REGIONE TOSCANA

Consiglio Regionale

Premio tesi di Laurea
“David Sassoli”
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Presentazione

La scelta del Consiglio Regionale della Toscana di dedicare un premio di laurea a David Sassoli è un piccolo modo per tenere viva la memoria di tutto ciò che ha rappresentato nella sua vita.

Il Premio Sassoli non è soltanto un tributo all'eccellenza accademica, ma anche un omaggio all'immenso impegno di un uomo che ha dedicato la sua vita all'ideale dell'integrazione europea.

David è stato un politico appassionato, leader leale, rigoroso, ha saputo nutrire con la sua cultura un'iniziativa politica al servizio delle persone e delle Istituzioni. Un uomo del dialogo, sempre alla ricerca del bene comune, ma fermo nel difendere i valori della solidarietà e della libertà. Sassoli ha saputo avvicinare l'Europa alle cittadine e ai cittadini e questo senza dubbio rappresenta una delle sue più importanti eredità.

Oggi l'Unione Europea, grazie anche al suo contributo, rappresenta una dimensione essenziale, irrinunciabile per la nostra democrazia e per la libertà di ogni cittadino europeo. Senza le istituzioni europee i singoli Stati sarebbero impotenti di fronte alle sfide globali del nostro tempo: dai mutamenti climatici ai fenomeni migratori, dalle dinamiche demografiche a quelle geopolitiche condotte da attori di dimensione continentale fino ai poteri economici e finanziari che travalicano i confini e condizionano i mercati.

La nostra Europa non è perfetta, ma è la migliore garanzia per tutti i nostri cittadini.

Pubblicando le tesi vincitrici del premio, vogliamo tenere insieme il ricordo di David offrendo anche una prospettiva futura che solo i più giovani, coi loro occhi e il loro studio possono offrire per aspirare all'Europa della speranza tanto cara al Presidente Sassoli.

Spero, dunque, che questa collana possa ispirare ulteriori ricerche e riflessioni su questi temi cruciali, contribuendo a costruire un'Europa più inclusiva, solidale e democratica, proprio nel solco tracciato da David Sassoli.

Dobbiamo guardare all'Europa come luogo delle opportunità, come sogno per realizzare il proprio futuro, come orizzonte per le nuove generazioni.

L'Europa unita è l'eredità che Altiero Spinelli ci ha lasciato col suo "Sogno Europeo" nato sull'isola di Ventotene. Un sogno e un patrimonio di libertà di cui oggi noi dobbiamo essere non solo testimoni ma, soprattutto, custodi.

Antonio Mazzeo
Presidente del Consiglio regionale della Toscana

Prefazione

È con grande soddisfazione che salutiamo la pubblicazione di questa tesi che ha conquistato uno dei riconoscimenti assegnati nell'ambito del premio di laurea intitolato a David Sassoli.

Si tratta di un'iniziativa che abbiamo fortemente voluto come Commissione Politiche Europee e Relazioni Internazionali del Consiglio Regionale della Toscana, trovando pieno e fondamentale sostegno da parte dell'Ufficio di Presidenza della nostra Assemblea a partire dal Presidente Antonio Mazzeo.

Valorizzare le idee e le proposte delle giovani generazioni ci è sembrato il modo più bello ed emozionante per ricordare ed onorare David Sassoli.

Un'esperienza che nel giorno della consegna dei riconoscimenti tiene insieme emozioni contrastanti, quali il dolore per una scomparsa tanto rilevante e al tempo stesso la gioia nel vedere evidenziato il lavoro delle ragazze e dei ragazzi, guardando soprattutto alle prospettive di un'Europa che deve essere rafforzata e costruita partendo proprio dalle idee delle giovani generazioni. Ed a questo David Sassoli teneva moltissimo.

E noi teniamo tantissimo anche al supporto che abbiamo ricevuto dal mondo delle Università toscane e vogliamo ringraziare le docenti ed i docenti che hanno accettato di far parte della commissione che ha scelto le tesi da premiare, perché, con la loro competenza e passione, hanno dato un valore aggiunto a questa nostra iniziativa: una commissione presieduta da Jacopo Cellini dell'Istituto Universitario Europeo e composta da Benedetta Baldi dell'Università degli Studi di Firenze, Edoardo Bressanelli della Scuola superiore Sant'Anna di Pisa, Massimiliano Montini dell'Università degli studi di Siena, Manuela Moschella della Scuola Normale Superiore di Pisa, Luca Paladini, dell'Università per Stranieri di Siena, Saulle Panizza, dell'Università di Pisa.

E la pubblicazione che state per sfogliare rappresenta anche un altro obbiettivo che abbiamo fortemente voluto e che porterà alla creazione di un'apposita collana all'interno delle pubblicazioni del Consiglio Regionale della Toscana. Queste tesi resteranno dunque segno tangibile di un impegno che guarda all'Europa ed anche di un'iniziativa che è stata inserita, per volontà unanime, tra le attività istituzionali del Consiglio Regionale della Toscana e che dunque affidiamo anche alle colleghe ed ai colleghi che arriveranno dopo di noi.

Ma tutto questo non si sarebbe potuto realizzare senza lo straordinario impegno e lavoro dei componenti della "Commissione Europa" che ho avuto l'onore di guidare. Una Commissione di cui, in questa XI Legislatura, hanno fatto parte Giovanni Galli (vicepresidente, Lega), Anna Paris (vicepresidente segretaria, PD), Irene Galletti (M5S), Valentina Mercanti (PD), Fausto Merlotti (PD), Massimiliano Pescini (PD), Marco Stella (FI), Andrea Vannucci (PD) e Gabriele Veneri (FdI).

È tutto loro il merito dei risultati raggiunti, di chi c'era all'inizio e soprattutto di chi continua a fare parte di questa Commissione con una passione ed una competenza davvero uniche. È a loro che va tutta la mia riconoscenza che estendo a tutti gli uffici ed al personale che ci hanno accompagnato in questo percorso.

Mi sia concesso di ringraziare il mio gruppo, il PD, per un supporto che è stato totale e costante ed anche il gruppo di Italia Viva che, seppur non rappresentato in Commissione, non ha mai fatto mancare stimoli e sostegno. Ma è a tutti i gruppi, di maggioranza e di opposizione, che va la mia più profonda gratitudine per un lavoro che, grazie alle commissarie ed ai commissari, stiamo portando avanti insieme, costruendo una modalità di dialogo e di confronto che è un elemento di vanto ed orgoglio.

Un lavoro, quello della Commissione, che proseguirà con iniziative e progetti legati alle Giornate dell'Europa a cui si aggiunge una volontà di approfondimento dei vari temi, contando anche sulla disponibilità della Giunta guidata dal Presidente Eugenio Giani con le assessore e gli assessori che ne fanno parte.

In conclusione mi sia permesso di rivolgere un affettuoso pensiero ai familiari di David Sassoli che, in questi anni, hanno sempre dimostrato grandissima attenzione a questa nostra iniziativa: a loro va un abbraccio fortissimo, unito all'impegno che vale per l'oggi e per il domani e che è quello di tenere sempre vivo il ricordo di un uomo come David che ci ha fatto sentire orgogliosi di essere toscani, italiani ed europei.

Francesco Gazzetti
Presidente Commissione Politiche Europee
e Relazioni Internazionali del Consiglio Regionale della Toscana

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The green transition and wealth redistribution: An exploratory analysis of Twitter responses to the EU Green Deal and its redistributive mechanisms

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Abstract

Transitioning from a fossil-fuel-dependent reality to a climate-neutral system requires an immense structural shift, reframing jobs, incomes, bills, and education. The European Union's (EU) Green Deal offers several different strategies. These include the Just Transition Mechanism, consisting of funds, investment, and loans to support those most affected by the 'green transition' away from greenhouse gas emissions; the Just Transition Fund (JTF) targeting regions, particularly employment and income; and the Social Climate Fund (SCF) supporting households whose living costs become unmanageable due to the new road transport and buildings emissions trading system (EU ETS2).

These mechanisms' success depends partly on public acceptance of wealth redistribution in the name of climate change mitigation policies, and on their perceptions of different actors' levels of responsibility. In order to explore these dynamics, this research uses English-language tweets from January 2020 to May 2022 to analyse responses to the EU Green Deal and its redistributive mechanisms. The analysis is both quantitative and qualitative, and the mechanisms are further analysed through in-depth coding of the relevant tweets.

The results of this analysis show an emphasis on information about and advocacy for the policies, which are predominantly spoken about in terms of overall gain or system change. European institutional actors and programmes dominate across the actors, topics, and keywords. There is a concern with equity and situating the Green Deal in climate change action. However, these are broadly defined and loosely expressed in the tweets, lacking significant attention to specific communities, climate change phenomena, or responsibilities. The ETS and JTM face mixed responses, while the SCF is more decidedly positively viewed. Active responses to climate change are referenced or invoked across the tweets. A minority of tweets express a significant potential system change, offering research and policy avenues that challenge even the EU Green Deal's framework.

This research is novel contribution to the fields of European governance, civil society action, and climate mitigation policy. It is among the first to study public responses to a wide-reaching economic and climate change programme, as distinct from solely emissions policies.

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I. Introduction

1. Overview: What will the reader find in this dissertation?

Since December 2019 the EU has been debating and legislating the European Green Deal, addressing ecosystem services (air, water, soil, biodiversity), energy efficiency in buildings, food and agriculture, transport, clean technology, waste reduction, jobs and skills for the green transition, and competitive and resilient industries (European Commission, 2022). Of particular interest for the present research is one of the three main aims highlighted by the European Commission: "no person and no place left behind". The two other aims ("no net emissions of greenhouse gases by 2050" and "economic growth decoupled from resource use") highlight the locus of the EU's climate policy: emissions, resources, and economic growth. While critiques of this focus will be touched upon later, the governance of these three elements, involving the phasing out of economic activities, the creation of new ones, and the consequent transformations of communities and households, is intricately tied to wealth redistribution, which is the focus of this thesis.

The EU's current redistributive approach to the green transition manifests in:

1. The Just Transition Mechanism (JTM), which includes the Just Transition Fund (JTF), to support regions that depend on environmentally-intensive industries.
2. The Social Climate Fund (SCF) in which, as part of the 'Fit for 55' package, 25% of revenue from the new road transport and buildings Emissions Trading Systems (ETS) should go to households and small businesses affected by higher transport and heating costs.

Using tweets from 2020, 2021, and up to 5 May 2022, this research sets out to understand the social acceptance of the Green Deal's redistributive approach, with particular emphasis on learning the methodologies of collecting and analysing social media data, in this case from Twitter.

The dissertation first builds a firm foundation in the narrative and policy background. This starts with tracing how oil firms and the US government shaped a climate change narrative around absolving institutional structures of responsibility. From here the research details the evolution of European policy

responses to emissions regulation and climate change, laying the foundations for studying the EU Green Deal. This is followed by a comprehensive explanation of the EU Green Deal, specifically the JTM and SCF.

The literature section provides an extensive review of fairness perceptions and public policy, specifically for climate change mitigation. It also draws on studies that have used similar social media data and domains.

The theoretical framework critically examines the chosen data and methodology, unpacking the motives, mechanisms, and limitations of using social media for public policy analysis.

In the methodology Section the studies referenced in the literature review are expanded upon, this time with a focus on their methodologies as precedents and guides for developing the present data collection, pre-processing, tools, and analyses. The rest of the section thoroughly explains the methodological choices and the iterative research design process undertaken for the present research.

The results and discussion section is divided into two parts: the EU Green Deal, and responses to the JTM and SCF, as they entail different datasets and analytical tools. Lastly, the conclusions present the key findings and explore further possible work.

While the research questions for this dissertation (Section I.3) are by necessity focused, tangible, and immediate, my underlying interest in this topic goes beyond the short-, or even medium-term success of a given policy. Working through the lens of education – in the broadest, most long-term sense of the word – my motivation is in understanding how public perceptions of redistributive climate policy reflect a society's long-term sustainability: attitudes towards and knowledge of justice, responsibility, and the civic capacities and skills needed to effect necessary change. As such, this dissertation looks towards studies such as Loureiro and Alló (2021), who cross-tabulated Twitter data with socioeconomic and cultural variables. The long-term aim of the present research is to advance the results to learn new methodologies that would allow the researcher to apply further layers of analyses and meaning beyond the dissertation.

It is important to note that as it stands, the present research is a key, novel contribution to the fields of European governance, citizen and civil society action, and international climate mitigation policy. The research for this dissertation revealed that, to the best of the author's knowledge, as yet no one has studied public responses to an overarching economic and climate change programme, like the JTM, not tied to a specific carbon emissions policy. The present research will be among the first to study responses to a programme on such a scale.

2. History and policy salience

The EU's JTM and SCF, and the Green Deal overall, catch our attention because they are systemic. This does not mean that the approach is without flaws, or that the system itself is not founded upon economic growth principles that some see as antithetical to climate mitigation (Ossewaarde and Ossewaarde-Lowtoo, 2020). Nonetheless, by expanding the taxation of polluting industries, and integrating investment, national policies, and public budgets *specifically* for supporting regions and households through the socioeconomic fallout of the green transition, the programme takes a step away from narratives of individual blame that easily characterise perceptions of inequality.

The European Commission's proposal for the SCF states that, at least in theory, the system must take responsibility for those who will be economically marginalised, and those who have historically been most affected by climate change, i.e., the most vulnerable parts of society (European Commission, 2021c) affected by drought, floods, storms, and the financial costs of dealing with a changing climate (EEA, 2020). With collective responsibility, individual support, and a policy centrality that sidelines climate science scepticism, it is an open challenge to a climate change narrative that has dominated for decades and continues to receive extensive private and public support, as will be shown below.

2.1 The narrative to change

The present research is in part a response to a narrative of climate change responsibility that would impede efforts to effect structural or civic changes for

climate change mitigation. As will be shown below, narratives shape and are shaped by policymaking, prevalent ideas, and interest or pressure groups. They are not static, but offer insight into how actors and issues are woven together by influential interests. This section sets the foundation of this narrative, drawing on podcasts, newspaper articles, interest group research, and official speeches and documents.

In August 2020, in the middle of a year criss-crossed by narratives around health, responsibility, facts, truth, and collective and individual actions, a BBC Radio 4 podcast series titled *How they made us doubt everything* (Keane, 2020) unpacked how the fossil fuel industry drew on big tobacco's blueprint for seeding doubt on the relationship between smoking and cancer to foster uncertainty around climate change (Keane, 2020; Franta, 2021; Union of Concerned Scientists, 2007). It was, one might argue, one of the first instances of wide-reaching climate diplomacy, executed not by nations or transnational organisations as would be the case later, but by multinational companies and their political allies.

It was noteworthy that this podcast was being created and broadcast in 2020, five years after the findings about the fossil fuel industry's campaign had first been publicly written about. Furthermore, the fact that the revelations came decades after the industry's initial plans and work implied that perhaps society is experiencing a delay in 'catching up' with a broader understanding of how our attitudes and actions have been shaped.

Indeed, the existence of 'soft climate scepticism' and national educational curricula that continually and almost universally emphasise climate *information* at the expense of *action* (UNESCO, 2021) seem to suggest that our sense of redistribution and climate justice continues to partially ignore the social engineering that played a significant role in at least two generations' outlooks on climate change. If the EU's JTM and SCF are a success among publics, one might argue that they succeeded in challenging on a mass level one of the largest and most persistently detrimental climate change narratives.

The strategy involved three main tactics (Union, 2007; Keane, 2020):

- Hiring climate scientists to work internally on the oil companies' research and dissemination (in which the information from the research and the information disseminated did not always align)
- Framing climate change in terms of uncertainty and inconclusiveness rather than outright denial
- Placing the burden of responsibility on consumers.

While the first two tactics are more obviously relevant for research into climate denial, they have particular implications for the present research as, as will be shown later in Section III, publics typically display low trust in the government and in companies to fulfil promises and act responsibly in climate change mitigation policy. The third tactic is central to the present study, given the EU JTM and SCF's focus on collective change and individual or household redistribution or gain, rather than blame.

From the late 1960s onwards, the American Petroleum Institute (API), and later Exxon (now ExxonMobil) developed a growing awareness of climate change trends, including the *possible* human and environmental impacts if the then-current fossil fuel trends were to continue. This information was provided by research conducted by Ivy League scientists commissioned specifically by Exxon and by the covert industry task force created by API (Franta, 2021). In parallel with other oil companies researching the relationship between CO2 and climate change (Banerjee, 2015), the API task force aimed to understand the science, its implications, and how emissions could be *reduced*. In the minutes from a February 1980 meeting it was suggested that the task force's overall goals ought to include developing rules for using fossil fuels, *remedying their carbon dioxide production,* and potentially determining how a *new energy source* could be introduced for global use (Banerjee, 2015).

The Exxon and API findings included the potential impacts on temperature changes, economic growth, regional dependence, global disasters and environmental damage, rising sea levels, arctic melting, decreasing habitability, desertification, and drought. In 1968 scientists warned API of almost certain significant temperature and consequent climatic changes, with no doubt about the

potential severity of the environmental damage. In 1979 Exxon's scientists warned that these "severe climatic effects" would likely occur by the mid-21st Century unless a significant reduction in fossil fuel extraction and use was made (Franta, 2021). Similar conclusions were made by the World Climate Conference that same year. In the early 1980s, the scientists involved succeeded in convincing the oil companies that publishing their findings in scientific journals would be ethical, and profitable, for the companies, lending them legitimacy and credibility (Banerjee et al., 2015).

On 14 June 2022 the Guardian revealed that President Jimmy Carter read memos from his scientific advisors explicitly warning of atmospheric CO2 concentration, temperature rises, extreme weather effects, the population-agriculture crisis, and the near-impossibility of the natural dissipation of CO2 from the atmosphere. This branch of research in the White House had been building since the 1960s (Pattee, 2022).

However, the memo never made it to President Carter's public speeches, as the information was deemed too uncertain. Likewise, the API task force's information was sparingly shared with shareholders and in filings with securities regulators (Banerjee et al., 2015). The paper circulated among the API industry task force members in 1979 claimed that although fossil fuels will cause global warming, natural variability would mask its effects until around 2000. The public report published by API, titled *Two energy futures: A national choice for the 80s*, and the World Coal Study (supported and supervised by fossil fuel companies), both published in 1980, assured the public that expanding fossil fuel usage would be safe for decades, and that tripling coal production was necessary and feasible at a low cost and without significant human or environmental detriment. The World Coal Study, and many of the scientific and task force meeting minutes during these two decades, often referred to 'uncertainty': the absence of conclusive evidence to firmly suggest that drastic changes to national and international fossil fuel policy be effected in the near future, and the need (as in good scientific practice) for more thorough research from which to draw reliable conclusions.

By the early 1990s API and Exxon had transitioned from "a fact-finding mission," involving high-quality research and a public campaign built around this, to a

political mission centred around sowing doubt (Banerjee, 2015; Union of Concerned Scientists, 2007). This came to involve extensive funding for political groups, think tanks, and lobbyists that opposed climate policy, specifically emissions and global warming (Union of Concerned Scientists, 2007) largely on the grounds that the science was making predictions far into the future based on worst-case scenarios, or simply by emphasising ambiguity around regional variability of climate effects and the Earth's carbon absorption mechanisms (Hasemyer and Cushman, 2015; Banerjee et al., 2015). Despite the industry publicly voicing concern for the effects of fossil fuels, the vast financing of climate science denial has continued (Union of Concerned Scientists, 2020).

Throughout the early and mid-2000s, the global narrative around climate change shifted, largely executed by the fossil fuel industry itself, towards a discourse of individual responsibility. This involved disproportionately framing global warming as uncertain and a 'risk' rather than reality; positioning fossil fuel companies as passive suppliers serving consumer demand for energy; emphasising the tangible benefits of fossil fuels, the inadequacy of low-carbon energy sources, and the ambiguity of fossil fuel impacts; and finally, blaming individual consumers for their demand for fossil fuels, and by extension for global warming (Supran and Oresker, 2021).

Although in Europe the trend was not so explicit, the focus in the 1980s was nonetheless relatively market-oriented, emphasising the liberalisation of European energy markets to ensure a secure energy supply (Hafner and Raimondi, 2020). However, while Exxon and API moved towards their political campaign, in the early 2000s the EU began laying the legal groundwork for common energy policies. Did this turning point signal a point of departure from the American/global narrative, away from the corporate and short-term towards the social and long-term? Reflecting on *Our Common Future* thirty years after its publication, Meadowcroft et al. (2015) put "structural and systemic issues" front and centre, arguing that sustainable development depends on "transitions and transformations from the personal (or inner) level to the broader systems-level" (p.5); for the EU's JTM and SCF to work, the public – institutions and individuals – need to agree.

3. Research questions

The above contextual evolution on individual and institutional responsibility offers two important elements for the present research. Firstly, the emphasis on individual behaviour is perpetuated in much formal education (national curricula, education plans) around the world, where social and civic skills and approaches to climate change (the ability to critique a system, to enact political change, to take intra- and inter-generational responsibility) are notable by their absence, although there is evidence to suggest that some young people are compensating for the gaps in their formal learning through their own social networks (UNESCO, 2021). Secondly, the fossil fuel industry and its proponents often defend their stances on the grounds of safeguarding the common family's income and jobs (Zibel, 2021; Western Energy Alliance, n.d.).

The redistributive climate policies currently being enacted in the EU challenge both of these dynamics: by propagating a collective perspective on wealth and decarbonisation, by situating climate action in the civic (not only individual) domain, and by challenging the notion that people must necessarily be 'left behind' by the climate transition.

The research questions driving this thesis are:

1. How do publics respond to:
    a. Wealth redistribution for climate change adaptation through the EU Green Deal's JTM, drawn from the EU Budget, public and private investment, and member state co-financing?
    b. Wealth redistribution for climate change adaptation through the EU Green Deal's SCF, drawn from the new EU Emissions Trading System for buildings and transport?
2. What patterns and correlations emerge that could explain these responses?

There is a wealth of possible comparisons and analyses that could accompany this research, such as comparisons with perceptions of wealth distribution in other contexts, correlations with socioeconomic or cultural factors, or attitudes analysed by actor rather than topic. However, given the multidimensional cognitive and

practical realities that characterise attitudes and actions around climate change, these currently lie beyond the scope of the present study, which focuses on identifying public responses to a given redistributive environmental policy.

This research comes with a strong awareness of the limitations of social media, most notably limited user bases and the manipulation of information by algorithms (White and Boatwright, 2020). Two factors make this research nonetheless a worthwhile endeavour. The first is the presence of political debates on Twitter, particularly amongst legislators who will ultimately act on the EU's Green Deal. The second is using Twitter data not as an assumed perfect representation of what users *think*, but rather of what they are exposed to and engaging with. A retweeted or commented-on tweet still reflects a public piece of information and engagement, whether the original tweet was created by a bot or by a person (Cody et al., 2015; Camarillo et al., 2021). The methodological challenges and responses will be discussed in more detail in Section V on methodology.

1960s-90s evolution of the fossil fuel industry's climate change narrative

- **1968:** Stanford scientists commissioned by API inform them that significant temperature changes are almost certain by 2000, bringing climatic changes; no doubt that environmental damage could be severe; recommend bringing CO2 emissions under control (Robinson and Robbins, 1968).
- **1977:** President Jimmy Carter reads a memo regarding CO2 and climate change.
- **1979**: API creates a secret industry-wide task force to monitor developments in climate science.
- **1979 (February)**: Laurmann (Stanford engineer) briefs the API industry group on the likely impacts of fossil fuel trends: temperature rises and their effects. Requires prompt action, as developing non-fossil fuel energy would likely take decades (Nelson, 1980).
- **1979 (February):** World Climate Conference: Effects of CO2 may be detectable on a regional and global scale by 2000, but information not conclusive. Urgent need to foresee and prevent potential manmade changes in climate that could have adverse effects on humanity's wellbeing.
- **1979 (September):** API circulates a background paper on climate change among the industry task force: Atmospheric carbon dioxide is rising and continued fossil fuel trends would cause some global warming. However, this would initially be masked by natural variability and would become noticeable around 2000 (Campion, 1979).
- **1979 (October):** Exxon internal scientific assessment of global warming, known to the industry task force: Predicts several climatic effects by mid-21st century, unless severe reduction in fossil fuel use (Knisely and Ferrall, 1979).
- **1980 (January):** World Coal Study (WOCOL): Effects of CO2 may be detectable on a regional and global scale by 2000, but information not conclusive enough to delay expanding coal use (highlights that this is consistent with World Climate Conference). Calls for tripling coal production and use by 2000.

- **1980 (August):** Two Energy Futures published by API: Possible impacts of carbon dioxide, but also doubt (wrongly citing Carl Sagan as 'sanguine' about the buildup of carbon dioxide from fossil fuels). Used WOCOL to claim that fossil fuel expansion would cause no significant damage to the environment for several decades and was consistent with the World Climate Conference.
- **1980 (October):** American Association for the Advancement of Science (AAAS) report describes risks to life on Earth that could only be avoided with prompt action.
- **1980:** WOCOL author Wilson lobbies US President Carter to triple (then reduced to double) coal production in G7 countries by 1990; approved and adopted by G7 that year.
- **1989:** George C. Marshall Institute (conservative American science and public policy think tank, with extensive fossil fuel industry funding) begins environmental skeptic and climate change denial publications.
- **1989:** Global Climate Coalition founded: Came to be one of the largest and most significant industry groups advocating in the domain of climate policy and international negotiations. Businesses lobbying against policy to mitigate greenhouse gas emissions and questioning climate change science.
- **1998:** API launches political campaign to convince Americans not to ratify the Kyoto Protocol and not launch further initiatives to prevent climate change.

Figure 1: A timeline of fossil fuel industry-led climate change knowledge, dissemination, and narratives from the 1960s to the 1990s. Adapted from Franta (2021).

II. Policy background

1. Evolution: What is the EU building on?

From the late 1980s to the early 2000s the EU (the European Community at the time) liberalised its energy markets, consequently centring its policy largely on securing energy supply (Hafner and Raimondo, 2020; Tagliapietra, 2017), fuelling the neoliberal drive towards the new millennium. However, this liberalisation was flanked by summits, papers, and politics bringing the risks of climate change to the public sphere, such as the Brundtland Report in 1987, the Rio de Janeiro Earth Summit in 1992, and the Kyoto Protocol in 1997.

The 2006 *Green Paper: A European strategy for sustainable, competitive and secure energy* (European Commission, 2006) emerged from the triangulation at the time between sustainable development (from the Kyoto Protocol), competitiveness (from the Lisbon Agenda) and secure energy supply (from the EU's international trajectory and objectives), and to a large extent this framework still holds (Tagliapietra, 2017). The Green Paper formed the basis for a common European energy policy in 2007, as well as the so-called 20-20-20 targets for greenhouse gas emissions reduction, increase in renewables, and increase in energy efficiency. These years marked a shift from solely securing energy supply to wanting to ensure that the supply is sustainable and that actors in the energy industry are competitive. It also marked energy as a shared EU-Member State competence (Hafner and Raimondi, 2020), with implications for how policy moved forward.

The EU has continued on a similar trajectory, institutionalising Member State contributions and 'ratcheting up' EU targets: the Effort Sharing Decision in 2009 with binding national greenhouse gas (GHG) emissions targets; new EU emissions targets in 2011; the 2030 Climate and Energy Framework in 2014 with Member State goals for 2050; and a similar vision in 2018 aligning the EU's vision with the Paris Agreement and the Sustainable Development Goals.

In the span of six months the EU laid the narrative and strategic direction for the EU Green Deal. In May 2019 the Clean Energy for All Europeans package put the

fossil fuel transition, GHG emissions reduction, and the 2030 targets front and centre in legislation, with particular emphasis on energy efficiency for consumers. While there was initial opposition from the Czech Republic, Estonia, Hungary, and Poland, by the end only the latter's opposition remained (Hafner and Raimondi, 2020). The package drew on an awareness of household and regional disparities, with the narratives of consumer fairness and affordability, the emphasis on renewables and efficiency, and the tensions with countries that depend more strongly on fossil fuels, or see their right to economic growth threatened.

These developments, and the roots of the Green Deal, are even more evident in the European Commission's strategic vision adopted in November 2018, *A clean planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy.* Five elements in particular stand out in its narrative around the green transition and its continuity with the Green Deal:

1. The centrality of social impacts
2. The mention of energy poverty
3. The EU's provision for social rights
4. The recognition of systemic interconnections and risks of modernisation
5. The recommendation of revenue recycling.

The document explicitly notes the need to build the social impacts of the green transition into the policy actions from the outset, as addressing them post-facto would be too late. In the absence of "adequate regulatory or mitigating measures" to account for the social consequences, the document warns, society runs the risk of imposing disproportionate burden and "some form of energy poverty" on low-income households (European Commission, 2018). Not only are these measures to support the just transition necessary, but the document reiterates that they are also a duty under the European Pillar of Social Rights and its related Action Plan. While the vision does not question the pathway of 'modernity', it does recognise that strategies of digitalisation, innovation, reskilling, etc. embedded in the transition can have negative externalities if the process of modernisation is not well planned. In an era of pushback against assumed trajectories towards consumerist societies, and awareness of the value-laden and contextually-bound nature of 'modernity', this recognition of where such endeavours can go wrong could be a step in the right direction, if well implemented. Lastly, it recommends

using tax shifts and revenue recycling (rather than regulating energy tariffs) to finance welfare and social policy solutions to social issues, arguing that energy tariffs would have unwanted effects on market signals, policy effectiveness, and technology deployment (European Commission, 2018). The EU SCF is precisely an example of revenue recycling, and Section III.1.4 will look at public responses to revenue use.

On a policy level, the EU has a precedent of funds designed to respond to inequalities within the EU: The European Social Fund [Plus], the European Globalisation Adjustment Fund [for Displaced Workers], and the European Regional Development Fund. Together they address many of the same issues as the Just Transition Fund and the Social Climate Fund: technological and social evolutions leaving people 'behind' (with the assumption, particularly in terms of globalisation, that a model based on growth and connectedness is the way 'forward'), regional disparities, and the changing nature of work.

But the EU Green Deal's Just Transition Mechanism and Social Climate Fund stand out as being rooted in an *EU-initiated* shift. While the EU has certainly had a strong role as an agent in globalisation (enacting legislation on digitalisation, innovation, and connectedness), the narrative around globalisation is often one of inevitability and being swept away with the global tide.

By contrast, when it comes to decarbonisation, renewable energy, energy efficiency, and wealth redistribution, policies swim largely *against* the tide. Although there are strong international conversations around environmental justice, cohesion, and tackling climate change, the overarching global system demonstrates a relative path-dependency towards growth and profit, with the accompanying social and environmental consequences. As such, we have a somewhat 'against the grain' set of environmental policies being implemented by the EU, and the consequent creation of associated mechanisms to tackle the policies' socioeconomic fallout: job losses, transport and household energy costs, and hits to regional economies. In widening the scope of the Emissions Trading System and placing greater responsibility on institutions and companies to ensure a "fair and just transition," does the EU's Green Deal succeed in challenging the old framings of burden, certainty, risk, and progress?

2. The current policy

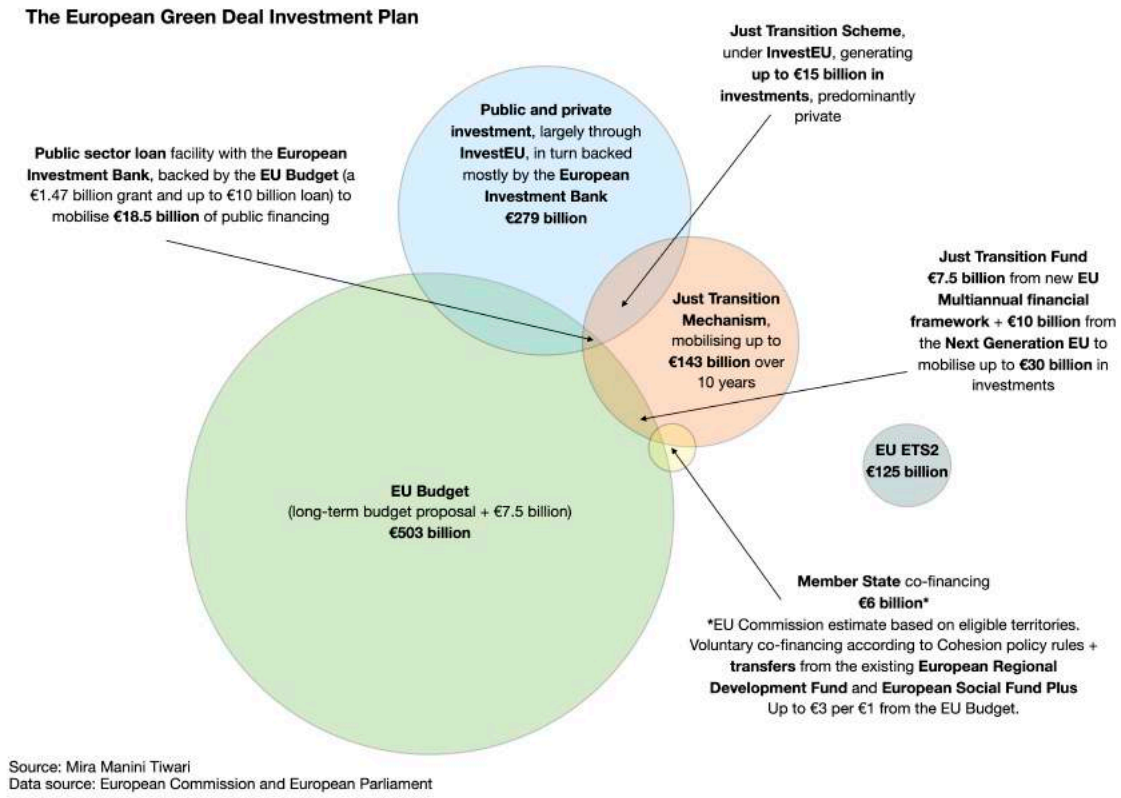

Figure 2: A Venn diagram of the European Green Deal Investment Plan. Figures are as of September 2022. Data sourced from the European Commission and European Parliament. Diagram made by the author.

Figure 2 is designed to serve as a reference point for contextualising and correlating the different elements of the European Green Deal Investment Plan (EGDIP). In order to research the public's responses to the European Green Deal's redistributive policies it is important to have a broad baseline understanding of the mechanisms and funding involved to be aware of *what* public narratives are responding to. We cannot assume that the public has fully read the vast documentation surrounding the policies, but as researchers, knowing the foundations allows a more informed set of benchmarks for studying the narratives, depth of information, and any eventual divergences between different actors.

Kuhlmann and Blum (2021) note that while distributive policies involve the allocation of resources to general infrastructure and populations, *redistributive* policies "allocate resources to specific individuals or groups; [thus] those gaining (or losing) are more visible" (p. 283).

2.1 The European Green Deal Investment Plan (EGDIP)

On the 14th of January 2020 President Ursula von der Leyen heralded the European Green Deal's Investment Plan, with calls for justice, support for people and regions, investment opportunities and "green investment waves," and "leav[ing] no one behind" (European Commission, 2020a). The "solidarity" with highly affected regions invoked by Executive Vice-President of the European Commission Frans Timmermans is not purely in the interest of environmental and social justice, but is equally, if not centrally, instrumental: "to make sure the Green Deal gets everyone's full support and has a chance to become a reality" (European Commission, 2020b).

The Plan, also known as the Sustainable Europe Investment Plan, builds on the present European Commission's long-term budget for 2021-2027 (the Multiannual Financial Framework or MFF) and sets outs how the EU aims to garner public and private funds through EU mechanisms to offer both practical and funding support for sustainable projects (European Commission, 2020a).

The Plan's practical support branch seeks to facilitate the administrative and technical structures that enable the investments to be efficiently and appropriately used: streamlining state approvals for aid, facilitating green budgeting, reorienting the financial system around sustainable investment, and accompanying the planning, designing, and execution of projects.

The Plan's main funding mechanism (i.e. outside the EU Budget) is the nexus between InvestEU and the European Investment Bank (EIB). InvestEU has a dedicated Just Transition Scheme that offers an EU guarantee to allow larger, potentially riskier investments by the EIB and its partners, aiming to mobilise €45 billion of investments in sustainability in the regions most impacted by the green transition. At the time of InvestEU's launch in June 2018, 30% of mobilised investments were earmarked to be dedicated to climate and environment-related projects (European Commission, 2020a). Under the EGDIP, InvestEU also promotes sustainability practices, sets standards for tracking environmental and social investment and impacts, provides technical assistance and advice to private

actors and member state administrations, and facilitates visibility and connections between actors.

2.2 The Just Transition Mechanism (JTM)

The Just Transition Mechanism (JTM) is one part of the EGDIP, channeling funds specifically to (try to) meet the promise of "making] sure no one is left behind" in the transition away from fossil fuels (European Commission, 2020a; 2020c). While the EGDIP overall supports all regions, the JTM targets the most socioeconomically-affected regions.

These are allocated on the basis of environmental, economic, and labour criteria: greenhouse gas emissions from structures in regions with carbon intensity above the EU average, and employment in these regions; employment in coal and lignite mining; and peat and oil shale production (European Commission, 2020d[1]).

The Commission set aside a financial package of minimum of €100 billion for 2021-2027, amounting to €143 billion over 10 years, and aiming to *mobilise* at least €1 trillion. Its scope spans employment and job transitions; low-carbon technology and energy transitions; economic diversification; investment and loans; creating start-ups or small-and-medium enterprises (SMEs); research and innovation; technical assistance; digital connectivity; and energy, heating, and transport infrastructure. The Mechanism targets these areas across people and citizens, companies and industry sectors, and member states and regions (European Commission, 2020b).

[1] A full list of the current JTF allocations to member states is available here: https://ec.europa.eu/info/sites/default/files/about_the_european_commission/eu_budget/jtf_current.pdf
The following document includes the computations, i.e., the current levels, weights, and EU shares of the economic and social criteria: https://ec.europa.eu/commission/presscorner/api/files/attachment/860491/JTM%20and%20JTF%20Allocation%20Table.pdf
This European Parliament webpage has a series of interactive infographics on financing and on member state performances on each of the criteria: https://www.europarl.europa.eu/thinktank/infographics/JTF/index.html#/just-transition-fund
The European Commission DG Regional and Urban Policy has an interactive map indicating current JTF territories: https://ec.europa.eu/regional_policy/en/funding/jtf/just-transition-platform/

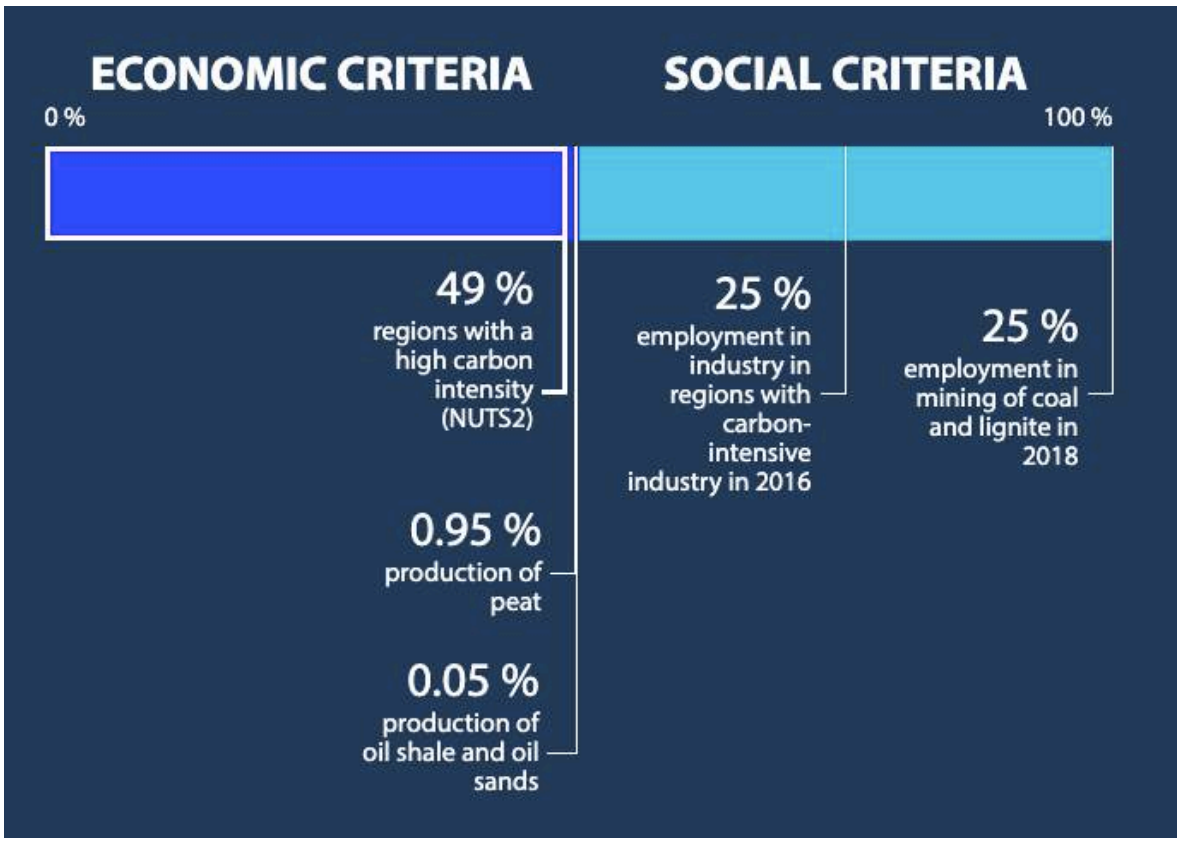

Figure 3: Allocation criteria for the JTF. Source: European Parliament (n.d.).

To achieve this the Mechanism relies on three funding pillars (European Commission, 2020a):

Pillar 1

The Just Transition Fund (JTF), situated within the European Commission's budget, with €7.5 billion of 'new funds' in addition to the Commission's long-term budget. Funds from the JTF are accompanied by member states' voluntary co-financing and transfers from the European Regional Development Fund (ERDF) and the European Social Fund Plus (ESF+). Accessing JTF funding is conditional on approved Territorial Just Transition Plans, which specify the sectors, operations, governance mechanisms, and regions to be targeted (European Commission, n.d.d.).

The JTF predominantly targets employment and economic diversification: offering grants to workers whose jobs or regions are heavily fossil fuel-dependent, supporting reskilling and training, supporting SMEs, creating jobs, investing in sustainable buildings local transport, and investing in energy efficiency (European Commission, n.d.c). Funds are allocated based on the scale of the technical and

social challenges created by the transition away from fossil fuels and on member states' economic development and investment capacities to respond to these challenges (European Commission, n.d.c).

JTF spending is evaluated by indicators covering a broad range of social and structural improvements, from new enterprises to buildings' energy efficiency, childcare and social care facilities to public transport, apprenticeships to healthcare, and renewable energy to unemployment (European Commission, n.d.a). Eligible activities must support the implementation of their region's Territorial Just Transition Plan and work towards lessening the green transition's socioeconomic fallouts.

A few core evolutions have taken place in the JTF. In May 2020, in response to the pandemic, the Commission proposed providing additional funding for the JTF both from the EU budget (MFF) and the Next Generation EU recovery instrument, which was approved (European Commission, 2020e; 2020f). In July 2020 the Council decided to allocate fewer funds than proposed by the Commission, but nonetheless more than the initial proposal: €7.5 billion from the EU budget and €10 billion from the recovery fund (European Parliament, n.d.). In September 2020 the Parliament called for an increase of at least €7.5 billion from the EU budget for the JTF. Following Commission, Council, and Parliament debates, the financial allocation remained with the July agreement (€17.5 billion in 2018 prices), but a compromise incorporated some of the suggestions made by the European Parliament over the course of the year (European Parliament, n.d.):

1. A Green Rewarding Mechanism to favour JTF recipient regions that meet their emissions reduction targets earlier than anticipated.
2. Making member state transfers from the ERDF and ESF+ voluntary.
3. Tying 50% of the JTF allocation to the member state's commitment to the EU's 2050 climate neutrality goal.

The Parliament's suggestions, which should be at least an initial indicator of the member states' populations' perspectives, favour a lower de facto requirement for member states to pay, but support both payment incentives and concessions tied to climate change commitments.

Pillar 2

The InvestEU dedicated Just Transition Scheme. The scheme's main focus is to mobilise private investments that would enable affected regions to develop new sustainable growth pathways, such as through decarbonisation, economic diversification, and energy, transport, and social infrastructure. InvestEU creates a pipeline of projects from investors to implementers, so the funds' usage depends on the regions' demand and absorption capacity. A much wider range of projects are eligible for InvestEU funding than for the JTF, covering projects that address social, economic, and environmental issues.

As in Pillar 1, there is an administrative condition requiring member states to develop approved Just Transition Plans (European Commission, 2020b).

Pillar 3

Public sector loans from the European Investment Bank, with EU budgetary backing. The loans target the same geographical area as the InvestEU Just Transition Scheme and offer public entities loans for investments in energy, transport, heating, making buildings more energy efficient, or developing social infrastructure. The focus of this pillar is on projects that do not generate revenue and therefore would not otherwise receive financing, filling the gap of the InvestEU's Just Transition Scheme investments.

The indicators for the public sector loan facility are the scope and number of projects supported, reductions in greenhouse gas emissions, and jobs created (European Commission, 2020b; n.d.a).

2.3 The Social Climate Fund (SCF)

The JTM aims to work on a somewhat structural level, operating through local administrations, public bodies, Just Transition Plans, project pipelines, infrastructure, and co-financing. The Social Climate Fund (SCF), on the other hand, is more concentratedly dedicated to mitigating energy costs for vulnerable households and micro-enterprises, picking up the thread of energy poverty referenced in the Commission's 2018 Strategic long-term vision. The SCF aims to

mobilise €72.2 billion over 2025-2032, to be used to support citizens through investment in making buildings more energy efficient and increasing renewable energy use, direct income support, and financing greener transport (European Commission, 2021a; European Parliament, 2022d).

Energy poverty is not a new concept, and in its report on the Commission's proposal to establish a Social Climate Fund the European Parliament laments precisely the absence of a standard EU definition and the dearth of national definitions amongst member states, despite more than a decade of conversations and initiatives around energy poverty (European Parliament, 2022a), including an observatory, participatory action, and analytical tools. The Parliament's report on the proposal seeks to build consensus on defining energy and mobility poverty, drawing on definitions of energy poverty including the inability to keep one's home adequately warm, spending more than 10% of one's household income to obtain a basic level of heating, being forced into late payments on energy bills, or a lack of access to adequate energy to satisfy basic needs (European Parliament, 2022a; European Commission, n.d.b).

Structurally, the SCF is part of the EU's Fit for 55 legislative package, whose purpose is to achieve the Green Deal's aims (European Parliament, 2022b) and reduce the EU's greenhouse gas emissions by a minimum of 55% compared to 1990 levels by 2030. Similarly to the JTF, in order to benefit from the SCF member states will need to provide Social Climate Plans in consultation with local stakeholders to outline their strategy for addressing energy and mobility poverty (the latter being an inability to access or afford transport to meet basic needs) (European Parliament, 2022c). Building on the Commission's proposal, the Parliament added a definition of mobility poverty, focused on the specific challenges for inland and peripheral areas, and emphasised EU funds being conditional on respecting the rule of law (European Parliament, 2022c).

The SCF appears to have relatively strong parliamentary support, with the Environment, Public Health and Food and Safety (ENVI) and on Employment and Social Affairs (EMPL) committees voting in favour of adopting the SCF proposal (107 for, 16 against, and 15 abstentions) (European Parliament, 2022c). The Parliament then referred the report back to the ENVI and EMPL committees to

develop the legislation further (European Parliament, 2022b). The Parliament's additions to the proposal imply a deepening of the understanding of the green transition's social impacts, moving from households to including transport, and a greater attention to the variation that can exist between different areas based on their geographies. The reference to rule of law might signal tensions between member states in favour of and against the SCF, with those who fear other member states free riding on the Fund's provisions, or the recent escalation of conflict in potential future EU countries.

The European Parliament adopted its position on the SCF on 22 June 2022 (outside the data collection period of the present research): 479 in favour, 103 against, and 48 abstentions. The agreed position includes a reinforced emphasis on supporting vulnerable households, users, or micro-enterprises through:

- Temporary direct income support through tax and fee reductions
- Long-term structural changes in transport use and building efficiencies through investment and possibly loans, fiscal incentives, vouchers, and subsidies (European Parliament, 2022d).

On an individual level, a provision was put in place to partially address this fear, with direct income support intended to be removed by 2032, and until then capped at 40% of the total cost of a national Social Climate Plan for 2024-2027, responding to the potential risk of creating long-term dependencies (European Parliament, 2022c).

Crucially, the SCF has perhaps the greatest, or most controversial, implications for the economy, environmental policy, and the green transition overall. The funds for the SCF are set to be provided by a new European Emissions Trading System (EU ETS) for the commercial road transport and building sectors. 25% of revenues from the new EU ETS will be allocated to the SCF (European Commission, 2021b), supplemented by auctioning an additional 150 million ETS allowances (European Parliament, 2022d). This is a direct manifestation of the Strategic long-term vision's recommendation of revenue recycling, bringing revenues from transport and building industry actors to those who struggle to pay for transport, fuel, or building energy costs. Conversely, it exists alongside longstanding criticism of the use of a substantial proportion of ETS revenues for free emissions permits

for firms, though these are diminishing (Klenert et al., 2018). Following the June 2022 adoption, Ministers of the European Parliament were able to begin Member State negotiations and preparations of their national Social Climate Plans (European Parliament, 2022d).

The JTM and SCF are situated within a wider framework of mechanisms that reinforce the just transition approach: emissions reduction, carbon removal, renewable energy, and energy efficiency targets based on member states' per capita GDPs, allowances for member states to choose the most cost-efficient way to reduce emissions and remove carbon, support for lower-income member states' clean energy transitions, and more ETS allowances for lower-income member states (European Commission, 2021a). An auxiliary component is the carbon border adjustment mechanism (CBAM), by which imports from countries with lower emissions regulations are taxed to try to prevent carbon leakage (importing high-emission goods, and thereby 'exporting' the emissions) and to maintain price competitiveness for European industries.

III. Literature

The first two parts of this section specifically discuss key findings and the relevance of public perceptions of wealth redistribution in climate change policy. The third part narrows this even further to look at the findings from similar studies that used Twitter data. The methodologies of these Twitter data studies are examined in detail in Section V.1, 'Methodological precedents'.

1. Redistributive environmental policy

From a very young age we are inundated with attempts to instil in us a sense of duty to do what is 'right,' but seldom with clear answers: If one student causes chaos, should the whole class face a punishment or just the culprit? How much, and what kind of help should disadvantaged students receive compared to the rest of their class? How much should you share the cake that your parents packed for you in your lunchbox? Perceptions of fairness and trust, towards ourselves and others, are central to our decision-making, regardless of their rationality.

As there are two main mechanisms being studied in this research, the JTM and the SCF, this literature review will integrate findings on public perceptions of redistributive environmental policies (in line with the JTM) and on redistributive environmental policies arising from carbon pricing (in line with the SCF). The review will *not* address studies of general perceptions of wealth redistribution, or general perceptions of climate change.

It would be interesting to compare perceptions of wealth redistribution in general with those of wealth redistribution in terms of climate change. However, this comparison is beyond the scope of the present study, which focuses on identify public perceptions of a given redistributive environmental policy, and given the cognitive, individual, practical, and cultural realities that characterise attitudes towards and action for climate change more broadly (Poortinga et al., 2019). These include, among others, heuristic decision-making with an emphasis on the actor’s immediate environment; attention and cognitive limitations; personal and emotional dynamics; uncertainty and risk; the social nature of human action; confirmation, cost, status quo, and single-action biases; and misperceptions or a

lack of awareness or knowledge (Zaval and Cornwell, 2016; Zhao and Luo, 2021; Stadelmann-Steffen, 2011).

Like studies of wealth redistribution, studies of perceptions of climate change overall are a field unto themselves, with a stronger focus on what underlies an initial attitude, or how these attitudes manifest, rather than a specific policy acceptance. However, given that at the time of writing the world is still facing a pandemic and is in the midst of a war in Ukraine, with particular effects on the EU, the review will highlight the emerging literature on how these crises are affecting public perceptions of climate change, in light of their potential impacts on both the JTM and the SCF acceptability.

While there is extensive material on fairness perceptions overall, the hypothetical fairness of various economic policies, and factors influencing public policy acceptance in general, Maestre-Andrés, Drews, and van den Bergh (2019) developed a review of the literature that notably includes preferences for *how* carbon pricing revenues are used. The study has a particularly pertinent focus compared with existing literature reviews that study general support for climate policy or carbon pricing. By focusing on individuals' personal, distributional, procedural judgements alongside their fairness perceptions of carbon tax and cap and trade, they build a more precise nexus of factors that are especially relevant for the EU Green Deal's just transition aims. The authors note the lack of studies working on upstream tradable permit schemes, due to the difficulty of measuring their impacts. The present work aims to contribute to the literature by working on the EU JTM and SCF, which were created just after Maestre-Andrés et al.'s work and were therefore not included in their research.

1.1 Why study fairness and public acceptability?

Ribot (1995) warns against speaking of the physical and consequent social impacts of climate change: the responsibility for these impacts lies not in nature, but in our underlying social organisation and the vulnerability it creates. The outcome has been a system of asymmetrical wealth, responsibility, impact, and adaptability. While seeking to remedy these issues, environmental policies (including carbon pricing and support for renewable energy, central to the JTM and

SCF) have large distributional impacts among industries and households, both within and across income groups (Fischer and Pizer, 2017; Hirth and Ueckeredt, 2013). For instance, even with tax offsets and job creation, carbon taxes tend to be regressive, often due to energy inefficient or rural homes and electricity's relative price inelasticity (Gough and Meadowcroft, 2011; Grösche and Schröder, 2014; Conin et al., 2019).

An effective response to climate change must take into account communities' social vulnerability to stresses on their livelihoods and wellbeing in addition to technical challenges, with equity and fair governance at the heart of the response (Kelly and Adger, 2000; Kohler, 2015). Providing for this vulnerability depends in turn on institutional structures that dictate how, and by whom, resources can be used (Fenichel et al., 2016). Within these institutions, Waeber et al. (2021) make the case for needing decision-makers who are able to understand how different actors conceive of gains and losses and different approaches to decision-making, as well as being able to question their own conceptions and approaches. Gough and Meadowcroft (2011) also argue that in social policy, incentives that impede altruism or solidarity may cease to have an effect on public acceptability, even if the incentives are in their own interest. Similarly, Loureiro and Alló (2021) underline the constraints of traditional economic theory that frames individuals as self-interested and rational, and risks excluding the influence of environmental justice and social norms.

Studying people's perceptions of policy fairness is therefore thought to enable stronger policymaking by offering better insight into the public's scepticism or acceptance of a given policy, their readiness to accept higher burdens or inequalities, and consequently its effectiveness through the political choices that people make (Grösche and Schröder, 2014; Maestre-Andrés et al., 2019; Anderson et al., 2017; Dresner, et al., 2006; Bolderdijk et al., 2017; Panno, et al., 2019). Many cost-benefit analyses separate efficiency and equity calculations (Cai et al., 2010), and findings that suggest that the two are linked in the public mindset can have significant impacts on public policymaking going forward.

Moreover, Andor et al. (2021) suggest that developing the 'correct' distribution of burden can enable a stronger environmental target, in addition to facilitating the

policy's implementation. Indeed, the increasingly strong and immediate interconnections between environmental and traditional social welfare interests have fostered a greater need and urgency to address risks, distributional conflicts, and competing policy objectives (Gough and Meadowcroft, 2011).

Maestre-Andrés et al.'s (2019) diagram (Figure 4) offers a starting point to illustrate the dynamics presumed to underlie the aims and data of the present research.

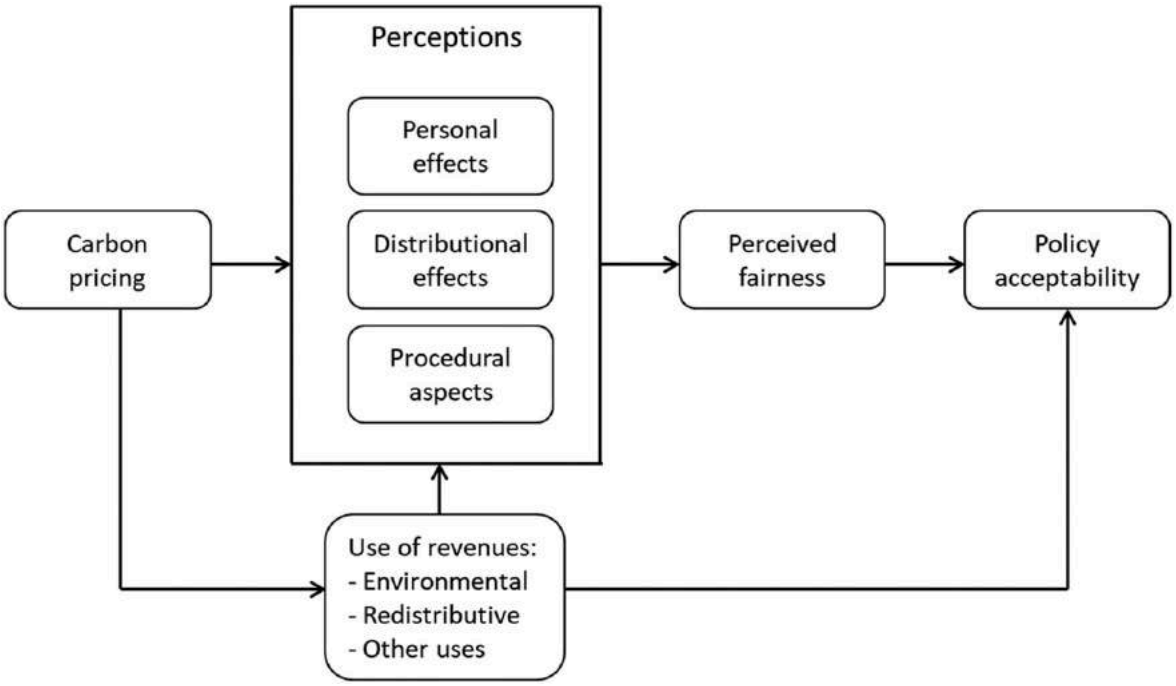

Figure 4: Model of the mechanisms concerned in the present study. Source: Maestre-Andrés et al. (2019).

The use of revenues is particularly relevant in the present research: if public funds are to be used from a new EU ETS or from EU budgets, private and public investment, and national co-financing in a time of crisis, it is not possible to ignore responses to *how* the funds are applied, and indeed, the findings discussed below demonstrate their relationship. Although the model above focuses on carbon pricing, the present study adopts the model with both carbon pricing (as in the SCF) and general redistributive environmental policy (as in the JTM) funds on the left-hand side of the diagram.

1.2 What factors are potentially at play?

Studies of the acceptability of redistributive environmental policies in general, like the JTM, include payments for promoting renewable energy, industry or low-income household exemptions (Andor, et al., 2021; 2018), revenue-neutral carbon taxes (Rivers and Schaufele, 2015), and the willingness to pay for climate mitigation in relation to perceived responsibility for climate change (Cai et al., 2010; Tavoni et al., 2011). Given the range of topics, there is an equally vast range of potential influencing factors at play (Andor et al., 2018, 2021; Stadelmann-Steffen, 2011; Almås et al., 2020; Carattini et al., 2017, 2018; Jagers et al., 2018; Drews and van den Bergh, 2016; Pitkänen et al., 2022), which I have categorised as follows:

Personal subjective:

- Fairness and inequality beliefs and perceptions
- Faith in the policy's ability to achieve the desired outcome
- Political orientation
- Perceptions of government self-interest
- Beliefs about climate responsibility

Personal situational:

- The income of exempted households
- Knowledge of the actors and costs involved in a policy
- Personal and wider economic costs
- Respondents' economic conditions

Policy:

- Justifications provided for different exemptions
- The relative market or regulatory nature of the policy
- How temporally and spatially diffuse the costs and benefits are
- The issue's actuality
- The policy's levels of innovation and inclusion

Contextual:

- Interest group lobbying
- Elite support
- National cultural and political differences

With regard to the fairness perception of wealth redistribution specifically through carbon pricing, as in the SCF, Maestre-Andrés et al. (2019) consider how the carbon pricing revenue is used, and the respondents' perceptions of the policy's personal, distributional, and procedural aspects. Personal factors include the policy's impacts on an individual's costs and freedoms; distributional aspects include the burden faced by different parts of society (low-income, rural, industrial, etc.); and procedural factors involve the government consistently and fairly following and applying the rules and promises embedded in a policy (Maestre-Andrés et al., 2019).

The authors argue that public acceptance of the revenue being used for wealth redistribution is mediated by their perceptions and beliefs about fairness, while support for using the revenue for environmental purposes stands apart. I would argue that, while not the strictly interpersonal concept of fairness, public support for using carbon pricing revenues for environmental versus redistributional purposes, or public willingness to pay for a public good, reflects a wider notion of fairness: the overarching planetary imbalances and redressals desired, a sense of human responsibility for the problem (Bulte et al., 2005), perceptions of the actors involved in given environmental projects, and perceptions of those areas deemed to be most in need of this investment.

1.3 How do publics perceive carbon emissions mitigation policies?

Maestre-Andrés et al.'s (2019) review covers 43 empirical studies, of which 29 were quantitative, and 18 of the quantitative studies were representative of the population at the chosen data level (mostly country-level). The studies, conducted from 2006 onwards, covered the USA, UK, Australia, Sweden, Switzerland, Canada, France, Germany, Ireland, Denmark, Norway, Italy, Turkey, India, and South Africa. This section follows the review's personal, distributional, and procedural categories, with further analysis and integration of studies that were not included in the 2019 literature review.

<u>Personal</u>

The most commonly perceived personal effect of carbon pricing is its potential impact on a household's available income, roughly three times other concerns

such as the loss of jobs, comfort and wellbeing, or freedom of choice (Maestre-Andrés et al., 2019). Though small, an interesting concern involved the (un)fairness of being 'punished' through carbon pricing, irrespective of any climate action they had already taken voluntarily. More than half of the studies in Maestre-Andrés's review that reported dominant concerns about household income also found that this significantly impacted policy acceptability. Other personal concerns did not consistently show an influence on acceptability.

Distributional

On a distributional level, publics in Maestre-Andrés et al.'s review are most concerned about fuel poverty resulting from the impact on poorer households. This is closely followed by concerns about the distribution of the policy burden between households and firms (with CO2 costs passed on to consumers through higher prices, and firms seen as better able to handle the policy burden than an ordinary household), or among households. Both neutral and progressive cost distributions have a positive effect on policy acceptability, while regressive distributions have a negative effect, as would be expected.

Far fewer studies in the review found publics concerned about the geographical distribution of the burden, impacts on categories such as the elderly or rural households, and exemptions and privileges for certain sectors. However, when looking at the effects on policy acceptability, there is evidence that publics are not very willing to shoulder the economic cost of making energy more sustainable, and want to ensure large industries do not escape the burden (Andor et al., 2021; Dreyer et al., 2013; Dreyer and Walker, 2015; Johnson, 2006). Andor et al. (2018; 2021) find that in Germany publics prefer exemptions for low-income households over those for industries, that industry exemptions negatively affect policy acceptability, and that swapping household and industry exemptions (or adding household exemptions if industry exemptions are politically necessary) would have a significant positive impact on acceptability. The 2018 study suggested that support for household exemptions did not depend on the respondents' incomes or whether their household was eligible for them. Similarly, Cai et al. (2010) find that people's willingness to pay for climate mitigation depends on their perceptions of who bears the greatest responsibility for, and who faces the greatest impact of, climate change.

Responsibility for future generations and the expectation that fellow citizens will cooperate were each only found to affect policy acceptability in one study, suggesting that the concern for corporate cooperation, and present-day benefits, are more salient.

Procedural

Lastly, the majority of the procedural concerns regard distrust in the government in general and in their capacity to implement environmental tax reform. Distrust in the government to use the carbon pricing revenues well, i.e., in line with their promises, emerges slightly less often as a concern. Slightly lower is public dissatisfaction with the government's information about the policy, in terms of quantity and transparency. Three studies reported publics feeling that social partners were not adequately consulted, and two report distrust in the markets. Greater satisfaction with the government's policy information, and trust in government, both have significant effects on policy acceptability.

From the Australian context there is some evidence that overall fairness perceptions of the policy significantly influence policy acceptability, even with only a small increase in the perceived fairness: a 1-unit fairness increase corresponding to 2.5 times greater likelihood of supporting the policy (Dreyer et al., 2015; Dreyer and Walker, 2013).

1.4 How does revenue use impact policy acceptability?

Following the dominance of distributional fairness considerations in policy perception, perhaps the most striking finding from Maestre-Andrés et al.'s (2019) review is that more than three times as many studies found that funding environmental projects (reducing carbon dioxide emissions or funding low-emission energy) were the public's preferred use of carbon revenues compared to those who found a preference for wealth redistribution. Very few studies found a preference for other purposes, such as tax reforms or rebates, deficit reduction, government budget, or public transport; rather, the majority found these to be the *least* preferred option. The latter finding aligns with the aforementioned public distrust in the government's ability to maintain its promises. It is also found to be

associated with the complexity of achieving a 'double dividend' through environmental taxes, and a sense that adjusting taxes would simply result in the same overall income, and therefore no reduction in the consumption of the taxed goods and services.

Within the responses regarding income redistribution, there was a clear preference for redistributing revenue to vulnerable households, compared to sharing the revenue equally among taxpayers. Overall, public acceptability of the carbon policy increased when revenues were recycled in some way, rather than being fed back into the government budget, in line with the recommendations in the 2018 EU Strategic Vision document.

The authors explore several possible explanations of why publics express high concern over the distributional effects of carbon pricing, but do not strictly prefer revenues to be used to make the policy distribution fairer (Maestre-Andrés et al., 2019). Firstly, a sense that the tax will not resolve the issue; secondly, feeling that non-environmental uses would harm government credibility; thirdly, confusion between regulatory and revenue-generating taxes; fourthly, low trust in revenue recycling's progressivity or fairness; and fifthly, a perceived administrative burden of redistributing income. The studies overall found that compared to distributional concerns, procedural concerns (trust that the government will use revenues fairly or as promised) were a stronger determiner of preferences for environmental earmarking.

2. The public and climate change in times of crisis

Significant research has been conducted on the EU's climate policy response in times of crisis (Bruns et al., 2019; Dyrhauge, 2019; Oberthür and Roche Kelly, 2008; Dupont et al., 2020). As the focus of this research is on policy response, rather than policymaking, this section outlines the emerging, and as yet limited, findings on the impact of crises on public responses to climate change.

Papoulis et al. (2015) studied Athenians' environmental awareness and readiness to take mitigative action during a period of economic crisis. Although the respondents demonstrated awareness, care, and knowledge, the authors found

that public awareness had fallen during the period of the economic crisis. There were key institutional implications: respondents firmly saw public authorities and large companies as responsible for environmental degradation, and were therefore resistant towards taking individual actions, but they simultaneously had low trust in the authorities' and companies' abilities to tackle climate change. Indeed, respondents largely did *not* believe that individual actions must be compensated/ rewarded, financially or otherwise, arguing rather that individual actions will not resolve the problem without political, institutional, and corporate involvement.

Since January 2020 the pandemic has occupied significant space in news, reporting, and communication. References to climate change have tied the phenomenon to the pandemic as a related or similar phenomenon, distanced it from the pandemic as a secondary concern, or even actively worked against it through encouraging environmentally-harmful actions (Ecker et al., 2020).

In response, Ecker et al. (2020) tested the effects (in two different experiments) of two different climate change-COVID-19 framings on 1460 US residents' concern about climate change and support for mitigation. With the tangibility of the pandemic's effects, its reach across sectors of society and policy, and its need for both individual behavioural change and international cooperation, there is a strong potential parallel with addressing climate change effects. The authors thus tested whether framing the pandemic as a 'trial run' for tackling climate change would increase public concern about climate change and support for climate mitigation measures, and found that the 'trial run' framing *reduced* respondents' support for mitigation. They also tested the effects of suggesting that climate change needs to take a 'back seat' while we concentrate on economic recovery. This 'back-seat' framing also reduced support for mitigation, and reduced some climate change concern.

The authors were able to partially counter a drop in climate concern through providing a message containing debunking information and warning readers that the information provided in the 'back seat' framing article could be biased or invalid. However, this did not succeed in reducing the drop in mitigation support. The authors recognise the limited results, but also draw attention to the possibility that these might be amplified by repeated exposure to a certain narrative.

Camarillo et al. (2021) set out to empirically test the change in climate change discourse on Twitter over the course of the first year of the pandemic. There were variations in the prominence of different terms, in part following the evolution of the pandemic, with its influence on specific behaviours and spheres. Interestingly, climate change-related "action tweets" increased over 2020, more than doubling from February to June and remaining relatively high in October. This is relevant for the present study, where the central element is the role of action by individuals and institutions, rather than merely awareness. It is noteworthy that this increased, despite being a year in which actions were decidedly constrained. "Energy," "food," "people," and "help" were consistently salient topics among the action tweets. There was, however, an evolution from focusing on carbon, fuel, tax, money, emissions, and energy in February, to agriculture, recovery, waste, production, people, development, and future in June, and industry, packaging, plastic, and fashion in October. The findings suggest that the core themes of the present study are likely to be salient in the data, and equally that the conversation around climate change mitigation has the capacity to evolve rapidly based on the immediate surrounding circumstances.

Both "government actions" and "energy" remained a consistently salient feature of conversations about climate change mitigation. The former reflects the findings in Section III.1.3 on the prominence of concerns about the government. The latter suggests there is a public interest that will enable the present study of responses to the EU's largely energy-based climate change and redistributive policy.

Bostrom et al. (2020) studied Americans' perceptions of morality and risk management in the context of COVID-19 and climate change. They were interested in investigating the evidence of two phenomena: 1. whether risk perception in the pandemic drove risk perception and policy preferences around climate change, implying the two issues are inextricable, and 2. whether respondents demonstrated finite 'worry budgets', i.e., an inability to process two large worries simultaneously, turning instead to the most immediate. The authors found evidence for the latter, with respondents expressing a greater sense of responsibility to mitigate the pandemic than climate change, and that they have a greater capacity to do so. This is despite the fact that respondents perceived both

the pandemic and climate change as large, relatively uncontrollable threats, with inequitable distribution.

Bostrom et al. additionally found that, notwithstanding the evidence of the worry budget model, those who supported mitigation policies for one issue were disproportionately more likely to support mitigation policies for the other. They suggest that "perhaps our questions tap three different cognitive realities: a finite pool of worry, acceptance that policy resources are finite, and general support for policies to address communal threats". They call for further research to investigate the connections publics make between the two threats of the pandemic and climate change, or lack thereof, and their preferences on how to address them, to which the present research will contribute in part.

Loureiro and Alló (2021) also studied the relationship between the climate change debate and COVID-19 but, thanks to their use of Twitter data in conjunction with demographic and attitudinal data, they were able to control for an extensive range of factors: socioeconomic characteristics, a community's social norms, and individual risk preferences. The authors investigated the relationships between risk aversion and climate change and altruism and climate change. Societies that are overall more altruistic (identified through the 2020 Global Preference Survey) and those with greater trust in scientific advice were more active in communicating on Twitter about climate change, whereas those societies that are more willing to take risks communicated less about climate change.

Overall, they found that Twitter activity around climate change significantly decreased in line with the pandemic. However, there were political variations: in Italy, France, Finland, the USA, and the UK COVID-19 led to an increase in climate change conversations on Twitter, whereas countries with less interventionist pandemic responses, and most of Latin America, saw a decrease in climate change conversations. Furthermore, in richer countries the conversations maintained a stronger connection between climate change and COVID-19, whereas in poorer countries tensions between the two issues were more salient. This complementarity challenges Bostrom et al.'s (2020) 'worry budget' finding, suggesting that different contexts may manifest a stronger perceptual relationship between crises.

3. Twitter data precedents

In addition to the topic-specific findings discussed in the preceding sections, there is a body of work whose topics might be broader than the present study, but whose findings provide useful background and reference in terms of the data and tools used. This section reports the findings that are potentially pertinent for the present research, while the methodologies of each paper are described in detail in Section V on methodological precedents.

Topics

Al-Rawi et al. (2021) found that in the USA the most retweeted tweets about climate change emphasised it as a natural phenomenon, or denied its existence, while a third of them emphasised climate change's anthropogenic nature.

Shangguan et al. (2021) encountered a wide range of topics in climate change tweets, spanning the role of company responsibility, community collaboration, protecting the environment, inter- and intragenerational sustainability, government responsibility, COVID-19, and science versus climate change denial.

Climate change, climate, and extreme weather terms were the most common hashtags among English- and Spanish-language climate change tweets (Loureiro and Alló, 2021), with climate action leading the top three hashtags in the UK and Australia. Similarly, Kirilenko and Stepchenkova (2014) found that almost all the hashtags in the six languages studied were relevant to climate change.

Location

Less than 2% of posts about climate change included geolocation in Roxburgh et al.'s (2019) study. 0.82% of English-language climate change or global warming tweets were geolocated in Kirilenko and Stepchenkova (2014). Camarillo et al. (2021), studying global climate change tweets, identified the countries that contributed more than 1% of total climate change tweets. Of these, the EU countries were: Spain (7th), Germany (13th), Netherlands (15th), Italy (16th), France (17th). They found that metropolitan areas produced half of the daily tweets on climate change. These were dominated by London, major North

American and Australian cities, and some Latin American cities. However, they also included Paris (8th), Madrid (14th), Rome (20th).

Focus and actors

Citizen media and NGOs in Stier et al.'s study (2018) place greater emphasis on framing their tweets in terms of action, specific goals, and critiquing complicit actors. Traditional media and political actors were found to emphasise institutions, political policy/decision-making, and established actors. Carrasco Polaino et al. (2021) found that administration and public bodies were the most active users on Twitter (27.6%), followed by NGOs, foundations, and activists (23.7%), the political sphere (15.6%), the media (14.5%), private companies and organisations (7%), scientists, experts, and news disseminators (4.7%), journalists (2.5%), and celebrities (1%).

4. Expectations and further questions

There is a challenge in determining *what* environmental projects or earmarking the public would support, as most studies did not provide specific named options, and support takes different forms, such as subsidies, grants, and investment. Public responses might vary based on the specific mechanism used, compared to expressing their preference regarding environmentally-friendly funding in general. The present research results might reveal responses to specific environmental applications, especially given the range of investment, grant, and co-financing mechanisms involved in the SCF and JTM.

Andor et al.'s (2018) and Carattini et al.'s (2018) findings on the impacts of industry exceptions and burden distribution on policy acceptance highlight the importance of knowledge of a policy: those respondents who did not know about industry exemptions were more likely to accept a greater distributional burden themselves, and Carattini et al.'s findings relied on respondents receiving information about the mechanisms' distributional properties. It will be interesting to see the extent to which the present research's data reveals conversations about wider distributional properties and factors such as industry exemptions.

This research offers an opportunity to identify the extent to which the following findings are replicated in the context of the EU's JTM and SCF: high concern for distributional fairness (between households and with firms) in carbon pricing and environmental policy overall; a strong preference for using carbon pricing revenues for environmental projects; and relatively low trust in the government to use revenues fairly or as promised.

Based on the findings on climate change responses in crises, the following points will be of particular interest in the data and analysis of public perceptions of redistribution, responsibility, and action in climate change mitigation under the EU's JTM and SCF:

- Responsibility assigned to, and levels of trust in, public authorities and companies
- 'Trial run' or 'back seat' narratives between the pandemic and climate change (the 'back seat' could be particularly pertinent with the war in Ukraine)
- 'Action' tweets
- The salience of energy, food, people, and help topics (these, too, might be affected by the Ukraine crisis, in a form of situational response)
- Sense of responsibility and ability to mitigate climate change in relation to the pandemic, if mentioned.

IV. Theoretical framework

1. Social media *as* informal learning and public discourse

A person in their sixties did not stop learning about climate change, industry, decarbonisation, taxation, or redistribution when they left school. In fact, when they were at school the narrative around fossil fuels could likely have been different from what it is today, crafted in part by the oil industry and national governments themselves, as discussed in Section I.2. If they were part of a minority they might have gone to university to study biology, botany, conservation, or engineering and been in contact with the fields' formative debates. If the person did not pursue environmental studies in their formal education, over the following decades as climate change entered the mainstream through successive international conferences and serious visible natural shifts, they might have learned more from colleagues, local organisations, or classes. In their everyday life they might have found more information, reading up in articles and books, or watching videos explaining the issues that seemed increasingly ubiquitous. In short, they would have continued their learning alongside the evolution of wider knowledge, narratives, and conversations.

We typically divide education into formal, non-formal, and informal learning. Formal learning tends to be defined as occurring in a formal school setting, structured by an official education system. Non-formal learning is seen to occur outside of school, within planned structures, but with more flexibility and independence, such as at the workplace, in political parties or civil society groups, or in courses (European Commission, 2000; Lewin and Charania, 2018). The European Commission in their memorandum on lifelong learning defines informal learning as "a natural accompaniment to everyday life. Unlike formal and non-formal learning, informal learning is not necessarily intentional learning, and so may well not be recognised even by individuals themselves as contributing to their knowledge and skills" (European Commission, 2000, p. 8). Some divide informal learning into intentional and incidental or accidental, the latter being a more unconscious, ongoing phenomenon (Rogers, 2014; Hoffman, 2005; Sefton-Green, 2004).

However, it is unhelpful to define types of learning by the locations where they take place (Sefton-Green, 2004; Callanan et al., 2011), as even before digital technology blurred the home, school, and work environments, different ways of learning have always coexisted and overlapped. The crucial distinguisher is not the location, but the learner's attitude and social context in which the learning is embedded.

There are two ways of viewing the 'social' in informal learning: one in which socialisation is *just one type* of informal learning, alongside self-directed and incidental (Schugurensky, 2000), and another in which high social collaboration and embedment in meaningful activity are *fundamental* to informal learning (Callanan et al., 2011). Social media encapsulates both of these perspectives, offering itself as a prime informal learning context: users consciously turn to social media to seek information on a topic (self-directed), casually scroll and in so doing encounter and absorb information (incidental), and actively collaborate with other users, such as to organise an event, build knowledge, or develop a network (social collaboration and meaningful activity).

This condition rests on two main theoretical underpinnings: social constructivism and connectivism, elaborated by Greenhow and Lewin (2015) in relation to social media. Social constructivism takes learning as "participation in a social context," with knowledge being "decentralised, accessible, and co-constructed among a broad range of users" (Greenhow and Lewin, 2015, p. 8-9; Dede, 2008). Dede (2008) goes further to argue that validity and expertise in these forms of knowledge emerge respectively from the community's 'peer review' of information and from opportunities for individuals to provide understanding, syntheses, and responses accepted by the community. Connectivism, like social constructivism, situates learning in a given social context, but places greater emphasis on building and using connections in the network, rather than just on the 'nodes' themselves. It allows for recognising that learning is not linear, that the foundations of knowledge for a person or field are continually shifting, and that these are not always entirely under individuals' control (Greenhow and Lewin, 2015).

It is under this lens that social media such as Twitter emerge as an essential tool for studying perceptions of climate change policy. Crucially, the aforementioned

co-construction of knowledge and the recognition of shifting foundations distinguish the present perspective from standard public perception studies. Public perception in the context of social media and informal learning is not taken as a static fact, passively developed in response to policies. Rather, social media captures the perceptions, learning, and creation of new knowledge about a policy in a continual feedback cycle. The weaknesses of social media in terms of representation and mediation will be addressed in the following section of the thesis. However, for the purposes of this research, social media provide a wide-reaching source of relatively first-hand knowledge construction and public perception. Furthermore, as Loureiro and Alló (2020) note, there are limited European surveys regarding climate change and energy. The Eurobarometer and European Social Survey make reference to these topics, but they are relatively broad and not annual, and using social media data can help to plug gaps in these social indicators (Loureiro and Alló, 2020).

2. Social media for public policy research

The use of social media for public policy research is a relatively new domain. In 2014 Rogers, in his book laying out digital methods as a broad approach, called on researchers to use social media to study society, its phenomena, and evolutions. Williams et al.'s (2013) analysis of peer-reviewed studies using Twitter data suggests that at the time almost no one was using Twitter to investigate public responses to climate change.

However, with great power to access millions of statements, visual materials, and conversations, not to mention wider data about the producers of this data, comes great responsibility to use it effectively and ethically. As Rogers implored a wider use of social media, Lupton (2015) published an extensive investigation into the domains, tools, methodologies, and wider issues around what she termed 'digital sociology'.

These questions are of significance to wider society, not merely to researchers. Most individuals are currently continual producers of 'big data': automatic data that is produced as we buy, read, browse, and transact; content we generate in the form of online publications such as Twitter; and the vast surrounding meta data

about ourselves, our networks, our 'pathways' on the Internet, and our interactions (Lupton, 2015).

This data contributes to the wider global knowledge economy or 'informational society,' with a cyclical production of knowledge and data that further drives the development of knowledge and data-producing technologies (Castells, 2009). In 2017 *The Economist* named data as the world's most valuable commodity, and its leaders the world's most valuable firms (The Economist, 2017). While there has been a longstanding awareness that data and its processing have become a commodity (Castells, 2009; Thrift, 2005; 2006) some argue that users themselves have become the real commodity (Lupton, 2015; White and Boatwright, 2020).

If we and what we produce through our actions and interactions are central economic drivers, and if "how we learn about the world is… digitally mediated," (Lupton, 2015, p.3) it follows that everyday citizens have a threefold interest in how this digital mediation takes place. Firstly, we wield power in how politics, economics, and societies unfold. Secondly, our own perception and knowledge of events and phenomena are increasingly likely to involve social media content in some form. Thirdly, with the growing presence of government, political, activist, and other influential users (An et al., 2014), and the use of social media data for academic research and policy responses, the consequent solutions and policies are likely to be at least in part shaped by social media's human and algorithmic structures, too. Understanding the limitations of these mechanisms can enable a more informed and accurate engagement, both on social media and outside.

Indeed, while the present study is interested in *collective* action for climate mitigation through social and economic policy, it is debatable whether the social media data that expresses this action is itself more collective or individual (Castells, in Kreisler, 2001). The evolution of social media challenges our notions of collectivism and individualism, opening new spaces for cross-boundary exchange, and simultaneously enabling invisible boundaries to mask realities and exchanges with individual users.

Of methodological interest to the present research are the two sides of social media data: the active co-construction between users on the one hand, and the hidden influence of algorithms and technology on the other. The remainder of this section will address the components and implications of these two dimensions.

2.1 Data production

Collecting data via social media offers the attractive prospect of reaching individuals and data points that would never be accessible in person, with an apparent extensiveness and authenticity through the scope and speed of data production and collection. In reality, social media data is shaped by the digital divide, with socioeconomic, age, and geographic factors determining who has access to social media, and therefore whose data is represented or excluded (Olteanu et al., 2016).

Within those who are able to access social media, their activity is characterised by 'prosumption': the simultaneous production and consumption of information online that blurs the boundaries between the producer, the collector, and the data itself (Beer and Burrows, 2010; Ritzer, 2014). This analysis aligns with the conception of social media as the platform for truly democratic exchange and participation. Indeed, the present research uses Twitter data precisely for the production-consumption dynamic that characterises social media as informal learning, and the real-time reading of public response. Furthermore, Lupton (2015) highlights the alignment between prosumption and neoliberal politics, assuming individual responsibility, creativity, freedom, and the ability to isolate their actions from the wider structure. However, to idealise social media data as 'democratic' is to overlook the tangible actions and decisions that produce and mediate this data. At the point of data creation, this involves the user directing their content (such as a tweet) at their specific audience with the aim of attaining a wider reach or starting a conversation (Camarillo et al., 2021). This audience is at least to some extent conscious, as they are users who have chosen to follow the producer. But this exchange is not unmediated, as the following section explains.

2.2 Data collection

Excessive choice creates cognitive and efficacy challenges, and data is no exception. Andrejevic (2013) notes that data mining (collecting vast amounts of digital data) is both speculative and comprehensive. In other words, we have such extensive data available that we can often merely speculate on what data we will eventually need, and consequently collect as much data as possible, building a comprehensive, but perhaps ill-thought-out and understood, dataset. The 'digital divide' extends to researchers, with increasingly specialised computer and data skills, permissions, and funds required to access and process digital data (Olteanu et al., 2016).

The co-construction begins as early on as a Twitter feed or a search query, whether simply on Google or on a data mining programme. Twitter feeds (streams of content from accounts followed by the user) contain tweets deemed relevant by the platform's algorithm, drawing on the user's explicitly chosen preferences and implicitly revealed data as they interact online (Camarillo et al., 2021). Google search results, similarly, are the product of Google's algorithm and the user's own Internet history, tailoring the outcomes to an individual user with "algorithmic authority" (Rogers, 2013, p. 97). In more scientific research, the researcher further determines which key terms and concepts are relevant and which are marginal.

Even if these key terms (often hashtags, in the case of Twitter) were to be entirely objective and valid, data collection runs into a further delineation problem (van Vliet et al., 2020): not all those who participate in a Twitter conversation use a given hashtag, and not all those that use a given hashtag contribute to the conversation. When collecting a large sample, it becomes difficult to distinguish relevant material from 'noise'. Furthermore, for certain topics researchers need to be aware of how specific contexts might create variations in the terms or hashtags used across locations.

The software in turn usually returns only a random fraction of the data available, as in the case of Twitter's API, which mediates most Twitter data collection. Even if Twitter were to return all the available data for a search query, most computers and software would be unable to process such a volume, and researchers must

make choices of what data to use (Bruns, 2013). The data is returned pre-formatted (defined, ordered, and filtered) by the web scraper. Short of developing their own tool (as the developers of TCAT did (Borra and Rieder, 2014)), the researcher is unable to change these conventions (Marres and Weltevrede, 2013; Lupton, 2015).

2.3 Data analysis

The above section highlights one of the least visible elements of handling digital data: the influence of software and machine designers, which goes on to interact with the decisions made by data retrievers, archivers, classifiers, analysts, visualisers, disseminators, and users (Beer, 2013; Lupton, 2015).

These individuals rely on software to analyse social media data, but unlike a documented, analogue method, these tools are non-standardised and undergo continual change, with most of their structure inaccessible or incomprehensible to the majority of users, rendering it difficult to verify methods, results, and validity (van Vliet et al., 2020; Bruns, 2013).

In terms of the content, social media data analysis faces two complementary challenges: an absence of desired information and an excess of seemingly undesirable information. Analysts cannot reliably or consistently identify users' gender, education, socioeconomic status, community, location, linguistic nuance and ambiguities, or other contextual information that make data more meaningful and applicable (van Vliet et al., 2020; Lupton, 2014). Instead, they face a significant amount of excessively decontextualised information, i.e., tweets from 'bots' that are programmed to produce large numbers of tweets in a short amount of time, typically driving a particular social or political stance.

Lupton (2014) places bots in the same category as what she terms 'false' or 'manipulated' information such as users promoting a certain profile, topic, or idea. I argue that users' conscious promotion of topics or ideas is not 'false', but precisely an example of social media's capacity, akin to studying a physical protest. Regarding bots, the present research draws on Roxburgh et al.'s (2019) argument that irrespective of their accuracy, media reports (and by by extension social media

content) can feed into awareness, political coverage, and dialogue around a given issue, or even influence individuals' thoughts and responses. At the same time, bots and other similar tools do distort attempts to identify contextual data about tweets through proxies such as followers, hashtags, geolocation, and usernames (van Vliet et al., 2020).

As will be seen in the methodology section, researchers include or exclude bots from their datasets according to their research aims. To address the absence of wider contextual data, an increasing number of studies combine big data analysis as a starting point with subsequent qualitative analysis of the same data or of new data, such as interviews, to better identify the 'why' behind the big data results (Pearce et al., 2014; Beer, 2012). A smaller number of others, such as Loureiro and Alló (2020; 2021) compare their findings with survey data, such as the European Social Survey, the Global Preference Survey, or the World Values Survey, or run regression analyses with other demographic, socioeconomic, and cultural data.

2.4 Implications

In the context of social media and other digital data, the term "raw data" is oxymoronic (Gitelman, 2013); from the moment of its production it is processed through countless human actions, perceptions, and tools, even more so than in other social data, given the sheer extent of potential technologies and contributors (Marres, 2012; Lupton, 2015).

Lupton therefore argues that researchers might need to see the data as structuring the questions and research and not vice versa (Lupton, 2015). This does not mean that social media research is ineffective or uncontrollable. An et al. (2014) are optimistic about Twitter data if used well, citing the growing number of influential and institutional actors using the platform. While Twitter therefore cannot represent an entire population, it is an increasingly accurate representation of institutional and other public actors.

A crucial broader consequence of the mechanisms discussed in this section is the dispersed, dynamic, and multimodal nature of power: individuals and organisations

wield power in terms of their data production, and the resulting products offer change-, policy-, and profit-making power, with the two continually interacting (Lupton, 2015). Researchers, as in the case of the present research, have the opportunity to use an awareness of this power dynamic to study the framing and evolution of events and relationships in a given social or policy context (Lupton, 2015).

Camarillo et al. (2021, p. 14) capture the fine balance of how Twitter data can be viewed:

"Whilst Twitter can be used to gather information about people's perceptions of a topic, we acknowledge that the information found in the tweets does not necessarily define the views of the user."

In addition to the technological mediation of Twitter data described above, the authors note that users often present varying 'selves' to real or imagined audiences.

"The implications of this for our data are that they may not represent people's perceptions but may reflect what the user is exposed to on his or her news feed or virtual context and what he or she may perceive as "socially accepted" by other users."

This intersection of exposure, perception, and social acceptability sits at the basis of the present research's work.

Lastly, while researchers may strive for maximum cognisance and accounting for methodological difficulties, a limitation does remain in terms of the ultimate situating and applicability of the research. As a result of the ephemerality of online data, and the co-construction and variation across data production, collection, and analysis, datasets and results are difficult to replicate.

V. Methodology

1. Methodological precedents

The author reviewed studies that used Twitter to study climate change or the environment, specifically those with a public response or policy focus. Given the ongoing evolution of Twitter and digital tools to analyse it, the emphasis is on more recent studies, apart from some seminal works such as Kirilenko and Stepchenkova (2014). This section outlines the methods reviewed and their findings, focusing on the aspects most relevant for the present research. The subsequent section presents the chosen methods and expectations for the present research, based on this review.

Authors	Language	Parameters	Cleaning and pre-processing	Analysis
Al-Rawi et al. (2021)	English	"Fake news" tweets (6.8 million). Extracted those on climate change and/ or global warming: 12,055 tweets. 4 months.	Maintained retweets.	Content focus: countries, parties, or topics referenced. Analysed the most retweeted posts.
An et a. (2014)	English	Over 7,000,000 tweets in 3 months. Streamed, therefore a subsample of the total available. Extracted English tweets mentioning climate change: 494,097 tweets.	Lower-cased, tokenised. removed rare words and words that occur less than twice, removed stop words and frequent words, and stemmed words.	Excluded retweets for sentiment analysis. Included retweets for calculating the ratio of climate change tweets to the daily number of tweets.
Camarillo et al. (2021)	English	Streamed tweets at three intervals in 2020. 6 keywords.	Removed duplicates that occurred within 2-3 days of each other. 300,000 tweets per interval Identified 'action tweets'. Filtered stop words and keywords, lemmatised remaining words.	Compared the number of topics, frequency of occurrence, nature of topics, relevant topic words, and the emergence of new topics.
Carrasco Polaino et al. (2021)		#cop25 tweets from media, NGO, international and other actors. Tweets published during the 2019 Madrid summit: 67,431 tweets.	Removed interaction tweets, i.e., kept only original tweets: 1,094 tweets.	Content analysis: type of author, format, type of content, sentiment. Calculated engagement with the tweets.
Cody et al. (2015)	English	1.5 million "climate" tweets over 6 years.	Included retweets.	Hedonometer: sentiment tool to assess relative happiness.
Hopke (2015)	English (filtered from the initial data set)	2 weeks around the Global Crackdown. 9,449 tweets containing the movement's main hashtag.	Filtered language. English: 7,678 tweets.	Manual thematic analysis coding using author-developed frames. In-depth interviews with five stakeholders.

Authors	Language	Parameters	Cleaning and pre-processing	Analysis
Hopke and Hestres (2018)	English	Visual tweets around COP21, 2015. 94 accounts: media, climate institutional leaders, climate activists, fossil fuel industry groups, and other climate stakeholders: over 150,000 posts.	Included retweets. Focused on COP21, climate change, and divest mentions: 12,699 tweets. Filtered those including visuals: 9,477.	Developed frames to code the tweets. Manual coding of visual and textual components together.
Kirilenko and Stepchenkova (2014)	English, Spanish, Dutch, German, Portuguese, Russian	"Climate change" or "global warming" in each language. Roughly one year.	1.8 million tweets analysed.	Developed a python code to identify written place names in tweets. Spatial, temporal, network, and influence analysis of the main hashtags, users, media organisations, and news events.
Loureiro and Alló (2020)	English, Spanish	6 months. 811,211 tweets from the UK and 961,929 tweets from Spain	Removed empty tweets, monosyllabic tweets, song/saying tweets, irrelevant hashtags, tabs, stop words, punctuation, empty spaces, and urls. Lower-cased. 1.7 million tweets.	Word clouds and frequencies. Emotional and sentiment analysis. Emphasis on energy demand and policy preferences. Compared findings with European surveys and Google Trends.
Loureiro and Alló (2021)	English, Spanish	Streamed over 2018-2020. 48,234,241 tweets. Gender API to identify gender from meta information.	Specified keywords and hashtags. Final useable dataset: 36,205,609 tweets.	Regression analyses with socioeconomic factors, political preferences, and social norms.
Pearce et al. (2014)	English	Tweets mentioning IPCC in 3 weeks around the publication of the report. 152,893 tweets	Removed retweets and duplicates. Removed tweets sent 'via' another account. 61,713 'original' conversational tweets. Identified usernames with 10 or more connections: 239 relevant usernames.	Focus on directed conversational tweets, not retweets. Gephi network mapping: supportive, unsupportive, or neutral stance towards conversation topic. Manual coding.
Rathore et al. (2021)	English	Keyword and hashtag for Indian public health insurance scheme (Ayushman Bharat). 1 year.	47,754 tweets. Removed stop words, tokenised, stemmed, and identified n-grams.	Text analysis (facts, themes, word frequency, clustering, word associations) through TF-IDF. Sentiment analysis. Semi-structured interviews with policymakers.
Roxburgh et al. (2019)	English	Streaming and search around three high-magnitude extreme weather events in the USA: two hurricanes and one snowstorm.	Removed non-alphanumeric characters, corrected common spelling mistakes, and extracted climate change/ global warming tweets co-occurring with mentions of the storm keywords.	Analysed relative tweets and retweets. Assigned frames to tweets through two manual coders. Frames included the nature and role of science, political or ideological struggle, economy, opportunity, morality and ethics, health, and security.
Shangguan et al. (2021)	English	12 climate change and global warming belief or denial keywords or hashtags; the same as those used in the Harvard Dataverse. 29 months.	Random 10% of the data set. 1,507,554 tweets. Removed duplicate tweets. Lemmatised. Lower-cased. Removed stop words. Removed "climate change".	Number of tweets and their relationships with major climate events; 15 main topics; top 10 keywords per topic; sentiment trends.

Authors	Language	Parameters	Cleaning and pre-processing	Analysis
Stier et al. (2018)	English	Tweets with #climatechange for 8 months. Streaming. 2,712,828 tweets. NB: authors also studied #netneutrality but this is not relevant for the present research.	Removed stop words. Only included words that occurred at least 5 times in each type of actor. 50 entries per keyword list.	Coded the 500 most central accounts into groups of relevant political actors. Coded connective action, policy process and implementation, political goals and challenges, science, other media or events, and business actors and practices. Comparative keyword analysis.
Vydra and Kantorowicz (2021)	Dutch	Two 4-month periods, one during COVID and one a year prior. Keywords for two Dutch policies.	Removed re-tweets and duplicates. Joined quoted tweets with the text of the tweet quoting them. Removed bots (accounts tweeting more than 1500 times and/or authoring more than 450 times a month). Tokenised and lemmatised.	Topic modelling.

Figure 5: Data collection, processing, and analysis methods used with Twitter data to study climate change responses and policies.

2. Data parameters

The parameters for the present study underwent and extensive process of planning and refining based on the above studies.

2.1 Language

As the review above demonstrates, working with English is common practice in social media research, both for the comprehensibility of the researchers and for the functioning of the software and tools involved. Ideally a study of this nature would span as many European languages as possible, but the analytical tools do not possess the dictionaries and capacities to process all languages equally. Furthermore, processing data in several languages requires a wider team of researchers with time and skills not available in the context of an individual Master's research project.

Working with another language *instead of* English would potentially offer more democratic data in terms of a wider range of users, namely those not in an institutional, English-speaking context, and therefore without the privileges that such a context brings. However, working without English would exclude important

institutional tweets, such as from the EU Commission, and might limit the dataset significantly, as preliminary searches resulted in relatively few non-English tweets about specific elements of the EU Green Deal, such as the JTM and SCF.

This research was undertaken to begin to understand European responses to the JTM and SCF as they unfold, and therefore choosing only one European language to work with alongside English would be arbitrary and would not give satisfactory results.

Data can be collected including all languages. Due to the language of the search terms (see below), the results will de facto be largely in English.

2.2 Context

The researcher did consider an external comparison for this study, such as:

a) Other regional emissions trading systems:
    - Strength: These offer a similar policy context
    - Weakness: Most are not explicitly redistributive
    - Weakness: They lack the 'baggage', positive and negative, that comes with EU institutions and policy and that influences discourse around them.

b) Transnational agreements, like the Paris Agreement or COP26:
    - Strength: These foreground financial assistance and redistribution for climate change
    - Weakness: They are much more internationally high-profile than the EU's policy
    - Weakness: Individuals' attitudes towards helping those in another/farther country will be different from those towards industries, regions, and communities nearby, whether more positive because they seem more 'in need', or more negative because they fel more distant.

c) Domestic policy:
    - Weakness: These are often environmental *or* redistributive

- Weakness: They lack the influence of the policy being supranational.

In the absence of valid external comparisons, the decision was made to develop the comparison within the EU Green Deal. The initial search was therefore designed to cover three key moments in the evolution of the Just Transition Mechanism and the Social Climate Fund. Each of these was unlikely to have sufficiently extensive Twitter coverage on their own, whereas combining key moments of the two mechanisms offers a fuller dataset. Finally, working with these moments allows the researcher to make comparisons that remain within the parameters of climate, wealth redistribution, and supranational policy, avoiding excessive tangents, as would be likely the case with the transnational agreement or domestic policy comparisons.

The three identified moments were:

1. The proposal of the Just Transition Fund by the European Commission on 14 January 2020 (data collection 1 January to 30 January 2020)
2. The approval of the Just Transition Fund by the Council of the European Union on 7 June 2021 (data collection from 1 June to 30 June 2021)
3. The adoption of the Social Climate Fund by the European Commission on 14 July 2021 (data collection from 14 July 2021 to 11 August 2021).

The data collection periods were determined following extensive searches and adjustments to identify periods of a similar duration, with dates that enabled the inclusion of a roughly equal number of relevant responses on Twitter.

In order to achieve a better balance in the data between the two mechanisms, a second SCF period was identified, resulting in four data collection periods in total:

4. The debate in the European Parliament on the SCF-ETS2 linkage in February 2022 and Energy Poverty Action Week from 21 to 25 February 2022 (data collection from 1 February to 28 February 2022).

2.3 Search terms

The search terms were initially developed to be as extensive as possible. The list was formed based on thorough extraction from the EU Green Deal, JTF, and SCF documentation from the European Commission, Parliament, and Council. Following further research and consultation, it was found that an extensive list would impede the search by creating duplicates. It was recommended to work with 5-15 search terms per query and to focus on hashtags as conversation and topic signallers. It was additionally found that data could be collected for 2020, 2021, and 2022 thus far. Below are the initial search query and the refined search query.

Initial search query:

Terms to include:	European Social Fund Plus	EU Cohesion
Just transition	EU Social Fund Plus	European Cohesion
Transition fund	EU Social Fund	Cohesion Policy
Just transition fund	Social Fund Plus	EU Green Deal
JTF	ESF	European Green Deal
Just transition mechanism	ESF+	Green Deal
Transition mechanism	Territorial Just Transition Plan	Fit for 55
JTM	Just Transition Plan	EU Emissions Trading System
European Recovery Instrument	TJTP	EU Emissions
European Regional Development Fund	Just Transition Platform	EU Emissions Trading
Regional Development Fund	JTP	European Emissions
EU Regional Development Fund	InvestEU	European Emissions Trading
Regional development	Invest EU	European Emissions Trading System
EU regional development	European Investment Bank	EU ETS
ERDF	EIB	EU ETS 2
European Social Fund	Initiative for Coal Regions in Transition	Climate Social Fund
Social Fund	EU Cohesion Policy	Social Climate Fund
	European Cohesion Policy	SCF
		CSF
		#EUETS

#EUETS2	**Terms to exclude:**	Dollars
#EUinmyregion	NY	Senate
#EUGreenDeal	NYC	
#GreenDeal	New York	
#Fitfor55	Dollar	

Refined search query:

2020:	#EUGreenDeal	#EUETS2
“Just transition fund”	**2021 and 2022:**	#Fitfor55
“Just transition	“Social climate fund”	#JTF
mechanism”	“Just transition fund”	#JTM
“EU Green Deal”	“Just transition	#EUETS2
#Fitfor55	mechanism”	#EUGreenDeal
#JTF	“EU Green Deal”	
#JTM	#SCF	

The exclusion of irrelevant terms and the filtering by language need to be undertaken within the data analysis.

3. Twitter data

The data was collected from 1 January 2020 to 5 May 2022 through the Twitter archive, thanks to the academic permissions and kind help of the researcher’s supervisors. It was then converted to an Excel spreadsheet to enable both human and software readability.

3.1 Initial filtering and import

Twitter data contains a vast array of fields. Some of these were entirely unpopulated in the dataset, and some were irrelevant for the present study. The following fields were therefore eliminated from the dataset:

1. source: whether an Android or iOS app, browser, etc.
2. reply_setting: All tweets in the dataset had this set to "everyone"
3. possibly_sensitive: All tweets in the dataset had this as "FALSE"
4. withheld.scope: Blank
5. withheld.copyright: Blank

6. withheld.country_codes: Blank
7. entities.cashtags: Blank
8. attachments.media: Irrelevant and not captured by alphanumeric data
9. attachments.media_keys: Irrelevant and largely blank
10. attachments.poll.duration_minutes: Irrelevant and largely blank
11. attachments.poll.end_datetime: Irrelevant and blank
12. attachments.poll.id: Irrelevant and blank
13. attachments.poll.options: Irrelevant and blank
14. attachments.poll.voting_status: Irrelevant and blank
15. attachments.poll_ids: Irrelevant and blank
16. author.entities.description.cashtags: Blank
17. author.pinned_tweet_id: Irrelevant
18. author.profile_image_url: Irrelevant
19. author.protected: All tweets in the dataset had this as "FALSE"
20. author.withheld.scope: Blank
21. author.withheld.copyright: Blank
22. author.withheld.country_codes: Blank
23. geo.coordinates.coordinates
24. geo.coordinates.type
25. _twarc.retrieved_at: Irrelevant
26. _twarc.url: Irrelevant
27. _twarc.version: Irrelevant

The retained fields are:

1. id
2. conversation_id
3. referenced_tweets.replied_to.id
4. referenced_tweets.retweeted.id
5. referenced_tweets.quoted.id
6. author.id
7. in_reply_to_user_id
8. retweeted_user_id
9. quoted_user_id
10. created_at
11. text
12. public_metrics.like_count
13. public_metrics.quote_count
14. public_metrics.reply_count
15. public_metrics.retweet_count
16. entities.annotations
17. entities.hashtags
18. entities.mentions
19. entities.urls
20. context_annotations
21. author.id
22. author.created_at
23. author.username
24. author.name
25. author.description
26. author.entities.description.hashtags
27. author.entities.description.mentions
28. author.entities.description.urls
29. author.entities.urls.urls
30. author.location
31. author.public_metrics.followers_count
32. author.public_metrics.following_count

33. author.public_metrics.listed_count
34. author.public_metrics.tweet_count
35. author.url
36. author.verified
37. geo.country
38. geo.country_code
39. geo.full_name
40. geo.geo.bbox
41. geo.geo.type
42. geo.id
43. geo.name
44. geo.place_id
45. geo.place_type

The tweets were then filtered by language (English), resulting in a set of 19,265 tweets. Upon importing the dataset to WordStat, the text analysis tool, the researcher must check that the fields and data are correctly read by the software. The field names are automatically capped at 10 characters. The researcher therefore renamed the fields to avoid having overlapping field names.

3.2 Pre-processing

Pre-processing is an essential, and typically the most time-consuming, element of handling Twitter data. It involves specifying to the software how best to handle the data at hand: which characters to use, which sections of text to include, and how to simplify words to render the results as consistent as possible.

WordStat offers the possibility of a more advanced preprocessor, allowing programmers to design and apply 'routines' such as python scripts. This goes beyond the scope of the current research; for the present work the section on stemming and lemmatisation was considered the most appropriate. These functions are designed to reduce the number of distinct words, resulting in more consistent groupings of keywords. Stemming simply reduces words to their bases or 'stems,' such that "running" becomes "run". However, it also risks grouping words that seemingly have the same stem but have distinct meanings, such as "universal," "university," and "universe" (Provalis Research, 2018). The creators of WordStat, Provalis Research, also note that both stemming and lemmatisation can have implications for sentiment analysis, citing the example of "improved" versus "improve": the former has been found to typically carry positive sentiment, while the latter tends to carry negative sentiment.

Lemmatisation performs a similar function, but takes context and meaning into account, such that "university" would remain "university". However, it is nonetheless a machine-developed selection, and threats to precision remain, such as overlooking exception words, or the aforementioned sentiment distinction.

Lemmatisation and stemming are mutually exclusive tools. WordStat allows the user to manually check and edit the substitutions made under lemmatisation, whereas stemming applies a pre-set and non-modifiable routine. The researcher therefore chose lemmatisation for the present work. The list of substitutions was reviewed, and adjustments were made such as allowing exception words ("species" should not become "specie"), American and British English equivalences ("neighbourhood," "organisation"), and European language interference ("Europa").

In the character recognition section, common relevant punctuation like hyphens were included, with the specification that they be processed if embedded in a word, such as "ex-mining" (Provalis Research, 2018). Words that contain numbers are automatically ignored by WordStat. Given the array of icons and emojis that were incorrectly processed during the tweet collection, this processing option was maintained. For the purposes of processing the tweet content, all remaining text was included in the analysis.

For the present work, there is no variable that requires greater weighting than others.

3.3 Cleaning

Following Cody et al. (2015), retweets were not deleted from the dataset, to "ensure an appropriately higher weighting of messages authored by popular accounts (e.g. media, government)" (p. 3).

Running the keyword frequency analysis in the software's 'expert mode' provided a useful starting point for cleaning the data, i.e., removing tweets that were not relevant to the present study. WordStat allows the user to choose a keyword from the results list and review all the tweets containing that keyword. By exploring the

words in context, the researcher is able to identify whether the word is relevant enough to be a keyword: a word like "table" might occur very frequently, but may not carry significance for the given research. The researcher reviewed all words that appeared more than 10 times in the dataset and removed keywords from the list that did not carry significant meaning for this project.

The researcher can choose to substitute certain words with others. This was the case for several words that included an "n" before them, an apparent technical error in the conversion of tweet texts to processable data. As such, a word like "nif" was listed as a keyword due to the erroneous inclusion of an "n" before "if". By instructing the software to substitute all instances of "nif" with "if," the word was automatically reallocated to the 'stop words' category (common words that structure a sentence, such as "the," and should be ignored), and was therefore excluded from the keywords.

This keyword-in-context exploration additionally allows the user to identify entire topics and tweets that do not belong in the dataset. For example, the presence of words like "Tory," "[Amelia] Womack," or "Brexit" allowed the researcher to identify extensive series of tweets concerning the UK's departure from the EU and the UK's Green Party. Brexit tweets had to be examined particularly carefully, as while some were merely comments on Brexit itself (a common tweet was "EU ministers give Brexit deal green light"), others were commentaries on the EU Green Deal through a Brexit lens, and therefore needed to remain in the dataset. The second common irrelevant topic regarded fundraising for sexual transition operations. By noting down the case numbers of each irrelevant tweet, both through the keyword-in-context tool and the case filter, the researcher was then able to return to the data panel and manually eliminate them from the dataset. The final dataset includes 17,940 tweets.

3.4 Data structure and analytical tools

Some fields, including the tweet texts, were stored as 'documents'. Transforming these into 'string' variables, i.e., a series of values separated into units to be analysed as text, allows this data to be filtered and to be applied to naming cases. The 280-character limit imposed by Twitter meant that each case fit comfortably

within WordStat’s 1000-character limit for string data. The researcher converted the tweet text, context annotations, entity annotations, and entity hashtag variables from documents into string variables to trial this, while maintaining the full text document versions of these variables as well.

Context and entity annotations are labels allocated by Twitter to tweets and their surrounding data. Entities can be a person, place, product, organisation, or other. Context labels are more numerous, such as politicians, interests and hobbies, countries, or emergencies and events.

Converting the tweet text documents to string variables resulted in the content being analysed in the same format as the 'entity annotations', excluding verbs and most nouns, which are central to understanding the conversation around the Green Deal and redistributive mechanisms. The researcher therefore chose to use the 'document' formats for these fields.

VI. Results and discussion

The data indicate that most tweets were about the EU Green Deal overall, and less about the SCF and JTM specifically. This therefore expands the scope of the research and the questions to be answered. This section discusses the findings of how twitter users responded to the EU Green Deal.

1. Responses to the EU Green Deal

1.1 Keywords

In Expert Mode, WordStat enables a detailed processing of the most common words from the dataset. Stop words from the default categorisation model are automatically excluded. The researcher manually excluded further words that did not belong in the dataset.

The dominant keywords were understandably "EU Green Deal," "EU," "Climate," "Green," "Energy," "Europe," and "Deal". Figure 6 indicates the top 10 keywords.

	FREQUENCY	% SHOWN	% PROCESSED	% TOTAL	NO. CASES	% CASES	TF • IDF
EUGREENDEAL	12364	6.36%	3.51%	1.87%	12287	69.88%	1924.1
EU	7563	3.89%	2.15%	1.14%	6160	35.04%	3444.9
CLIMATE	6123	3.15%	1.74%	0.92%	4987	28.36%	3350.7
GREEN	3343	1.72%	0.95%	0.50%	3103	17.65%	2518.2
ENERGY	3113	1.60%	0.88%	0.47%	2303	13.10%	2748.1
EUROPE	2379	1.22%	0.68%	0.36%	2012	11.44%	2239.7
DEAL	2356	1.21%	0.67%	0.36%	2227	12.67%	2114.2
CITIES	1737	0.89%	0.49%	0.26%	1218	6.93%	2013.9
TRANSITION	1688	0.87%	0.48%	0.25%	1619	9.21%	1748.5
EUROPEAN	1665	0.86%	0.47%	0.25%	1536	8.74%	1762.7

Figure 6: Presence and relevance of the Top 10 keywords from the full dataset of tweet texts.

The frequency column indicates the number of times the word occurred: for example, "EU Green Deal" occurred more than 7 times as often as "Cities". The **%** Shown calculates the word's relative presence in terms of the final selection of words seen in the list, whereas % Processed is a calculation based on all words analysed. The % Total is even broader, including all non-excluded words. The % Cases indicates the relative number of cases that contain the keyword.

Finally, TF-IDF stands for term frequency weighted by inverse document frequency. A word that occurs often in a tweet is likely to be indicative of the tweet's topic or content. However, if the same word occurs often in several tweets, the word becomes less pertinent or discriminating (Provalis Research, 2021). This indicator therefore analyses the relevance of keywords, taking into account their presence across all tweets (Provalis Research, 2021, p. 156). For this reason, while "EU Green Deal" is the most frequent keyword, it does not have the highest TF-IDF; this position is instead held by "Climate".

For a given term or keyword TF is the term's frequency in a given document divided by the document's total number of terms. IDF is the logarithm of the total number of documents in the corpus/dataset divided by the number of documents that contain the term. The resulting formula (Karabiber, n.d.; Ramos, 2003) is:

$$TF = \frac{\text{number of times the term appears in the document}}{\text{total number of terms in the document}}$$

$$IDF = log\left(\frac{\text{total number of documents in the corpus}}{\text{number of documents in the corpus that contain the term}}\right)$$

$$TF\text{-}IDF = TF * IDF$$

For the purposes of this research the most relevant fields are % Shown, % Cases, and TF-IDF, as together they indicate:

- The keywords' presence in relation to the other keywords
- The keywords' presence in terms of the total tweets
- The keywords' relevance

The keyword results become more interesting, i.e., indicative of the conversations' focus, once the dominant expected words are removed, illustrated below in Figure 7. The researcher filtered not only the top keywords mentioned above, which were both frequent and expected/unsurprising, but also other keywords that were frequent and did not provide additional insight into the conversation: "European," "Sustainable," "Year," "Today," and "Climate Action".

	% SHOWN	% CASES	TF • IDF
CITIES	1.22%	6.93%	2013.9
TRANSITION	1.19%	9.21%	1748.5
COMMISSION	1.13%	9.01%	1678.3
FITFOR	0.90%	7.00%	1485.1
FUND	0.80%	6.18%	1379.7
NEUTRAL	0.77%	6.14%	1328.0
SUPPORT	0.75%	5.97%	1311.2
CHANGE	0.64%	5.11%	1185.4
ENVIRONMENT	0.64%	5.01%	1184.4
MISSIONCITIES	0.61%	4.67%	1160.4
PLANET	0.59%	4.66%	1126.2
FOOD	0.59%	3.22%	1252.0
EUCLIMATEPACT	0.58%	4.69%	1097.4
ACTION	0.56%	4.49%	1075.3
FUTURE	0.55%	4.40%	1071.5
WORLD	0.53%	4.24%	1042.0
EMISSIONS	0.53%	4.08%	1039.4
HORIZONEU	0.51%	3.78%	1042.5
SMART	0.51%	4.06%	1004.6
HYDROGEN	0.50%	3.12%	1080.0
PROJECTS	0.50%	3.94%	1001.3
TRANSPORT	0.50%	3.30%	1051.4
WORK	0.49%	3.81%	999.4
FOSSIL	0.49%	2.93%	1062.5

	% SHOWN	% CASES	TF • IDF
STRATEGY	0.47%	3.30%	1000.1
GLOBAL	0.47%	3.46%	968.3
PEOPLE	0.45%	3.53%	930.7
GAS	0.45%	3.18%	951.0
CLEAN	0.41%	3.28%	863.6
MOBILITY	0.41%	2.64%	918.7

Figure 7: Presence and relevance of the top 30 keywords from the full dataset of tweet texts, excluding common and expected keywords regarding Europe, climate, and sustainability.

The following themes emerge from the filtered keywords. In each category, the keyword with the highest TF*IDF is underlined.

- Policy: Transition, Fitfor[55], fund, EU Climate Pact, Horizon EU
- Context: Cities, mission cities, food, smart, transport, work, mobility
- Actors: Commission, people, global, world, planet
- Energy: Neutral, emissions, hydrogen, fossil, gas, clean
- Response: Action, future, projects, strategy

Figure 8: Word cloud of the keywords from the full dataset of tweet texts, excluding common and expected keywords regarding Europe, climate, and sustainability.

The five themes above are further reflected in the word cloud algorithmically developed by WordStat, in Figure 8. Loureiro and Alló (2020) found a similar array of keywords, but theirs included weather, warming, wildfires, and climate change effects, which did not emerge from the present results.

1.2 Topics

The researcher developed an indicative set of topic categories above (policy, context, actors, energy, and response), to help the researcher and readers identify the core concepts and domains communicated by the keywords, and the departure points for further investigation. However, this categorisation is limited to a subjective grouping of the top keywords. Programmes such as WordStat have topic modelling tools that enable them to identify core topics in a dataset. WordStat allows terms to be allocated to more than one topic. There are two means by which WordStat calculates topics: non-negative matrix factorisation (NNMF) and Varimax rotation: the former relies on probability, meaning results vary slightly with each run, while the latter can handle smaller matrices but produces identical results for a given dataset (Provalis Research, 2021, p. 178). For the present dataset the NNMF model was used, as it offers a greater possibility of wider applicability: being probabilistic, it considers how the given topics would emerge across contexts, not only in this specific data.

The researcher ran the NNMF twice and obtained two similar analyses of the top 10 topics. WordStat automatically names each topic, and the researcher modified some topic titles to render them clearer, such as changing VW (Volkswagen) to Vehicles. Nonsense characters or "n"-prefixed words were removed from the topic lists manually. Phrases that included these characters embedded within them were corrected outside of WordStat once the tables were exported. The two emergent topic lists were almost identical, but for one topic: the first list included a Climate change topic, while the second included a Food topic instead. Figure 9 includes the topic list with the keywords that defined it. Both the Climate change and Food topics are included for comparison.

TOPIC	KEYWORDS	COHERENCE
ENVIRONMENT PROGRAMMES	REACHED; LIFEPROGRAMME; AMBITIOUS; BILLION; PROGRAMME; ENVI; BUDGET; RELATED; PROJECTS; ENVIRONMENTAL; COUNCIL; FORNATURE; NEWS; OBJECTIVE; EUBIODIVERSITY; EUCOUNCIL; GREAT; ENVIRONMENT; DEAL; KEY; ENVI COUNCIL;	0.653
FUNDING	REPAY; NEXTGENERATIONEU; MEANS; FINANCE; GENERATION; RESOURCES; DIGITAL; STRONG; AMBITION; SOCIAL; PROPOSAL; COMMITMENT; DELIVER; FUND; EUROPE; PROPOSING; CLIMATE FUND; SOCIAL CLIMATE FUND; FINANCE THE SOCIAL CLIMATE FUND; GREEN AND DIGITAL; COMMITMENT TO REPAY; GENERATION TO THRIVE; GREEN AND DIGITAL EUROPE; MEANS TO MATCH THIS AMBITION; WITH OUR OWN RESOURCES PROPOSAL; SOURCES OF REVENUE; NEXTGENEU BORROWING FOR GRANTS; NEXTGENEU RECOVERY INSTRUMENT; GREEN AND DIGITAL RECOVERY; GREEN; MEANS NO NEW COAL; OIL OR GAS PROJECTS; RENEWABLE ENERGY GENERATION AND EXPORTS; GAS PROJECTS; NEXTGENERATIONEU GRANTS; REPAY THE BORROWING;	0.651
CITIES	EUMISSIONS; CITIES; MISSIONCITIES; SMART; NEUTRAL; INSPIRE; HORIZONEU; LEAD; FOLLOW; MEET; MISSION; SELECTED; INFO; CORK; CLIMATE; ANNOUNCE; CITY; EUROPEAN; NEUTRAL AND SMART; CLIMATE NEUTRAL; NEUTRAL AND SMART CITIES; MISSION FOR CLIMATE; EU MISSION FOR CLIMATE; HAPPY TO BE PART;	0.639
EQUITABLE	EQUITABLE; ERA; LEADERS; IMPLEMENT; FUEL; FOSSIL; END; RENEWABLE; WORLD; TRANSITION; CALLING; CALL; ENERGY; FOSSIL FUEL; RENEWABLE ENERGY; WORLD LEADERS; EQUITABLE TRANSITION; FOSSIL FUEL ERA; END THE FOSSIL FUEL ERA; ORGS CALL; ORGS CALL ON WORLD LEADERS; FOSSIL FUELS; PREVENT IRREVERSIBLE HARM; MASS SUFFERING; ELEPHANTS ARE KILLED EVERY YEAR; END TO MOST FORMS; EU AND TACKLE IVORY TRAFFICKING; IVORY IS OFTEN SOLD INTERNATIONALLY; LOSING WILDLIFE AT AN INCREDIBLE; UPDATE OUR RULES; ENERGY PERFORMANCE; ENERGY PERFORMANCE OF BUILDINGS; ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE; OFFICES; PUBLIC BUILDINGS; RENEWABLE AND LESS POLLUTING ENERGY; SYSTEMS FOR OUR HOMES; ENERGY EFFICIENCY; CALLING UPON WORLD LEADERS; ENERGY TRANSITION; ENERGY; COR RAPPORTEURS; SECURE ENERGY; BOOST ENERGY EFFICIENCY; ACCELERATE TRANSITION TO AFFORDABLE; ENERGY SOVEREIGNTY; COR RAPPORTEURS EXPLAIN; SUSTAINABLE AND SECURE ENERGY; FUND CLIMATE; FUND A JUST TRANSITION; BILLION IN GOVERNMENT SUBSIDIES; DESTROYS OUR LIVES; DOLLARS TO FUND CLIMATE DENIAL; DOOMISM ON SOCIAL MEDIA; FOSSIL FUEL COMPANIES RECEIVE; THIS MUST END ASAP;	0.638
EFFORT	INVOLVED; LAUNCH; EUCLIMATEPACT; COMMITMENT; SAVE; PLANET; TODAY; CLIMATEACTION; AMBASSADORS; TACKLING; SAVE OUR PLANET; AND WE COUNT; BUT EUROPE ALONE WON'T; SAVE OUR PLANET; FIGHTING FOR THE CLIMATE; WORK WITH INDIA; A GLOBAL EFFORT; PATH TO CLIMATE NEUTRALITY; YOUNG PEOPLE; EUCLIMATEPACT LAUNCH; ENERGY; LAUNCH EVENT; DEDICATION TO SAVE OUR PLANET; GET INVOLVED TODAY; COMMITMENT; PASSION;	0.625
ATTENTION	ATTENTION; MISS; CHANCE; PROPOSALS; OPEN; WORKING; REGISTER; CALL; INFO; WORLD; SUSTAINABLE; INNOVATIONFUND; ENERGY; EUGREENDEAL CALL;	0.591
CLIMATE CHANGE* (NNMF first results)	GRETATHUNBERG; CLIMATEEMERGENCY; CLIMATECHANGEISREAL; GREENRECOVERY; CLIMATECRISIS; CLIMATEACTIONNOW; CLIMATEACTION; CHANGE; CLIMATE CHANGE;	0.439

TOPIC	KEYWORDS	COHERENCE
HEALTHY FOOD* (NNMF second results)	AGRIOUTLOOK; SAFE; SECURE; HEALTHY; EUROPEANS; FIGHT; PRODUCE; NATURE; AMBITION; FOOD; PROTECT; CHANGE; CLIMATE CHANGE; HEALTHY FOOD; FIGHT CLIMATE CHANGE; AMBITION TO FIGHT CLIMATE CHANGE; NATURE AND PRODUCE HEALTHY FOOD; NWE NEED TO SECURE SAFE; LATEST EUROBAROMETER; SUSTAINABLE FOOD; FOOD FIT FOR THE FUTURE; FOOD LABELS; FOOD LABELS TO SHOW SUSTAINABILITY; IMPROVED ACCESS TO SUSTAINABLE FOOD; LATEST EUROBAROMETER ON MAKING; FIT FOR THE FUTURE; COR RAPPORTEURS; COR RAPPORTEURS EXPLAIN; SECURE ENERGY; SUSTAINABLE AND SECURE ENERGY; BOOST ENERGY EFFICIENCY; ACCELERATE TRANSITION TO AFFORDABLE; ENERGY SOVEREIGNTY; BASED SOLUTIONS; FOOD PRODUCTION; EUSOILS STRATEGY SHOWS; FIGHT POLLUTION; FOUNDATION OF OUR FOOD PRODUCTION; HEAL OUR SOILS; REGULATE OUR CLIMATE; SOIL HEALTH LAW; SOIL HEALTH; ENERGY; BASED SOLUTIONS IN A NATURE; VITAL ROLE OF NATURE;	0.620
ENERGY AND EMISSIONS	RULES; GUIDELINES; AID; REVISION; PROTECTION; SYSTEM; STATE; INVESTING; ENERGY; MAJOR; PROPOSING; REACH; ELECTRICITY; ACCELERATE; GOAL; INFRASTRUCTURE; STEP; ROLE; SUPPORTING; ENSURE; REDUCE; EMISSIONS; REVISED; FULL; ENVIRONMENTAL; FUTURE; ENVIRONMENTAL PROTECTION; STATE AID; ENERGY INFRASTRUCTURE; REDUCE EMISSIONS; GUIDELINES ON STATE AID; ENERGY PERFORMANCE; ENERGY PERFORMANCE OF BUILDINGS; ENVIRONMENTAL PROTECTION AND ENERGY; EU RULES; ENERGY EFFICIENCY; EUROPEAN NETWORKS; EU RULES ON TRANSPORT; EUROPEAN NETWORKS FOR ENERGY; ELECTRICITY SYSTEM MORE SUSTAINABLE; ENERGY INFRASTRUCTURE OF THE FUTURE; ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE; EUGREENDEAL GOAL OF CLIMATE NEUTRALITY; GOAL OF CLIMATE NEUTRALITY; WE ARE PROPOSING A REVISION; REDUCE EMISSIONS AND HELP REACH; OFFICES; PUBLIC BUILDINGS; RENEWABLE AND LESS POLLUTING ENERGY; SYSTEMS FOR OUR HOMES; MAJOR STEP; STATE AID RULES; COR RAPPORTEURS; FULL ROLE IN SUPPORTING; SECURE ENERGY; BOOST ENERGY EFFICIENCY; ACCELERATE TRANSITION TO AFFORDABLE; ENERGY SYSTEM; COR RAPPORTEURS EXPLAIN; SUSTAINABLE AND SECURE ENERGY; ENERGY; ENERGY SOVEREIGNTY; CLEAN TECHNOLOGIES TO BE PLUGGED; CUT EMISSIONS; EUGREENDEAL IN A COST; A MAJOR STEP TO ENSURE; IMPORTANT STEP FORWARD; INCLUDING OFFSHORE WIND; STEP FORWARD; INCLUDING OFFSHORE WIND; CARRY THROUGH THE GREEN DEAL; EU COMMISSIONER BRETON; CUT EMISSIONS; TELLING THE TRUTH;	0.270

Figure 9: The main topics emerging from the full dataset of tweet texts, under an NNMF analysis. "Climate change" and "Healthy food" emerged in the first and second results set respectively.

Coherence (the normalised pointwise mutual information (NPMI)) measures the weighted average of the word correlations associated with a topic (Provalis Research, 2021, p. 179). This calculates the mean of the semantic relationships ('mutual information') between pairs of topic words ('points'), which are benchmarked ('normalised') against an external, apparently representative corpus. In most programmes the external corpus is Wikipedia (Du and Pielström, 2021).

The most coherent topic is Vehicles, whereas the least coherent is Energy and Emissions. In order to render the other topics more coherent, they would need a much narrower set of keywords, which would require the categories to be

manually created. To do this well, the researcher should know the content well, to produce categories that are meaningful for the data being analysed. Alternatively, the researcher builds frames with pre-assigned keywords (as in Hopke, 2015; Hopke and Hestres, 2018; and Roxburgh et al., 2019), if specific dynamics or tensions are being investigated, and if the researcher knows that these topics will be covered in the data. The scale of the present data, both numerically and in the exploratory, relatively unknown nature of the content, mean that it was not feasible to manually create methodologically-reliable categories.

The majority of the topics are self-explanatory. Below is a summarisation and categorisation of the concepts covered in the larger topics:

The Equitable topic covers the following equity issues:

1. Nature: Wildlife and landscapes
2. Individuals: Mass suffering, climate belief and denial, doomism
3. Institutions: Organisations, world leaders, fossil fuel companies, CoR (Committee of the Regions) rapporteur
4. Energy: Energy security, sovereignty, and affordability
5. Regulation: The energy performance of buildings directive, public buildings, homes

The Healthy Food topic addresses:

1. Nature: Nature, pollution, soil health
2. Food access: Agriculture, safety and security, access
3. Energy: Energy efficiency, sovereignty
4. Regulation: Labelling and regulation, soil regulations, CoR rapporteur

The topic's scope suggests a regional interest in how local soils, food accessibility, markets, and fuel to obtain these are handled in relation to external actors and local impacts.

The Energy and Emissions topic includes:

1. Access: Investment, affordable
2. Communication: CoR rapporteur, truth

3. Infrastructure: Infrastructure, emissions, performance, buildings, network, offices, homes, clean technologies, wind
4. Regulation: EU rules, guidelines, system, state aid and rules, protection

WordStat's algorithm had initially named the Energy and Emissions topic as State aid, suggesting an overall nation-state thread in the conversation around energy. If so, this might mean that the discussion is less about household or individual costs, preferences, and effects, and more about top-down policy changes. The presence of the Energy topic is far greater than the 1.44% of tweets and retweets about energy demand and policies in Spain and 2.66% in the UK, found in Loureiro and Alló (2020). However, like in Loureiro and Alló, the Energy topic in the present study is led by renewable energies.

The Funding topic has a strong institutional emphasis, including programme/ investment initiative names, and official actions or terms such as "strong," "ambition," "proposal," "commitment," and "deliver".

Energy, government actions, and food emerged as salient topics in Camarillo et al.'s (2021) study as well, accompanied by "people" and "help". While the Effort topic echoes "help," the topics in the present study are decidedly more institutional, structural, and programmatic. This is possibly in part because Camarillo et al. extracted their topics from within an already narrower category of 'action tweets', whereas the present topics are extracted based on the entire dataset.

Shangguan et al. (2021) developed a much more extensive dataset and used machine learning analysis, which would have contributed in part to having both a wider and more specific set of emergent topics, such as inter- and intra-generational sustainability, government and corporate responsibility, and community collaboration. It would be interesting to develop coding frames to attempt to corroborate their findings.

	% CASES	TF • IDF
CITIES	34.58%	2927.7
FUNDING	37.09%	2706.6
EFFORT	31.62%	2988.0
EQUITABLE SYSTEMS AND INSTITUTIONS	29.80%	2837.6
ENERGY	34.52%	2127.7
EUROPEAN ENVIRONMENTAL PROGRAMMES	33.76%	2169.4
CLIMATE CHANGE	27.07%	2598.1
ATTENTION	27.43%	2275.7
HEALTHY FOOD	21.30%	2490.9
VEHICLES	6.03%	3496.5

Figure 10: The percentage of tweets that include a term listed in a given topic's keywords, and the TF-IDF measure of each topic using the NNMF model.

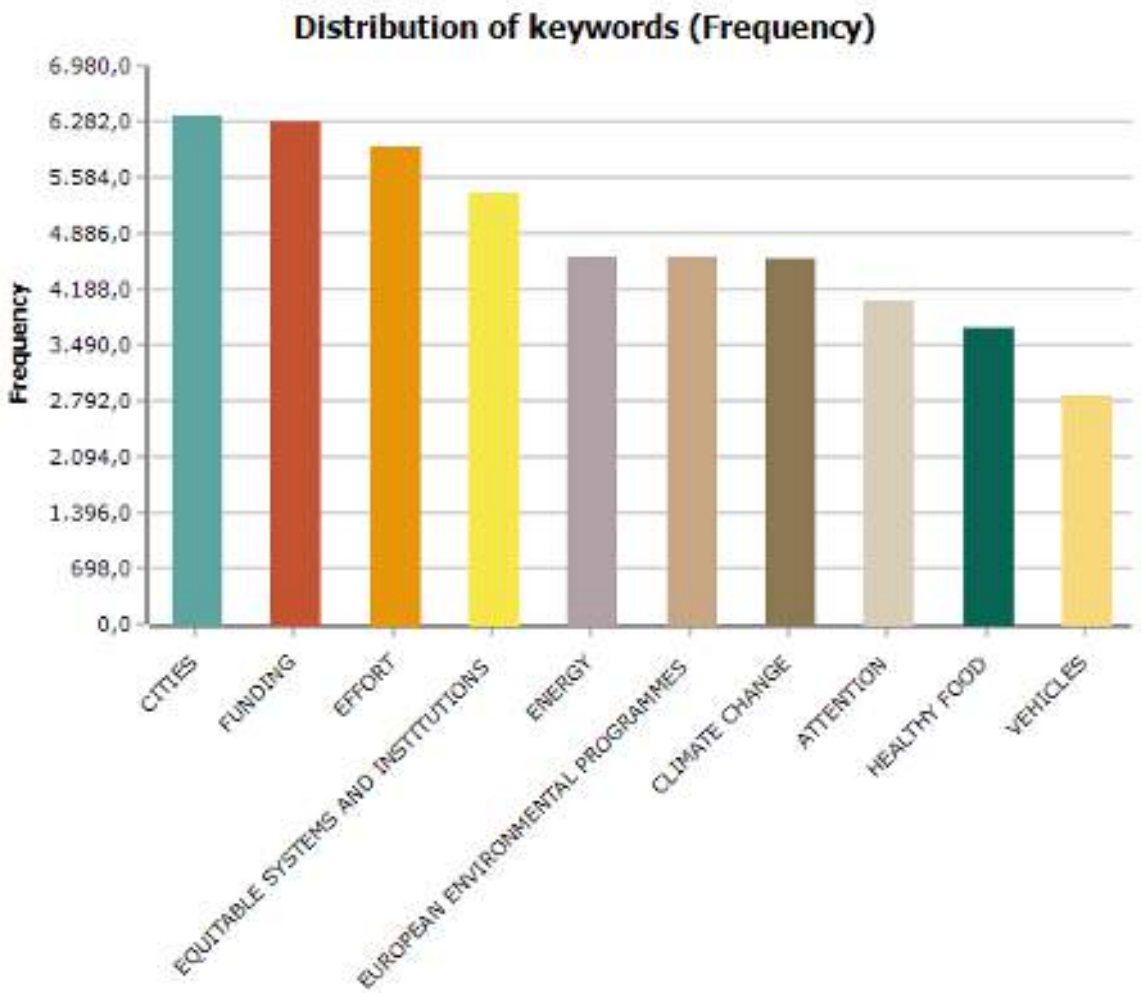

Figure 11: The frequency distribution of keywords from the tweet dataset, grouped by topic.

1.3 Hashtags

The dataset includes an 'entity hashtag' field. By removing the structuring words (such as "tag"), the most common hashtags across the dataset can be analysed.

	% SHOWN	% CASES	TF • IDF
EUGREENDEAL	29.76%	69.87%	1922.8
FITFOR	3.10%	7.00%	1485.1
CLIMATEACTION	2.61%	6.16%	1310.9
MISSIONCITIES	2.09%	4.65%	1157.8
EUCLIMATEPACT	1.98%	4.68%	1094.3
CLIMATEACTIONNOW	1.96%	4.63%	1086.2
EU	1.86%	4.27%	1057.6
CLIMATE	1.57%	3.67%	934.1
CLIMATECHANGE	1.55%	3.66%	924.9
HORIZONEU	1.55%	3.65%	922.9
CLIMATEEMERGENCY	1.36%	3.22%	844.6
GREENRECOVERY	1.29%	3.05%	813.6
CLIMATECRISIS	1.24%	2.93%	790.7
ENVI	1.10%	2.59%	722.1
EUBIODIVERSITY	0.97%	2.29%	660.8
ENERGY	0.95%	2.13%	660.1
FORK	0.93%	2.09%	651.5
HYDROGEN	0.89%	2.10%	620.4
SCF	0.88%	2.08%	617.1
CLIMATECHANGEISREAL	0.84%	1.97%	591.5
GRETATHUNBERG	0.83%	1.96%	589.0
CLIMATENEUTRALEU	0.77%	1.82%	556.8
RENEWABLES	0.77%	1.82%	556.8
CIRCULARECONOMY	0.77%	1.80%	554.6
EUFARM	0.75%	1.65%	552.6
EUMISSIONS	0.65%	1.54%	491.1

	% SHOWN	% CASES	TF • IDF
ENERGYTRANSITION	0.62%	1.46%	471.6
EUSPACE	0.61%	1.43%	464.6
EARTHDAY	0.60%	1.33%	467.6
ELECTRICVEHICLES	0.60%	1.41%	459.0

Figure 12: The top 30 hashtags from the full tweet dataset.

Three main themes emerge from the dominant hashtags:

1. EU initiatives, policies, and bodies: EUGreendeal, Fitfor[55], Missioncities, EU, HorizonEU, Greenrecovery, ENVI (Environment, Public Health, and Food Safety Committee), EUBiodiversity, Fork, SCF, ClimateneutralEU, EUFarm, EUMissions, EUSpace
2. Climate change belief, denial, and action: Climateaction, Climate, Climatechange, Climateemergency, Greenrecovery, Climatecrisis, Climatechangeisreal, Gretathunberg, Circulareconomy, Earthday
3. Energy, which aligns with both the EU and climate change categories: Energy, Hydrogen, Renewables, Energytransition, Electric Vehicles

Excluding the EUGreendeal and Fitfor55, which were expected as they were explicitly searched for in the data collection, the top 10 hashtags are almost perfectly divided between the EU and climate change categories. Kirilenko and Stepchenkova (2014), too, found that all the hashtags across the six languages studied were relevant to climate change, implying a tight focus in the Twitter conversation.

It is interesting that even with the dominance of EU policy hashtags, climate and climate action remain highly present. This in part echoes Loureiro and Alló's (2021) findings that across the dataset the most common hashtags concerned climate change and climate, and that the top three hashtags in the UK and Australia included climate action. Given the high UK presence in the present study as well, this might suggest a potential Anglo-Saxon emphasis. However, in Loureiro and Alló's study the most common hashtags overall also included extreme weather events, similar to their 2020 findings on weather, wildfire, and climate effect

keywords, which was not the case in the present study. It would seem that the Twitter conversation around the EU Green Deal has not developed a link between the everyday impacts of climate change and the policies designed to address it.

1.4 Location

Geotagging provides a precise name or coordinates to the location from which a tweet was sent. As noted in the review in Section V.1, a minute percentage of users geotag their tweets: in the present study, 0.46% included geolocation. This is even lower than the under 2% of climate change tweets geolocated in Roxburgh et al. (2019) and 0.82% of English-language climate change/global warming tweets geolocated in Kirilenko and Stepchenkova (2014). However, many users insert their general location at the time of creating their account. The Twitter dataset therefore includes a 'user location' field, which can offer an indicative idea of the tweets' geographical distribution.

The researcher first ran the frequency calculations using WordStat's default dictionary/categorisation model to identify the place names that emerged. Three key challenges arise from the place list. Firstly, irrespective of the language of the tweet, users might insert their stable account location in their own language. Secondly, users can choose the level of specificity when inserting their location. Thirdly, some might insert fictional or satirical locations. These resulted in a combination of locations such as:

- Belgium
- Belgio
- Bruxelles
- Madrid
- PA
- Europa
- Lower Saxony
- 12 Mount St
- Third Rock
- World

Furthermore, WordStat picked up certain characters or words that formed a part of several place names, such as "low," "los," "republic," or "united". These cannot be straightforwardly categorised, and need to be categorised using proximity rules. Proximity rules instruct the software to allocate a case to a given category if it matches certain rules. Thus, given specific instructions by the researcher, "united" will be allocated to the USA category if the case also contains "states".

The researcher therefore began by using the frequency list to build a dictionary/ categorisation to sort the immediately evident words. The researcher then returned to the frequency list and used the 'keyword in context' tool to understand how each ambiguous place name was used. These term-specific lists were exported as individual files and used as reference points to build the several proximity rules that would allow all the terms to be categorised correctly. The final categorisation model can be found in Appendix A.

	% SHOWN	% CASES
EUROPE	81.74%	49.73%
NORTH_AMERICA	7.48%	5.31%
ASIA	4.22%	2.23%
WORLD	2.78%	2.21%
AFRICA	2.65%	1.44%
AUSTRALASIA	0.74%	0.55%
LATIN_AMERICA	0.39%	0.34%

Figure 13: The user account location of each tweet in the dataset, categorised by continent.

	% SHOWN	% CASES
BELGIUM	35.84%	22.03%
UK	8.35%	5.56%
USA	6.24%	4.54%
GERMANY	6.02%	3.80%
SPAIN	5.25%	3.39%
ITALY	4.28%	2.48%
FRANCE	3.31%	2.33%
REPUBLIC OF IRELAND	2.24%	1.35%
NETHERLANDS	2.19%	1.57%
INDIA	1.65%	0.99%
GREECE	1.52%	1.00%
FINLAND	1.50%	0.94%

	% SHOWN	% CASES
POLAND	1.28%	0.80%
AUSTRIA	1.14%	0.67%
CANADA	1.14%	0.70%
EUROPEAN	1.05%	0.93%
PORTUGAL	0.94%	0.71%
CROATIA	0.84%	0.40%
GLOBAL	0.82%	0.73%
SWITZERLAND	0.77%	0.59%

Figure 14: The user account location of each tweet in the dataset, categorised by country.

The category World (Figure 13) includes all tweets that gave a world/global/planet location. The categories European and Global (Figure 14) reflect those tweets that mentioned Europe or the world in some form respectively.

As expected, the tweets are dominated by Europe, and specifically Central Europe: Belgium (the headquarters of the European Commission and Council), Germany, Spain, Italy, France, and the Netherlands. Ireland is an interesting exception, with several tweets mentioning regional debates or initiatives. This is likely due to the English-language search favouring English-language tweets from the EU, for which Ireland is the perfect candidate. These results partially corroborate Camarillo et al.'s (2021) findings: they found that the EU countries that contributed more than 1% of the total climate change tweets were Spain, Germany, the Netherlands, Italy, and France, in descending order. The present results have a slightly different order compared to Camarillo et al.'s, as well as a dominant Belgian presence, which is to be expected given the EU policy focus (compared to Camarillo et al.'s broader climate change focus).

While every attempt has been made to eliminate irrelevant tweets, it is likely that there is a disproportionate number of tweets from the USA, the UK, and Germany. The former two arise in part from the English-language bias, and in part from tweets regarding domestic policy that match the same keywords as the present search. Future work on this study could identify a more secure way to ensure that search results match the queried term identically.

The surplus German tweets are largely owed to #SCF tweets regarding the football club SC Freiburg. In any Twitter research study there are unexpected double meanings for the queried hashtags, and the researcher manually eliminated as many of these as possible. In the present case, one could re-run the search query, explicitly excluding Freiburg. However, this is not always possible, particularly in the case of studies that stream the tweets rather than collecting them from the archive.

1.5 Users

Studies that focus on the nature of users (the type of organisation, political party, news outlet, job, family, etc.) begin with a different search query than the present study, typically filtering tweets by user, rather than by content. Given the present study's search query, there is relatively limited scope to identify the users' precise nature. However, in addition to the user locations discussed above, two important metrics are available: whether the user is verified or not, and the terms used to describe themselves in their Twitter bio (a short description on each user's profile).

Verified accounts are those for which Twitter has undertaken background verification of a notable account's authenticity. They are therefore typically more public, high-profile accounts, for which it is important to have an assurance of their genuineness. It is important to note that official organisations are not by default verified accounts; rather, many verified accounts are individuals, given the need to ascertain the veracity of celebrity or influential figures' tweets. However, by extension one can argue that verified accounts, with their higher profile, offer an image of the potentially most 'visible' or 'followed' content.

VALUE	FREQUENCY	TOTAL PERCENT
UNVERIFIED	15866	90.2%
VERIFIED	1713	9.7%

Figure 15: The percentages of tweets by unverified and verified users.

KEYWORD	UNVERIFIED	VERIFIED	KEYWORD	VERIFIED	UNVERIFIED
TESLA	100.00%	0.00%	EUROPEDAY	27.46%	72.54%
HYDROGENNOW	100.00%	0.00%	DUBLIN	23.45%	76.55%
PSA	100.00%	0.00%	RESULT	22.89%	77.11%
DAIMLER	100.00%	0.00%	AMBASSADOR	22.09%	77.91%
ELECTRICVEHICLES	100.00%	0.00%	INSPIRE	21.39%	78.61%
VOLVO	100.00%	0.00%	PARTNER	19.55%	80.45%
ELECTRICCARS	100.00%	0.00%	BLUEECONOMY	19.53%	80.47%
VW	100.00%	0.00%	BRUSSELS	19.47%	80.53%
ELECTRICCAR	100.00%	0.00%	ANSWER	19.27%	80.73%
GREENHYDROGEN	100.00%	0.00%	MORNING	18.88%	81.12%
EVS	100.00%	0.00%	MINISTER	18.82%	81.18%
CLIMATEACTIONNOW	100.00%	0.00%	COMMISSIONER	18.18%	81.82%
BMW	100.00%	0.00%	FORNATURE	18.18%	81.82%
CLIMATECHANGEISREAL	100.00%	0.00%	CAPTURE	18.03%	81.97%
CLIMATEEMERGENCY	99.82%	0.18%	DEBATE	18.01%	81.99%
GREENRECOVERY	99.63%	0.37%	QUESTION	17.96%	82.04%
GREENNEWDEAL	99.52%	0.48%	EUSPACE	17.86%	82.14%
GRETATHUNBERG	99.45%	0.55%	PROGRESS	17.69%	82.31%
BELGIQUE	99.21%	0.79%	STORY	17.56%	82.44%

Figure 16: The top 20 keywords by unverified and verified users.

There is an immediately noticeable distinction between the terms used by unverified versus verified users (Figure 16). Unverified users' tweets are heavily dominated by the Vehicles topic, which might be a result of advertising. Interestingly, this topic is not at all shared by verified users' tweets.

Conversely, most verified users' tweets concern official or institutional topics: the European Union, ambassadors, partners, Brussels, ministers, commissioners, and debates. They also emphasise key institutional 'narrative' words such as "inspire," "answer," "progress," and "story". Crucially, however, verified users do not dominate the usage of any of the key terms, with the exception of a slight

dominance in the use of the word "Union". This reflects the overall greater proportion of unverified users in the EU Green Deal conversation.

Figure 17: A word cloud of the terms most used in the user bios of the tweets in the dataset.

Within this verified/unverified distribution, users nonetheless appear to be predominantly from a context or background strongly associated with the EU Green Deal. The word cloud (Figure 17) illustrates the relative proportion of words used in user bios.

Europe and Brussels evidently dominate, followed by the Commission and then keywords specific to climate policy and the EU Green Deal. Terms like "director," "PhD," "head," "research," "innovation," "EUI" (European University Institute), "science," and "official" indicate the academic or 'high' professional nature of most of the users tweeting about the EU Green Deal. "News" is relatively large, suggesting that the other set of key tweeters on the topic consists of news outlets.

Stier et al. (2018) had a much narrower dataset and dedicated coders to manually distinguish between twitter users as political elites and professional media versus political activism and citizen journalism. This allowed them to then identify the nature of the content being addressed by each type of actor. They found that the former placed greater emphasis on institutions, political decision-making, and established actors, while the latter emphasised specific actions and goals, and critiques of actors involved. The present study does not have the appropriate tools

to conduct the same analysis, but a similar task could be undertaken to identify different approaches to the EU Green Deal.

2. Responses to the JTM and SCF

The tweets were filtered to include only those that mentioned the following keywords: '"just transition," "ETS," "EUETS," "social climate fund," or "SCF". After removing irrelevant tweets, 762 cases remained. This dataset will be hereinafter referred to as the 'redistribution dataset' or 'redistribution tweets'.

Throughout this section, illustrative tweets will be included to provide examples of the findings. These are included without their corresponding usernames for data protection reasons. The inclusion of these tweets is the product of repeated and thorough readings of the redistribution dataset, and a response to calls for broader trend analyses to be complemented by qualitative, focused analyses that capture nuance, variety, and detail (Pearce et al., 2014; Beer, 2012).

2.1 Keywords

The word cloud below (Figure 18) illustrates the relative presence of keywords in the redistribution tweets. The researcher removed the expected terms, including "social," "climate," "fund," "EU," "Europe," "just transition," "EU Green Deal," "ETS," "EUETS," and "green".

As with the analyses performed on the wider EU Green Deal dataset, the frequency analysis of the redistribution dataset revealed similar findings, namely the focus on European programmes, financing, carbon, and transitions. However, it also demonstrate the diversity of actors and dynamics involved at this more focused level: terms such as "Greenpeace," "borrowing," "haveyoursay," "resources," "ambition," "EUBudget," "territorial," and "repay" stand out as significant terms that were not dominant in the wider dataset. They provide initial insight into the civil society organisations, citizen involvement initiatives, procedural mechanisms, and financial concerns that emerge in the debates around the JTM, SCF, and ETS.

Figure 18: Word cloud of most common terms in the redistribution tweet dataset, excluding common and expected keywords regarding the EU, the ETS, SCF, JTM, and Green Deal.

	TERM	FREQUENCY	RATE PER 10K
1	FINANCE	149	53.7
2	REPAY	148	53.3
3	DIGITAL	130	46.9
4	RECOVERY	117	42.2
5	CARBON	113	40.7
6	NEXTGENEU	112	40.4
7	TRANSPORT	102	36.8
8	PROPOSAL	97	35.0
9	NEXTGENERATIONEU	91	32.8
10	AMBITION	85	30.6
11	RESOURCES	84	30.3

Figure 19: Top 11 terms in the redistribution tweet dataset, excluding common and expected keywords regarding the EU, the ETS, SCF, JTM, and Green Deal.

The table in Figure 19 offers a more concentrated lens on the core concepts that dominated the redistribution tweets. It includes the top 11 keywords, given the

overlap between "NextGenEU" and "NextGenerationEU" (keywords 6 and 9). The emphasis on financial aspects is immediately noticeable (keywords 1 and 2). We then see that the SCF, JTM, and ETS debates are embedded in the European "Recovery" (keyword 4), which is tied to "digital transformations" (keyword 3).

"With the #NextGenEU recovery instrument, Europe's green and digital recovery is already underway. Today, we are proposing three new sources of revenue for the #EUbudget, to help repay the #NextGenEU borrowing for grants and finance the Social Climate Fund."
Illustrative tweet 1: Green and digital recovery and related financing.

"Recovery and Resilience Facility #EUSolidarity Priorities 1: Green Transition 2: Digital Transformation #EUGreenDeal = #DigitalEU 3. Economic Cohesion, Productivity, Competitiveness 4. Social and Territorial Cohesion 5. Institutional Resilience 6. Policies for the Next Generation."
Illustrative tweet 2: Recovery priorities, including green transition and digital transformation.

"We want the next generation to thrive in a strong, green and digital Europe. So we need the means to match this ambition. With our Own Resources proposal, we deliver on our commitment to repay #NextGenerationEU and finance the Social Climate Fund."
Illustrative tweet 3: Green and digital next generation and related financing.

The "Transport" (keyword 7) is emphasised due to its rootedness in the expansion of the EU ETS to include road transport and building heating. This is in turn tied to the "Resources" question (keyword 11), specifically the European Commission's 2021 Own Resources proposal. This proposal is inextricable from the core issues in the present research: the Commission proposes using ETS revenues and the EU carbon border adjustment mechanism (CBAM) as two among three pillars of internal revenue generation to repay NextGenerationEU and finance the Social Climate Fund.

While the above tweets were relatively consistently advocating or announcing policies, the "Ambition" tweets (keyword 10) spanned these domains and illustrated different purposes:

"The #EU needs to readjust the #ETS in line with its 2050 #netzero #emissions ambition and make sure rest of economic sectors also deliver on the goal, Shell's David Hone

argues in this video. #climatechange #EUGreenDeal #ClimateNeutralEU with @Shell_EUAffairs"

Illustrative tweet 4: Ambition as a benchmark.

"The European #steel industry reiterates its call upon the #EU #ENVIcouncil discussing the #Fitfor55 Package: urgent action is required to avoid that #ETS and #CBAM as currently designed become a Trojan horse for the EU's own climate ambitions. @EUCouncil"

Illustrative tweet 5: Ambition as a threat.

"The proposal to introduce the #CBAM border tax is a response to the persistent differences in levels of ambition worldwide with increased EU #climate ambitions and; risk of #carbonleakage in the EU. Check in #GO250 report. #EUGreenDeal #EUETS #CO2"

Illustrative tweet 6: Ambition as varying globally.

"Tomorrow | CBAM - How do we ensure that we cut emissions - not move them? join us to discuss the challenges faced by the #CBAM to ensure EU Green Deal ambitions can truly avoid carbon leakage. find out more and register here: [link] supported by @yara #ETS"

Illustrative tweet 7: Ambition as a goal.

"The European Green Deal is likely to significantly impact carbon prices under the EU ETS. We are proposing to initiate a multi-client study to investigate how carbon prices respond to changes in ambition and scope. Find out more: [link]"

Illustrative tweet 8: Ambition as an independent variable.

2.2 Coding

Coding involves allocating codes or 'labels' to pieces of textual or visual material, whether algorithmically or manually. The researcher undertook a thorough process to develop the codes with which to analyse the redistribution tweets. Unlike the wider EU Green Deal dataset, the data was limited enough to permit the researcher to study the full set and create the codes accordingly, involving creating and testing two different coding frameworks before finalising the codebook.

The first trial was entirely inductive, i.e., building the set of codes directly through the data. This has the advantage of drawing out specificities and complexities in the text, but also risks creating an overabundance of excessively detailed codes

(Linneberg and Korsgaard, 2019). This is precisely what occurred with the researcher's first codebook.

The second trial was blended: the codes were first created deductively, i.e., outside of the dataset and then applied onto the tweets, rather than emerging from the tweets. The researcher designed the codes by building on their extensive reading of the European documentation around the Green Deal, SCF, JTM, and JTF. These documents allowed the researcher to recognise what actors, contexts, and specific domains shape the topics. Linneberg and Korsgaard (2019) highlight the prevalence of blended approaches, and recommend adopting this flexibility. Codes were therefore added or merged where necessary.

The full codebook, with descriptions and keywords, is available in Appendix B. The codes are divided into six categories that enable an analysis of the dynamics involved in a given tweet:

1. Purpose: Whether a tweet's aim is to inform, advocate, or critique
2. Context: The JTM, SCF, and ETS
3. Actor: The actors creating, or referenced/implied in, a tweet
4. Nature: How the actors are implicated, e.g., blame or praise
5. Focus: The specific domain(s), such as funding or environment
6. Outcome: The implied or expected outcome of a tweet's content: societal loss or gain, greater participation, or change to the present system

The notable 'inductive' changes included:

- All Citizens was added under Actors to allow for tweets that didn't specify vulnerable or privileged citizens
- Raw Materials was added under Focus
- Participation was added as an Outcome to account for tweets that did not express gain, loss, or system change, but rather elicited public involvement; this often overlapped with the "all citizens" code
- CBAM was split into Taxation and Carbon Leakage to accommodate tweets that mentioned only one, and to highlight the slight distinction between domestic and international framing.

Following Roxburgh et al. (2019), Hopke (2015) and Hopke and Hestres (2018) tweets were taken as the unit of analysis. Given their restricted length (maximum 280 characters), they are typically the length of a sentence.

The redistribution tweets were uploaded to the Provalis programme QDA Miner, chosen for its compatibility with WordStat. The tweets were manually coded by the researcher. The co-occurrence and distance of various codes can then be analysed to understand the relationships between topics, actors, stances, etc., and specific cases can be investigated in more detail to understand the underlying messages.

The majority of the allocations are 'objective,' such as mentions of specific actors, programmes, or concepts. The Nature and Outcome categories involve more subjective understandings. The present research is being conducted for a university dissertation, and therefore must be independently conducted. Outside of the context of this task, the coding shall be repeated with a second coder, the allocations compared, and the inter-coder reliability tested (Roxburgh et al., 2019).

2.2.1 Code frequencies

After completing the coding, the researcher tabulated the code frequencies using QDA Miner. This section reports the main results of this tabulation. The full frequency tree of the redistribution tweets is available in Appendix C.

Purpose

Information and Advocacy tweets are each over twice as common as Critique tweets, suggesting an overall positive lens on the redistributive mechanisms. It might additionally suggest a slightly more 'projection'-based approach rather than one based on responding to others' tweets.

Context

The tweets were relatively equally divided between the JTM, SCF, and ETS: 27.7%, 34.8%, and 37% of the cases respectively. The ETS is dominant, reflecting the aforementioned evolutions involving the Own Resources proposal and the

debate around extending the ETS to road transport and building heating. Its close association with the SCF likely explains their close proportions.

Actor

European institutions and politicians were by far the most common actor in the redistribution tweets, including tweets published by, about, or directed at these actors. This is not surprising, given the dominance of European institutional keywords and topics evidenced in the EU Green Deal data analysis. It also aligns with Carrasco Polaino et al.'s (2021) finding that the most active accounts were administration and public bodies, followed by NGOs, foundations, and activists.

It is important to note the impact of language in these results: being an English-language search query, the resulting tweets are likely to have a greater proportion of English-language outlets, whether news media, academics, or institutions. These in turn are likely to speak about events and actors at the European level, while more specific national responses might not emerge if tweeted about in local languages.

"Putting a price on carbon can be part of the solution, but it must bring winter cheer rather than winter fear. Here's what the Social Climate Fund needs to do - looking at you #ENVI ministers."

Illustrative tweet 9: Calling on Ministers on the European Environment Council.

"Minister @TimoHarakka and MEP @JytteGuteland met today in Brussels and discussed about #Fitfor55 package and especially sustainable maritime transport / winter navigation. #EU #ETS #FuelEUMaritime"

Illustrative tweet 10: Reporting on a Minister of the European Parliament's meetings.

"EU environment ministers discussed the #Fitfor55 package at a Council meeting earlier today, including the extension of ETS to road transport and ; buildings, and EU proposals for stricter emissions limits on cars and vans. So where did the countries land on these topics?"

Illustrative tweet 11: Investigating and reporting on EU Environment ministers' responses.

"Social fairness is at the heart of the #EUGreenDeal. Today, we put forward guidance to help EU countries address the employment and social aspects of the green transition. Our goal: to ensure no one is left behind and enable people to make the most of new opportunities. #SocialRights."
Illustrative tweet 12: Announcement by a European institution.

These were followed by national references. This included countries' MEPs' responses to given proposals, conversations about or within a given national context, and broader references to the national level in general.

"We are pleased to inform that EMRA has been appointed as the Managing Authority for the EU #JustTransition Fund in Ireland. @Dept_ECC has launched a public consultation as part of the development of Ireland's Territorial #JustTransition Plan. #HaveYourSay: [link]."
Illustrative tweet 13: Domestic actions in Ireland related to EU programmes and policies.

"EU countries are split over the social climate fund – some think it's unnecessary, some think there's not enough money. The one thing they agree on: they don't like the Commission's proposal."
Illustrative tweet 14: Reporting on member state responses to the SCF.

"@rahmstorf To be more specific: * accelerate #fitfor55 in DE * accelerate cap system on all fuels + social compensation * accelerate #cbam, EU industry does get all their allowances for free. * be generally bolder"
Illustrative tweet 15: Discussing implementing EU programmes and policies in Germany.

"Lithuania is sceptical about extensions to the emissions trading scheme and vulnerable households must be taken into consideration. Therefore, the social climate fund is key but may not be enough, according to the country's representative."
Illustrative tweet 16: Reporting on Lithuania's response to the EUETS2 and SCF proposals.

Despite the SCF and JTM's supposed policy focus on supporting vulnerable households, enterprises, and regions, the proportion of references to them was strikingly low: 3.15% of the cases for Vulnerable Citizens and 0.3% for Small Businesses. The Vulnerable Citizens cases concerned heating and fuel costs for poorer households, in line with Maestre-Andrés et al.'s (2019) finding that publics in the studies reviewed were most concerned about household disposable income and fuel poverty for poorer households, slightly ahead of the burden distribution between firms and households. Indeed, as regards firms, in the present study just

under 2% of cases referenced the 'polluter pays' concept or allocating responsibility to industry actors.

While Maestre-Andrés et al.'s review found only one study referencing responsibility for future generations, future generations constituted 10% of the redistribution dataset codes. This could be partly attributed to the connection with the NextGenerationEU programme, but also included calls for youth projects and responses to fossil fuel transition areas.

"On #EarthDay we urge leaders to speed up the green transition and ensure a #JustTransition! The EU must: Maintain strong support for a truly transformative #EUGreenDeal Use tax revenues to protect the most vulnerable. read our joint NGO letter"

Illustrative tweet 17: Using tax revenue to protect the most vulnerable.

"@KatharineKlaca wrote a policy paper on "The Future of Energy Poverty: Will the Social Climate Fund be enough for a just transition?" in which she mentions, for example, that a just transition to a green economy is one that leaves no one behind."

Illustrative tweet 18: A policy paper on energy poverty and the SCF.

Nature

Duty was the most frequent way in which actors and mechanisms were spoken of, spanning 21.4% of cases, compared to Praise, the next highest at 12.3%. Both categories were taken relatively broadly: the former covered instances of "need to," "must," and implicit references to responding to a sense of duty to others; the latter included any positive tone when referencing an actor or mechanism. In addition to examples above, such as Illustrative tweet 12, the following two examples demonstrate invocations of duty.

"Don't fall in the trap of opposing social to sustainability", @TimmermansEU urges @EP_Environment when discussing the consequences of the war in Ukraine on the #EUGreenDeal agenda. stresses need to go on with the green transition and at the same time #LeaveNoOneBehind."

Illustrative tweet 19: Frans Timmermans invoking a collective duty to continue with the green transition and leave no one behind.

"The fact that the @EU_Commission puts more focus on social and labour dimensions of the #EUGreenDeal is good news for @etuc_ces, but for the coalition just

recommendations to EU states is weak, legislation to make sure affected workers receive adequate support and quality jobs is needed."

Illustrative tweet 20: Suggesting a European Commission duty to support affected workers.

Interestingly, Burden was referenced the least, at 4.2% of cases. This is in line with the low references to Vulnerable citizens and Small businesses among the actors.

Focus

Echoing the term/keyword frequency results, the Funding/Investment focus was the most present, at 29.1% of the cases. Less immediately intuitive is the relatively high presence of the Equity focus, with 21.8%, considering the low proportions of Vulnerable Citizens, Small Businesses, and Burden codes. This is likely because Equity included references to addressing or improving overall fairness, whether generational, compensational, environmental, (#LessFeedMoreFood), or transitional (#LeaveNoOneBehind).

The Equity case count (the number of cases containing a given code) aligns almost perfectly with that of the Duty code: 166 and 163 respectively, and both covering 3.1% of the codes.

The case count data does not indicate overlap in content. For this, the researcher checked the codes' Jaccard Similarity scores. In QDA Miner, the Jaccard Similarity score ($\mathbf{J}$) measures the similarity between two sets of codes by dividing the overlapping cases by the total number of cases in the two codes. Matches and non-matches are weighted equally (Provalis Research, 2020).

$$\mathbf{J} = \frac{\text{Duty} \cap \text{Equity}}{\text{Duty} \cup \text{Equity}}$$

Indeed, the results reveal Equity as the coding pair with the strongest Jaccard Similarity score in terms of the similarity between Duty and all other codes. It is also the second-highest similarity score when all Nature codes are analysed with all other codes. The highest scoring pair, at 0.619, was Blame and Loss. This is expected, as most cases that assign blame imply that the action in question entails an overall loss for society.

The results do not mean that the two codes occur identically. Rather, their Jaccard score is 0.489, whereas perfect alignment would be a score of 1. While the two codes co-occur within a case 108 times, they each occur 58 and 55 times respectively *without* the other code.

Outcome

It is interesting to note that the greatest percentage of tweets implied a societal Gain (34.3% of the cases). The next highest was System Change, i.e., those that saw a need for, or reported on, a change to the current status quo (27.4%). These will be examined in more detail in the following sections.

Tweets regarding webinars, surveys, events, etc. constituted the Participation outcome code, which constitutes 19% of the cases. The lowest proportion (13% of cases) were the tweets coded with Loss, i.e., those that referred to a current decision, stance, policy, or mechanism resulting in an overall loss to society.

The implications of these could be encouraging: provided the policies are overall valid, they suggest that Twitter users see them either as beneficial, or are advocating for the changes they seek, while fewer see overall losses. We cannot know the true rate or quality of participation in response to the calls for participation.

2.2.2 Cluster analysis

Creating concept maps in the co-occurrence section of QDA miner involves applying a co-occurrence or similarity index on a series of cases or codes followed by hierarchical clustering and multidimensional scaling (Provalis Research, 2020). The former develops a hierarchy of 'groups' based on the 'distance' or difference between pairs of data in different sets, and thus the overall (dis)similarity between the two sets (Nielsen, 2016). Multidimensional scaling involves transforming these relative similarities/dissimilarities into physical points in a geometric space based on the 'distance' between the data; in this case, codes (Zhang and Takane, 2010).

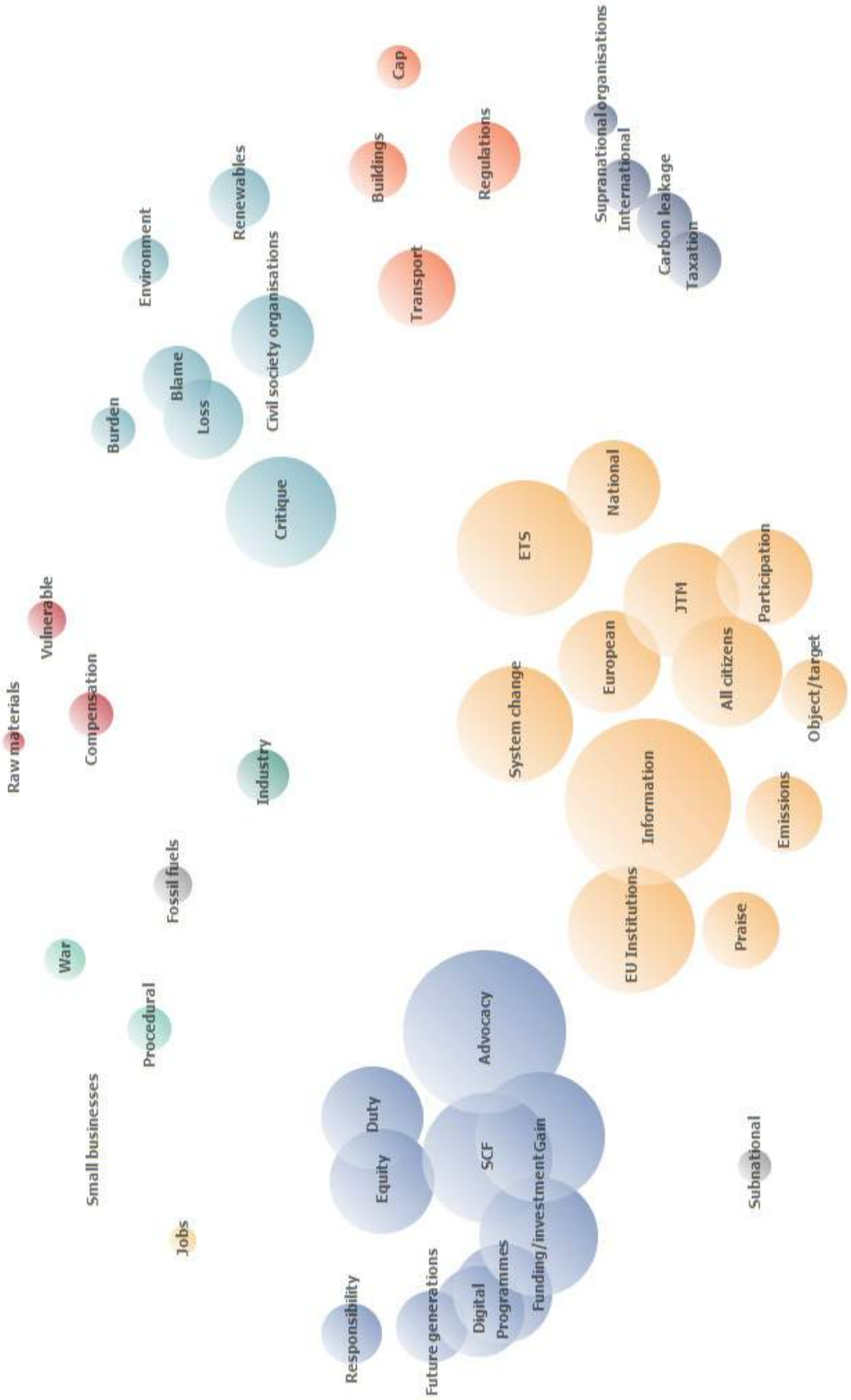

Figure 20: Concept map for the codes used to analyse the redistribution dataset.

The analysis was performed across all codes in the redistribution dataset, and the level of proximity was set to individual tweets. A low tolerance factor (0.000001) and high maximum iterations (500, i.e., the number of permutations the algorithm can attempt before finalising the most accurate map) were set to enable higher accuracy.

QDA Miner offers four possible indices for analysing co-occurrences. Sorensen's coefficient was not chosen as it assigns double weight to code matches/co-occurrences compared to non-matches. Cosine theta takes into account the frequency with which a code appears in a case. This was irrelevant as the tweets were coded as wholes, given their short length. The Ochiai coefficient is appropriate for binary data (Provalis Research, 2020, p. 237). The researcher therefore ran the Jaccard coefficient.

Both classical scaling and randomised location modes were trialled. Classical scaling scales the initial similarity results and accordingly develops the multidimensional scaling. Conversely, randomised location chooses a random set of points on which to perform the multidimensional scaling. There was no difference in the composition or size of the clusters between the two resulting maps.

The concept map illustrates the clusters, indicated by colour, and their levels of (dis)similarity, indicated by their relative overlaps with or distance from each other. The creators of QDA Miner warn of possible distortion emerging from the multidimensional scaling, as a result of the programme attempting to plot data points in two-dimensional space. Data points that belong in the same cluster or belong near each other might therefore be erroneously placed far from each other (Provalis Research, 2020, p. 241).

This is possibly the case in the placement of Fossil Fuels, Subnational, and Jobs, which are placed far from the rest of their respective clusters (Figure 20).

The SCF cluster (dark blue) highlights the proximity between Equity, Duty, and the SCF, as would be expected. The SCF is also closely tied to Advocacy and Gain, suggesting overall positive associations. Responsibility is suitably near Equity and

Duty, as well as to Future Generations, which in turn are closely associated with Digital and Programmes, reflecting the co-occurrences in tweets about the EU's multi-pronged recovery (see Illustrative tweets 1-3). It is interesting to note that financing and funding are associated with overall gain, suggesting that they are seen as investments in society rather than costs.

One notices that the SCF and ETS are in two different clusters, despite their inherent linkage. The ETS's (yellow) proximity to System Change and more loosely to Critique, while SCF firmly overlaps with Gain, hints at a decisive division in how users perceive the two mechanisms: one more favourable and welcomed, the other more critiqued or targeted to be modified. The National code is closest to the ETS, reflecting national actors' larger presence in the Twitter conversation about the ETS proposals.

The EU Institutions-Information proximity can be explained by the tweets by or about EU institutions reporting on decisions, proposals, debates, and responses. This aligns with the proximity of the Object/Target code, highlighting that a number of the tweets about the JTM were neutral.

Praise is closest to the EU Institutions code, and indeed, there were no tweets actively praising other actors. The implication is that users' responses are divided between those that critique or seek to change the policy and those that praise it, but that both sets of responses are largely centred around the relevant European institutional actors.

The light blue cluster stands out as divided between perceptions/tones and concepts, whereas the other two large clusters are more concept-heavy. This is due to the large proportion of tweets by, or targeted at, civil society organisations (particularly Greenpeace), critiquing their stance on renewable energies and the environmental destruction involved in producing solar panels or wind turbines, and promoting nuclear power. These were therefore also coded as Loss and Blame.

"@Greenpeace "…#RenewableEnergy is now the cheapest source of power in much of the world, cheaper than polluting fossil fuels.." so, what is #greenpeace waiting for? #CleanAirNow #Energiewende #eugreendeal #GreenNewDeal #JustTransition #climate #climatechange #ClimateEmergency #ClimateCrisis"
Illustrative tweet 21: Calling on support for clean and cheap energy.

"@FinancialTimes @greenpeace Destroying the environment to save it. #Energiewende #eugreendeal #GreenNewDeal #JustTransition #climate #climatechange #ClimateEmergency #ClimateCrisis #ClimateCrisis #ClimateJustice #cop26"
Illustrative tweet 22: Environmental impacts of renewable energies.

"@Greenpeace Faux-#greens attack #coal leaving aside natural #gas (a fossil fuel, methane: worse than CO2). #climate #climatechange #ClimateEmergency #climatecrisis #ClimateStrike #ClimateStrikeOnline #ClimateAction #justtransition #EUGreenDeal #energiewende #cop26 #wind #renewables"
Illustrative tweet 23: The omission of natural gas from fossil fuel critiques.

"@Greenpeace @EmmanuelMacron Faux-greens want to replace carbon-free nuclear with intermittent #renewables(bird-choppers/and-intensive monstrosities backed up by #coal/oil/#gas to compensate intermittencies). #climate #climatechange #EUGreenDeal #JustTransition #GreenNewDeal #ClimateEmergency #ClimateAction"
Illustrative tweet 24: Environmental impacts of renewable energies.

Aside from the Environment/Renewable theme, Loss and Blame are equally close to the Burden code; this is understandable, as instances of communities or regions bearing a burden are likely to be seen as a loss to society, and are likely to have the blame assigned to a particular actor event.

"Implicitly, the Social Climate Fund will be fully funded by the #ETS2 revenues, while revenues from the existing one will repay EU debt. good for the optics, as it does not give the impression that EU citizens repay EU debt through their heating/fuel bills.. 5/13"
Illustrative tweet 25: The use of the ETS2 revenues.

"For Greece, the inclusion of road transports and building in the ETS may have social impact that cannot be covered by the climate social fund"
Illustrative tweet 26: The potential social impact of the ETS2 in Greece.

"3/3 unfortunately, micro and small enterprises have been also included in the @EP_Transport opinion as possible recipients of the Social Climate Fund. While they

surely can also be affected by the rising energy and fuel prices, enterprises can seek money from other programmes."

Illustrative tweet 27: Different types of enterprise and the SCF.

"Followed the #Fitfor55 debate in the environment council today – what was obvious for me overall is that the social argument (rising prices for citizens) is increasingly being weaponised to delay real progress on the climate emergency – #JustTransition is being hijacked"

Illustrative tweet 28: Discussing citizen impacts of the JTM in the Environment Council.

"The dysfunctional, unreformed #ETS system cannot be transposed to other industries. If the #Fitfor55 package contains solutions to the detriment of citizens, we will take all legal action to veto them. - said Minister @moskwa_anna during the latest #ENVI Council in 2021."

Illustrative tweet 29: Poland's response to the ETS2 proposal.

Tweets coded to Burden, Loss, and Blame included cases such as those above, concerning the ETS2 proposal and who would bear the burden of higher transport and building heating costs. While Transport and Buildings are in a separate cluster, they are closer to the Critique code than the Praise code. This will be explored further in the following section.

The grey cluster (with Fossil Fuels and Subnational farther away) presents an interesting set of dynamics. It is conceptually anchored by Carbon Leakage, Taxation, and Fossil Fuels. The first two are the codes that constitute the CBAM category/code, and the third is central to the CBAM's aims and functioning, i.e., to prevent higher emission goods from competing with those in Europe that face more stringent emissions regulations. It makes sense therefore that this be closely aligned with the International code. The Supranational code is largely composed of tweets that referenced World Trade Organisation compliance in relation to the CBAM. These responses suggest that amidst a general European focus, a minority of users are responding to the policies by situating them in the wider global context.

"I wonder if the CBAM revenue would be better off going 100% into the social climate fund. Builds support for the carbon border tax by directly linking it to a popular policy. But would that be WTO compliant?"

Illustrative tweet 30: Discussing the use of CBAM revenues and WTO compliance.

"#Germany’s new government supports strengthening #EUETS (incl. 60€ floor price) w EU ETS f. #buildings+#transport and #CBAM, but 2 conditions: 1/ in line with WTO, +2/ exports to be addressed (+efforts of. climate clubs) state secretary @P_Graichen at #ENVI Council #Fitfor55"
Illustrative tweet 31: Discussing conditional German support for the ETS2 and CBAM.

The placement of the Subnational code may not in fact be a distortion. Its positioning between the dark blue and yellow clusters, containing EU Institutions, Information, Future Generations, Programmes Advocacy, and Funding, seems to reflect the tweets offering information or calls for projects for young people and/or coal regions, thereby justifying the conceptual link with Fossil Fuels, and the physical placement away from the grey cluster.

"Important information for #coalregionsWBUA #justtransition #EUGreenDeal @Energy4Europe"
Illustrative tweet 32: Information for coal regions.

"Call for proposals to organise, manage a call for projects dedicated to young people (15-24) from #coalregionsEU eligible for #JustTransitionFund #EUGreenDeal #justtransition @energy4Europe @euinmyRegion Apply 31.01.22 #EUTeens4Green #EUYearofYouth"
Illustrative tweet 33: Call for proposal to manage coal region youth projects.

2.2.3 Targeted policy responses

The concept map and its analysis built a strong starting point from which to analyse perceptions of the JTM, SCF, and ETS. However, given the experiments nature of multidimensional scaling, the results may not fully reflect true proximity.

Proximity plots build on the Jaccard similarity scores to accurately and graphically represent the relationships between chosen terms. Using proximity plots the researcher mapped the coded responses to the JTM, SCF, and ETS using three code pairs: Advocacy-Critique, Praise-Blame, and Gain-Loss. The proximity table with the full set of values referred to for this section is available in Appendix D.

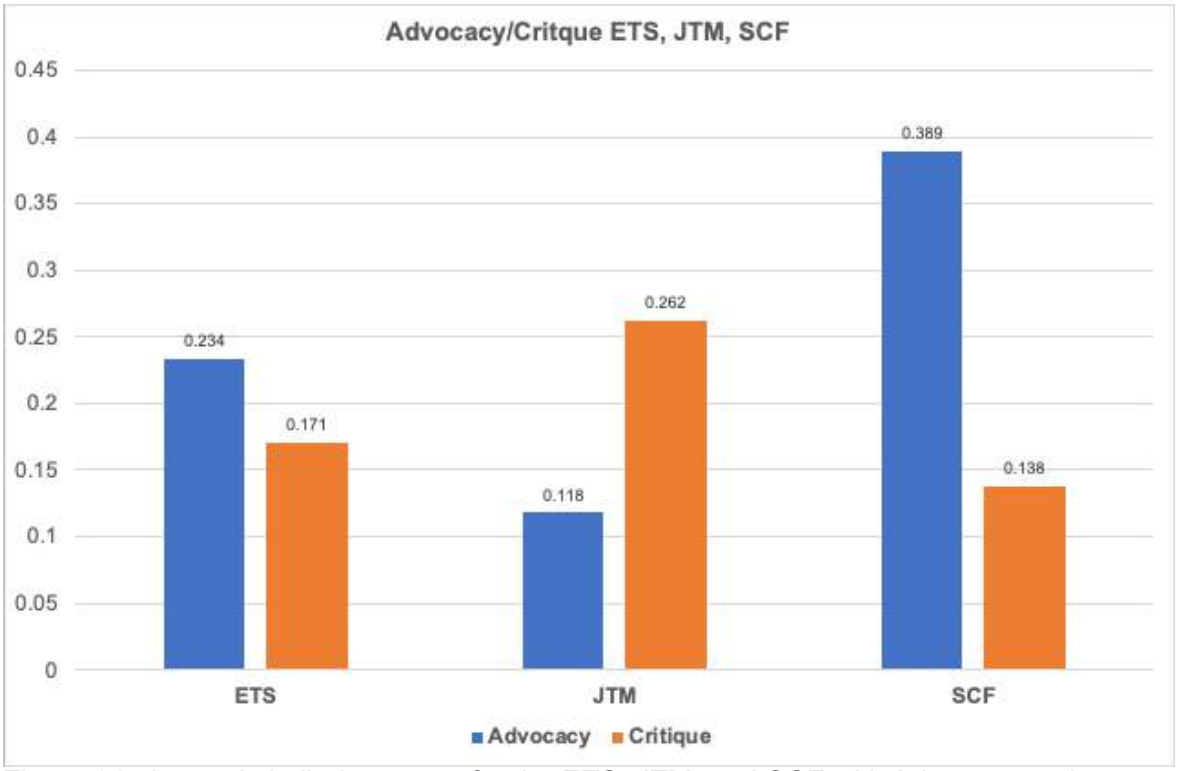

Figure 21: Jaccard similarity scores for the ETS, JTM, and SCF with Advocacy and Critique.

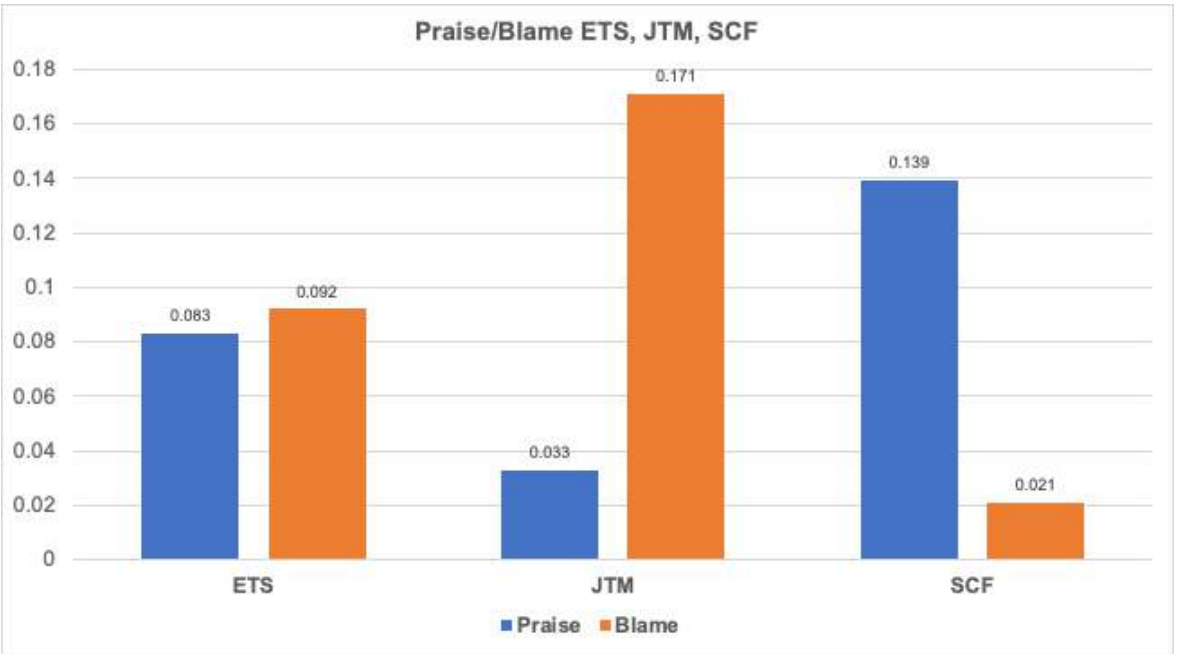

Figure 22: Jaccard similarity scores for the ETS, JTM, and SCF with Praise and Blame.

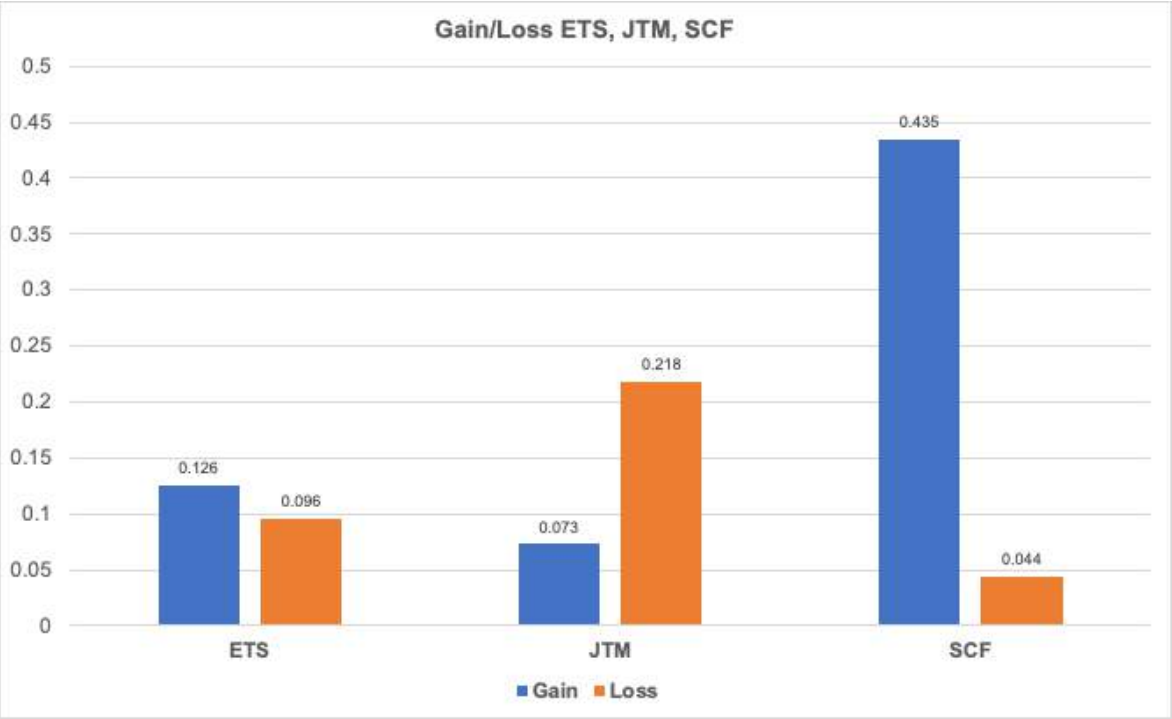

Figure 23: Jaccard similarity scores for the ETS, JTM, and SCF with Gain and Loss.

SCF

The Social Climate Fund emerges as the most consistently 'positively' viewed: advocated almost 3 times as much as it was critiqued, praised almost 7 times as often as it was associated with blame, and associated with gain more than 11 times as often as it was associated with loss. An inspection of the Critique tweets associated with the SCF reveals that the results include some tweets that involved advocating for the SCF while critiquing the ETS2. Conversely some of the Advocacy tweets were coded as advocating for the policy in a modified form.

The SCF Praise and Gain tweets were almost exclusively by European institutional or political actors proposing, celebrating, or promoting progress and accomplishments in the policy development. As such their content is similar to official websites and press statements regarding the SCF.

Alongside the praise and gains, the critiques, blames, and losses remain present and clear. They span:

- Claims that the Fund is insufficient, both overall and in the allocations to member states)
- The Fund's overlap with other tools, specifically the ETS

- The Fund's potential procedural impacts, namely reopening the Multiannual Financial Framework
- The inclusion of micro and small enterprises
- Criticism of financing direct household income support
- Allegations of inordinate ambitions or expectations of the Fund
- Criticism of the absence of new money and its dependence on the ETS2, with arguments that the ETS2 would further contribute to energy poverty.

JTM

The JTM presents almost the opposite results compared to the SCF. There are twice as many Critique tweets as Advocacy tweets, it is associated with Blame more than 5 times as often as it is associated with Praise, and it is associated with overall Loss more than thrice as often as Gain. One potential contributing factor is the possibility that the #justransition hashtag has become a mainstay of climate change policy debates, such that certain tweets included the hashtag even if not pointedly critiquing the European mechanism. As referenced earlier, some of the most pertinent critiques included those accusing the mechanism of "industrialising nature" through its clean energy transition plan.

The Praise, Gain, and Advocacy tweets included:

- Praise for ending JTF funding for fossil fuels
- Calls for greater investment and alignment with just transition principles
- Praising its ambition
- Promoting funds and projects that grow out of the JTM
- Advocating the EU's policy guidelines for implementing the just transition
- Calling on continued commitment during the war. As referenced earlier, there was criticism of the inclusion of fossil fuels in subsidies, and the harm to nature resulting from the production of renewable energies.

ETS

The ETS appears to have the most divided or balanced responses. Some of the principal critiques (those that specified a reason) were mentioned earlier, such as the potentially unforeseen or unmanageable costs to citizens, and the argument that the ETS masks a reality of citizens repaying EU debt through their fuel and heating costs. Others involved debates on European intervention in gas markets to

respond to higher energy prices (claimed to be associated with the ETS and carbon tax), and politicians allegedly supporting the interests of polluting industries in the ETS.

The tweets promoting the ETS included:

- Promoting it as essential for decarbonising road transport
- Publicising webinars on the need for the EU ETS2 to achieve Fit for 55 goals
- Calling for the use of ETS revenues for rail transport
- Celebrating a record high carbon price on the EU ETS as beneficial for a low-carbon circular economy
- The ETS's integration with social compensation
- Advocating the ETS as enabling us to attain higher climate targets while protecting the investment capacities of decarbonising industries

System change

There is significant overlap between the System Change codes and the others, as an Advocacy or a Critique tweet may contain a call for an alternative approach, or a Praise or Gain tweet may celebrate a change/shift in the system. Furthermore, the JTM, SCF, and ETS are inherently forms of pursuing 'system change', irrespective of different actors' perceptions of the mechanisms' success or the true extent of change. Nonetheless certain tweets stood out as actively discussing or proposing changes in behaviour, structures, or approaches.

"@autumngales @climatesolution @ITDP_HQ @ITS_UCDavis A strict emission cap on all fuels + social compensation (never forget this) does both: nudge people into EV and make them drive less. Makes sure the quantity that counts is reduced. In DE this might come 2026, in EU with #fitfor55 a bit later. support this if you can!"

Illustrative tweet 34: Reducing the "quantity that counts".

"@JavierBlas @HenriBontenbal High gas prices need to be solved, but much of this statement is a non-genuine stab at the #EUETS price, which is hardly part of the problem (see @EmberClimate chart). Current statement risks undermining a successful #Fitfor55 package and #EUGreenDeal. #EuropeanEnergyCrisis."

Illustrative tweet 35: Looking beyond immediate symptoms.

"Top tread. It’s the fundamentals, not the speculation. It’s the gas, not the ETS. It’s policy incoherence, not irrational exuberance of markets #EUETS #energycrunch #EUCO #fitfor55 #NetZero"

Illustrative tweet 36: Questioning underlying systemic shortcomings.

"To accelerate decarbonisation in hard-to-abate industries the "polluter-pays-principle" must rule in EU. Phaseout free allocation in #ETS to: - incentivise investments in green tech - reward companies taking action - create a level playing field #Fitfor55"

Illustrative tweet 37: Shifting responsibility.

"The @EU_Commisson published its guidance for a #JustTransition as part of #Fitfor55 this week. We welcome the recognition go #CommunityEnergy as a tool to empower citizens. But policy needs to avoid distributional impacts of the #EnergyTransition, not to provide band aids."

Illustrative tweet 38: Alleging and questioning temporary solutions.

2.2.4 Governments and institutions

This study began with the exploration of how industries and governments collaborated in the second half of the 20th Century to steer the narrative around climate change. Furthermore, as referenced in Section III, the responsibility assigned to, and levels of trust in, public authorities and companies can be among the factors contributing to policy acceptability. The findings here demonstrate low reference to industries in the redistribution dataset, but references to national and especially European institutions have led the findings across categories. This hence opens the field to investigate more qualitatively how responses to these actors manifest.

23% of the cases referenced government responsibility or duty, whether by government actors themselves or direct at them. 3.5% were in reference to state-level, whereas 19.6% concerned European institutions and politicians. This is significant, given that together these constitute almost a quarter of the cases.

The review in Section III also noted the importance of perceptions of government self-interest for policy acceptability. Very few cases implied distrust of government actions or interests (1%). Trust is tied to how the revenues of a given policy are used (Maestre-Andrés et al., 2019). This dataset contained particularly few

responses to how the ETS revenues ought to be used (2%). Of these, almost three quarters advocated using the funds for climate action, overwhelmingly for rail transport. The remainder was divided between using the revenues for poorer households' heating bills, and critiquing the use of ETS revenues to repay EU debt. The current results therefore do not seem to offer clear conclusions on a relationship between ETS revenue use and trust in government.

However, a significant finding was that 10% of the cases expressed low or no faith in the efficacy of the policies. It is worth noting that none of these concerned the SCF, but the combination of high responsibility allocated to governmental actors and visible, if minority, low faith in the policies opens useful avenues for investigating how these actors may respond.

VII. Conclusions

1. Key findings

Across the keywords, topics, and hashtags in the wider EU Green Deal dataset, there was a consistent prominence of the EU Commission, EU programmes and policies (including the Cities topic), and other institutional structures. These were accompanied by focuses on energy and funding, and the latter, too, had a strong institutional grounding. The Response topics and keywords, which focus on action, the future, projects, and strategies, highlight running themes of active response.

Food was less prominent, but aligned conceptually with Energy in terms of the parallel discourses around access, affordability, health, and environmental protection.

The presence of the Equitable Systems topic in the wider dataset prefaces its centrality in the mechanisms studied in the focused redistributive section, creating an encouraging thread of 'equity' through the dataset. Equity is shown to have a broad scope in the tweets, spanning environment, people, institutions, energy, and regulations.

Climate Action and Climate Change were the most common topics after Vehicles for unverified users, suggesting that the EU Green Deal conversation on Twitter is being broadly situated in its wider scientific issue. However, the absence of keywords and topics referencing specific challenges, events, or impacts of climate change potentially implies an overall detachment between the two.

The emphasis on funding and on governmental actors and programmes was reiterated in the dominant terms used by verified users and their formal or institutional terms and tone. Although the vast majority of users were unverified, the users were mostly from a European political or academic context.

Finance and programmes were further echoed in the keywords that emerged from the focused analysis of the redistribution tweets, studying the JTM, SCF, and ETS.

This aligns with the predominant purposes of the tweets in the dataset: to inform and to advocate.

As in the wider dataset, the tweets were mostly references to or by European political or institutional actors, followed by national actors. There is a linguistic bias in this result, by which national commentaries in local languages are by default excluded from the tweets.

The most salient relationships in the redistribution dataset concern Duty, Equity, and Praise. However, these were not accompanied by significant levels of specific references to vulnerable communities, polluter responsibility, or particular patterns of burden or distribution.

Gain was the most frequently coded outcome, followed by System Change, suggesting an overall constructive approach to the topics discussed. In the concept mapping the SCF codes were nearer to Gain and accompanying Digital, Youth, and wider Programmes, whereas the ETS was closer to System Change and Critique. What began as studying the SCF as a policy alone became studying two policies, given the visibly different responses to them in the data. The ETS responses were divided between on the one hand criticising the costs to citizens, citizens paying for EU debt, and supporting polluting industries, and on the other hand ambition, investment, and social compensation.

The SCF was mostly positively viewed, though much of this response was from European institutions. The critiques of the SCF included insufficiency and procedural difficulties. However, unlike the procedural challenges found in Maestre-Andrés et al.'s (2021) review, these concerned institutional actors, not publics directly.

There was a high proportion of critiques of the Just Transition in general, particularly regarding renewable resources and efficacy. There was advocacy for the Just Transition's projects, commitments, and ambition.

It seems that the two sides of the JTM responses (efficacy versus commitments and ambition) are strictly tied to the System Change analysis. This brings us back

to the underlying motivation for this research: to begin to understand citizens' mobilisation for system change, not merely "band aids" (Illustrative tweet 38), and more specifically, for system change that is just and equitable for the environment and humans.

By focusing on the SCF, JTM, and ETS, the data invited a focus on systems and responding to them. Active response seems to characterise the tweets, whether political through institutions, economic through funding or support, regulatory through implementation, strengthening, and compliance, or individual through participation in surveys, hearings, webinars, calls, and journalism.

Indeed, the System Change tweets offer a fascinating point of departure from which to study attitudes, responses, and actions, whether around behaviour, policy coherence, responsibility, or systemic problems. This research grew from the aims and promises of the JTM, SCF, and ETS, which have been reflected in the findings. At the same time, criticisms of the EU Green Deal and its embeddedness in a persistent structure of production, innovation, and consumption, and the possibilities of a 'third way' are not to be ignored (Ossewaarde and Ossewaarde-Lowtoo, 2020). This embeddedness is also geopolitical: while the SCF proposal heralds protecting those historically and presently most affected by climate change (European Commission, 2021c), the acceptance of climate refugees from outside the EU remains highly contested (Fornalé, 2020), while many European practices that foster these very crises remain unchanged (UN SDSN, n.d.; Ercin et al., 2021).

The findings here are important for studying how to improve the understanding and acceptability of climate mitigation policies, and particularly those that consider distributional inequalities and impacts. They are equally useful for signalling where the policy might be one step 'behind' a call for a deeper rethinking of society. These tweets were a minority, but research such as the present work may help to bring them to the forefront before they fall behind. If the rapidity and diversity of social media data can offer one thing in light of research like this, it might be to avoid innovative ideas being buried like those hidden under the fossil fuel industry narratives fifty years ago.

2. Further work

As referenced earlier, Twitter data can be complemented by comparing the results with survey data. Poortinga et al.'s (2019) work on the individual and demographic aspects affecting climate change perception in the European Social Survey provides an excellent starting point.

Contrary to expectations and to the studies discussed in Section III.2, the tweets in the dataset did not draw connections between the COVID-19 pandemic and the EU Green Deal or its mechanisms. It would be interesting to expand on the present research by building a search query that explicitly seeks these connections and complement the work already done on English and Spanish tweets by Loureiro and Alló (2020; 2021), Bostrom et al. (2020), and Camarillo et al. (2021).

Many of the factors influencing policy acceptability that were mentioned in Section III emerged in the tweets in the present dataset: tweets focusing on the immediate energy crisis and prices, or on member state SCF allocations, spoke to the temporal and spatial diffusion of costs and benefits; some called for innovation; some for inclusion; some reflected interest group lobbying (such as tweets by Shell or unions); and many reflected elite support, given the prevalence of institutional actors. However, none of these were extensive enough to run analyses and draw conclusions on policy acceptability. Further research would take selected parameters from these to obtain a tailored dataset and might follow work such as Loureiro and Alló (2020) in correlating the findings with the Eurobarometer data on energy policy or with other survey, socioeconomic, social, and preferential variables as in Loureiro and Alló (2021).

Search queries or coding frames built around users, rather than content, can offer an entirely different approach to the topic. Following Stier et al. (2018), it would be useful to test their findings on the division in content between citizen media and NGOs (emphasising action and goals, and critiquing complicit actors), and traditional media and political actors (emphasising institutions, policy, decision-making, and established actors). The latter seemed to begin to emerge from the unverified/verified user keywords, but this needs further corroboration.

The methodological section of this thesis explained the data's and results' reliance on the softwares used. The present research enabled the researcher to develop their first experiences with social media data collection and analysis. Further refinements and runs of this research will be strengthened thanks to the researcher having learned what data to obtain and how to use it based on their knowledge and experience of the software structures, potentialities, challenges, and limitations. Outside of an academic assessment context, this can be developed with colleagues, both to check reliability, and to merge skills across disciplines.

For example, WordStat's analytical tools include a sentiment analysis based on their in-built sentiment dictionary. However, for effective results, the dictionary must be re-constructed for a given topic. This is a form of developing machine learning and would need to be executed as a collaboration with more than one researcher to identify and remove domain-specific words and incorrect predictions, add domain-specific words and phrases that express particular sentiments, and cross-tabulate the texts with other similar, already coded texts (Provalis Research, n.d.).

The same tools that have been employed in this dissertation can be applied to different data sources. In response to the relatively high potential proactivity but low representativeness of Twitter data, research can be carried out comparing news outlets, as in Boykoff's (2008) comparison of UK tabloid and broadsheet newspaper coverage of climate change, which had key implications for science communication and governance.

Finally, although this research claims to work on system change, it remains fairly rooted in a political-economic sphere and in relatively narrow conceptions of policy understanding, communication, and action. Returning to the educational roots of the research, future iterations can and should adopt further depth and lenses that build with non-hegemonic perspectives, both within and outside the EU, including different 'literacies', such as symbolic literacy, policy responses, governance structures, and civic participation.

VIII. References

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IX. Appendix

The appendices have been exported and inserted directly from WordStat and QDA Miner to preserve their authenticity and integrity.

Appendix A. Twitter user location categorisation model

- EUROPE
  - EU
    - BELGIUM
      - @BRXCAPITAL [CAPITAL AND BRUSSELS /A /D]
      - @HEADBRX [HEAD AND BRUSSELS /A /D]
      - @HQBELGIUM [HQ AND BELGIUM /A /D]
      - ANTWERP
      - BELGIEN
      - BELGIO
      - BELGIQUE
      - BELGIV
      - BRUSELAS
      - BRUSSEL
      - BRUSSELS
      - BELGIUM
      - BRUXELLES
      - BRV°SSEL
      - BV
      - BXL
      - FLANDERS
      - COMMISSION
      - LGICA
      - NABU
      - OFFICE
    - GERMANY
      - @DIGERMANY [DI AND MONACO AND BAVIERA /Y /D/D]
      - @GERMANAREA [AREA AND RHINE /A /D]
      - @HQBERLIN [HQ AND GRONAU AND BERLIN /Y /D/D]
      - @LOWERGER [LOWER AND RHINE AND SAXONY /Y /D/D]
      - @MUNCHENGLADBACH [MV AND ?nchengladbach AND DEUTSCHLAND /Y /D/D]
      - @SGERMANY [SOUTH AND GERMANY /A /D]
      - BAVIERA
      - BERLIN
      - BERLINO
      - BONN
      - FRANKFURT
      - GERMANIA
      - GERMANY
      - DEUTSCHLAND
      - GERMANY-OSTSEE
      - HAMBURG
      - HANNOVER
      - HANOVER
      - LV°BECK
      - MUNICH
      - KARLSRUHE
      - SAXONY
      - UND
    - FRANCE
      - @CVFRANCE [CV AND ¥te d'Azur /A /D]
      - @FRANCE [LA AND LOIRE AND ROCHELLE AND PICARDIE /Y /D/D/D]
      - @FRANCEAREA [AREA AND PARIS /A /D]
      - FRANCE
      - ILE-DE-FRANCE
      - PARIGI
      - PARIS
      - FRANCIA
      - STRASBOURG
      - RUE
    - EUROPEAN
    - EUROPA
    - MEDITERRANEAN
    - SPAIN
      - @CVSPAIN [CV AND °diz AND =rdoba AND °ceres AND Espav±a /Y /D/D/D/D]
      - @DISPAIN [DI AND GIACOMO AND MAIORCA /Y /D/D]
      - @LASPAIN [LA AND GARRIGA AND BARCELONA AND PLANA AND Lv?nea AND RIOJA AND PALMA AND REINA AND SIERRA AND LOSA /Y /
      - @MALAGA [MV AND °laga AND Espav±a /Y /D/D]
      - @SPAIN [SAN AND Josv© AND SEBASTIANO AND GIACOMO AND Sebastiv°n AND Agustv?n /Y /D/D/D/D/D]
      - @SPAINAREA [AREA AND BARCELONA /A /D]
      - @SPAINISLANDS [ISLANDS AND CANARY AND BALEARIC /Y /D/D]
      - BARCELONA
      - CANARIE
      - CATALUNYA
      - COMUNIDAD
      - ES
      - MADRID
      - ESPANA
      - MURCIA
      - SPAIN
      - SPAGNA
      - VALENCIA

- ITALY
  - @DIITALIA [DI AND BARGONE AND ROCCA /Y /D/D]
  - @STYROL [SOUTH AND TYROL /A /D]
  - CREMONA
  - EMILIA
  - FLORENCE
  - FRIULI
  - GIULIA
  - ISOLE
  - ISPRA
  - ITALY
  - ITALIA
  - LAZIO
  - LOMBARDIA
  - MILAN
  - MILANO
  - PALERMO
  - ROMAGNA
  - ROME
  - ROMA
  - SICILIA
  - ROMV
  - TORINO
  - TOSCANA
  - VENEZIA
- GREECE
  - @CORFU [ISLAND AND CORFU /A /D]
  - GREECE
  - ATHENS
  - THESSALONIKI
- NETHERLANDS
  - @DEN [DEN AND HAAG AND BOSCH /A /D/D]
  - @HAGUE [LA AND HAYE /A /D]
  - @HQAMS [HQ AND AMSTERDAM /A /D]
  - @SOUTH [SOUTH AND HOLLAND /Y /D]
  - HAGUE
  - NEDERLAND
  - NETHERLANDS
  - AMSTERDAM
  - NL
  - ROTTERDAM
  - UTRECHT
- REPUBLIC OF IRELAND
  - @EASTIRE [EAST AND CORK AND CLARE AND IRELAND /A /D/D/D]
  - @HEADIRE [HEAD AND CORK /A /D]
  - @HQIRELAND [HQ AND IRELAND /A /D]
  - @IRELAND [REPUBLIC AND IRELAND /A /D]
  - @MOUNTST [ST AND DUBLIN /A /D]
  - @SOUTHIRELAND [SOUTH AND KERRY AND CORK AND DUBLIN /A /D/D/D]
  - @WESTIRELAND [WEST AND CORK AND IRELAND /Y /D/D]
  - CITTV
  - DUBLIN
  - CORK
  - DUBLINO
  - IRLANDA
  - LR
  - MOUNT
- LUXEMBOURG
  - LUXEMBOURG
- FINLAND
  - FINLAND
  - HELSINKI
  - TAPIOLA
  - SUOMI
- PORTUGAL
  - @CVPORTUGAL [CV AND ¢mara AND MADEIRA /Y /D/D]
  - PORTO
  - PORTUGAL
  - LISBON
  - PT
- CROATIA
  - @CROATIA [REPUBLIC AND CROATIA /A /D]
  - CROATIA
  - ZAGREB
- AUSTRIA
  - @LOWERAUSTRIA [LOWER AND AUSTRIA /A /D]
  - VIENNA
  - AUSTRIA
  - WIEN
  - VÑSTERREICH
- POLAND

- POLAND
- POLONIA
- POLSKA
- WARSZAWA
- WARSAW

DENMARK
- DENMARK
- COPENHAGEN

BULGARIA
- BULGARIA
- SOFIA

SWEDEN
- SVERIGE
- SWEDEN
- STOCKHOLM

ESTONIA
- ESTONIA
- TALLINN

CZECH REPUBLIC
- @CZECH [REPUBLIC AND CZECH /A /D]
- CZECH
- CZECH_REPUBLIC
- PRAGUE

SLOVENIA
- @SLOVENIA [REPUBLIC AND SLOVENIA /A /D]
- SLOVENIA
- LJUBLJANA

MALTA
- MALTA

HUNGARY
- BUDAPEST
- HUNGARY
- HU

LATVIA
- LATVIA
- @GA [GA AND Rƒ´ AND Latvija AND Kuldƒ´ AND LATVIA /Y /D/D/D/D]

ROMANIA
- ROMANIA
- RO

SLOVAKIA
- @SLOVAKIA [REPUBLIC AND SLOVAK /A /D]
- @SLOVAKIAREGION [REGION AND SLOVAKIA /A /D]

SERBIA
- @SERBIA [REPUBLIC AND SERBIA /A /D]
- SE

MACEDONIA
- @MACEDONIA [REPUBLIC AND MACEDONIA /A /D]

- @MEDREG [REGION AND MEDITERRANEAN /A /D]
- @DENEUR [DEN AND FIN AND NOR AND SWE AND COL /A /D/D/D/D]
- @EURAREA [AREA AND EUROPEAN AND MEDITERRANEAN /Y /D/D]

UK
- @EASTUK [EAST AND ENGLAND AND YORKSHIRE AND MIDLANDS AND KILBRIDE AND SLOUGH AND BEACONSFIELD AND ANGLIA AND SUS
- @SOUTH [SOUTH AND DEVON AND ENGLAND AND COASTAL AND UK AND WEST AND CHESHIRE AND SHIELDS AND LONDON AND BEACON
- @STUK [ST AND HELENS AND ANDREWS /Y /D/D]
- @UK [UNITE AND KINGDOM /A /D]
- @WESTUK [WEST AND MIDLANDS AND SUSSEX AND ENGLAND AND SCOTLAND AND LONDON AND SOMERSET /Y /D/D/D/D/D/D]
- BRITAIN
- CAMBRIDGE
- CYMRU
- EDINBURGH
- ENGLAND
- GREAT_BRITAIN
- KINGDOM
- LONDON
- MIDLAND
- NORTHERN
- OXFORD
- REGNO
- REGNO_UNITO
- SCOTLAND
- UK
- UNITE_KINGDOM
- UNITED_KINGDOM
- UNITO
- WALE
- WALES
- YORK

NORWAY
- NORWAY
- OSLO

SWITZERLAND

- @SANSWITZ [SAN AND GALLO /A /D]
- @STGALLEN [ST AND GALLEN /A /D]
- SWITZERLAND
- GENEVA

RUSSIA
- @SANRUSSIA [SAN AND PIETROBURGO /A /D]
- @STPET [ST AND PETERSBURGH /A /D]

- @SEEUROPE [EAST AND EUROPE /A /D]

NORTH_AMERICA

CANADA
- @CANADAISLANDS [ISLAND AND VANCOUVER AND OTTAWA AND TORONTO /Y /D/D/D]
- @KINGLANDING [LANDING AND KING /A /D]
- @WESTCAN [WEST AND VANCOUVER AND CANADA /Y /D/D]
- CANADA
- MONTREAL
- ONTARIO
- TORONTO
- VANCOUVER

DOMINICAN_REPUBLIC
- @DOMINICANREPUBLIC [REPUBLIC AND DOMINICAN /A /D]

EL_SALVADOR
- @ELSALVADOR [SAN AND SALVADOR /A /D]

CUBA
- @CUBA [LA AND HABANA /A /D]

USA
- @GEORGIAUSA [GA AND ATLANTA AND EATONTON /Y /D/D]
- @LONGBEACHUSA [ISLAND AND LONG /A /D]
- @SANUSA [SAN AND FRANCISCO AND DIEGO AND JOSE AND FRAN AND ANTONIO /Y /D/D/D/D/D]
- @STUSA [ST AND ADA AND STOLEN /Y /D/D]
- @SUSA [SOUTH AND CAROLINA AND BEND AND BURLINGTON AND PASADENA /A /D/D/D/D]
- @USA [UNITE AND STATE AND STATES /Y /D/D]
- @USAAREA [AREA AND BOSTON AND BAY /Y /D/D]
- @USALAND [LAND AND OHLONE AND STOLEN AND AMERICAN AND MOHICAN AND AUCOCISCO AND OCCUPIED AND NACOTCHTANK AND M
- @WESTUSA [WEST AND MANHATTAN /A /D]
- ANGELES
- CA
- CALIFORNIA
- CHICAGO
- DC
- IL
- LOS
- LOS_ANGELES
- MA
- NY
- PA
- STATE
- TEXAS
- UNITE_STATES
- USA
- UNITED_STATES
- WASHINGTON
- VA
- @NCTRIANGLE [REGION AND TRIANGLE /A /D]

MEXICO
- @MEXICO [MV AND ©xico /A /D]

CAYMAN_ISLANDS
- @CAYMAN [ISLANDS AND CAYMAN /A /D]

LATIN_AMERICA

COLOMBIA
- COLOMBIA

CHILE
- CHILE
- @SANCHILE [SAN AND PEDRO /A /D]

BRASIL
- BRASIL
- @SANBRASIL [SAN AND PAOLO /A /D]

BOLIVIA
- @BOLIVIA [LA AND PAZ /A /D]

ASIA

INDIA
- @DELHINCR [CAPITAL AND NATIONAL AND REGION /A /D/D]
- @DELHINCREGION [REGION AND NATIONAL AND CAPITAL /A /D/D]
- @NATIONALCR [NATIONAL AND CAPITAL AND REGION /A /D/D]
- @NDELHI [NUOVA AND DELHI /A /D]
- INDIA
- DELHI

UNITED_ARAB_EMIRATES
- @UAE [UNITE AND ARAB AND EMIRATES AND EMIRATE /Y /D/D/D]
- ARAB
- DUBAI
- EMIRATES

- UNITED_ARAB_EMIRATES
- ASIA
- CHINA
  - CHINA
  - BEIJING
- JAPAN
  - JAPAN
  - TOKYO
- PAKISTAN
  - PAKISTAN
  - @PAKISTAN [REPUBLIC AND PAKISTAN /A /D]
- TAIWAN
  - TAIWAN
  - TAIPEI
- TURKEY
  - ANKARA
  - TURKEY
  - ISTANBUL
  - TV°RKIYE
  - F
- @SASIA [SOUTH AND ASIA /A /D]
- SOUTH_KOREA
  - @SKOREA [SOUTH AND KOREA /A /D]
  - @KOREA [REPUBLIC AND KOREA /A /D]
- IRAN
  - @IRAN [REPUBLIC AND IRAN /A /D]
- PHILIPPINES
  - @DAVAO [REGION AND DAVAO /A /D]
  - @PHILIPPINES [REPUBLIC AND PHILIPPINES /A /D]
  - @MANILA [CAPITAL AND MANILA /A /D]
- INDONESIA
  - @JAKARTA [CAPITAL AND JAKARTA /A /D]
  - @JAKARTACR [REGION AND JAKARTA /A /D]

AFRICA
- @AFCONTINENT [CONTINENT AND AFRICAN /A /D]
- AFRICA
- KENYA
  - KENYA
  - NAIROBI
- UGANDA
  - UGANDA
  - KAMPALA
- AFRICAN
- NIGERIA
  - NIGERIA
- EGYPT
  - @EGYPTST [ST AND ZAMALEK /A /D]
  - EGYPT
  - CAIRO
- SOUTH_AFRICA
  - @SAFRICA [SOUTH AND AFRICA /A /D]
  - @CITY [CITY AND SUN /A /D]
  - @SUNCITY [SUN AND CITY /A /D]
- SUN_CITY
- SOUTH_AFRICA
- PRETORIA
- SANDTON
- CAPE_TOWN
- CENTURION
- BLOEMFONTEIN
- STELLENBOSCH
- JOHANNESBURG
- DURBAN
- EMALAHLENI
- MAURITIUS
  - @MAURITIUS [REPUBLIC AND MAURITIUS /A /D]
- DEMOCRATIC_REPUBLIC_OF_CONGO
  - @CONGO [REPUBLIC AND CONGO /A /D]
- TANZANIA
  - @WESTTANZ [WEST AND TANZANIA /A /D]
- TUNISIA
  - @TUNISIA [LA AND SOUKRA /A /D]
- COTE_DIVOIRE
  - @COTEDIVOIRE [CV AND ¥te AND d'Ivoire /Y /D/D]

AUSTRALASIA
- AUSTRALIA
  - @AUSTRALIALAND [LAND AND GURANG AND KAURNA AND GADIGAL AND WANGAL AND WURUNDJERI AND GUNAIKURNAI /Y /D/D/D/D/D/D]
  - @NSWALES [SOUTH AND WALES AND NEW AND AUSTRALIA /Y /D/D/D]
  - @VICTORIA [REGION AND VICTORIA /A /D]
  - AUSTRALIA
  - MELBOURNE

- VICTORIA
- @TURTLEISLAND [ISLAND AND TURTLE /A /D]

WORLD
- EARTH
- GLOBAL
- INTERNATIONAL
- PLANET
- WORLDWIDE
- WORLD

Appendix B. ETS, JTM, SCF redistributive dataset codebook

- **Purpose**
  - Information
    Updates on national or European Commission, Parliament, Minister, or specific Committee debates, approvals, reports, etc. Webinars or events. Statistics.
    KEYWORDS: WEBINAR, DEBATE, DISCUSSION, APPROVAL, PUBLICATION, REPORT, COMMITTEE, PARLIAMENT, UPDATE, LATEST, TODAY
  - Advocacy
    Advocating for a policy or action, whether as it stands, or with proposed modifications.
  - Critique
    Critiquing a policy, action, or stance, or reporting on others' critiques. e.g, reporting on different MEPs' responses to a given issue.
- **Context**
  - JTM
    Includes Just Transition Mechanism and Just Transition Fund.
    KEYWORDS: JTM, JTF, JUST_TRANSITION
  - SCF
  - ETS
    Inlcudes ETS and ETS2. If coded without buildings and transport, then ETS.
    KEYWORDS: ETS, ETS2
- **Actor**
  - EU Institutions
    European Commission
    European Parliament
    European Council
    Special Rapporteurs
    Committees
    KEYWORDS: EUROPEAN_COMMISSION, EU_ENVI, EU_BUDGET, EC, EU_PARL, EU_COM
  - Industry
    Unions, industries, and large corporations.
  - **Politicians/governments**
    - European
      MEPs, Committee members, Council, or Commission members or leaders.
      KEYWORDS: FRANS_TIMMERMANS, URSULA_VON_DER_LEYEN, PETER_LIESE
    - National
      National governments, ministers, or politicians of EU member states or non-EU states. Issues regarding national contexts. e.g., Eamon Ryan
      KEYWORDS: MS, MINISTRY, GOVERNMENT, MINISTER
  - Civil society organisations
    Non-governmental organisations, academic institutions, news media.
    KEYWORDS: GREENPEACE, EURACTIV, FINANCIAL_TIMES, EUI
  - **Citizens**
    - Privileged
    - Vulnerable
      References to vulnerable citizens or households, energy poverty, mobility poverty, or indirect references, such as 'those most affected' or 'at risk'.
      KEYWORDS: ENERGY_POVERTY, MOBILITY_POVERTY
    - All citizens
      References to citizens or general populations without specifying a particular socioeconomic category. Also includes general calls for participation, such as surveys, applications, or webinars.
    - Future generations
      Inlcudes references to youth or future generations.
      KEYWORDS: YOUTH, FUTURE_GENERATION, YOUNG
  - Small businesses
    Small and micro businesses or enterprises.
    KEYWORDS: SMALL, MICRO, SMES, SMALL_ENTERPRISE, SMALL_BUSINESS
  - Supranational organisations
    References to supranational organisations other than the EU, such as the WTO.
    KEYWORDS: WTO
- **Nature**
  - Praise
    Tweets supporting a given action, policy, figure, or stance.
  - Object/target
    Neutral reference to the context, actor, or focus. Often in correspondence with a purely 'information' tweet.
  - Blame
    Blaming actors, stances, or systems for negative outcomes.
  - Duty
    An expectation, obligation, or duty to effect a given action or change, or take a given stance. Expressed by the actors themselves, or about other actors.
    KEYWORDS: MUST
  - Responsibility
    Actors taking responsibility for, or ownership of, a task, change, or outcome.
  - Burden
    References to actors facing apparently unfair obligations or effects, such as costs.
    KEYWORDS: BEAR, UNFAIR, BURDEN
- **Focus**
  - International
    Referencing different nations, including extra-EU, or to a global or international context generally, such as international institutions, or global inequalities.
  - **CBAM**
    - Carbon leakage
      References to carbon leakage, international competitiveness, competition.
      KEYWORDS: CARBON_LEAKAGE, CBAM
    - Taxation
      References to border carbon taxes.
      KEYWORDS: CBAM, BORDER_TAX
  - Funding/investment
    References to funds, investment, subsidies, financing, debts. and repayments.
  - Digital
    References to digital transitions, recoveries, growth, or tools.
  - Subnational
    References to subnational regions, cities, or actors. For example, citizen surveys in the Midland Region in Ireland.
    KEYWORDS: EUINMYREGION, LOCAL, CITY, SMART_CITIES
  - Renewables
    References to solar, wind, or hydro power. Also includes references to nuclear power, as this always co-occurred with renewables.
    KEYWORDS: SOLAR, WIND, HYDRO, RENEWABLE, NUCLEAR
  - Fossil fuels
    References to fossil fuels and to fossil fuel-producing regions.
    KEYWORDS: COAL, FOSSIL_FUEL, CARBON, CO2, GAS, NATURAL_GAS, OIL, DIESEL
  - Programmes
    References to European programmes such as NextGenEU, the Forest Strategy, or the Year of Rail.
    KEYWORDS: EU_YEAR_OF_RAIL, CIRCULAR_ECONOMY, RECOVERY_AND_RESILIENCE, NEXT_GENERATION_EU, OWN_RESOURCES, EU_FOREST_STRATEGY
  - Environment
    References to the environment, species, nature, pollution.

KEYWORDS: ENVIRONMENT, NATURE, SPECIES, POLLUTION, DEGRADATION, FOREST, LAND

- Jobs
  References to jobs, employment.
  KEYWORDS: JOB, EMPLOYMENT
- Emissions
  References to emissions trading, emissions, neutrality, carbon transition.
  KEYWORDS: NEUTRAL, NEUTRALITY, EMISSION, CARBON, CO2
- Transport
  References to rail, electric vehicles, and the inclusion of transport in the EUETS2.
  KEYWORDS: RAIL, ELECTRIC_VEHICLE, EV, TRANSPORT, ROAD_TRANSPORT, ROAD, EUETS2
- Equity
  References to fairness, inequality, social justice, inclusion.
  *KEYWORDS: SOCIAL_JUSTICE, INEQUALIT**
- Raw materials
  References to raw material extraction, mining, resources.
  KEYWORDS: RAW_MATERIAL, MINE, MINING, NATURAL_RESOURCES, EXTRACTION
- Regulations
  References to European regulations, e.g., on emissions, competition, forests.
  KEYWORDS: EFFORT_SHARING_REGULATION, REGULATION, CAP, IMPLEMENTATION
- Compensation
  References to accounting or compensating for costs faced by citizens or industries due to the green transition and related policies.
  KEYWORDS: COMPENSATION
- Cap
  References to carbon caps.
- Buildings
  References to building energy efficiency and the inclusion of buildings in the EUETS2.
  KEYWORDS: BUILDING, HEATING, PUBLIC_BUILDING
- Procedural
  References to procedural or administrative aspects, such as the multi-year financial framework, debates and decisions, or budget planning.
  KEYWORDS: MFF, BUDGET, APPROVE, ANNOUNCE, AGREE, DECISION, DEBATE, DISCUSSION, MULTI_YEAR_FINANCIAL_FRAMEWORK
- War
  References to the war in Ukraine.
  KEYWORDS: WAR, UKRAINE

Outcome

- Loss
  Tweets that frame a current or proposed action, stance, or policy as resulting in a net loss for, or detriment to, society.
- Gain
  Tweets that frame a current or proposed action, stance, or policy as resulting in a net gain for, or benefit to, society.
- Participation
  Tweets whose aim is to generate participation, e.g., in a survey, a webinar, an event, etc.
  KEYWORDS: REGISTER, JOIN, SIGN_UP, SUMBIT, APPLY, PARTICIPATE, ATTEND, HAVE_YOUR_SAY
- System change
  Tweets that reference a need/call for a change to how a mechanism, relationship, or system operates.
  KEYWORDS: CHANGE, IMPROVE, TRANSFORM, MODIFY, OVERHAUL, RETHINK

Appendix C. ETS, JTM, SCF frequency tree

	Count	% Codes	Cases	% Cases
Purpose				
Information	429	7,9%	425	55,8%
Advocacy	413	7,6%	405	53,1%
Critique	187	3,4%	185	24,3%
Context				
JTM	212	3,9%	211	27,7%
SCF	267	4,9%	265	34,8%
ETS	282	5,2%	282	37,0%
Actor				
EU Institutions	253	4,7%	249	32,7%
Industry	42	0,8%	42	5,5%
Politicians/governments				
European	165	3,0%	165	21,7%
National	139	2,6%	139	18,2%
Civil society organisations	109	2,0%	109	14,3%
Citizens				
Privileged				
Vulnerable	24	0,4%	24	3,1%
All citizens	188	3,5%	187	24,5%
Future generations	80	1,5%	80	10,5%
Small businesses	2	0,0%	2	0,3%
Supranational organisations	18	0,3%	18	2,4%
Nature				
Praise	95	1,7%	94	12,3%
Object/target	67	1,2%	67	8,8%
Blame	72	1,3%	71	9,3%
Duty	167	3,1%	163	21,4%
Responsibility	56	1,0%	56	7,3%
Burden	32	0,6%	32	4,2%
Focus				
International	41	0,8%	41	5,4%
CBAM				
Carbon leakage	46	0,8%	46	6,0%
Taxation	53	1,0%	53	7,0%
Funding/investment	222	4,1%	222	29,1%
Digital	134	2,5%	134	17,6%
Subnational	17	0,3%	17	2,2%
Renewables	59	1,1%	58	7,6%
Fossil fuels	25	0,5%	24	3,1%
Programmes	151	2,8%	151	19,8%
Environment	35	0,6%	35	4,6%
Jobs	12	0,2%	12	1,6%
Emissions	97	1,8%	95	12,5%
Transport	95	1,7%	94	12,3%
Equity	170	3,1%	166	21,8%
Raw materials	7	0,1%	7	0,9%
Regulations	82	1,5%	72	9,4%
Compensation	30	0,6%	30	3,9%
Cap	30	0,6%	30	3,9%
Buildings	52	1,0%	52	6,8%
Procedural	30	0,6%	30	3,9%
War	28	0,5%	28	3,7%
Outcome				
Loss	101	1,9%	99	13,0%
Gain	265	4,9%	261	34,3%
Participation	147	2,7%	145	19,0%
System change	211	3,9%	209	27,4%

Appendix D. ETS, JTM, SCF proximity tables

Co-occurrences with [Advocacy;Blame;Critique;Gain;Loss;Praise;System change]

TARGET	KEYWORD	CO-OCCURS	DO NOT	IS ABSENT	Jaccard	STRENGTH
Blame	All citizens	22	168	52	0,091	•••••
Loss	All citizens	26	164	79	0,097	•••••
Praise	All citizens	37	153	60	0,148	•••••••
Critique	All citizens	47	143	144	0,141	•••••••
System change	All citizens	48	142	167	0,134	•••••••
Gain	All citizens	55	135	218	0,135	•••••••
Advocacy	All citizens	70	120	359	0,128	••••••
Blame	Buildings	4	48	70	0,033	••
Praise	Buildings	8	44	89	0,057	•••
Loss	Buildings	9	43	96	0,061	•••
Gain	Buildings	10	42	263	0,032	••
System change	Buildings	15	37	200	0,060	•••
Critique	Buildings	20	32	171	0,090	••••
Advocacy	Buildings	24	28	405	0,053	•••
Praise	Burden	3	29	94	0,024	•
Gain	Burden	3	29	270	0,010	
System change	Burden	4	28	211	0,016	•
Advocacy	Burden	4	28	425	0,009	
Blame	Burden	20	12	54	0,233	••••••••••••
Loss	Burden	27	5	78	0,245	••••••••••••
Critique	Burden	29	3	162	0,149	•••••••
Praise	Cap	2	28	95	0,016	•
Gain	Cap	3	27	270	0,010	
System change	Cap	4	26	211	0,017	•
Advocacy	Cap	12	18	417	0,027	•
Praise	Carbon leakage	8	38	89	0,059	•••
Gain	Carbon leakage	25	21	248	0,085	••••
System change	Carbon leakage	30	16	185	0,130	••••••
Advocacy	Carbon leakage	32	14	397	0,072	••••
Praise	Civil society organisations	4	105	93	0,020	•
System change	Civil society organisations	20	89	195	0,066	•••
Blame	Civil society organisations	28	81	46	0,181	•••••••••
Gain	Civil society organisations	28	81	245	0,079	••••
Loss	Civil society organisations	30	79	75	0,163	••••••••
Critique	Civil society organisations	35	74	156	0,132	•••••••
Advocacy	Civil society organisations	36	73	393	0,072	••••
Praise	Compensation	1	29	96	0,008	
Blame	Compensation	3	27	71	0,030	•
Gain	Compensation	5	25	268	0,017	•
Loss	Compensation	9	21	96	0,071	••••
Critique	Compensation	12	18	179	0,057	•••
Advocacy	Compensation	12	18	417	0,027	•
System change	Compensation	16	14	199	0,070	•••
Praise	Digital	1	133	96	0,004	
System change	Digital	5	129	210	0,015	•
Gain	Digital	124	10	149	0,438	••••••••••••••••••••
Advocacy	Digital	128	6	301	0,294	••••••••••••••
Loss	Duty	5	170	100	0,018	•
Blame	Duty	8	167	66	0,033	••
Praise	Duty	14	161	83	0,054	•••
Critique	Duty	29	146	162	0,086	••••
System change	Duty	62	113	153	0,189	•••••••••
Gain	Duty	107	68	166	0,314	••••••••••••••••

Co-occurrences with [Advocacy;Blame;Critique;Gain;Loss;Praise;System change]

TARGET	KEYWORD	CO-OCCURS	DO NOT	IS ABSENT	Jaccard	STRENGTH
Advocacy	Duty	160	15	269	0,360	••••••••••••••••
Blame	Emissions	3	98	71	0,017	•
Loss	Emissions	5	96	100	0,025	•
Praise	Emissions	18	83	79	0,100	•••••
Gain	Emissions	19	82	254	0,054	•••
Critique	Emissions	22	79	169	0,081	••••
System change	Emissions	41	60	174	0,149	•••••••
Advocacy	Emissions	49	52	380	0,102	•••••
Gain	Environment	2	33	271	0,007	
Praise	Environment	3	32	94	0,023	•
System change	Environment	5	30	210	0,020	•
Advocacy	Environment	9	26	420	0,020	•
Critique	Environment	21	14	170	0,102	•••••
Blame	Environment	22	13	52	0,253	••••••••••••
Loss	Environment	22	13	83	0,186	•••••••••
Blame	Equity	3	175	71	0,012	•
Loss	Equity	5	173	100	0,018	•
Praise	Equity	26	152	71	0,104	•••••
Critique	Equity	31	147	160	0,092	•••••
System change	Equity	65	113	150	0,198	••••••••••
Gain	Equity	101	77	172	0,289	••••••••••••••
Advocacy	Equity	153	25	276	0,337	••••••••••••••••
Praise	ETS	29	253	68	0,083	••••
Blame	ETS	30	252	44	0,092	•••••
Loss	ETS	34	248	71	0,096	•••••
Gain	ETS	62	220	211	0,126	••••••
Critique	ETS	69	213	122	0,171	•••••••••
System change	ETS	91	191	124	0,224	••••••••••
Advocacy	ETS	135	147	294	0,234	••••••••••••
Blame	EU Institutions	11	250	63	0,034	••
Loss	EU Institutions	12	249	93	0,034	••
Critique	EU Institutions	46	215	145	0,113	••••••
Praise	EU Institutions	54	207	43	0,178	•••••••••
System change	EU Institutions	81	180	134	0,205	•••••••••
Gain	EU Institutions	119	142	154	0,287	••••••••••••••
Advocacy	EU Institutions	180	81	249	0,353	••••••••••••••••••
Blame	European	21	144	53	0,096	•••••
Loss	European	27	138	78	0,111	••••••
Praise	European	29	136	68	0,124	••••••
Gain	European	29	136	244	0,071	••••
Critique	European	36	129	155	0,112	••••••
System change	European	36	129	179	0,105	•••••
Advocacy	European	55	110	374	0,102	•••••
Praise	Fossil fuels	3	24	94	0,025	•
Gain	Fossil fuels	3	24	270	0,010	•
Blame	Fossil fuels	8	19	66	0,086	••••
Advocacy	Fossil fuels	8	19	421	0,018	•
System change	Fossil fuels	9	18	206	0,039	••
Critique	Fossil fuels	11	16	180	0,053	•••
Loss	Fossil fuels	12	15	93	0,100	•••••
Blame	Funding/investment	7	215	67	0,024	•
Loss	Funding/investment	11	211	94	0,035	••
Praise	Funding/investment	15	207	82	0,049	••
System change	Funding/investment	31	191	184	0,076	••••
Critique	Funding/investment	32	190	159	0,084	••••
Gain	Funding/investment	133	89	140	0,367	••••••••••••••••

Co-occurrences with [Advocacy;Blame;Critique;Gain;Loss;Praise;System change]

TARGET	KEYWORD	CO-OCCURS	DO NOT	IS ABSENT	Jaccard	STRENGTH
Advocacy	Funding/investment	150	72	279	0,299	•••••••••••••••
System change	Future generations	1	79	214	0,003	
Gain	Future generations	70	10	203	0,247	••••••••••••
Advocacy	Future generations	72	8	357	0,165	••••••••
Loss	Industry	3	39	102	0,021	•
Blame	Industry	7	35	67	0,064	•••
Gain	Industry	12	30	261	0,040	••
Critique	Industry	14	28	177	0,064	•••
System change	Industry	19	23	196	0,080	••••
Advocacy	Industry	22	20	407	0,049	••
Blame	Information	18	419	56	0,037	••
Loss	Information	22	415	83	0,042	••
Praise	Information	60	377	37	0,127	•••••••
Critique	Information	65	372	126	0,115	•••••••
System change	Information	98	339	117	0,177	•••••••••
Gain	Information	122	315	151	0,207	••••••••••
Advocacy	Information	175	262	254	0,253	••••••••••••
Loss	International	1	40	104	0,007	
Critique	International	4	37	187	0,018	•
Praise	International	8	33	89	0,062	•••
System change	International	28	13	187	0,123	•••••••
Gain	International	28	13	245	0,098	•••••
Advocacy	International	33	8	396	0,076	••••
Blame	Jobs	1	11	73	0,012	•
Loss	Jobs	1	11	104	0,009	
Critique	Jobs	1	11	190	0,005	
System change	Jobs	2	10	213	0,009	
Praise	Jobs	9	3	88	0,090	•••••
Advocacy	Jobs	12	0	417	0,028	•
Gain	Jobs	13	-1	260	0,048	••
Praise	JTM	10	204	87	0,033	••
Gain	JTM	33	181	240	0,073	••••
Blame	JTM	42	172	32	0,171	•••••••••
System change	JTM	51	163	164	0,135	•••••••
Loss	JTM	57	157	48	0,218	••••••••••
Advocacy	JTM	68	146	361	0,118	•••••••
Critique	JTM	84	130	107	0,262	••••••••••••
Praise	National	15	124	82	0,068	•••
Blame	National	27	112	47	0,145	•••••••
Gain	National	31	108	242	0,081	••••
Loss	National	34	105	71	0,162	••••••••
System change	National	35	104	180	0,110	•••••
Critique	National	47	92	144	0,166	••••••••
Advocacy	National	54	85	375	0,105	•••••
Advocacy	Object/target	1	66	428	0,002	
Loss	Object/target	4	63	101	0,024	•
System change	Object/target	10	57	205	0,037	••
Critique	Object/target	11	56	180	0,045	••
Praise	Participation	3	148	94	0,012	•
Critique	Participation	18	133	173	0,056	•••
System change	Participation	23	128	192	0,067	•••
Gain	Participation	23	128	250	0,057	•••
Advocacy	Participation	56	95	373	0,107	•••••
Loss	Procedural	1	29	104	0,007	
Blame	Procedural	2	28	72	0,020	•
Critique	Procedural	10	20	181	0,047	••

Co-occurrences with [Advocacy;Blame;Critique;Gain;Loss;Praise;System change]

TARGET	KEYWORD	CO-OCCURS	DO NOT	IS ABSENT	Jaccard	STRENGTH
Advocacy	Procedural	10	20	419	0,022	•
Praise	Procedural	11	19	86	0,095	•••••
Gain	Procedural	11	19	262	0,038	••
System change	Procedural	23	7	192	0,104	•••••
Critique	Programmes	5	146	186	0,015	•
System change	Programmes	8	143	207	0,022	•
Praise	Programmes	9	142	88	0,038	••
Gain	Programmes	127	24	146	0,428	••••••••••••••••••••
Advocacy	Programmes	138	13	291	0,312	••••••••••••••••
Blame	Raw materials	1	6	73	0,013	•
Loss	Raw materials	1	6	104	0,009	
Critique	Raw materials	1	6	190	0,005	
Gain	Raw materials	6	1	267	0,022	•
Advocacy	Raw materials	6	1	423	0,014	•
Blame	Regulations	1	101	73	0,006	
Loss	Regulations	1	101	104	0,005	
Praise	Regulations	6	96	91	0,031	••
Critique	Regulations	9	93	182	0,032	••
Gain	Regulations	24	78	249	0,068	•••
System change	Regulations	36	66	179	0,128	••••••
Advocacy	Regulations	48	54	381	0,099	•••••
Praise	Renewables	2	59	95	0,013	•
System change	Renewables	10	51	205	0,038	••
Gain	Renewables	11	50	262	0,034	••
Blame	Renewables	13	48	61	0,107	•••••
Advocacy	Renewables	15	46	414	0,032	••
Loss	Renewables	33	28	72	0,248	••••••••••••
Critique	Renewables	37	24	154	0,172	•••••••••
Gain	Responsibility	53	3	220	0,192	••••••••••
Advocacy	Responsibility	56	0	373	0,131	•••••••
Blame	SCF	7	264	67	0,021	•
Loss	SCF	16	255	89	0,044	••
Praise	SCF	45	226	52	0,139	•••••••
System change	SCF	55	216	160	0,128	••••••
Critique	SCF	56	215	135	0,138	•••••••
Gain	SCF	165	106	108	0,435	••••••••••••••••••••••
Advocacy	SCF	196	75	233	0,389	••••••••••••••••••
Praise	Small businesses	1	1	96	0,010	•
Loss	Small businesses	1	1	104	0,009	
Critique	Small businesses	1	1	190	0,005	
Gain	Small businesses	1	1	272	0,004	
Advocacy	Small businesses	1	1	428	0,002	
System change	Subnational	4	13	211	0,018	•
Advocacy	Subnational	6	11	423	0,014	•
Critique	Supranational organisations	1	17	190	0,005	
Gain	Supranational organisations	17	1	256	0,062	•••
Advocacy	Supranational organisations	17	1	412	0,040	••
System change	Supranational organisations	18	0	197	0,084	••••
Praise	Taxation	1	52	96	0,007	
Loss	Taxation	3	50	102	0,019	•
Critique	Taxation	9	44	182	0,038	••
Gain	Taxation	18	35	255	0,058	•••
System change	Taxation	28	25	187	0,117	••••••
Advocacy	Taxation	30	23	399	0,066	•••
Blame	Transport	5	92	69	0,030	••
Loss	Transport	10	87	95	0,052	•••

Co-occurrences with [Advocacy;Blame;Critique;Gain;Loss;Praise;System change]

TARGET	KEYWORD	CO-OCCURS	DO NOT	IS ABSENT	Jaccard	STRENGTH
Critique	Transport	17	80	174	0,063	•••
Praise	Transport	21	76	76	0,121	••••••
System change	Transport	24	73	191	0,083	••••
Gain	Transport	30	67	243	0,088	••••
Advocacy	Transport	54	43	375	0,114	••••••
Blame	Vulnerable	1	23	73	0,010	•
Praise	Vulnerable	3	21	94	0,025	•
Loss	Vulnerable	7	17	98	0,057	•••
Gain	Vulnerable	7	17	266	0,024	•
System change	Vulnerable	8	16	207	0,035	••
Critique	Vulnerable	10	14	181	0,049	••
Advocacy	Vulnerable	14	10	415	0,032	••
Gain	War	2	26	271	0,007	
Critique	War	3	25	188	0,014	•
Advocacy	War	10	18	419	0,022	•

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