

Social Risk Indexing and Rating for Infrastructure Investors

The case of the UK Water Sector

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Authors

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1. Social Risks and Infrastructure Investment

Infrastructure assets have large positive effects on economies and society but they can also have real or perceived negative impacts. They are also immobile and often linked to the public sector and its policies. As a result, the social acceptance of infrastructure investments is a material topic for an investor and can create significant risks and consequences.

In the **UK**, nationwide protests against sewage spilling by water companies led to the removal of the fine cap in April 2023. This regulatory change more than doubled pollution fines for the first half of 2023 compared to the entire year 2022 (Environment Agency, 2023; Segal, 2023). Our research results show that the UK government had no other choice but to react with a change in regulations. Since 2022, the UK water sector has seen a strong decline in social support, paired with intense discussions in the news and on social media regarding environmental pollution, questions of ownership, and an overall negative reputation. We discuss this use case in more detail in Chapter 4.

Last year, a court ordered the dismantling of all turbines from an operating wind farm near Montpellier in **France**. Residents protested against the noise, and environmental groups presented a study claiming the death of more than 1,000 birds, including a golden eagle (Jenkinson, 2023). Likewise, local protests stopped a wind farm development in **Ireland** after four years of costly legal proceedings (The Kerryman, 2018).

In the **US**, landowners in Iowa used the upcoming 2024 presidential election to stop a carbon pipeline project to protect their property rights

and the agriculture industry (Frankel and Tabet, 2023).

Such developments are frequent and not new. A decade ago in **Australia**, developers had to cancel the East West Link road in Melbourne because a deterioration in support of the project triggered protests. This cancellation cost Victorian taxpayers AUD1.1 billion (Alcorn, 2014).

In **Germany**, coal-mining projects have always faced strong opposition: Protests required the expensive and difficult clearance of the Hambacher forest in 2013 and the village Lützerath in 2023, which increased the costs and delayed coal-mining projects (DW, 2023).

These examples illustrate social risks and their consequences for companies that own infrastructure assets that impact people and the environment - a dynamic relationship of actions and reactions. From short-term protests, project delays, and increased project costs to long-term regulatory changes and reputational impacts for companies as well as entire sectors, social risks are financially material.

However, not all activities impact people and the environment in the same way. Investing in the workforce's well-being could improve productivity, following the overspill limitations would have negligible consequences, but exploiting indigenous communities damages a company's reputation and, potentially, its profits.

Those activities with salient and negative impacts can result in material financial risks for companies. Accordingly, for ESG risk management and investment decisions, it is

crucial to understand which impact factors have salient consequences that result in material financial risks.

In order to manage social risk factors, asset and investment managers need to identify what risks they are exposed to, and which part of these risks they can control and which part they cannot. In other words, there are two main components of social risk at the asset level:

1. The *systematic component* - relating to a market or country and a sector - combines various material risk factors stemming from the sector's reputation, the public's perception of the industry, and regulations affecting the respective sector and country. A project's exposure to systematic social risks can be assessed but is not directly under the control of the investor.
2. On the other hand, the *idiosyncratic component* of social risks is linked directly to the company or asset in question. Investors can have an influence on this part of their total exposure to social risks by taking actions in favour of users and customers, the workforce, or the public, who may, in turn, change their perception.

In this research, we measure the systematic part of social risk using media data. Because most infrastructure companies or projects are not mentioned by name in the press or in social media, it is generally not possible to measure the social risk of a specific asset. In fact, the asset-specific part is often only known by the project owner or developer, who is in touch with the local authorities, inhabitants, and users directly impacted by the project's activity.

However, in cases where measuring asset-level social risk is possible (for very visible assets like Thames Water or Heathrow Airport), our research shows that the systemic component of social risks in infrastructure investment represents about 60-70% of total social risk. In other

words, only 30-40% of a company's social acceptance (the idiosyncratic component) can directly be controlled and influenced to improve the acceptance of the asset.

Thus, once an investor has selected a market or country to invest in and an activity sector, **more than half of the social risk to which they are exposed is given at that point in time** due to its systematic nature (e.g., for the private water sector in the UK).

Accordingly, asset and investment managers can use the systematic component that we offer through our indices for two types of assessment:

1. The systematic component can be a **starting point to estimate social risks on the asset level**. By adding company-specific information (e.g., conducted through surveys among customers, employees, and the general public), asset managers can identify the idiosyncratic component and actively address this part to minimise social risks.
2. Investment managers can use the systematic component as a **benchmark** to estimate social risks on the sector and country level and to assess, compare, and **manage social risk at the portfolio level**.

In this research note, we show the results of using an AI-driven methodology to analyse news and social media and measure the systematic exposures to social risks that investors face in several English-speaking countries and any infrastructure sector.

In the rest of this document, we first describe three types of social acceptance metrics before displaying our social acceptance sector ratings for the US, UK, Canada and Australia, as well as an aggregated (global) rating. We then carry out an in depth case study of the water sector in the UK and show how the systematic exposure to social risks faced by investors represents the largest part of their risk exposure.

2. Social Risk Indices

Social acceptance functions as an indicator of social impact and risk factors that can become financially material. Knowing which factors impact people and how they affect public support for a sector is the first step to identifying material risk factors. More on the concept of social acceptance can be found in the conceptual background on p. 24.

We developed three social acceptance metrics to support infrastructure developers and investors in monitoring the social acceptance across various infrastructure asset groups on a regional level. We currently cover 23 sector groups in five countries (the US, UK, Canada, Australia, and New Zealand) over a period of more than 10 years. The sector groups follow EDHEC*infra*'s TICCS classification (2022). Our methodology is based on techniques from Natural Language Processing (NLP) and sentiment analysis, further described in Appendix A.2 on p. 26.

Social Support Index

The Social Support Index reflects the average **level of acceptance** across the public on a range from 0 to 100, with 100 representing full social support. The index combines sentiment from news coverage and the social media discourse to detect the public's support toward specific infrastructure asset classes in each of the five countries and at each point in time between 2013 and 2023. The level of social support is best understood by comparing sectors or countries or by analysing its development over time.

Social Consensus Index

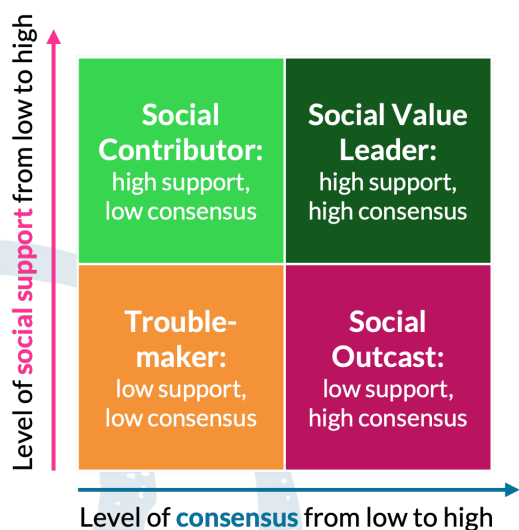
The Social Consensus Index reflects the **level of agreement** within the public on a range from 0 to 100. To identify the consensus, the index measures the level of polarisation in sentiment scores or, more precisely, the distance between the most and least supporting sentiment scores at each point in time and across all sectors and countries. The higher the index value, the higher the consensus and the more stable the public acceptance and social support.

Social Attention Trend

The Social Attention Trend reflects the **attention toward selected topics** in the news coverage and social media discourse, providing a deeper understanding of the sentiment results and reasons for declining or increasing social support. The trend measures the proportion (in per cent) of ESG topics covered in news articles and discussed on X (formerly *Twitter*). Increasing attention toward an issue indicates for a social factor to become salient and, hence, a material risk factor. More on the social factors covered can be found in our methodology on p. 26.

3. Social Risk Sector Ratings

Figure 1: Style boxes representing four types of sectors based on their level of social support and consensus



EDHEC*infra*'s sector ratings provide overviews of the relationship between the Social Support Index and the Social Consensus Index for all sector groups. The style boxes (see Figure 1) provide global results across all countries (the US, UK, Canada, Australia, and New Zealand) and are split by the global cross-sector median (2018-2023) of the Social Support and the Social Consensus indices.

The four squares represent potential level of social acceptance and risk for a sector in a specific market or country:

- **Social Value Leader** represents a sector with a high level of support from most members of the public.
- **Social Contributor** represents a strongly supported but widely debated sector.
- **Troublemaker** represents an unsupported and widely debated sector.
- **Social Outcast** represents a sector with a low level of support from most members of the public.

To differentiate within each type on a more granular level and to indicate changes in social acceptance, we focus on three results:

1. We split the style boxes into quartiles of the Social Support and the Social Consensus indices. The highlighted square shows the average **social acceptance of the past quarter (Q3/2023)**.
2. In case a sector has moved from one quartile to another over the past year, the style boxes highlight those changes through a **lighter shade for the same quarter a year ago (Q3/2022)**.
3. Additionally, a trend indicator provides information on a positive ($> +1\%$ ↑), negative ($< -1\%$ ↓), or unchanged ($-1 > +1\%$ →) **development of the Social Support Index** from the same period a year ago (Q3/2022). Note that the trend indicator focuses on the level of support, not consensus.

In the following pages, we present the results of the global sector rating and compare them to sector ratings in the US, Canada, Australia, and the UK.

Globally and across countries, we find that sectors providing a solution to climate change (i.e., renewable energy sector) are more well respected than those sectors causing pollution (i.e., conventional power, transport). However, the style boxes provide further insights within those sector groups and across countries.

For example, while people in most countries strongly support renewable energy sectors, such as solar power, hydro-, or bio and geothermal power, wind power generation is widely discussed and less favoured. The UK is the

only exception, where wind power receives the same level of support as other forms of renewable power generation. The UK's unique perspective could be attributed to various factors, including government policies, public awareness campaigns, and the country's geographical suitability for wind farms. Due to its strong winds and extensive coastline, the UK has been a leader in wind power, especially offshore wind. Generally, the public sees wind power as a key component in reducing carbon emissions and combating climate change. Furthermore, wind power generation provides economic benefits through job creation and investment.

On the other hand, the public discourses in the US, Canada, and Australia are often dominated by concerns about wind farms' impact on the environment (e.g., bird and bat deaths, habitat disruption), noise pollution, and aesthetic concerns. Some also argue that wind power is unreliable and requires backup from fossil fuel sources. Understanding the various public perceptions and sentiments toward renewable energy aids investors in their decision-making process, helping them focus their renewable energy investments in the UK or European market.

By way of comparison, the transport sector - a source of CO₂ and pollution - experiences less support across the global population. However, on a more granular level, we can see differences within individual sector groups. For instance, the rail and urban commuter sectors are more strongly supported than the highly polluting airport and road sectors. This distinction suggests that the public recognises and supports sectors it perceives as more environmentally friendly due to their lower greenhouse gas emissions per passenger mile. Furthermore, rail and urban transit can help alleviate traffic congestion in cities and - depending on the level of expansion of the public transport network - can be more cost-effective, accessible, and convenient compared to the road and airport sectors.

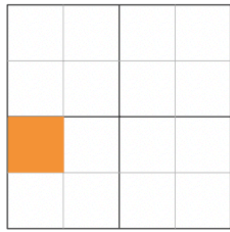
In contrast, people often complain about the condition of roads, bridges, and highways and the lack of investment in road maintenance. Many major cities also experience significant traffic congestion, leading to long commutes and frustration among drivers.

Moreover, there are notable differences in sector support across countries. Australia, for example, demonstrates the most support for the transport sector, while the UK shows the least support. The transport sector in Australia is often viewed positively due to its role in connecting vast distances in the country. It is seen as essential for facilitating economic growth, tourism, and regional development. Additionally, public transport in major cities like Sydney and Melbourne is becoming more efficient and accessible, leading to greater support. In contrast, people in the UK often experience delays, cancellations, and overcrowding, which leads to frustration among commuters. Furthermore, people criticise high ticket prices, lack of modernisation, and a generally low quality of customer service.

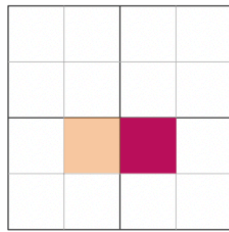
Understanding these nuances is crucial for investors when deciding on investing in specific sectors and markets. By aligning their investments with more socially accepted sectors in a particular country, investors can mitigate social risks and capitalise on opportunities associated with changing public sentiments.

Our findings underscore the importance of considering public perceptions of sectors and industries when making investment decisions. By incorporating social acceptance metrics into their investment strategies, investors can gain valuable insights into sector dynamics and make more informed decisions that align with societal values and preferences.

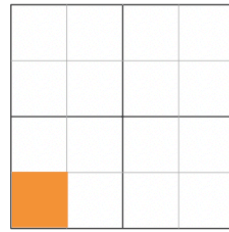
Global Sector Rating YE2023



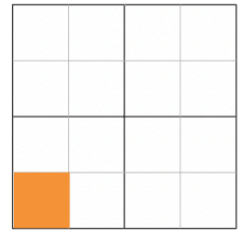
Water & Sewage ↓



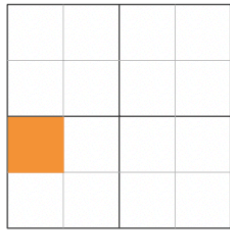
Water Treatm. →



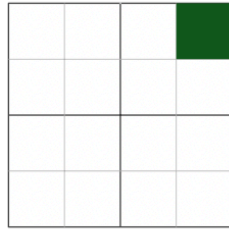
Waste Treatm. →



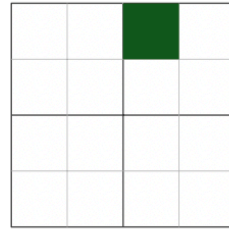
Conv. Power ↓



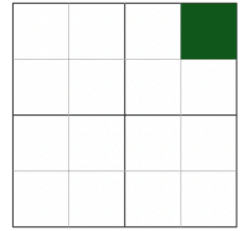
Wind Power ↓



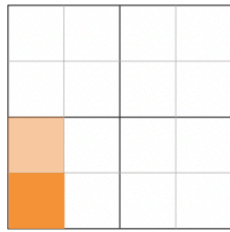
Solar Power →



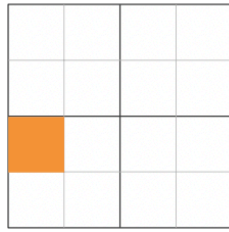
Hydro Power →



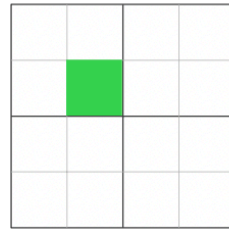
Bio & Geotherm. →



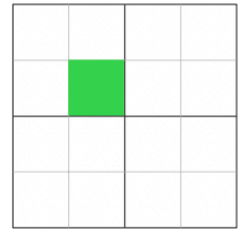
Airports →



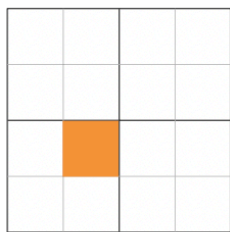
Ports →



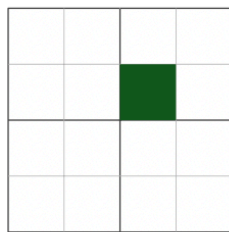
Rails ↑



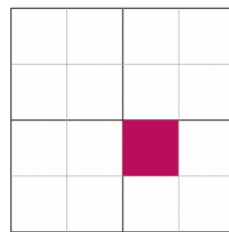
Urban Commuter →



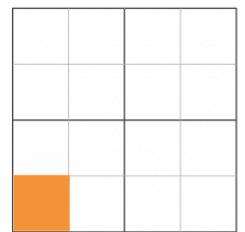
Roads →



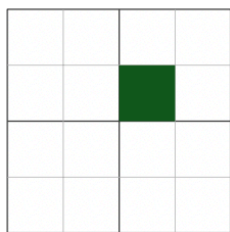
Carparks →



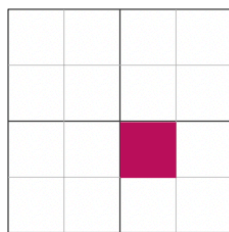
Data Transm. →



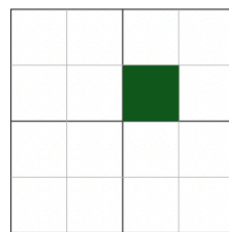
Nat. Resources →



Electricity →

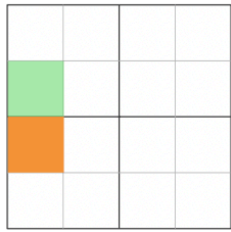


Gas Distribution →

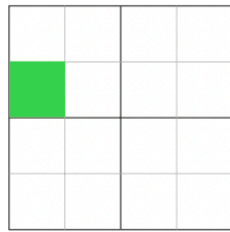


Social Infra ↓

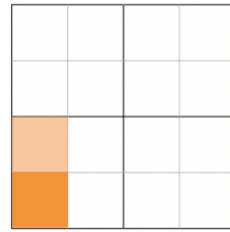
United States Sector Rating YE2023



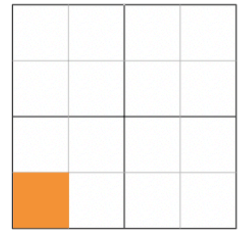
Water & Sewage →



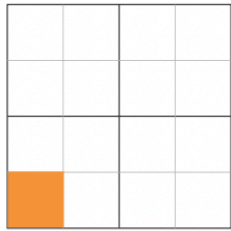
Water Treatm. →



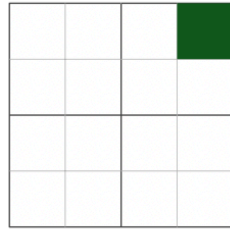
Waste Treatm. ↓



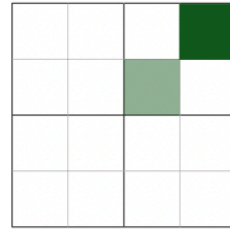
Conv. Power ↓



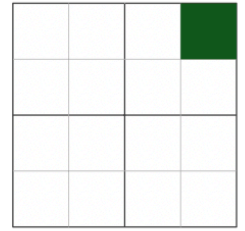
Wind Power ↓



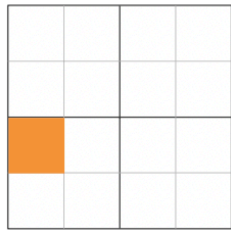
Solar Power ↑



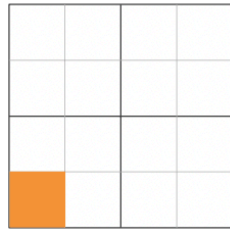
Hydro Power ↑



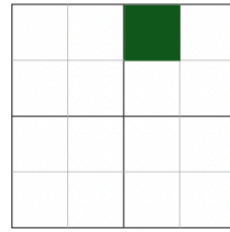
Bio & Geotherm. →



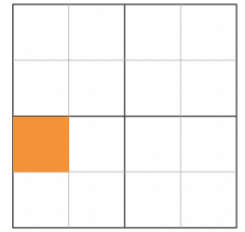
Airports ↓



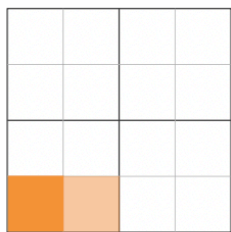
Ports ↑



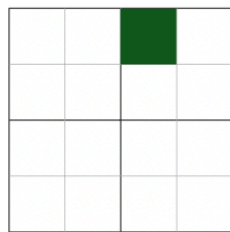
Rails →



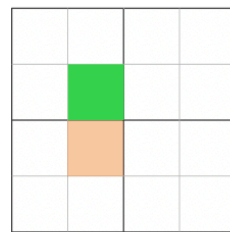
Urban Commuter →



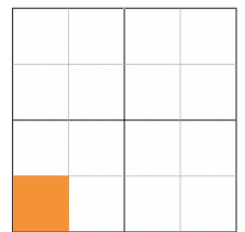
Roads →



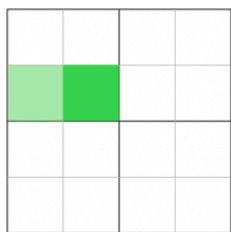
Carparks ↑



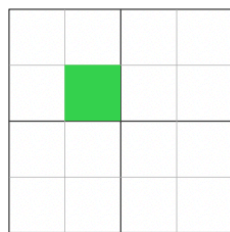
Data Transm. ↑



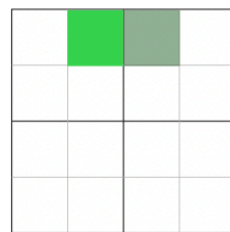
Nat. Resources ↓



Electricity ↑



Gas Distribution →

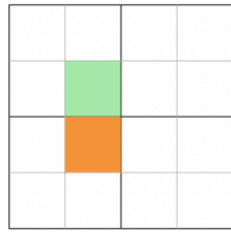


Social Infra ↓

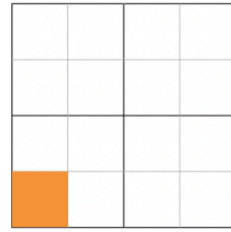
Canada Sector Rating YE2023



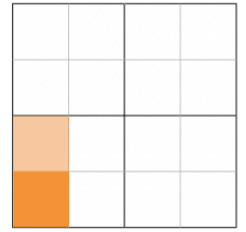
Water & Sewage ↓



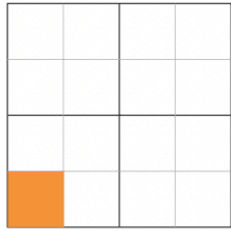
Water Treatm. ↓



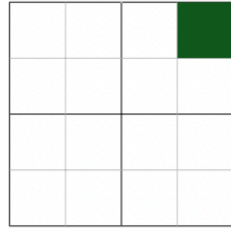
Waste Treatm. →



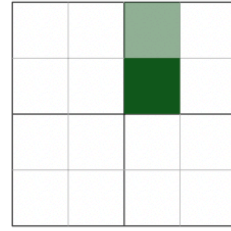
Conv. Power ↓



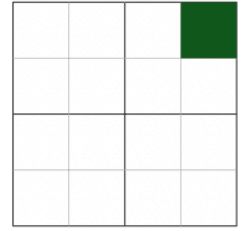
Wind Power ↓



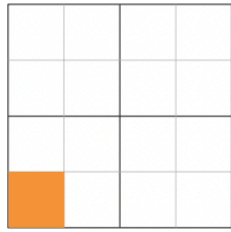
Solar Power →



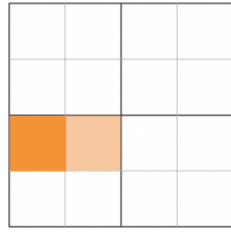
Hydro Power ↓



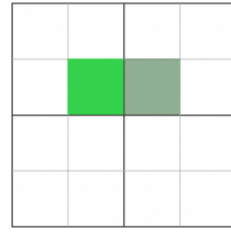
Bio & Geotherm. →



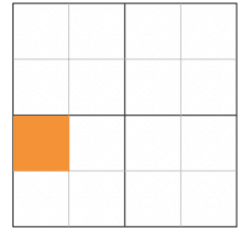
Airports ↓



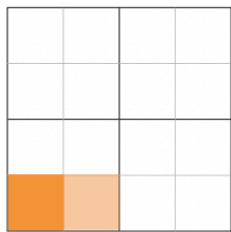
Ports ↓



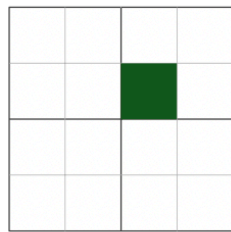
Rails →



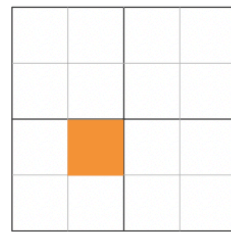
Urban Commuter →



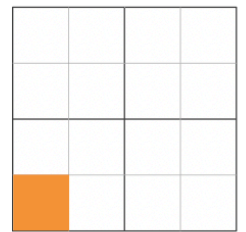
Roads →



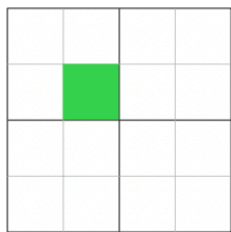
Carparks →



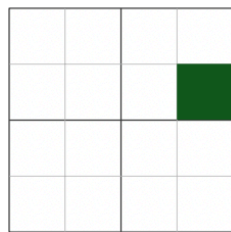
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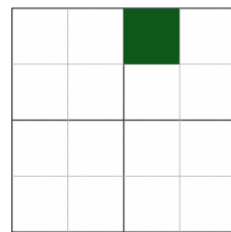
Nat. Resources ↓



Electricity →

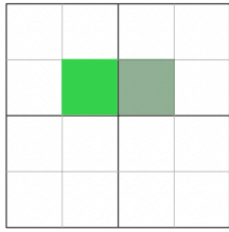


Gas Distribution ↓

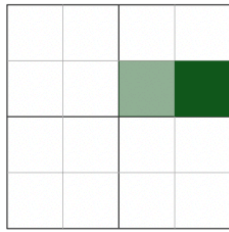


Social Infra ↓

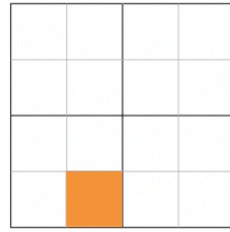
Australia Sector Rating YE2023



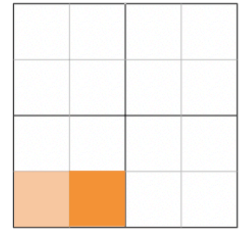
Water & Sewage ↓



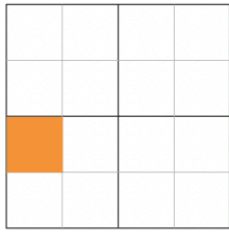
Water Treatm. ↑



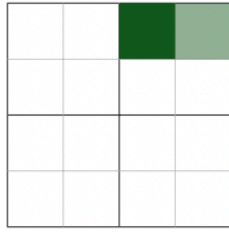
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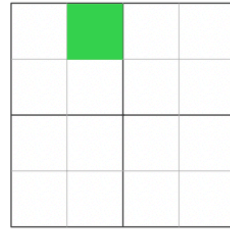
Conv. Power →



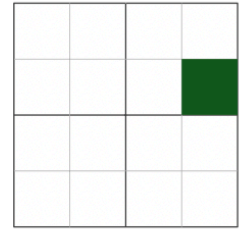
Wind Power ↓



Solar Power →



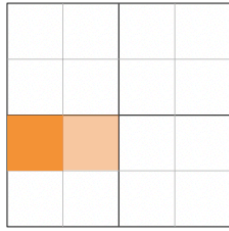
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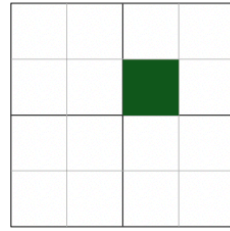
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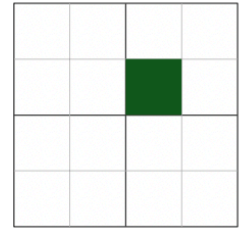
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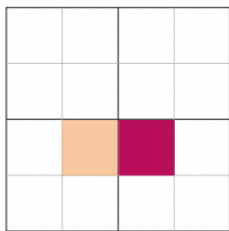
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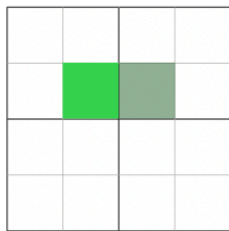
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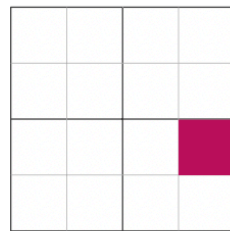
Urban Commuter →



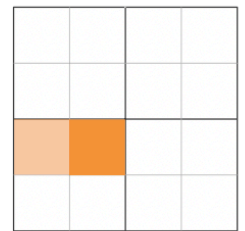
Roads →



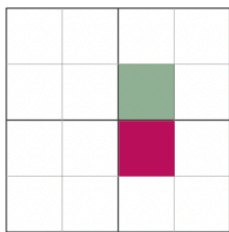
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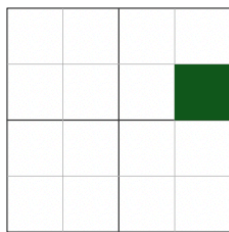
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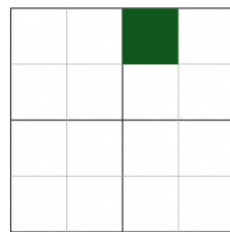
Nat. Resources →



Electricity ↓

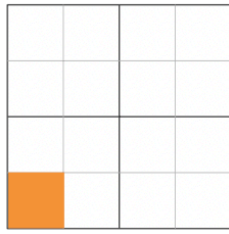


Gas Distribution →

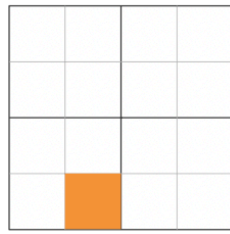


Social Infra →

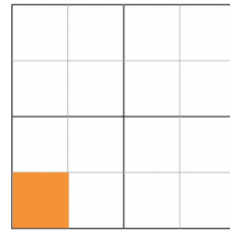
United Kingdom Sector Rating YE2023



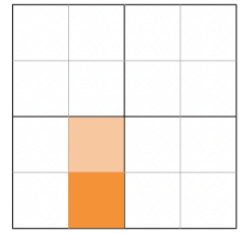
Water & Sewage ↓



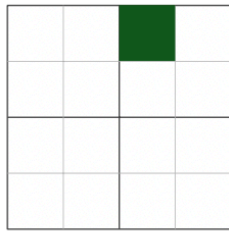
Water Treatm. ↑



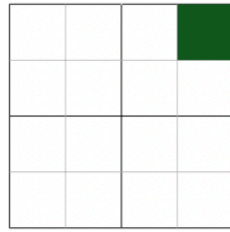
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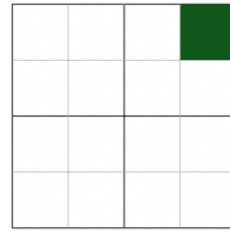
Conv. Power ↓



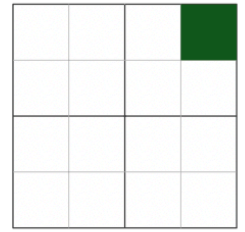
Wind Power →



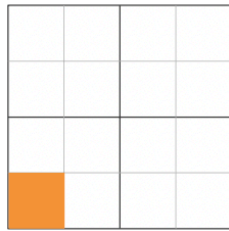
Solar Power ↑



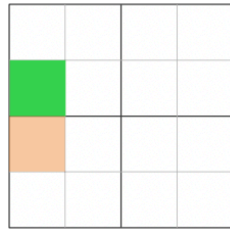
Hydro Power →



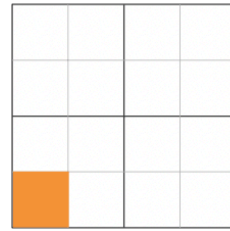
Bio & Geotherm. →



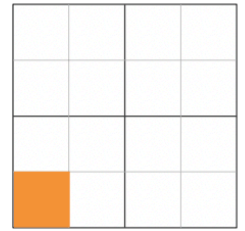
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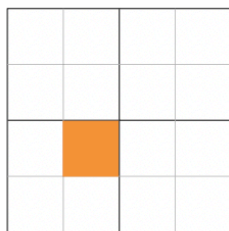
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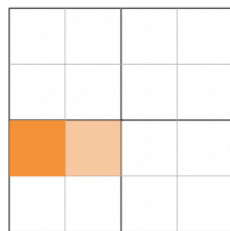
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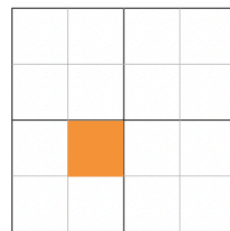
Urban Commuter ↓



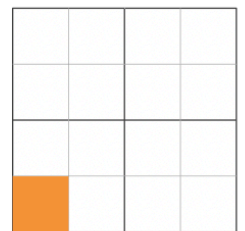
Roads →



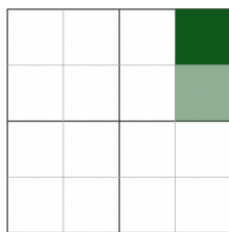
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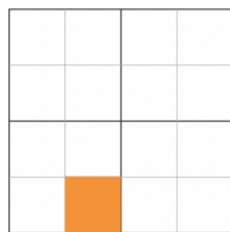
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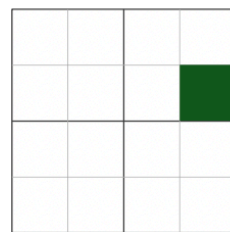
Nat. Resources ↓



Electricity ↑



Gas Distribution →



Social Infra ↓

4. Case Study: The UK Water and Sewage Sector

A Sector Becoming Increasingly Controversial

The water and sewage sector in the UK has gone through significant changes and evolution over the years: In 1989, the Water Act led to the privatisation of the water and sewage sector in England and Wales, shifting the priorities from infrastructure development and ensuring access to clean water to improving efficiency, private investments, and service quality. Privatisation marked a significant shift in the sector's ownership structure but did not change the monopolism, with only one water supply provider in most areas. The government's Water Services Regulation Authority (Ofwat) regulates the privatised sector to monitor service standards and pricing. Despite regulatory efforts, the water sector received constant customer complaints, and water bills increased significantly after the sector's privatisation, which led to public concerns about the private water companies' and investors' profit-driven motives.

Since its privatisation, the sector has seen significant investments in infrastructure and technology. This has contributed to some improvements in the early stages of privatisation regarding water quality, reducing leakage, and enhancing environmental sustainability. However, water company executives' high salaries and bonuses have been the subject of controversy. In 2020, analyses by *The Guardian* revealed that companies prioritised dividends and short-term financial gains over long-term investments in infrastructure. To finance these payouts, water companies increased their debts to £57 billion between 1991 and 2019 (Laville, 2020).

In comparison, the latest decrease in public support is of a much bigger scale. Water companies have been criticised for more than a decade for failing to meet leakage reduction targets, and ageing infrastructure was considered wasteful and environmentally damaging. With more storms and rainwater hitting the UK in 2022, pipes were overwhelmed and could not handle the increased amount of combined rain- and wastewater. The primarily combined sewage system in the UK, which carries rain- and wastewater, is still designed to overflow when capacities are exceeded. While this is allowed during heavy rainfall, sewage overflows nonetheless pose risks to human health and ecosystems. In 2022, the combined sewer overflows, where wastewater lands in rivers or the sea, happened more than 300,000 times, including on days without any rainfall. In other words, sewage went into the UK's water ecosystem an average of 825 times daily (Busby, 2023). Moreover, *BBC* investigations have found evidence for so-called "dry spills" when water companies illegally spill sewage on days without rain to dilute the sewage (BBC News, 2023).

Following the "biggest wave of public protests since privatisation 34 years ago" (Plimmer, 2023b), in April 2023, the regulator removed the fine cap of £250,000 to penalise water companies for dumping sewage. This has led to a steep increase in pollution fines for England's water sector. Just five years ago, the UK's Environment Agency (EA) filed only five prosecutions worth £2.2 million (Environment Agency, 2020). However, they imposed nine prosecutions with combined fines of £4.2 million in 2022 and four prosecutions at £8.6 million in the first half of 2023 alone. Additional enforcement

Table 1: Social Support (SSI) and Social Consensus (SCI) indices for UK's water sector compared to the average indices across all sectors in the UK, the global water sector, and three selected infrastructure sectors in the UK.

Social Acceptance		Q3/2023		Q2/2023		Q3/2022		Ave. 2023		Ave. 2022		Ave. 2018	
Support	Consensus	SSI	SCI	SSI	SCI	SSI	SCI	SSI	SCI	SSI	SCI	SSI	SCI
UK water sector		57.5	54.2	58.1	54.1	61.0	53.7	58.2	53.7	62.5	53.6	62.0	58.5
Global water sector		71.0	62.1	71.2	62.3	72.1	62.2	71.3	62.2	72.2	62.2	70.0	65.0
UK cross-sector		70.4	64.3	70.6	64.3	70.5	64.0	70.5	64.2	70.9	64.0	70.2	67.8
UK roads		71.9	63.0	72.2	63.1	71.9	63.9	72.0	63.3	71.8	63.7	71.4	68.7
UK urban commuters		63.6	52.0	63.9	52.4	65.1	53.1	63.7	52.3	65.9	53.7	59.3	49.5
UK renewable power		82.5	74.7	82.6	74.8	82.1	74.8	82.5	74.8	82.2	74.9	80.7	78.3

undertakings – “a voluntary agreement offered by those who have committed a less serious offence” – of £10.8 million between 2018 and 2023 have been accepted (Environment Agency, 2020, 2023). However, these fines are just the tip of the iceberg. According to the Department for Environment, Food and Rural Affairs (Defra), improving the UK's sewage infrastructure to avoid sewer spills (and future pollution fines) would require £56 billion – “the largest infrastructure investment in water company history” (Busby, 2023).

Water companies have apologised and pledged to invest £10 billion to reduce waste overflows. But environmental campaigners are not convinced, and customers worry that the investments will be passed on to their bills (Reuters, 2023). Furthermore, the UK's Office for Environmental Protection (OEP) suspects that the government and water regulator Ofwat may have broken and misinterpreted the law and allowed more untreated sewage discharges without risk of sanction (BBC News, 2023).

The latest developments have led to discussions about the renationalisation of the sector. Some political parties and interest groups (e.g., the campaign *We Own It*) have advocated for the reacquisition of water services by the government to eliminate the focus on profits and shareholder payouts. With the call for moving ownership

back to the government, the public hopes for more stable prices and increased transparency regarding the monopolies' spending and their financial structure (Plimmer, 2023a).

Sector-Level Analysis

It is clear from the above review that the private water sector does not have a good reputation in the UK and faces potentially costly social and political backlash as a result. But how bad is it compared to other countries or sectors?

Our social acceptance indices show the low support for the UK's water sector and, specifically, the steep decline in support over the past two years. Based on the latest developments, we expected the government to react and regulations to change, bringing material consequences for the water sector. Table 1 presents the development of the Social Support and the Social Consensus indices for the UK's water sector compared with other infrastructure sectors in the UK and the global water sector.

Low Social Acceptance with Growing Concerns for the Sector

Our social acceptance indices analyse the public's sentiment surrounding the latest developments and indicate social impact and risk factors for the UK's sewage sector and the policy direction. Based

on news articles and the social media discourse on X, the social acceptance indices represent low social support for the UK's sewage sector over the past 10 years (as of 30 September 2023).

Figure 2 shows the development of the **Social Support Index**, which is relatively stable until 2020 when the support first drops in the second half of 2019 and then increases slightly until Q1/2022. After that, the support for the UK's water and sewage sector collapsed to a new low in July 2023. Overall, the support for the water sector in the UK is significantly lower than the average Social Support Index for the sector in other countries (US, Canada, Australia, and New Zealand; see pink dotted line in Figure 2) as well as across infrastructure sectors in the UK (see Table 1).

Generally, the discourse around the water sector remains slightly polarised; the **Social Consensus Index** declines continuously, especially between 2019 and 2023, after which it improves slightly. This indicates that most issues around the UK water sector call for opposing discussions, for example, the discourse on public vs private ownership or the calls for environmental protection that require consequences for companies' price politics. However, the latest sewage scandal and its impact on the environment and human health led to a more aligned public discourse, with people agreeing on the low support.

A comparison between the sentiment emanating from news articles and social media posts confirms that the Social Consensus Index is significantly higher when analysing news coverage (where environmental issues are primarily discussed; see next section) than it is for the discourse on X, where a more polarising discussion on ownership leads to a lower level of consensus.

When dissatisfaction among the public accumulates (especially paired with a high level of

consensus), it can trigger various risk factors. While the direct impact of customers on the UK's water companies is minimal (the monopolistic structure leaves no room for free consumer choices), the public's outcry influences the government to act in the public's interest. As a consequence, regulatory actions by the government can create material risks that impact the entire sector.

In the case of the UK's sewage sector, it was probably the vanishing social support that persuaded the government to lift the pollution fine cap (that came into force on 1 April 2023). After the first pollution fines of 2023 had been processed (Environment Agency, 2023) and the summer months (when people spent more time at local water bodies) had passed, the social support stabilised slowly. However, higher pollution fees increase the pressure on water companies, who need to manage these additional costs as well as investments to improve their sewage system and avoid future pollution. Furthermore, the continuous low support could add further pressure on the government and guide future discussions on the renationalisation of the sector.

Accordingly, and in order to provide a full risk assessment, it is crucial to understand the social factors behind the low social support and polarising debates.

Negative Reputation in the News and on Social Media

To understand the development of the social acceptance indices, the **Social Attention Trend** represents to what extent journalists and social media users discuss various social factors (see p. 26 for details on social factors covered by our research). Both the discourse on X and the news coverage focused primarily on the sector's negative reputation. This topic includes various negative issues causing the sector's reputation to decrease, such as environmental pollution,

Figure 2: The Social Support Index (pink line) and the Social Consensus Index (blue line) for the UK water sector. The left axis represents the Social Support and the Social Consensus indices in comparison to the global water sector (dotted lines). The right axis provides the number of tweets and news articles for each month (grey area).

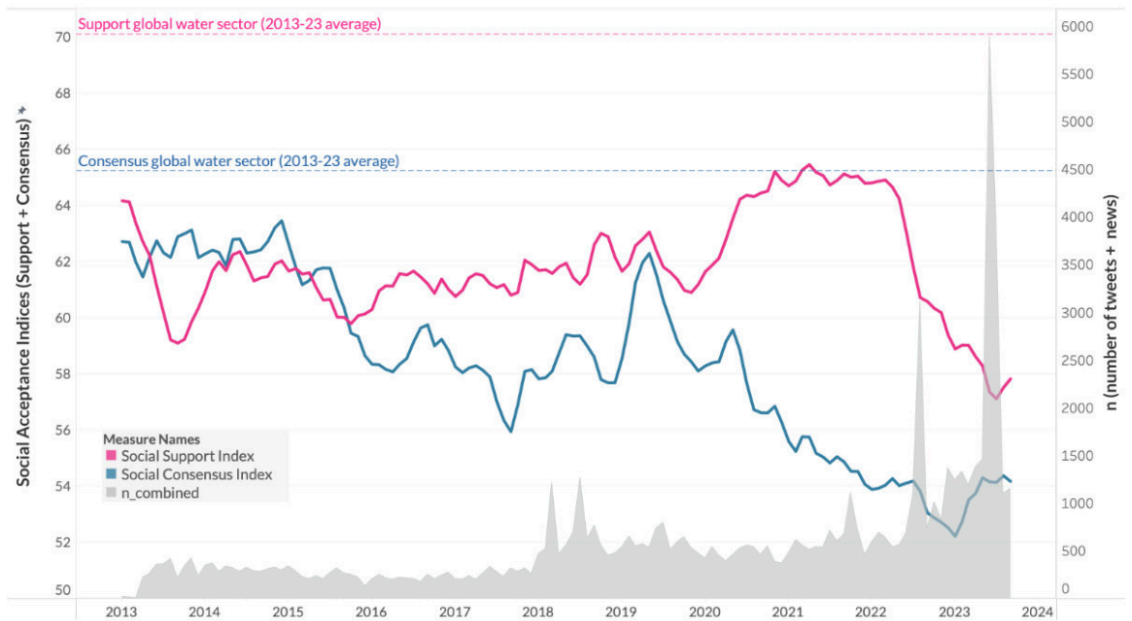


Figure 3: The Social Support Index for the UK water sector (pink line) and two of the most discussed topics on X: negative reputation (blue line) and ownership (grey line).

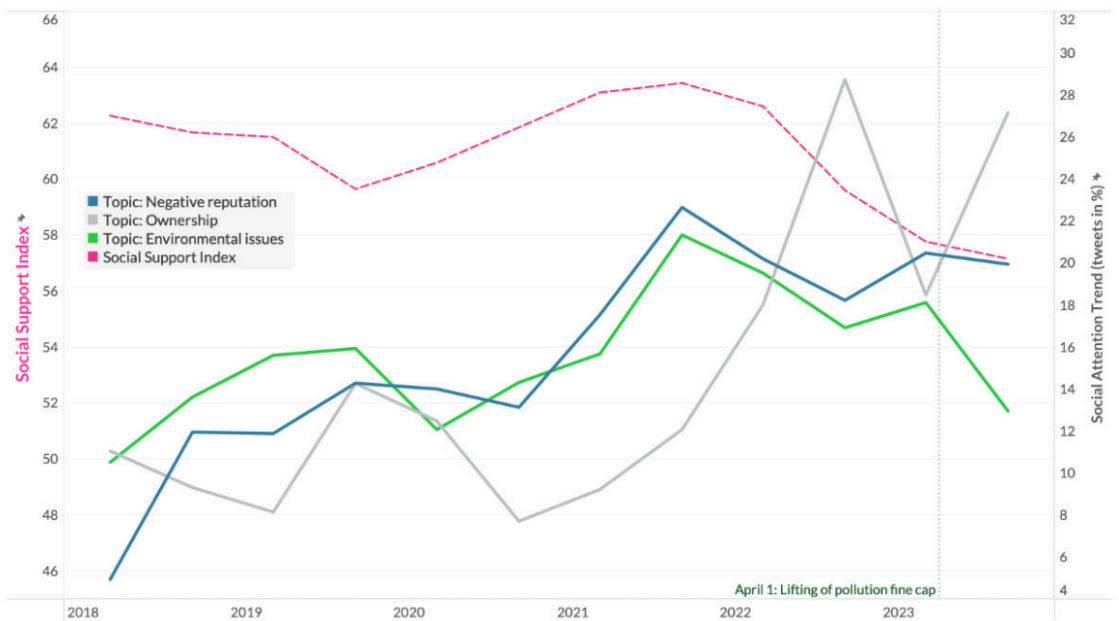
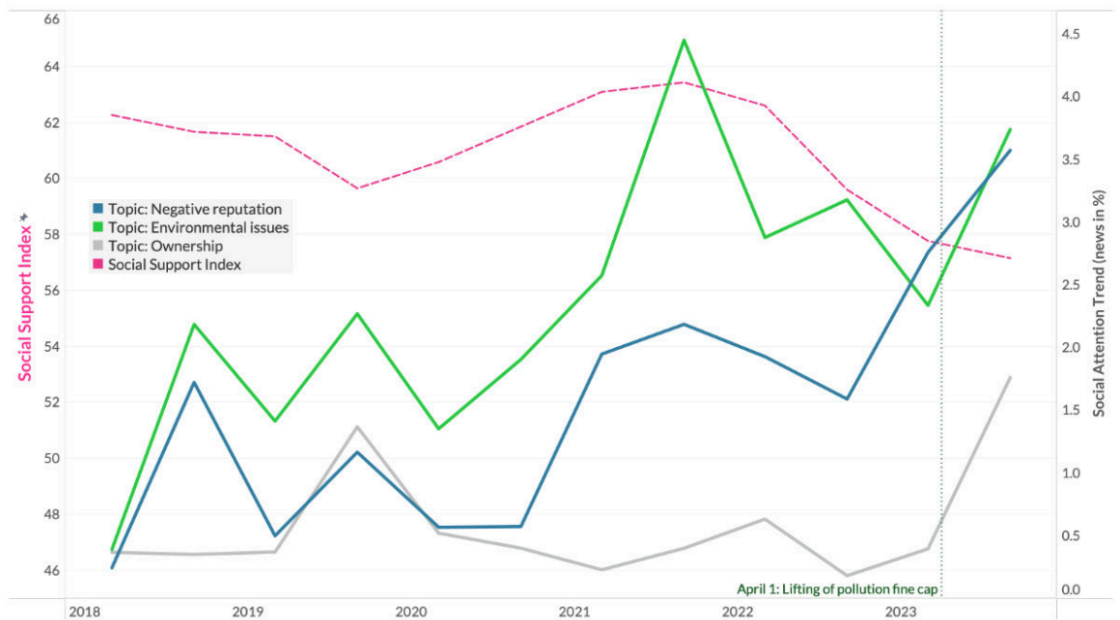


Figure 4: The Social Support Index for the UK water sector (pink line) and two of the most discussed topics in the news: negative reputation (blue line) and environmental issues (green line).



human health and biodiversity impacts, human rights, and workforce safety hazards. The significant increase in attention toward issues related to the sector's negative reputation explains the industry's long-lasting low social acceptance.

Social media users keep the discourse on ownership alive

On X, where the public can share opinions unfiltered and directly, users mainly discuss the sector's negative reputation together with the topic of ownership (see Figure 3). This is uncommon among infrastructure sectors where, usually, social factors related to customer service receive much greater attention across ESG-related discourses than the topic of ownership. The ongoing debate on the water sector's ownership since the end of 2020 emphasises the public's interest in the sector's potential renationalisation and in finding a solution to the ongoing challenges the water and sewage sector faces (water quality, sewage spills, infrastructure investments, debts, consumer prices etc.).

Journalists focus on the consequences of sewage spills on the environment

Much like social media users, journalists have increasingly covered the sector's negative reputation in news articles (see blue line in Figure 4). Such content has increased sixfold since 2020, when the Covid pandemic started. The simultaneous rising coverage of environmental issues indicates that the negative reputation of the sector is based on environmental concerns. In comparison with social media, where consumers discuss their own interests (e.g., in the form of public ownership that would move the sector's motivation from profits to consumers), the news represents the interests of the general public, which show a deep concern regarding the sector's impact on the environment. This is especially the case since the lifting of the pollution fine cap; while the news increasingly covers cases of environmental pollution (which get fined now), social media users' debate on ownership has increased once more, focussing on the consequences of those fees for consumers.

How Important are Sector Effects?

To confirm the sector-level analyses and gain further insights into the systematic component of social support, we used our social acceptance indices to explore the public's sentiment toward

specific companies **for which there is enough coverage in the news and on social media to measure public sentiment.**

Below, we compare *Thames Water*, which provides water to residents in London and surrounding areas in Western England, *Southern Water*, which serves the South of England, and *Dwr Cymru Water*, which covers most parts of Wales. While all three companies are private monopolies in their respective regions, they differ in some characteristics, the support they receive from the public (see Figure 5), and to what extent the sector-level support (systematic component) affects them.

Overall, the companies' acceptance levels mirror the trends observed in the Social Support Index and Social Attention Trend at the sector level, offering consistent results. Employing regression analyses, which involved natural logarithms, we delved into the connection between sector-level sentiment and the performance of individual water companies. The outcomes unveiled statistically significant relationships between the water sector's Social Support indices and those of the companies. However, the coefficients ranged from 0.26 to 1.24, indicating distinct variations in the corresponding changes in support for each company (see an overview of all regression results in Table 2).

Table 2: Effects of the UK water sector on the social acceptance for three water companies

Variables	Thames	Southern	Welsh
UK water sector	0.678** (0.037)	0.265* (0.095)	1.236** (0.059)
Constant	1.242** (0.154)	2.940** (0.394)	-0.867** (0.244)
Obs.	68	68	68
R ²	0.778	0.036	0.774

Note: Standard errors in parentheses.

**p<.001, *p<.01

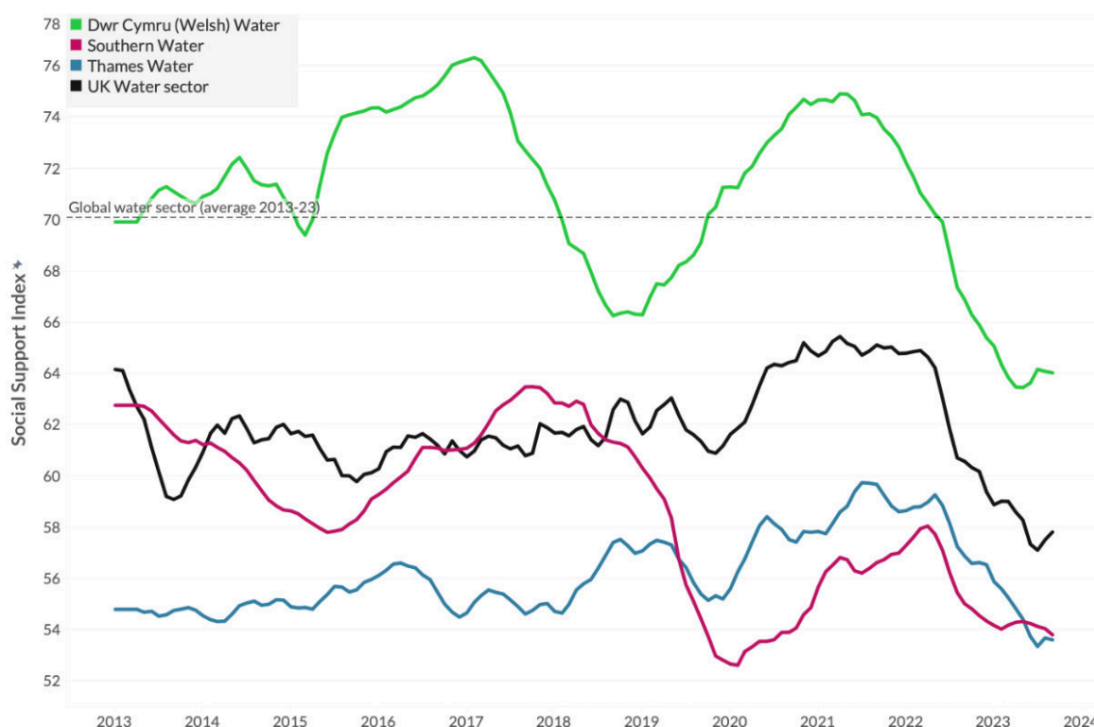
Until 2018, **Southern Water** represented the average UK water and sewage sector with a

similar level of social support. After that, the Social Support Index declined drastically to its lowest point in February 2020. This period of declining support was accompanied by a long investigation by Ofwat, after which Southern Water was fined a record of £90 million for unpermitted and premature spilling of wastewater (BBC News, 2021). After two years of recovery from this material financial impact, Southern Water was hit again by the same accusations that have resulted in an ongoing – although less extreme – decline in social support since April 2022. Currently, Southern Water and Thames Water are experiencing the lowest support among water companies in the UK. This low support is in line with the latest rating by the UK's Environment Agency: Southern Water and Thames Water received the lowest rating across England's water companies and "require improvements" (Environment Agency, 2023).

Furthermore, Southern Water exhibited the lowest coefficient of 0.26 (p=.007) across the water companies, suggesting a modest yet significant relationship between sector-level sentiment and its Social Support Index. This implies that changes in overall sentiment at the sector level contribute to a relatively mild impact on the support for Southern Water. In return, Southern Water could use its control over the relatively high idiosyncratic component and improve its social support independently of the sector.

By way of comparison, the Welsh not-for-profit company **Dwr Cymru Water** enjoys the most support among the UK's water companies, slightly above the average global water sector. The company's unique structure, its main difference from other water companies, could well explain the significant difference in social support. Without the involvement of shareholders, the managers and independent trustees make decisions in the public's interest, and all profits are either reinvested or returned to customers (Branston and Tomlinson, 2023).

Figure 5: The Social Support Index for the UK water sector (black line) in comparison to the support for Dwr Cymru (Welsh) Water (green line), Southern Water (red line), and Thames Water (blue line).



However, the company also experienced two sharp declines: as with Southern Water, social support dropped between early 2017 and late 2018. After an almost full recovery by mid-2021, the company now faces the same challenges as the overall water sector, with an all-time low of support in May 2023. Considering that Dwr Cymru Water spilt sewage for 7,500 hours in 2022 – almost the entire year (de Hoog, 2023) – such negative coverage and public outrage should be expected.

In contrast with Southern Water, Welsh Water demonstrated the highest coefficient of 1.24 ($p > .001$) across all water companies, highlighting a stronger and more pronounced relationship between sector-level sentiment and its Social Support index. The results suggest that variations in the overall sentiment within the water sector significantly influence the support for Welsh Water. Hence, it appears that the company has little control over the social sentiment and is reliant on the sector's support level.

Thames Water is the UK's largest water and sewage company, and serves about a quarter of the British population. Its Social Support Index for Thames Water has constantly been the lowest among UK water companies, seeing only a slight uptick between 2020 and 2021 before reaching its lowest point in more than 10 years in July 2023. Considering the years of concerns for the company's finances (Dearbail and Ben, 2023) and the first-class legal action the company is currently facing for failing to report sewage discharges (Laville, 2023), such low social support is not surprising. Additionally, Thames Water is burdened with debt and needs to refinance some by the end of 2024 as well as raise new equity by 2030 in order to continue its operations. The latest developments led the UK pension fund *Universities Superannuation Scheme* (USS) to write down two-thirds of its stake's value (Cumbo, 2024). In its current vulnerable state, Thames Water needs to be aware that – besides the direct material risks – this low social support can lead to further financial risks, for example, if the government decides to toughen up more regulations.

In regards to the regression analysis, Thames Water - with a coefficient of 0.68 ($p > .001$) - falls between Southern Water and Welsh Water in terms of the strength of the relationship between sector-level sentiment and its Social Support index. This suggests that while Thames Water is influenced by sector-level sentiment, the impact is less pronounced than for Welsh Water but more substantial than in the case of Southern Water.



5. Conclusions: The Importance of Sector-Level Social Risk

Companies and sectors are affected by the double materiality of their actions: their impacts on society and the environment return as material social risks and, hence, need to be included in ESG risk management practices. The water sector in the UK has demonstrated that actions such as environmental pollution, lack of transparency, and financial mismanagement can trigger the long-term consequences of low social support, harsher penalties, and changed regulations.

Our study highlights the importance of measuring (systemic) sector effects as these provide crucial information on material risk factors. Our analysis shows that about 70% of the assets' total social risk stems from the sector. These systemic risk factors - compared to idiosyncratic risk components - lie outside of investors' and asset managers' control. While the social support for a sector cannot be directly improved, knowing the sector effects can aid the management of social risks in two ways. Investors can use the systematic components to either estimate an asset's social support (as they would know how their assets differ from the average for the sector) or to compare sectors and markets to manage social risk at the portfolio level.

Furthermore, our analysis demonstrates the effectiveness of sectors' and markets' social acceptance indices and their practical use. By understanding how the UK's sewage sector is affected by public sentiment, companies could have anticipated the government's need to react. Had companies been aware of the negative perception and reputation around the sector's operations, they might have expected the risk of higher penalties and fees that the UK government

implemented in an attempt to salvage its own reputational risk - and future elections.

The social acceptance indices and the analysis of news articles and tweets show that the UK government's decision to impose unlimited fines on water companies who were found dumping sewage into rivers and the sea could be a response to the long-lasting low social support of the water and sewage sector and its increasing negative reputation. Public dissatisfaction pressured the government to take action and address the environmental and public health issues associated with sewage dumping, especially in the post-Covid period. The decision to lift the pollution fine cap and establish the Water Restoration Fund managed by the Department for Environment, Food, and Rural Affairs indicates the government's intention to hold water companies more accountable and to prioritise the restoration and better management of the environment. On the other hand, the UK's Environment Agency and regulator Ofwat have not reported past sewage spills accurately, and reliable information on illegal spills remains unknown. Consequently, ongoing weak support and further reactions from the government and regulators can be expected.

One such action could be the renationalisation of the sector - a discussion that is still ongoing. However, since the sector is highly indebted, public ownership would be challenging for the UK government. Accordingly - whether private or public - the sector might load future costs onto their customers, who will continue to share their dissatisfaction. While the UK's water consumers have no choice due to the monopolistic structure of the sector, their frustration

can have implications for future elections. The various consequences (implementation of fees, increased costs, etc.) show the interrelationship between social acceptance, financial materiality, and public policy.



A. Appendix

A.1 Conceptual Background

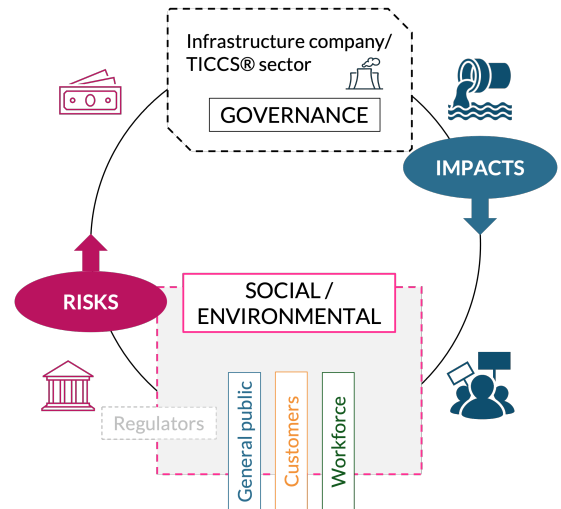
What is social acceptance?

Research around *social acceptance* is interdisciplinary and provides various definitions of the concept. Generally, social acceptance needs to be differentiated from *social acceptability*. Social acceptability describes a dynamic process influenced by individual attitudes, inter- and intrapersonal evaluations, and perceptions of involved stakeholders, circumstances, and the broader economic and political situation. By contrast, social acceptance is the positive result and outcome of the acceptability process at a specific point in time. Due to the continuous acceptability process and stakeholder interactions, social acceptance can change over time (Busse and Siebert, 2018).

Wüstenhagen et al. (2007) divide the concept into three types of acceptance to refer to different interest groups: the broad socio-political acceptance of policies and new technologies by the public; the local community acceptance that represents those directly affected by siting decisions around infrastructure assets; and consumers' and investors' market acceptance reflected in demand and investments made in new technologies and infrastructure assets. Often, the public's socio-political acceptance of an infrastructure asset can be high, while the community's acceptance of a specific project - or the market's willingness to invest in solutions - is low.

The process of social acceptability is needed to gain socio-political, community, and market acceptance to finally provide a project with a *social license to operate*. A social license provides

Figure 6: The concept of double materiality, illustrating social impacts and risks for companies.



infrastructure developers with an informal "social contract" and consent to develop, deliver, and operate a project (Vauban Infrastructure Partners, 2022). Without aligning stakeholders' interests, monitoring social acceptance, and maintaining a social license to operate, project costs and development time can increase significantly and lead to the cancellation of infrastructure projects (several examples of project delays, cancellations, and increased costs are discussed in Orminski and Shen (2023)).

What is double materiality?

Double materiality explains how companies exist in a dichotomous and circular relationship of impacting and being impacted (see Figure 6): Companies - as a result of their activities, processes, operations, and policies - can have a positive or negative impact on society and the environment. Simultaneously, these impact factors can become risks with material financial consequences (Manocha et al., 2023). Accordingly, the International Sustainability Standards Board (ISSB) added *impact materiality* to the

better-known concept of *single* or *financial materiality* (Brightest, 2023). While impact materiality explains whether a company has a salient effect on people or the environment, financial materiality focuses on how these impacts affect a company's financial performance. According to the European Sustainability Reporting Standards (ESRS), an impact is salient based on its severity (measured through the scope, scale, and likelihood). Those salient impacts can return as material risks either as direct (e.g., fines), indirect (e.g., negative reputation decreases revenues), or potential (e.g., future regulatory changes) financial risks.

Following the example of the sewage scandal in the UK, many water companies allowed heavy sewage overflows and, hence, caused the pollution of waterways and ecosystems, posing risks to the environment and public health. These actions impacted people who reacted with protests and - because their power as consumers of monopolies is limited - increased their pressure on the government. Following public pressure, the government acted and lifted the pollution fine cap. These regulations - present or unknown changes in the future - bear risks for companies that now face increased financial material risks from those regulations.

A.2 Methodology

What is the scope of the social acceptance indices?

Currently, we are covering **23 sector groups** in **five countries** (the US, UK, Canada, Australia, and New Zealand) over a period of **11 years**. The sector groups follow EDHEC*infra's* TICCS classification (EDHEC*infra*, 2022), and the ESG topics are in line with EDHEC*infra's* ESG Taxonomy (Manocha et al., 2022) and the ESG Dictionary (Orminski and Shen, 2023). We aim to cover more countries and more granular regions in the future.

Our research and product development focuses primarily on sector-level data. We analyse sector-level data to provide less biased and higher-quality information on the social impacts and risks that can be applied to individual assets. Based on our research - as presented in this report - the results of the social acceptance indices on the company level follow similar trends and developments as the indices on the sector level. In most cases - particularly in the infrastructure sector - negative reputation and governmental regulations primarily affect sectors rather than individual companies. Knowing the systematic component of social acceptance can support social risk management in two ways:

1. Using the systematic component as a starting point, companies can identify their idiosyncratic component of social acceptance and hence, take control of the latter. Furthermore, the systematic component can function as an early indicator for reputational and regulatory changes that affect individual companies directly.
2. Additionally, investment managers can use the systematic component as a benchmark to assess and manage social risks across portfolios.

Where is the data coming from?

We collect two types of data: 1) Local and international **news articles** provide a good impression of what the public cares about on a national and regional level, and 2) the **social media** discourse on X often represents people's unfiltered opinions. We filter both data sources for articles and tweets in English about various infrastructure sectors and specifically focus on those that discuss ESG-related topics. The sentiment in those articles and tweets represents the public's social acceptance.

How do you measure sentiment?

We are following the lexicographic approach to measuring the sentiment in each article and each tweet. That means that we are applying a dictionary that defines whether a word or heuristic is a) positive, neutral, or negative and b) how strong the polarity is (e.g., "The meal was amazing!" is more positive than "The meal was good."). For this task, we applied the VADER dictionary (Hutto and Gilbert, 2014), providing a normalised sentiment score between -1 and +1 for each tweet and article.

Because the VADER dictionary has been developed for social media data, we added an additional step to analyse the news data. Some news articles were analysed manually by a group of researchers to build a "Ground Truth" dataset. With that data, we were able to calculate the pointwise mutual information (PMI) for each word (Shapiro et al., 2022) and, hence, improved the accuracy of our analysis.

What social factors do you cover?

To identify the salient social impact and risk factors, we followed the ESG Taxonomy (Manocha et al., 2022) to develop EDHEC*infra's* ESG Dictionary (Orminski and Shen, 2023). Overall,

the ESG Dictionary is able to successfully detect 20 social impact and risk factors in social media texts and news reports related to the **public and communities** (e.g., human health, pollution, socio-economic factors), **customer service** (quality, availability, and affordability of services), the **workforce** (e.g., working conditions, payment, safety, labour rights), and **regulatory risks**. Additionally, we specifically filter for content related to the **negative reputation** of the sector, **transition risks**, and **carbon offsets**.

Are your results valid?

We tested the Social Support Index using other measures of public opinion. Especially in the US and the UK, representative panel surveys measure public opinion on various topics and on a regular basis. We used those results to compare the Social Support Index with public opinion surveys. While the Social Support Index can be on a generally higher or lower level than the survey results (for more details, see Orminski and Shen (2023)), both sources follow the same trend and, hence, represent a valid picture of social support.

How do I read the indices?

In combination, the three social acceptance indices present a good indicator of social risks and are able to

- monitor social support for individual sectors and regions;
- add information on how stable the social support is; and
- provide deeper insights and reasons for past trend developments.

EDHEC*infra*'s social risk style boxes (pp. 7) aim to provide an immediate impression of how accepted a specific sector is – in terms of the average support as well as how aligned this support is (level of consensus). Together with the Social Attention Trend, which provides reasons for

upwards or downwards trends and insights on (polarised) discussions, investors can understand the results of the style box and estimate whether the respective topics represent a valid social risk for the sector and their portfolios.

Can you make predictions?

Although our data shows the historical trend of the social acceptance indices and we can learn from past experiences, we cannot make valid predictions of future events and how those events affect financial performance exactly. However – based on our data – we know how the public reacts to specific topics. Those topics – social impact factors – indicate material social risks. Accordingly, we can make assumptions about the development of the social acceptance indices in different scenarios and use the results to identify material risk factors.

Do you have feedback or questions?

We would love to hear from you!

Send us an email to

jeanette.orminski@scientificinfra.com with the subject "EDHEC's Sentiment Report."

- Alcorn, G. (2014, October). East West Link: The case for and against Melbourne's \$6.8bn road. *The Guardian*.
- BBC News (2021, July). Southern Water fined record £90m for dumping raw sewage. *BBC News*.
- BBC News (2023, October). Why is sewage released into rivers and the sea? *BBC News*.
- Branston, J. R. and P. Tomlinson (2023, July). Renationalising Thames Water would be a gamble – but there is another way to help clean up the industry. *The Conversation*.
- Brightest (2023). What is double materiality in ESG and sustainability? – A definition, overview and explainer.
- Busby, M. (2023, July). Swimmers avoiding the water over fears of raw sewage on UK beaches. *The Guardian*.
- Busse, M. and R. Siebert (2018). Acceptance studies in the field of land use – A critical and systematic review to advance the conceptualization of acceptance and acceptability. *Land Use Policy* 76, 235–245.
- Cumbo, J. (2024, January). Pension fund slashes value of its Thames Water stake by almost two-thirds. *Financial Times*.
- de Hoog, N. (2023, September). 'Unacceptable': how raw sewage has affected rivers in England and Wales – in maps. *The Guardian*.
- Dearbail, J. and K. Ben (2023, June). Why is Thames Water in so much trouble? *BBC News*.
- DW (2023, February). Germany: Lützerath anti-coal activists brace for clearance. *DW*.
- EDHECinfra (2022, May). The Infrastructure Company Classification Standard (TICCS®) 2022 Edition – includes NACE, EU Taxonomy and CPRS Mappings.
- Environment Agency (2020, October). Water and sewerage companies in England: environmental performance report for 2019. Technical report, Environment Agency, England.
- Environment Agency (2023, July). Water and sewerage companies in England: environmental performance report 2022. Technical report, Environment Agency, England.
- Frankel, J. and A. Tabet (2023, September). A local struggle over carbon pipelines in Iowa is becoming a 2024 presidential flashpoint. *NBC News*.
- Hutto, C. and E. Gilbert (2014). VADER: A parsimonious rule-based model for sentiment analysis of social media text. *Proceedings of the International AAAI Conference on Web and Social Media* 8(1), 216–225.
- Jenkinson, O. (2023, December). Court orders dismantling of French wind farm over bird deaths. *Windpower Monthly*.

References

- Laville, S. (2020, July). England's privatised water firms paid £57bn in dividends since 1991. *The Guardian*.
- Laville, S. (2023, August). Public could receive hundreds of millions as water firms face sewage lawsuit. *The Guardian*.
- Manocha, N., D. Marcelo, and F. Blanc-Brude (2022, July). ESG Taxonomy of Impacts and Risks for Infrastructure Companies. Version 2.0. Technical report, EDHECinfra.
- Manocha, N., D. Marcelo, and F. Blanc-Brude (2023). The ESG risks & impacts of infrastructure companies classification standard. TICCS+ Version 2.0. *EDHECinfra Research Publication*.
- Orminski, J. and J. Shen (2023). Social impact and risk analysis using social media. Using Twitter data to measure sentiment about infrastructure sectors on the example of wind power generation. *EDHECinfra Research Publication*.
- Plimmer, G. (2023a, October). UK regulator warns on financial health of four water suppliers. *Financial Times*.
- Plimmer, G. (2023b, May). UK water industry pledges £10bn investment to stem sewage spills. *Financial Times*.
- Reuters (2023, May). Sick of sewage, Britons protest at water companies' pollution. *Reuters*.
- Segal, M. (2023, December). UK eliminates cap on penalties on polluting companies. *ESG Today*.
- Shapiro, A. H., M. Sudhof, and D. J. Wilson (2022). Measuring news sentiment. *Journal of Econometrics* 228, 221–243.
- The Kerryman (2018, March). Locals win Supreme Court battle against wind farm. *Independent.ie*.
- Vauban Infrastructure Partners (2022). Social license to invest, social license to operate. How to secure and leverage stakeholder engagement for infrastructure in 2022. Technical report.
- Wüstenhagen, R., M. Wolsink, and M. J. Burer (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy* 35, 2683–2691.

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