of rain for an extended period that causes a considerable hydrologic (water) imbalance and, consequently, water

		shortages, crop damage, streamflow reduction, and depletion of groundwater and soil moisture.
	Food insecurity (crop damage)	Food insecurity refers to the limited or uncertain availability of a sufficient quantity of affordable, healthy, and nutritious food due to the changes brought by the contentious project, or the limited or uncertain ability to acquire acceptable and affordable food. Food insecurity could also be the consequence of crop failure or damage due to the disruptions caused by the contentious project.
	Loss of landscape/aesthetic degradation	Loss of landscape and aesthetic degradation refers to disruptive changes and modifications in the aesthetic appearance of traditional, customary, or previously prevailing landscapes, including landscapes created and maintained for generations by human activities, as part of local cultures and identities. Examples include disruptions, changes, and modifications in traditional small-scale agricultural landscapes, agro-forests, grazing landscapes, fishponds, rice terraces, traditional wood-pastures, meadows, and other landscapes.
	Soil erosion	Soil erosion is a form of soil degradation that refers to the denudation and loss of the upper level of the soil. Soil erosion entails or can lead to soil fertility decreases or desertification. Soil erosion occurs for example when the impacts of water, ice (glaciers), snow, air (wind), plants, animals, and human activities remove the nutrient-rich upper layer of the soil.
	Deforestation and loss of vegetation cover	Deforestation refers to the removal of forests and stands of trees from land subsequently converted into other, non-forested land. Loss of vegetation cover refers to significant losses in other forest-like, perennial vegetation cover. Examples of deforestation include the removal of trees for farming or livestock activities, timber extraction for fuels, construction or manufacturing, forest clearance for infrastructure development, or illegal timber logging, among other causes of deforestation.
	Large-scale disturbance of hydro and geological systems	This category refers to large-scale changes in the aquatic, marine or terrestrial environment that hinder or harm their ecological functioning.
	Other Environmental impacts	Any other environmental impact that is not included in the previous list of impacts. Please explain.
Health Impacts	Accidents	Events happening unexpectedly, intentionally or unintentionally, resulting in damages or injury to surrounding dwellers and/or the environment. It can occur because of human errors, miscalculations or deliberate carelessness (e.g dam collapse due to poor maintenance of infrastructures, or as a result of extending the capacity of dumping sites beyond its safe level).
	Mental problems including stress, depression and suicide	All forms of mental illnesses or severe emotional distress or caused by stress, depression, fear, rage, and/or a feeling of helplessness caused by the contentious project. It includes mental problems linked to pollution (exposure to heavy metals, toxic substances in one's body or the environment) and extreme actions such as suicide related to or triggered

		by the loss of livelihoods, familiar landscapes, and social and ecological bonds.
	Occupational disease and accidents	Diseases and accidents caused by or closely linked to working conditions. They often are a result of inadequate equipment protecting workers from different types of hazards and/or potential diseases (e.g. asbestosis). Accidents refer to events that occur unexpectedly and unintentionally within the working environment, sometimes closely linked to careless and poor maintenance of the working place.
	Other environmental-related diseases	All other possible illnesses related to environmental factors (e.g. chronic diseases, acute poisoning, asthma, kidney failure, etc).
	Exposure to unknown or uncertain complex risks (radiation, etc…)	Exposure to pollutants, hazards and/or toxic or radioactive substances in the air, soil or water and of which there is insufficient knowledge on how they can affect human and ecosystem health in the short, middle and/or long term.
	Violence-related health impacts (homicides, rape, etc..)	This category refers to the health consequences (e.g. diseases or severe mental stress) of violent acts. These can include homicides, rape, and injuries, occurring or increasing because of the conflictive project. Examples include community violence, sexual violence or violent acts committed by new actors in the territory (workers, security guards, etc.)
	Infectious diseases	Diseases caused by the invasion of an organism's body tissues such as bacteria, viruses, vector-borne diseases, parasites, or fungi as a consequence of the ecosystem disruption or modification by a contentious project. For instance, the appearance of such organisms can be the result of poor maintenance of water management (i.e. cholera) or mosquitoes (i.e. dengue, malaria).
	Malnutrition	Deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. It includes undernutrition or being overweight. Environmental degradation leading to a decrease and/or pollution of available natural resources (water, fish, crops) often threatens local people's accessibility to food and causes illnesses.
	Health problems related to alcoholism, prostitution	This category refers to health issues resulting from harmful addictions such as alcoholism or drug addiction, human trafficking, and prostitution.
	Deaths	Deaths resulting from chronic diseases linked to environmental pollution (e.g., cancer) or as a result of accidents around the affected area due to the conflictive project (e.g. landslides caused by a conflictive infrastructure).
	Other Health impacts	Other health impacts that are not included in the former categories. Please explain.

Socio-economic Impacts	Increase in Corruption/Co-optation of different actors	This category refers to an increase in reported cases (in the media, civil society reports, or judicial proceedings) of corruption and cooptation of different actors, resulting from the planning, implementation or operation of the project. It can refer to corruption and cooptation among state or public authorities as well as in the companies, state utilities, construction work authorities, social leadership and local authorities.
	Lack of work security, labour absenteeism, firings, unemployment	This category assembles several occupational impacts of a project, such as lack or deterioration of work security, the phenomenon of labour absenteeism, workforce firings, and resulting unemployment.
	Militarization and increased police presence	Militarization and increased police presence refers to the increase and consolidation of armed forces in a given area as a consequence of extractive, industrial, or other conflictive activities. The EJAtlas accounts for diverse forms of militarisation, including the increased presence of state military forces, state guards, police forces, non-state armed groups, and private security armed groups, among others.
	Violations of human rights	Violation of any expression of human rights.
	Displacement	Displacement refers to the involuntary or coerced migration and movement of people from their homeland, dwelling site or working site, or country of origins. Examples include displacement caused by disasters, conflicts, industrial development, land acquisitions, land grabbing, or gentrification, among other causes.
	Loss of livelihood	Loss of livelihood refers to the loss or decline of one's ability to sustain their life through their previously prevailing or traditional way of living. For example, loss of livelihood may include losses or declines in monetary or environmental incomes, declining control over or access to lands, forests, waters, labour markets, employment opportunities, and other assets and flows that sustained previously prevailing livelihoods.
	Social problems (alcoholism, prostitution, etc..)	This category refers to severe social issues in the social and cultural fabric as a consequence of the contentious project, for example, derived from increasing harmful addictions such as alcoholism, drug addiction, human trafficking, prostitution, crime and juvenile delinquency, among others).
	Land dispossession	Land dispossession refers to the acts of depriving a person, household, or community of their previously used land resources, properties, and rights. Examples include land dispossession of locals for agribusiness development, conservation areas, infrastructure projects, mining sites, and concessions, among others.
	Increase in violence and crime	This category refers to a perceived and/or objective rise in violent and/or criminal activities, as a result of a project's planned or actual implementation.

	Loss of traditional knowledge/practices/cultures	Loss of traditional knowledge refers to the loss, decline, or distortion of knowledge, practice, and beliefs maintained through generations by cultural transmission, including the relation between humans and their environment. Examples include loss, decline, or distortion of knowledge about animals, crops, plants and medicine, sacred meanings and sounds of forests, lands, rocks, mountains, and rivers; oral traditions such as storytelling, songs, and arts; spiritual and religious rituals, tribal laws, identities, cultural practices, among others.
	Specific impacts on women	Specific impacts on women refer to the occurrence of social, political, economic, environmental, and/or health impacts that particularly affect women or women-centred groups and social collectives. This impact category includes those consequences that are particularly severe or worrisome either due to the social role women have (for example, additional labor burdens imposed on women as a consequence of a conflictive project), or for specific health and body conditions (for example, more severe impacts of contamination on women's bodies and health during pregnancy), or for the cultural and/or political symbolism they often represent in repressive societies (for example, women forbidden to go out due to the presence of foreign workers, rape used as repressive means in conflicts, and other forms of violence targeted against women, bordels being created around construction works, etc.).
	Loss of landscape/sense of place	Loss of landscape and sense of place refers to those changes provoked in a landscape that lead to a loss of associated meanings, feelings, and attachments to a place experienced by people. Examples include the destruction of lands with a collective or family history to which people hold emotional bonds, or the loss or destruction of landscapes with sacred, cultural, and/or spiritual meanings.
	Other socio-economic impacts	Other socio-economic impacts that are not included in the previous list of impacts. Please explain.

Name in the EJAtlas	**Definition**
Current status of the project development:	A categorical variable that describes the status of the project development at the time of entering information about the conflict caused by the project. The variable has six levels: Unknown; Proposed (exploration phase); Planned (decision to go ahead eg EIA undertaken, etc.); Under construction; In operation; Stopped.
Unknown	No information is available about the project status
Proposed (exploration phase)	The project is in an early exploration phase during which plans for the projects are evaluated, however, it is not yet decided whether the project is feasible and will move forward. This phase includes for example projects for which early plans have been proposed, but no feasibility studies or social and environmental impact assessments have been undertaken or finalised, and where no final decisions to move forward with the projects have been taken yet.

Planned (decision to go ahead eg EIA undertaken, etc)	The project status "planned" indicates that the project has already finalised the exploration phase, that some feasibility studies and/or impact assessments have been already undertaken and that final investment decisions or formal decision to move forward have been taken by all the appointed authorities. During this stage, construction has not yet started.
Under construction	The project status "under construction" indicates that the development of the project has already started but has not yet been finalised. For projects involving infrastructures, it means that the preparation and construction work has already started. For other projects (e.g. development of national parks, mining, etc.) it means that the preparations to set up the necessary physical and institutional infrastructures have started.
In operation	The project status "in operation" indicates that the construction phase has terminated and that the project is currently under operation, at least in some parts of the project area.
Stopped	The project status "stopped" indicates that construction and/or operations have ceased for any kind of reasons, temporarily, or in the long run. The reasons for stopping the project could be, but are not necessarily, related to the conflict associated with the project. For example, projects can appear as stopped if the project has been cancelled (see the outcome "cancelled"), if it has been temporarily suspended (see the outcome "temporarily suspended"), if the project turned out to be economically not viable, if the investor filed bankruptcy if the project developer faced technical issues in developing and/or operating the project, if the project achieved the end of its lifespan (e.g. exhaustion of natural resources exploited by the project) if new legislations required additional studies for the project to continue (e.g. additional impact assessments, etc.) and the company ceased its activities until it is allowed to restart operations and any other reasons that could lead to a temporary or complete stop of the project.